

UNIVERSITY OF MINNESOTA
PHYSICS AND NANOTECHNOLOGY BUILDING
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VOLUME 2: FIRE PROTECTION, PLUMBING, MECHANICAL
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Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

UNIVERSITY OF MINNESOTA
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e1.03E	Electrical Lighting Level 3 - Zone E		FC	FC
e1.04A	Electrical Lighting Level 4 - Zone A		FC	FC
e1.04B	Electrical Lighting Level 4 - Zone B		FC	FC
e1.04C	Electrical Lighting Level 4 - Zone C		FC	FC
e1.04D	Electrical Lighting Level 4 - Zone D		FC	FC
e1.04E	Electrical Lighting Level 4 - Zone E		FC	FC
e1.05A	Electrical Lighting Penthouse - Zone A		FC	FC
e1.05B	Electrical Lighting Penthouse - Zone B		FC	FC
e1.05C	Electrical Lighting Penthouse - Zone C		FC	FC
e1.05D	Electrical Lighting Penthouse - Zone D		FC	FC
e1.05E	Electrical Lighting Penthouse - Zone E		FC	FC
e2.00	Electrical Basement Ductbank Entry Plan	FC		FC
e2.00C	Electrical Power Basement-Zone C		FC	FC
e2.00D	Electrical Power Basement-Zone D		FC	FC
e2.00E	Electrical Power Basement-Zone E		FC	FC
e2.01C	Electrical Power Level 1 - Zone C		FC	FC
e2.01D	Electrical Power Level 1 - Zone D		FC	FC
e2.01E	Electrical Power Level 1 - Zone E		FC	FC
e2.02C	Electrical Power Level 2 - Zone C		FC	FC
e2.02D	Electrical Power Level 2 - Zone D		FC	FC
e2.02E	Electrical Power Level 2 - Zone E		FC	FC
e2.03A	Electrical Power Level 3 - Zone A		FC	FC
e2.03B	Electrical Power Level 3 - Zone B		FC	FC
e2.03C	Electrical Power Level 3 - Zone C		FC	FC
e2.03D	Electrical Power Level 3 - Zone D		FC	FC
e2.03E	Electrical Power Level 3 - Zone E		FC	FC
e2.04A	Electrical Power Level 4 - Zone A		FC	FC
e2.04B	Electrical Power Level 4 - Zone B		FC	FC
e2.04C	Electrical Power Level 4 - Zone C		FC	FC
e2.04D	Electrical Power Level 4 - Zone D		FC	FC
e2.04E	Electrical Power Level 4 - Zone E		FC	FC
e2.05A	Electrical Power Penthouse - Zone A		FC	FC
e2.05B	Electrical Power Penthouse - Zone B		FC	FC
e2.05C	Electrical Power Penthouse - Zone C		FC	FC
e2.05D	Electrical Power Penthouse - Zone D		FC	FC
e2.06A	Electrical Power Roof - Zone A		FC	FC
e2.06B	Electrical Power Roof - Zone B		FC	FC
e2.06C	Electrical Power Roof - Zone C		FC	FC
e2.06D	Electrical Power Roof - Zone D		FC	FC
e3.00C	Electrical Systems Basement-Zone C		FC	FC
e3.00D	Electrical Systems Basement-Zone D		FC	FC
e3.00E	Electrical Systems Basement-Zone E		FC	FC
e3.01C	Electrical Systems Level 1 - Zone C		FC	FC
e3.01D	Electrical Systems Level 1 - Zone D		FC	FC
e3.01E	Electrical Systems Level 1 - Zone E		FC	FC
e3.02C	Electrical Systems Level 2 - Zone C		FC	FC
e3.02D	Electrical Systems Level 2 - Zone D		FC	FC
e3.02E	Electrical Systems Level 2 - Zone E		FC	FC
e3.03A	Electrical Systems Level 3 - Zone A		FC	FC
e3.03B	Electrical Systems Level 3 - Zone B		FC	FC
e3.03C	Electrical Systems Level 3 - Zone C		FC	FC
e3.03D	Electrical Systems Level 3 - Zone D		FC	FC
e3.03E	Electrical Systems Level 3 - Zone E		FC	FC
e3.04A	Electrical Systems Level 4 - Zone A		FC	FC
e3.04B	Electrical Systems Level 4 - Zone B		FC	FC
e3.04C	Electrical Systems Level 4 - Zone C		FC	FC
e3.04D	Electrical Systems Level 4 - Zone D		FC	FC
e3.04E	Electrical Systems Level 4 - Zone E		FC	FC
e3.05A	Electrical Systems Penthouse - Zone A		FC	FC
e3.05B	Electrical Systems Penthouse - Zone B		FC	FC
e3.05C	Electrical Systems Penthouse - Zone C		FC	FC
e3.05D	Electrical Systems Penthouse - Zone D		FC	FC
e4.00C	Electrical Telecom Basement-Zone C		FC	FC
e4.00D	Electrical Telecom Basement-Zone D		FC	FC
e4.00E	Electrical Telecom Basement-Zone E		FC	FC
e4.01C	Electrical Telecom Level 1 - Zone C		FC	FC
e4.01D	Electrical Telecom Level 1 - Zone D		FC	FC
e4.01E	Electrical Telecom Level 1 - Zone E		FC	FC
e4.02C	Electrical Telecom Level 2 - Zone C		FC	FC
e4.02D	Electrical Telecom Level 2 - Zone D		FC	FC
e4.02E	Electrical Telecom Level 2 - Zone E		FC	FC
e4.03A	Electrical Telecom Level 3 - Zone A		FC	FC
e4.03B	Electrical Telecom Level 3 - Zone B		FC	FC
e4.03C	Electrical Telecom Level 3 - Zone C		FC	FC
e4.03D	Electrical Telecom Level 3 - Zone D		FC	FC
e4.03E	Electrical Telecom Level 3 - Zone E		FC	FC
e4.04A	Electrical Telecom Level 4 - Zone A		FC	FC
e4.04B	Electrical Telecom Level 4 - Zone B		FC	FC
e4.04C	Electrical Telecom Level 4 - Zone C		FC	FC
e4.04D	Electrical Telecom Level 4 - Zone D		FC	FC
e4.04E	Electrical Telecom Level 4 - Zone E		FC	FC
e4.05C	Electrical Telecom Penthouse - Zone C		FC	FC
e4.05D	Electrical Telecom Penthouse - Zone D		FC	FC
e5.01	Electrical One-Line Diagram		FC	FC
e5.02	Electrical One-Line Diagram		FC	FC
e5.03	Electrical One-Line Diagram		FC	FC
e5.04	Electrical One-Line Diagram		FC	FC
e5.05	Electrical One-Line Diagram		FC	FC
e5.06	Electrical One-Line Diagram		FC	FC
e5.07	Electrical One-Line Diagram		FC	FC
e5.08	Electrical One-Line Diagram		FC	FC
e5.09	Grounding One-Line Diagram		FC	FC
e5.10	Fire Alarm One-Line Diagram		FC	FC
e5.11	Rescue Assistance Intercom One-Line Diagram		FC	FC
e7.04	Steam Tunnel Electrical Lighting Power and Systems Plan		FC	FC
e8.01	Electrical Site Work Details	FC		FC
e8.02	Electrical Site Work Details	FC		FC
e8.03	Electrical Details		FC	FC
e8.04	Electrical Details		FC	FC
e9.01	Luminaire Schedule		FC	FC
e9.02	Electrical Feeder Schedule		FC	FC
e9.03	Electrical Panel Schedules		FC	FC
e9.04	Electrical Panel Schedules		FC	FC
e9.05	Electrical Panel Schedules		FC	FC
e9.06	Electrical Panel Schedules		FC	FC
e9.07	Electrical Panel Schedules		FC	FC
e9.08	Electrical Panel Schedules		FC	FC
e9.09	Electrical Panel Schedules		FC	FC
e9.10	Electrical Panel Schedules		FC	FC
e9.11	Electrical Panel Schedules		FC	FC
e9.12	Electrical Panel Schedules		FC	FC
e9.13	Electrical Panel Schedules		FC	FC
e9.14	Electrical Panel Schedules		FC	FC
e9.15	Electrical Panel Schedules		FC	FC
e9.16	Electrical Panel Schedules		FC	FC
e9.17	Electrical Motor Schedule		FC	FC

VOLUME 3 (CONT.)

COMMUNICATIONS				
Sheet Number	Sheet Name	BP-1	BP-2	PD3
T100	Title/ Index		FC	FC
T200	Basement Level Floor

FIRE PROTECTION SYMBOLS AND ABBREVIATIONS

NOTE: SYMBOLS AND ABBREVIATIONS INDICATED HERE AND NOT USED IN THE CONTRACT DOCUMENTS DO NOT APPLY TO THIS PROJECT. ADDITIONAL SYMBOLS MAY BE INDICATED IN THE CONTRACT DOCUMENTS.

GENERAL SYMBOLS

- D — DRAIN PIPE
- DSPR — DRY SPRINKLER PIPE
- F — FIRE SUPPLY
- FDC — FIRE DEPARTMENT CONNECTION PIPE
- FPTH — FIRE PUMP TEST HEADER PIPE
- SPR — SPRINKLER PIPE
- W — WATER SERVICE
- XF — EXISTING FIRE SUPPLY
- XSPR — EXISTING SPRINKLER PIPE
- R — BULK RISER
- ELBOW DOWN
- ELBOW UP
- TEE DOWN
- TEE UP
- PIPE CAP OR FLUSHING CONNECTION
- PIPE SLEEVE
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- SHUTOFF VALVE (SUPERVISED)
- SUPERVISED BUTTERFLY VALVE
- SUPERVISED OS&Y VALVE
- VALVE IN VERTICAL
- CHECK VALVE
- ALARM CHECK VALVE
- DRY PIPE VALVE ASSEMBLY
- PREACTION VALVE ASSEMBLY
- DELUGE VALVE ASSEMBLY
- SPRINKLER ZONE CONTROL VALVE ASSEMBLY
- FLOW SWITCH
- PRESSURE GAUGE (WITH VALVE)
- DOUBLE CHECK BACKFLOW PREVENTER (DCBP)
- REDUCED PRESSURE ZONE BACKFLOW PREVENTER (RPBP)
- HORN/STROBE
- FIRE ALARM BELL
- SMOKE DETECTOR IONIZATION TYPE
- SMOKE DETECTOR PHOTOELECTRIC TYPE
- HEAT DETECTOR
- AIR-ASPIRATING SMOKE DETECTOR
- A — ABORT SWITCH FOR CLEAN AGENT SYSTEM
- M — MANUAL ACTIVATION SWITCH FOR CLEAN AGENT SYSTEM
- D — DISCONNECT SWITCH FOR CLEAN AGENT SYSTEM
- RP — RELEASING PANEL FOR CLEAN AGENT SUPPRESSION SYSTEM

- SPRINKLER HEAD REFER TO DRAWING SPRINKLER HEAD LEGEND FOR TYPE
- EXISTING SPRINKLER HEAD CEILING MOUNTED
- SIDEWALL SPRINKLER HEAD
- EXISTING SIDEWALL SPRINKLER HEAD
- FDC — FIRE DEPARTMENT CONNECTION
- FPTH — FIRE PUMP TEST HEADER
- FDC — STORZ CONNECTION
- FDV — FIRE DEPARTMENT VALVE
- ROOFTOP TEST HEADER
- FHC — FIRE HOSE CABINET
- FHR — FIRE HOSE RACK
- FVC — FIRE VALVE CABINET
- EVC — EXISTING VALVE CABINET
- INSPECTOR'S TEST ASSEMBLY
- INSPECTOR'S TEST AND DRAIN ASSEMBLY
- SUPERVISED POST INDICATOR VALVE (PIV)
- SUPERVISED POST INDICATOR VALVE (PIV) (SHOWN IN PLAN VIEW)
- PUMP (FLOW DIAGRAM)
- PUMP (FLOOR PLAN)
- PIPE HANGER
- SPRINKLER ZONE BOUNDARY
- HYDRAULIC CALCULATION DESIGN AREA
- SCOPE OF WORK
- DEMOLITION OF PIPING, DEVICE, ETC. INSPECTOR'S TEST AND DRAIN ASSEMBLY
- PIPE SIZE / PIPE LENGTH — SPRINKLER PIPE TEXT (TOP INDICATES PIPE SIZE) (BOTTOM INDICATES CENTER TO CENTER PIPE LENGTH)
- FLOW METER
- LOW SUCTION THROTTLING VALVE

REFERENCE SYMBOLS

- REFER / SHT # — GENERAL REFERENCE DESIGNATES SHEET NUMBER
- DET # / SHT # — DETAIL REFERENCE TOP DESIGNATES DETAIL NUMBER BOTTOM DESIGNATES SHEET NUMBER
- # / SHT # — SECTION REFERENCE TOP DESIGNATES SECTION NUMBER BOTTOM DESIGNATES SHEET NUMBER
- ELEVATION SYMBOL
- NEW CONNECTION TO EXISTING
- XAMA / # — EQUIPMENT NAME AND NUMBER
- # — HYDRAULIC REFERENCE POINT
- XXXX / XXXX / XXXX — ROOM NUMBER
- # — SHEET KEYNOTE NUMBER
- # — REVISION NUMBER
- # — CONSTRUCTION BULLETIN NUMBER

ABBREVIATIONS

AC	-	AIR COMPRESSOR
ACC	-	ACCESS
ACV	-	ALARM CHECK VALVE
ADJ	-	ADJUSTABLE
AFF	-	ABOVE FINISHED FLOOR
ALT	-	ALTERNATE
AP	-	ACCESS PANEL
APPROX	-	APPROXIMATE
ARCH	-	ARCHITECTURAL
ASSY	-	ASSEMBLY
ATS	-	AUTOMATIC TRANSFER SWITCH
BLDG	-	BUILDING
BOP	-	BOTTOM OF PIPE
BOT	-	BOTTOM
BTWN	-	BETWEEN
CFCI	-	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
CL	-	CENTERLINE
CLG	-	CEILING
CONN	-	CONNECTION/CONNECT
CONTR	-	CONTRACTOR
CORR	-	CORRIDOR
CU	-	COPPER
D	-	DEPTH/DRAIN LINE
DCBP	-	DOUBLE CHECK BACKFLOW PREVENTER
DDBP	-	DOUBLE DETECTOR BACKFLOW PREVENTER
DET	-	DETAIL
DIA	-	DIAMETER
DIM	-	DIMENSION
DN	-	DOWN
DSPR	-	DRY SPRINKLER PIPE
DWG	-	DRAWING
EA	-	EACH
ELEV	-	ELEVATION
EQUIP	-	EQUIPMENT
ETR	-	EXISTING TO REMAIN
EXT	-	EXTERIOR
F	-	FIRE SUPPLY
FACP	-	FIRE ALARM CONTROL PANEL
FDC	-	FIRE DEPARTMENT CONNECTION
FDV	-	FIRE DEPARTMENT VALVE
FHC	-	FIRE HOSE CABINET
FHR	-	FIRE HOSE RACK
FLR	-	FLOOR
FMG	-	FACTORY MUTUAL GLOBAL
FP	-	FIRE PUMP
FPC	-	FIRE PUMP CONTROLLER
FPTH	-	FIRE PUMP TEST HEADER
FS	-	FLOW SWITCH
FT	-	FEET
FTG	-	FOOTING
FVC	-	FIRE VALVE CABINET
GA	-	GAUGE
GAL	-	GALLON
GALV	-	GALVANIZED
GPM	-	GALLONS PER MINUTE
HD	-	HUB DRAIN
IBC	-	INTERNATIONAL BUILDING CODE
ID	-	INSIDE DIAMETER
IE	-	INVERT ELEVATION
IFC	-	INTERNATIONAL FIRE CODE
IN	-	INCHES
JP	-	JOCKEY PUMP
JPC	-	JOCKEY PUMP CONTROLLER
L	-	LENGTH
LBS	-	POUNDS
MAX	-	MAXIMUM
MEZZ	-	MEZZANINE
MFR	-	MANUFACTURER
MIN	-	MINIMUM/MINUTE
MISC	-	MISCELLANEOUS
MTD	-	MOUNTED
MTG	-	MOUNTING
NFPA	-	NATIONAL FIRE PROTECTION ASSOCIATION
NO	-	NUMBER
NOM	-	NOMINAL
NPT	-	NATIONAL PIPE THREAD
NTS	-	NOT TO SCALE
OC	-	ON CENTER
OD	-	OUTSIDE DIAMETER
OFCI	-	OWNER FURNISHED CONTRACTOR INSTALLED
OFOI	-	OWNER FURNISHED OWNER INSTALLED
PIV	-	POST INDICATOR VALVE
PLBG	-	PLUMBING
PRESS	-	PRESSURE
PRV	-	PRESSURE REDUCING VALVE
PSF	-	POUNDS PER SQUARE FOOT
PSI	-	POUNDS PER SQUARE INCH
PSIG	-	POUNDS PER SQUARE INCH GAUGE
RAD	-	RADIUS
REC	-	RECESSED
REQD	-	REQUIRED
RI	-	ROUGH-IN
RPM	-	REVOLUTIONS PER MINUTE
RPBP	-	REDUCED PRESSURE ZONE BACKFLOW PREVENTER
RV	-	RELIEF VALVE
SCH	-	SCHEDULE
SHT	-	SHEET
SPEC	-	SPECIFICATION
SPR	-	SPRINKLER
SQ	-	SQUARE
S/S	-	STAINLESS STEEL
STRU	-	STRUCTURAL/STRUCTURE
TEMP	-	TEMPERATURE
TC	-	TEST CELL
TOB	-	TOP OF BEAM
TOD	-	TOP OF DECK
TOJ	-	TOP OF JOIST
TOS	-	TOP OF SLAB/TOP OF STEEL
TYP	-	TYPICAL
UBC	-	UNIFORM BUILDING CODE
UFC	-	UNIFORM FIRE CODE
UNO	-	UNLESS NOTED OTHERWISE
V	-	VALVE
VEL	-	VELOCITY
VESDA	-	VERY EARLY SMOKE DETECTION APPARATUS
VOL	-	VOLUME
W	-	WIDTH
W/	-	WITH
W/O	-	WITHOUT
X	-	EXISTING

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25384

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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Checked CMV

Date 05/11/12

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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FIRE PROTECTION SYMBOLS AND ABBREVIATIONS

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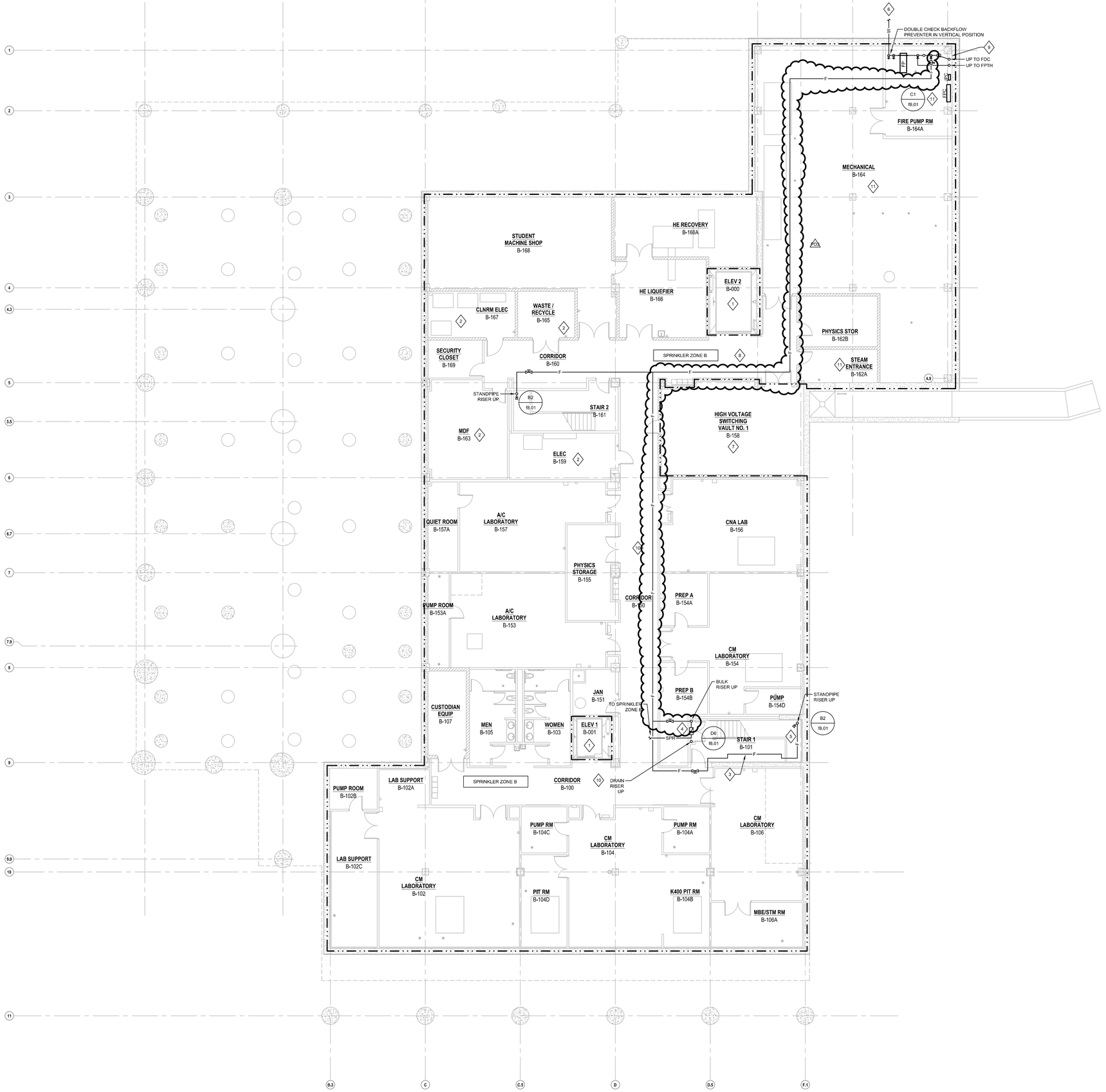

1 **FIRE PROTECTION - BASEMENT**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALLATION OF SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. INSTALLATION OF STANDPIPE SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 14, STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS.
3. CONTRACTOR SHALL BE HELD TO HAVE EXAMINED "REFLECTED CEILING" DRAWINGS AS WELL AS MECHANICAL, ELECTRICAL, PIPING, INFORMATION TECHNOLOGY, STRUCTURAL AND ARCHITECTURAL BUILDING PLANS PRIOR TO SYSTEM LAYOUT.
4. CONTRACTOR SHALL COORDINATE ROUTING OF PIPE WITH ALL OTHER TRADES AS WELL AS ARCHITECT. CONTRACTOR SHALL PARTICIPATE IN COORDINATION PROCESS AND SHALL NOT INSTALL PIPE PRIOR TO COORDINATION WITH OTHER TRADES.
5. SPRINKLERS IN LIGHT AND ORDINARY HAZARD OCCUPANCIES SHALL BE OF THE QUICK-RESPONSE TYPE.
6. SPRINKLERS SHALL BE INSTALLED UNDER FIXED OBSTRUCTIONS OVER 4 FT. WIDE, SUCH AS DUCTS, DECKS, OPEN GRATE FLOORING, CUTTING TABLES, AND OVERHEAD DOORS.
7. COORDINATE ALL PENETRATIONS BETWEEN FLOORS TO AVOID STRUCTURAL CONCRETE BEAMS.
8. REFER TO SPECIFICATIONS 21 0000 - GENERAL FIRE SUPPRESSION REQUIREMENTS, AND 21 1314 - AUTOMATIC FIRE SPRINKLER SYSTEM, FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

1. IN ACCORDANCE WITH SECTION 903.3.1.6.2 OF THE MINNESOTA STATE FIRE CODE, SPRINKLERS SHALL NOT BE INSTALLED IN ELEVATOR SHAFTS, ELEVATOR PITS OR ELEVATOR MACHINE ROOMS.
2. UTILIZE SIDEWALL SPRINKLERS IN THIS ROOM WHERE POSSIBLE. ALL SPRINKLERS IN THIS ROOM SHALL BE PROVIDED WITH LISTED HEAD GUARDS. DO NOT INSTALL FIRE PROTECTION PIPE DIRECTLY ABOVE ELECTRICAL OR DATA EQUIPMENT.
3. ROUTE PIPE PARALLEL AND TIGHT TO BOTTOM OF STAIRS. PROVIDE SWING JOINTS AS REQUIRED.
4. PROVIDE CAP AT BOTTOM OF DRAIN RISER WITH 1" BALL VALVE AND PLUG. AUXILIARY DRAIN TO BE USED FOR DRAINING TRAPPED WATER AFTER USE OF RISER.
5. FIRE DEPARTMENT VALVE IS SHOWN OUT OF ROTATION FOR CLARITY. STANDPIPE AND FIRE DEPARTMENT VALVE SHALL NOT INFRINGE UPON EGRESS PATH.
6. NEW 8" UNDERGROUND LEAD-IN. REFER TO CIVIL PLANS FOR ADDITIONAL INFORMATION.
7. SPRINKLER PROTECTION SHALL BE OMITTED FROM THIS ROOM PER NFPA 13 ('02 EDITION) SECTION 8.14.10.3.
8. FOR EQUIPMENT MAINTENANCE PURPOSES, ALL PIPE AND EQUIPMENT SHALL BE INSTALLED ABOVE 9'-0" AFF BETWEEN THE FREIGHT ELEVATOR AND THE HIGH VOLTAGE SWITCHING VAULT.
9. ROUTE BALL DRIP ON FDC LINE TO DISCHARGE TO HUB DRAIN.
10. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW CLOUD CEILINGS.
11. PROJECT ROOM UTILIZING HIGH TEMPERATURE-RATED SPRINKLER HEADS.

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For AFFILIATED ENGINEERS, INC.

By

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Drawn KJB

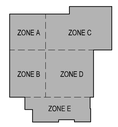
Checked CMV

Date 05/11/12

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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FIRE PROTECTION - BASEMENT

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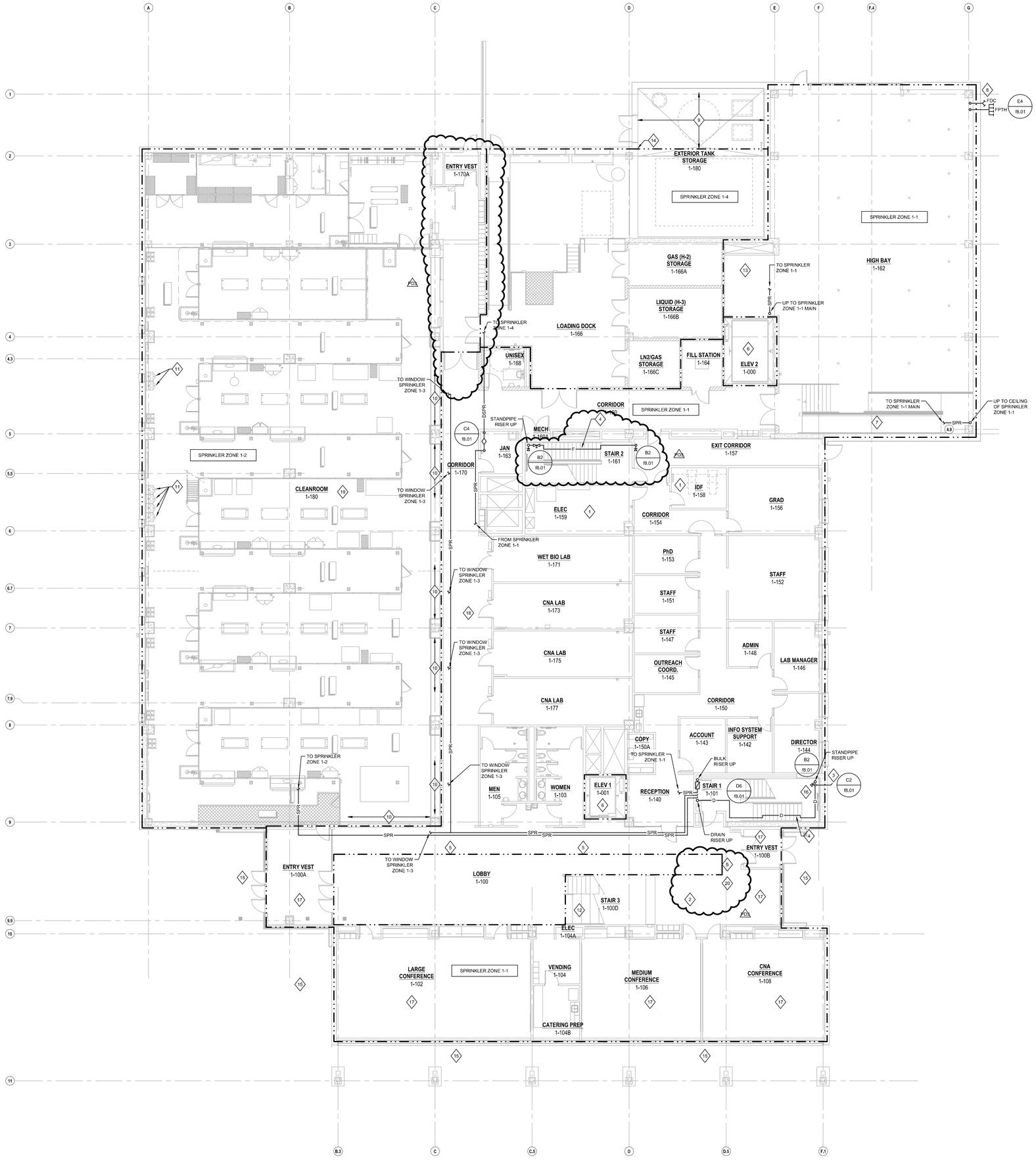

1 **FIRE PROTECTION - LEVEL 1**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALLATION OF SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. INSTALLATION OF STANDPIPE SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 14, STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS.
3. CONTRACTOR SHALL BE HELD TO HAVE EXAMINED "REFLECTED CEILING" DRAWINGS AS WELL AS MECHANICAL, ELECTRICAL, PIPING, INFORMATION TECHNOLOGY, STRUCTURAL AND ARCHITECTURAL BUILDING PLANS PRIOR TO SYSTEM LAYOUT.
4. CONTRACTOR SHALL COORDINATE ROUTING OF PIPE WITH ALL OTHER TRADES AS WELL AS ARCHITECT. CONTRACTOR SHALL PARTICIPATE IN COORDINATION PROCESS AND SHALL NOT INSTALL PIPE PRIOR TO COORDINATION WITH OTHER TRADES.
5. SPRINKLERS IN LIGHT AND ORDINARY HAZARD OCCUPANCIES SHALL BE OF THE QUICK-RESPONSE TYPE.
6. SPRINKLERS SHALL BE INSTALLED UNDER FIXED OBSTRUCTIONS OVER 4 FT. WIDE, SUCH AS DUCTS, DECKS, OPEN GRATE FLOORING, CUTTING TABLES, AND OVERHEAD DOORS.
7. COORDINATE ALL PENETRATIONS BETWEEN FLOORS TO AVOID STRUCTURAL CONCRETE BEAMS.
8. REFER TO SPECIFICATIONS 21 0000 - GENERAL FIRE SUPPRESSION REQUIREMENTS, AND 21 1314 - AUTOMATIC FIRE SPRINKLER SYSTEM, FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

1. UTILIZE SIDEWALL SPRINKLERS IN THIS ROOM WHERE POSSIBLE. ALL SPRINKLERS IN THIS ROOM SHALL BE PROVIDED WITH LISTED HEAD GUARDS. DO NOT INSTALL FIRE PROTECTION PIPE DIRECTLY ABOVE ELECTRICAL OR DATA EQUIPMENT.
2. PROVIDE SPRINKLER PROTECTION BENEATH STAIRS.
3. ROUTE DRAIN RISER TO DISCHARGE TO EXTERIOR. CONTRACTOR SHALL COORDINATE DISCHARGE LOCATION WITH ARCHITECT PRIOR TO INSTALLATION.
4. ROUTE PIPE PARALLEL AND TIGHT TO BOTTOM OF STAIRS. PROVIDE SWING JOINTS AS REQUIRED.
5. PROVIDE CLOSELY SPACED SPRINKLERS FOR PROTECTION OF VERTICAL OPENING. GENERAL CONTRACTOR SHALL PROVIDE 18 INCH-DEEP, NONCOMBUSTIBLE DRAFT STOP LOCATED IMMEDIATELY ADJACENT TO OPENING.
6. IN ACCORDANCE WITH SECTION 903.3.1.6.2 OF THE MINNESOTA STATE FIRE CODE, SPRINKLERS SHALL NOT BE INSTALLED IN ELEVATOR SHAFTS, ELEVATOR PITS OR ELEVATOR MACHINE ROOMS.
7. PROVIDE PROTECTION BENEATH MEZZANINE ON THIS LEVEL.
8. IN ACCORDANCE WITH SECTION 903.3.1.6.4 OF THE MINNESOTA STATE FIRE CODE, THERE SHALL BE A MAXIMUM OF 25' OF PIPE BETWEEN THE CHECK VALVE AND THE FIRE DEPARTMENT CONNECTION INLET.
9. AREA IS OPEN TO ATMOSPHERE. SPRINKLER PROTECTION IS NOT REQUIRED IN THIS AREA.
10. PROVIDE WINDOW SPRINKLERS ON BOTH SIDES OF GLASS TO MAINTAIN THE 2-HOUR RATED SEPARATION. PER UL/CORD-C263.1-99, WINDOW SPRINKLER SYSTEM SHALL BE INDEPENDENT OF THE FLOOR SPRINKLER SYSTEM AND HAVE A SEPARATE SPRINKLER ZONE CONTROL ASSEMBLY. EACH ZONE SHALL BE SEPARATELY SIZED AND ANNUNCIATED.
11. PROVIDE SPRINKLER HEAD IN GAS CABINET.
12. ROUTE BRANCH LINE CONCEALED BENEATH STAIRS. AT THE BOTTOM OF THE STAIRS, ROUTE DOWN INTO THE BASEMENT TO LOCATE THE AUXILIARY DRAIN.
13. PROVIDE PROTECTION OF ALCOVE AREA ON THIS LEVEL.
14. LOCATE DRY SPRINKLER SYSTEM'S INSPECTOR'S TEST CONNECTION AT THIS LOCATION.
15. SPRINKLERS ARE NOT REQUIRED WHERE CANOPY OR ROOF IS OF NONCOMBUSTIBLE OR LIMITED COMBUSTIBLE CONSTRUCTION. NO STORAGE OR HANDLING OF COMBUSTIBLES IS PERMITTED BENEATH THE ROOF OR CANOPY.
16. FIRE DEPARTMENT VALVE IS SHOWN OUT OF ROTATION FOR CLARITY. STANDPIPE AND FIRE DEPARTMENT VALVE SHALL NOT INFRINGE ON EGRESS PATH.
17. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW PERFORATED GYPSUM BOARD CEILING.
18. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW CLOUD CEILINGS.
19. REFER TO CLEANROOM REFLECTED CEILING PLANS FOR ADDITIONAL INFORMATION.
20. PROVIDE CONCEALED PENDENT SPRINKLER HEADS IN THE CENTER OF THE BOTTOM OF THE SOFFIT USED AS THE DRAFT STOP FOR THE VERTICAL OPENING. PENDENT SPRINKLERS ARE USED FOR PROTECTION OF FLOOR AREA BENEATH SUFFIT.

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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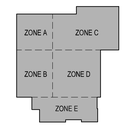
Date 05/11/12

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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FIRE PROTECTION - LEVEL 1

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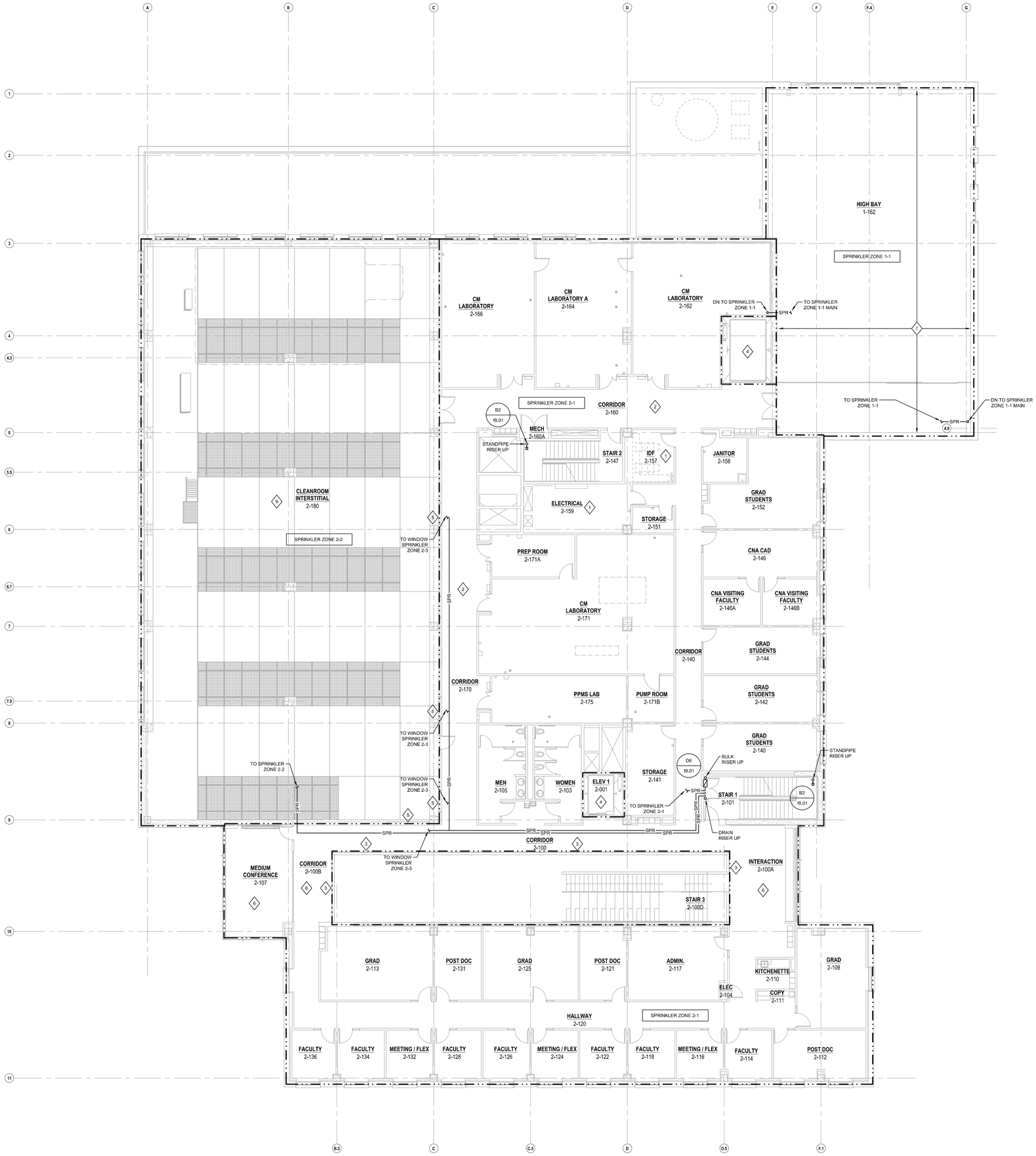

1 **FIRE PROTECTION - LEVEL 2**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALLATION OF SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. INSTALLATION OF STANDPIPE SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 14, STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS.
3. CONTRACTOR SHALL BE HELD TO HAVE EXAMINED "REFLECTED CEILING" DRAWINGS AS WELL AS MECHANICAL, ELECTRICAL, PIPING, INFORMATION TECHNOLOGY, STRUCTURAL AND ARCHITECTURAL BUILDING PLANS PRIOR TO SYSTEM LAYOUT.
4. CONTRACTOR SHALL COORDINATE ROUTING OF PIPE WITH ALL OTHER TRADES AS WELL AS ARCHITECT. CONTRACTOR SHALL PARTICIPATE IN COORDINATION PROCESS AND SHALL NOT INSTALL PIPE PRIOR TO COORDINATION WITH OTHER TRADES.
5. SPRINKLERS IN LIGHT AND ORDINARY HAZARD OCCUPANCIES SHALL BE OF THE QUICK-RESPONSE TYPE.
6. SPRINKLERS SHALL BE INSTALLED UNDER FIXED OBSTRUCTIONS OVER 4 FT. WIDE, SUCH AS DUCTS, DECKS, OPEN GRATE FLOORING, CUTTING TABLES, AND OVERHEAD DOORS.
7. COORDINATE ALL PENETRATIONS BETWEEN FLOORS TO AVOID STRUCTURAL CONCRETE BEAMS.
8. REFER TO SPECIFICATIONS 21 0000 - GENERAL FIRE SUPPRESSION REQUIREMENTS, AND 21 1314 - AUTOMATIC FIRE SPRINKLER SYSTEM, FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

1. UTILIZE SIDEWALL SPRINKLERS IN THIS ROOM WHERE POSSIBLE. ALL SPRINKLERS IN THIS ROOM SHALL BE PROVIDED WITH LISTED HEAD GUARDS. DO NOT INSTALL FIRE PROTECTION PIPE DIRECTLY ABOVE ELECTRICAL OR DATA EQUIPMENT.
2. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW CLOUD CEILINGS.
3. PROVIDE CLOSELY SPACED SPRINKLERS FOR PROTECTION OF VERTICAL OPENING. GENERAL CONTRACTOR SHALL PROVIDE 18 INCH-DEEP, NONCOMBUSTIBLE DRAFT STOP LOCATED IMMEDIATELY ADJACENT TO OPENING.
4. IN ACCORDANCE WITH SECTION 903.3.1.6.2 OF THE MINNESOTA STATE FIRE CODE, SPRINKLERS SHALL NOT BE INSTALLED IN ELEVATOR SHAFTS, ELEVATOR PITS OR ELEVATOR MACHINE ROOMS.
5. PROVIDE WINDOW SPRINKLERS ON BOTH SIDES OF GLASS TO MAINTAIN THE 2-HOUR RATED SEPARATION. PER ULC/ORD-C263.1-99, WINDOW SPRINKLER SYSTEM SHALL BE INDEPENDENT OF THE FLOOR SPRINKLER SYSTEM AND HAVE A SEPARATE SPRINKLER ZONE CONTROL ASSEMBLY. EACH ZONE SHALL BE SEPARATELY SIZED AND ANNUNCIATED.
6. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW PERFORATED GYPSUM BOARD CEILING.
7. AN OVERHEAD CRANE IS BEING INSTALLED. COORDINATE WITH OVERHEAD CRANE AND ALL OTHER TRADES TO ENSURE THAT COMPLETE AND UNOBSTRUCTED SPRINKLER COVERAGE IS PROVIDED PER NFPA 13. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION REGARDING THE COMPLEXITY OF THIS ROOM.
8. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW CLOUD CEILINGS.
9. PROJECT ROOM UTILIZING HIGH TEMPERATURE-RATED SPRINKLER HEADS.

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For AFFILIATED ENGINEERS, INC.

By

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Bid Package No. 2	02-24-2012

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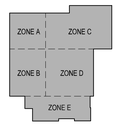
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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FIRE PROTECTION - LEVEL 2

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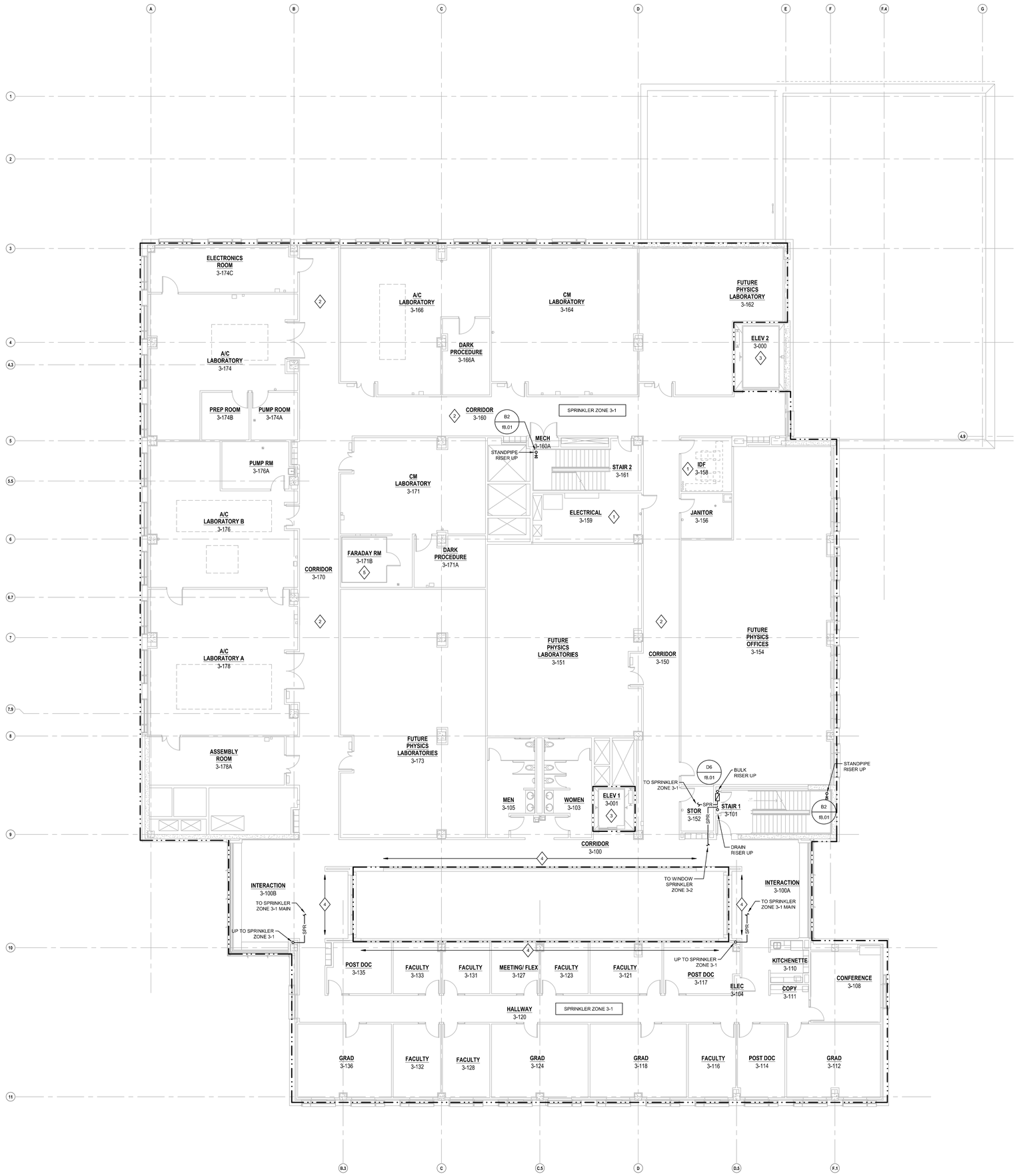

1 FIRE PROTECTION - LEVEL 3
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALLATION OF SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. INSTALLATION OF STANDPIPE SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 14, STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS.
3. CONTRACTOR SHALL BE HELD TO HAVE EXAMINED "REFLECTED CEILING" DRAWINGS AS WELL AS MECHANICAL, ELECTRICAL, PIPING, INFORMATION TECHNOLOGY, STRUCTURAL AND ARCHITECTURAL BUILDING PLANS PRIOR TO SYSTEM LAYOUT.
4. CONTRACTOR SHALL COORDINATE ROUTING OF PIPE WITH ALL OTHER TRADES AS WELL AS ARCHITECT. CONTRACTOR SHALL PARTICIPATE IN COORDINATION PROCESS AND SHALL NOT INSTALL PIPE PRIOR TO COORDINATION WITH OTHER TRADES.
5. SPRINKLERS IN LIGHT AND ORDINARY HAZARD OCCUPANCIES SHALL BE OF THE QUICK-RESPONSE TYPE.
6. SPRINKLERS SHALL BE INSTALLED UNDER FIXED OBSTRUCTIONS OVER 4 FT. WIDE, SUCH AS DUCTS, DECKS, OPEN GRATE FLOORING, CUTTING TABLES, AND OVERHEAD DOORS.
7. COORDINATE ALL PENETRATIONS BETWEEN FLOORS TO AVOID STRUCTURAL CONCRETE BEAMS.
8. REFER TO SPECIFICATIONS 21 0000 - GENERAL FIRE SUPPRESSION REQUIREMENTS, AND 21 1314 - AUTOMATIC FIRE SPRINKLER SYSTEM, FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

1. UTILIZE SIDEWALL SPRINKLERS IN THIS ROOM WHERE POSSIBLE, ALL SPRINKLERS IN THIS ROOM SHALL BE PROVIDED WITH LISTED HEAD GUARDS. DO NOT INSTALL FIRE PROTECTION PIPE DIRECTLY ABOVE ELECTRICAL OR DATA EQUIPMENT.
2. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW CLOUD CEILINGS.
3. IN ACCORDANCE WITH SECTION 903.3.1.6.2 OF THE MINNESOTA STATE FIRE CODE, SPRINKLERS SHALL NOT BE INSTALLED IN ELEVATOR SHAFTS, ELEVATOR PITS OR ELEVATOR MACHINE ROOMS.
4. PROVIDE WINDOW SPRINKLERS ON BOTH SIDES OF GLASS TO MAINTAIN THE 2-HOUR RATED SEPARATION. PER UL/CORD-C263.1-99, WINDOW SPRINKLER SYSTEM SHALL BE INDEPENDENT OF THE FLOOR SPRINKLER SYSTEM AND HAVE A SEPARATE SPRINKLER ZONE CONTROL ASSEMBLY. EACH ZONE SHALL BE SEPARATELY SIZED AND ANNUNCIATED.
5. PROVIDE TYPE L COPPER PIPE FOR ALL ROOMS SUSCEPTIBLE TO MAGNETIC FIELDS.
6. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW CLOUD CEILINGS.

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By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
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Bid Package No. 2	02-24-2012

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Comm. No. 2039037

Drawn KJB

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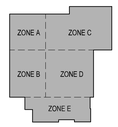
Date 05/11/12

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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FIRE PROTECTION - LEVEL 3

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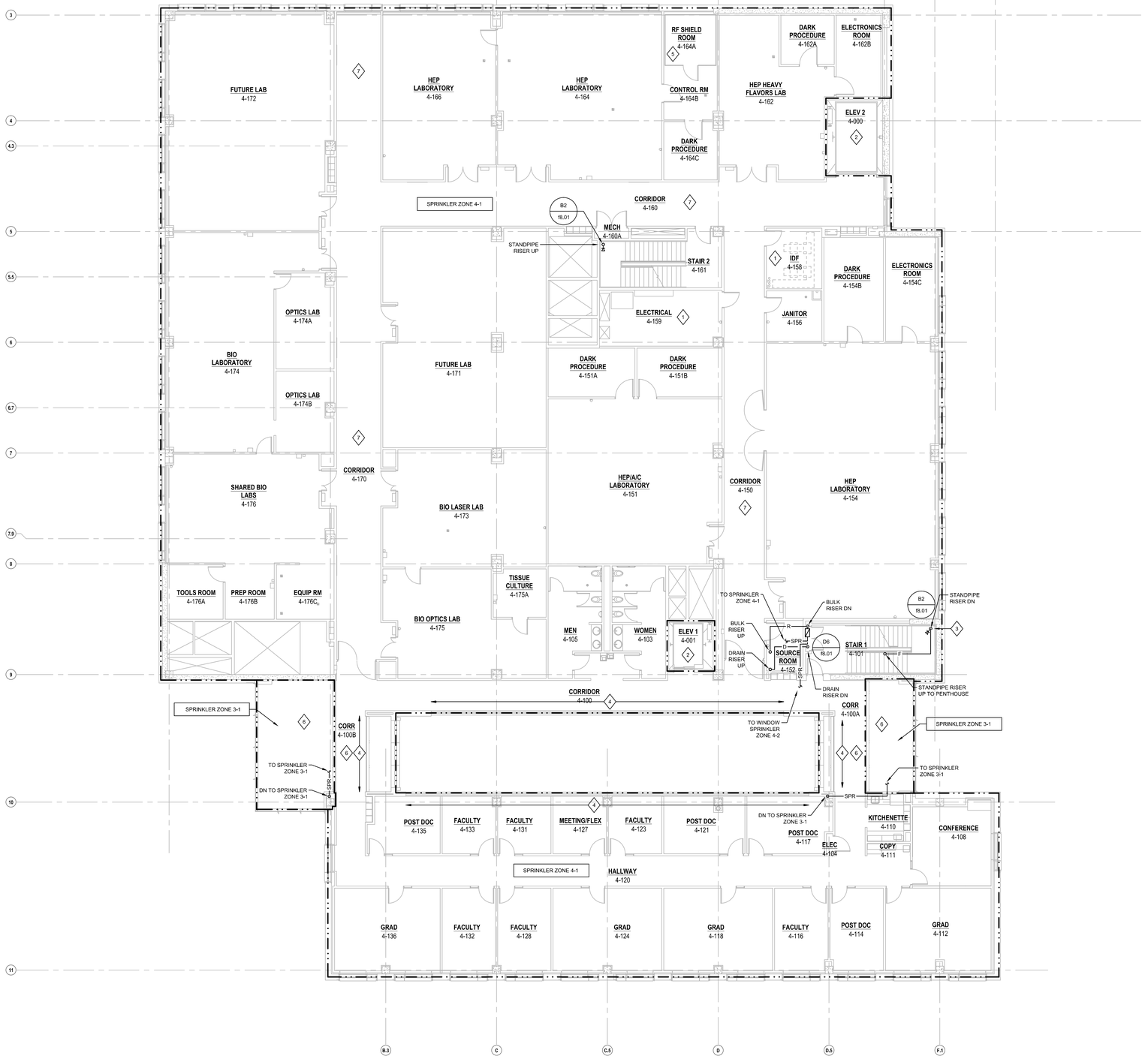

1 **FIRE PROTECTION - LEVEL 4**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALLATION OF SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. INSTALLATION OF STANDPIPE SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 14, STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS.
3. CONTRACTOR SHALL BE HELD TO HAVE EXAMINED "REFLECTED CEILING" DRAWINGS AS WELL AS MECHANICAL, ELECTRICAL, PIPING, INFORMATION TECHNOLOGY, STRUCTURAL AND ARCHITECTURAL BUILDING PLANS PRIOR TO SYSTEM LAYOUT.
4. CONTRACTOR SHALL COORDINATE ROUTING OF PIPE WITH ALL OTHER TRADES AS WELL AS ARCHITECT. CONTRACTOR SHALL PARTICIPATE IN COORDINATION PROCESS AND SHALL NOT INSTALL PIPE PRIOR TO COORDINATION WITH OTHER TRADES.
5. SPRINKLERS IN LIGHT AND ORDINARY HAZARD OCCUPANCIES SHALL BE OF THE QUICK-RESPONSE TYPE.
6. SPRINKLERS SHALL BE INSTALLED UNDER FIXED OBSTRUCTIONS OVER 4 FT. WIDE, SUCH AS DUCTS, DECKS, OPEN GRATE FLOORING, CUTTING TABLES, AND OVERHEAD DOORS.
7. COORDINATE ALL PENETRATIONS BETWEEN FLOORS TO AVOID STRUCTURAL CONCRETE BEAMS.
8. REFER TO SPECIFICATIONS 21 0000 - GENERAL FIRE SUPPRESSION REQUIREMENTS, AND 21 1314 - AUTOMATIC FIRE SPRINKLER SYSTEM, FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

1. UTILIZE SIDEWALL SPRINKLERS IN THIS ROOM WHERE POSSIBLE. ALL SPRINKLERS IN THIS ROOM SHALL BE PROVIDED WITH LISTED HEAD GUARDS. DO NOT INSTALL FIRE PROTECTION PIPE DIRECTLY ABOVE ELECTRICAL OR DATA EQUIPMENT.
2. IN ACCORDANCE WITH SECTION 903.3.1.6.2 OF THE MINNESOTA STATE FIRE CODE, SPRINKLERS SHALL NOT BE INSTALLED IN ELEVATOR SHAFTS, ELEVATOR PITS OR ELEVATOR MACHINE ROOMS.
3. FIRE DEPARTMENT VALVE IS SHOWN OUT OF ROTATION FOR CLARITY. STANDPIPE AND FIRE DEPARTMENT VALVE SHALL NOT INFRINGE ON EGRESS PATH.
4. PROVIDE WINDOW SPRINKLERS ON BOTH SIDES OF GLASS TO MAINTAIN THE 2-HOUR RATED SEPARATION. PER UL/CORD-C263.1-99, WINDOW SPRINKLER SYSTEM SHALL BE INDEPENDENT OF THE FLOOR SPRINKLER SYSTEM AND HAVE A SEPARATE SPRINKLER ZONE CONTROL ASSEMBLY. EACH ZONE SHALL BE SEPARATELY SIZED AND ANNUNCIATED.
5. PROVIDE TYPE L COPPER PIPE FOR ALL ROOMS SUSCEPTIBLE TO MAGNETIC FIELDS.
6. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW PERFORATED GYPSUM BOARD CEILING.
7. PROVIDE SPRINKLER PROTECTION ABOVE AND BELOW CLOUD CEILINGS.

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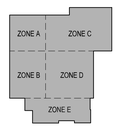

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FIRE PROTECTION - LEVEL 4

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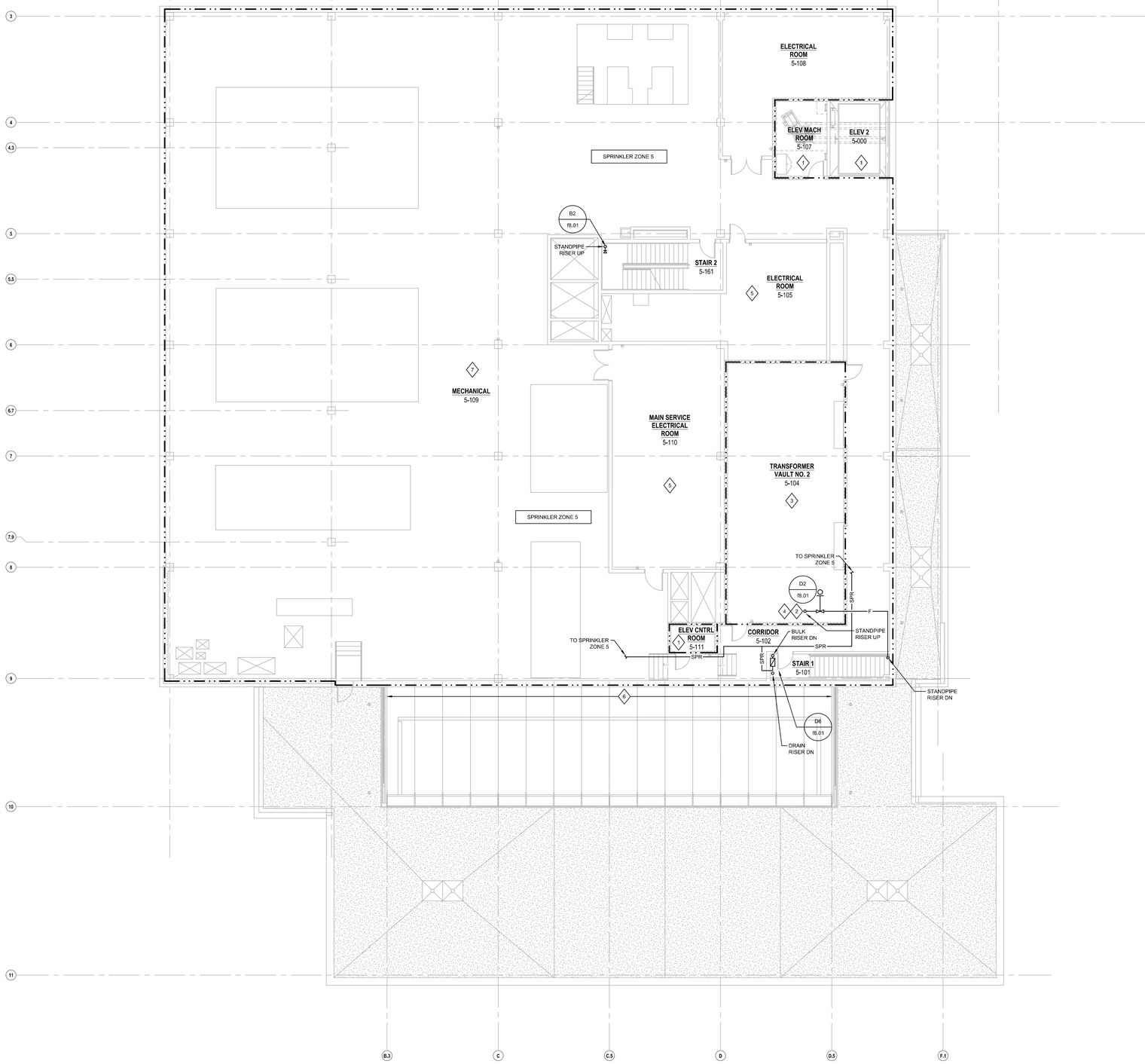

1 **FIRE PROTECTION - PENTHOUSE**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALLATION OF SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. INSTALLATION OF STANDPIPE SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 14, STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS.
3. CONTRACTOR SHALL BE HELD TO HAVE EXAMINED "REFLECTED CEILING" DRAWINGS AS WELL AS MECHANICAL, ELECTRICAL, PIPING, INFORMATION TECHNOLOGY, STRUCTURAL AND ARCHITECTURAL BUILDING PLANS PRIOR TO SYSTEM LAYOUT.
4. CONTRACTOR SHALL COORDINATE ROUTING OF PIPE WITH ALL OTHER TRADES AS WELL AS ARCHITECT. CONTRACTOR SHALL PARTICIPATE IN COORDINATION PROCESS AND SHALL NOT INSTALL PIPE PRIOR TO COORDINATION WITH OTHER TRADES.
5. SPRINKLERS IN LIGHT AND ORDINARY HAZARD OCCUPANCIES SHALL BE OF THE QUICK-RESPONSE TYPE.
6. SPRINKLERS SHALL BE INSTALLED UNDER FIXED OBSTRUCTIONS OVER 4 FT. WIDE, SUCH AS DUCTS, DECKS, OPEN GRATE FLOORING, CUTTING TABLES, AND OVERHEAD DOORS.
7. COORDINATE ALL PENETRATIONS BETWEEN FLOORS TO AVOID STRUCTURAL CONCRETE BEAMS.
8. REFER TO SPECIFICATIONS 21 0000 - GENERAL FIRE SUPPRESSION REQUIREMENTS, AND 21 1314 - AUTOMATIC FIRE SPRINKLER SYSTEM, FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

1. IN ACCORDANCE WITH SECTION 903.3.1.6.2 OF THE MINNESOTA STATE FIRE CODE, SPRINKLERS SHALL NOT BE INSTALLED IN ELEVATOR SHAFTS, ELEVATOR PITS OR ELEVATOR MACHINE ROOMS.
2. ROUTE BALL DRIP TO DISCHARGE TO DRAIN RISER.
3. SPRINKLER PROTECTION SHALL BE OMITTED FROM THIS ROOM PER NFPA 13 ('02 EDITION) SECTION 8.14.10.3. PROVIDE SPRINKLER PROTECTION FOR MECHANICAL SPACE ABOVE THIS ROOM.
4. FIRE PIPE TO ROOFTOP TEST HEADER SHALL BE ROUTED IN THE MECHANICAL SPACE ABOVE THE TRANSFORMER VAULT ROOM. NO FIRE PROTECTION PIPE SHALL BE ROUTED THROUGH THE TRANSFORMER VAULT ROOM.
5. UTILIZE SIDEWALL SPRINKLERS IN THIS ROOM WHERE POSSIBLE. ALL SPRINKLERS IN THIS ROOM SHALL BE PROVIDED WITH LISTED HEAD GUARDS. DO NOT INSTALL FIRE PROTECTION PIPE DIRECTLY ABOVE ELECTRICAL OR DATA EQUIPMENT.
6. UTILIZE HIGH TEMPERATURE-RATED HORIZONTAL SIDEWALL SPRINKLER HEADS FOR PROTECTION OF PLATFORM, PER DIRECTION FROM UNIVERSITY OF MINNESOTA BUILDING CODE DIVISION. REMAINDER OF LOBBY SHAFT SHALL NOT REQUIRE SPRINKLER PROTECTION.
7. PROJECT ROOM UTILIZING HIGH TEMPERATURE-RATED SPRINKLER HEADS.

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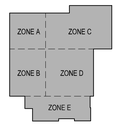
U of M Project # 01-155-08-1718



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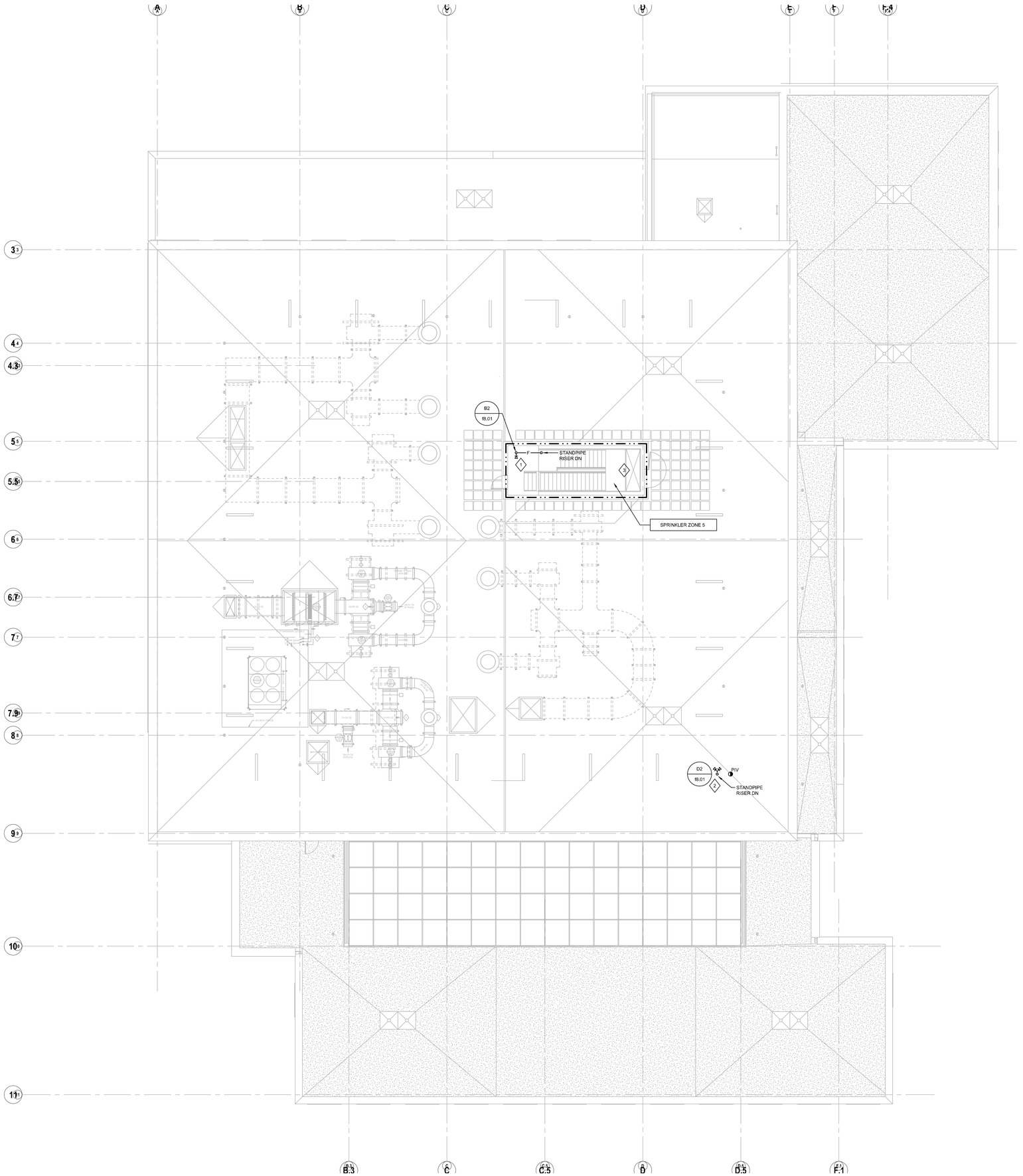
FIRE PROTECTION - PENTHOUSE

f2.05



1 **FIRE PROTECTION - ROOF**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALLATION OF SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. INSTALLATION OF STANDPIPE SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 14, STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS.
3. CONTRACTOR SHALL BE HELD TO HAVE EXAMINED "REFLECTED CEILING" DRAWINGS AS WELL AS MECHANICAL, ELECTRICAL, PIPING, INFORMATION TECHNOLOGY, STRUCTURAL AND ARCHITECTURAL BUILDING PLANS PRIOR TO SYSTEM LAYOUT.
4. CONTRACTOR SHALL COORDINATE ROUTING OF PIPE WITH ALL OTHER TRADES AS WELL AS ARCHITECT. CONTRACTOR SHALL PARTICIPATE IN COORDINATION PROCESS AND SHALL NOT INSTALL PIPE PRIOR TO COORDINATION WITH OTHER TRADES.
5. SPRINKLERS IN LIGHT AND ORDINARY HAZARD OCCUPANCIES SHALL BE OF THE QUICK-RESPONSE TYPE.
6. SPRINKLERS SHALL BE INSTALLED UNDER FIXED OBSTRUCTIONS OVER 4 FT. WIDE, SUCH AS DUCTS, DECKS, OPEN GRATE FLOORING, CUTTING TABLES, AND OVERHEAD DOORS.
7. COORDINATE ALL PENETRATIONS BETWEEN FLOORS TO AVOID STRUCTURAL CONCRETE BEAMS.
8. REFER TO SPECIFICATIONS 21 0000 - GENERAL FIRE SUPPRESSION REQUIREMENTS, AND 21 1314 - AUTOMATIC FIRE SPRINKLER SYSTEM, FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

1. FIRE DEPARTMENT VALVE SHALL BE PROVIDED AT THE HIGHEST LANDING OF STAIRWAYS WITH STAIRWAY ACCESS TO THE ROOF.
2. LOCATION OF MOST REMOTE STANDPIPE ROOFTOP TEST HEADER. PROVIDE TWO 2-1/2" FIRE DEPARTMENT VALVES AT THIS LOCATION TO FACILITATE TESTING OF THE STANDPIPE SYSTEM.
3. SPRINKLER PIPE SHALL NOT BE ROUTED THROUGH HOISTWAY. PROTECT HOISTWAY UTILIZING DRY HORIZONTAL SIDEWALL SPRINKLER HEADS.

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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Drawn KJB

Checked CMV

Date 05/11/12

Project

Physics and Nanotechnology Building

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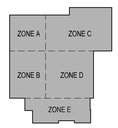

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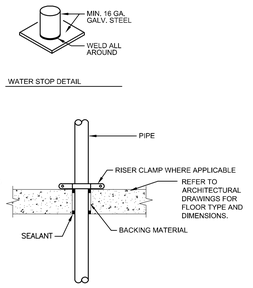
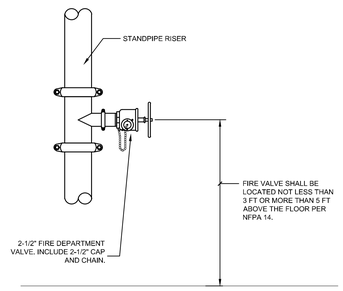
FIRE PROTECTION - ROOF

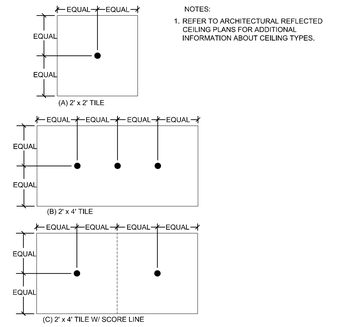
f2.06



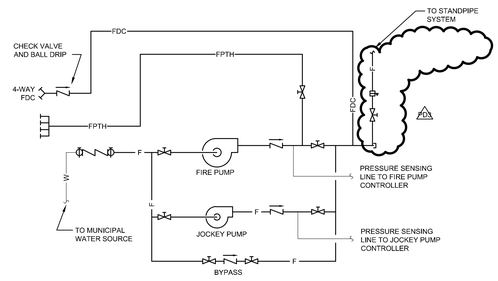
B1 PIPE THROUGH FLOOR
SCALE: NONE



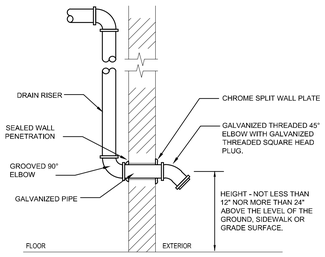
B2 FIRE DEPARTMENT VALVE
SCALE: NONE



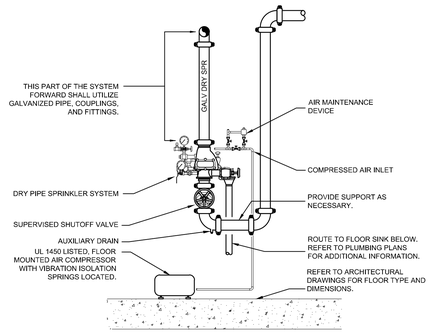
B4 SPRINKLER PLACEMENT CENTER OF TILE
SCALE: NONE



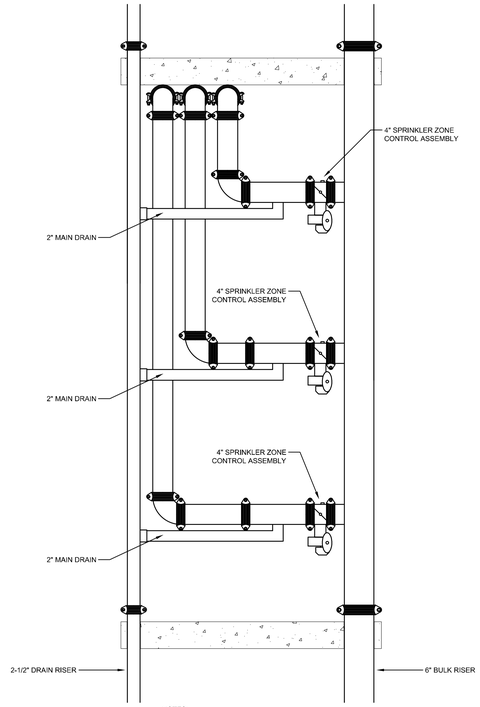
C1 FIRE PUMP SCHEMATIC
SCALE: NONE



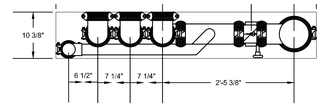
C2 DRAIN RISER EXTERIOR DISCHARGE
SCALE: NONE



C4 DRY PIPE VALVE ASSEMBLY
SCALE: NONE

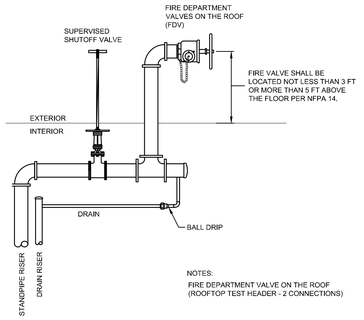


SECTION VIEW

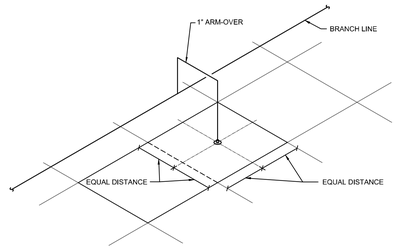


PLAN VIEW

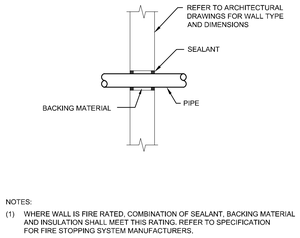
D6 SPRINKLER ZONE CONTROL ASSEMBLY
SCALE: NONE



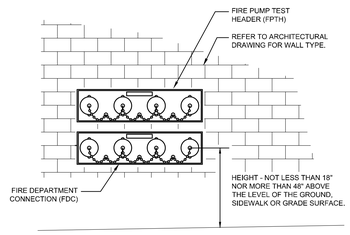
D2 FIRE DEPARTMENT VALVE ON ROOF
SCALE: NONE



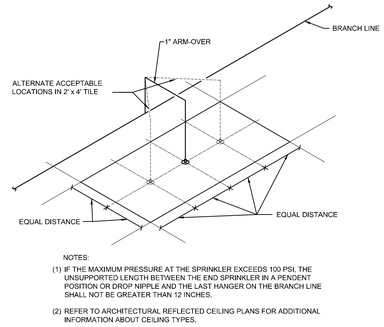
D4 CENTER OF 2' X 2' TILE
SCALE: NONE



E2 PIPE THROUGH INTERIOR WALL
SCALE: NONE



E4 FIRE DEPARTMENT CONNECTION AND FIRE TEST HEADER
SCALE: NONE



E6 CENTER OF 2' X 4' TILE
SCALE: NONE

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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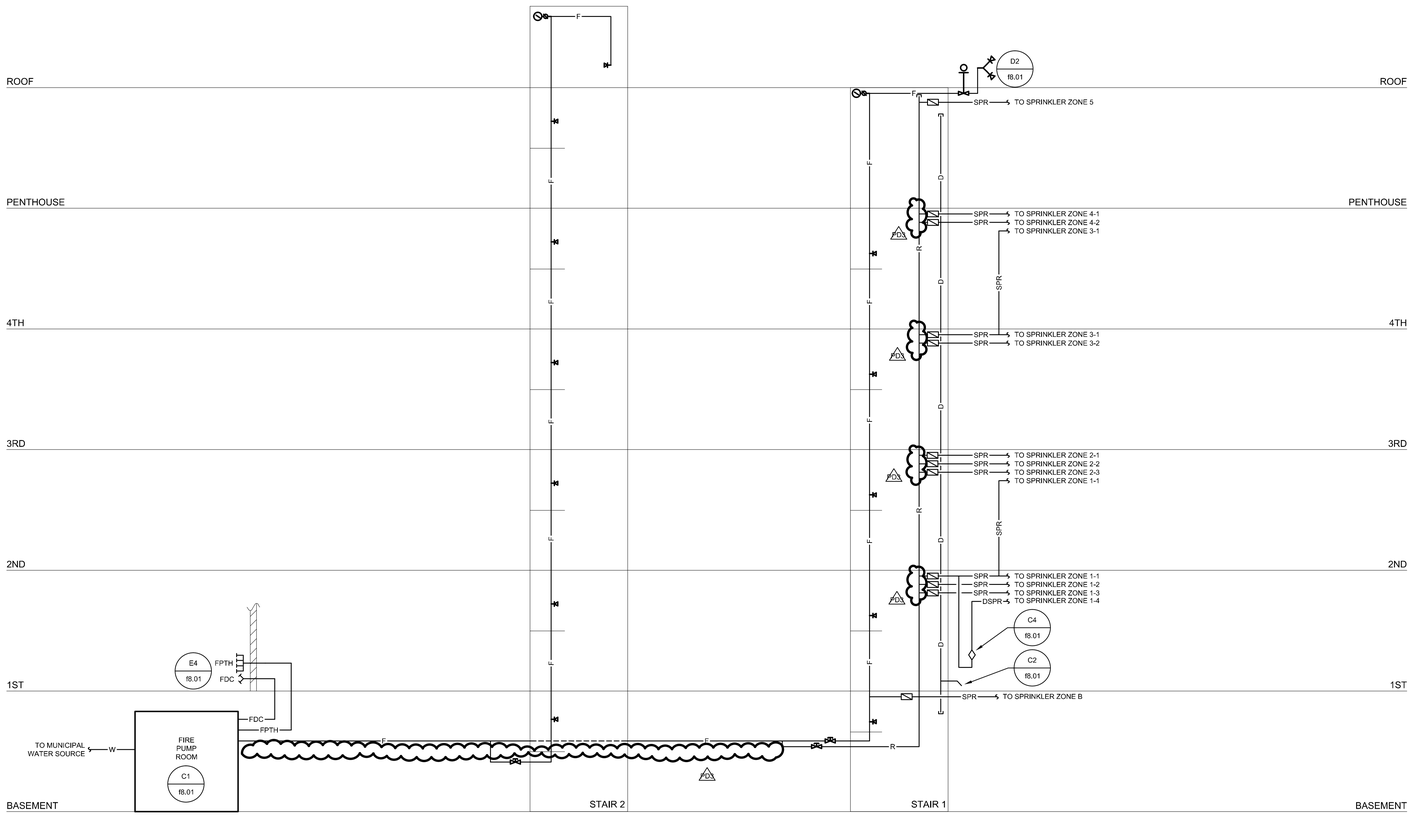
FIRE PROTECTION DETAILS

f8.01



1 **FIRE PROTECTION FLOW DIAGRAM**
SCALE: NONE

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FIRE PROTECTION
FLOW DIAGRAM

f9.01

PLUMBING SYMBOLS AND ABBREVIATIONS

NOTE:
SYMBOLS AND ABBREVIATIONS INDICATED HERE AND NOT USED IN THE CONTRACT DOCUMENTS DO NOT APPLY TO THIS PROJECT. ADDITIONAL SYMBOLS MAY BE INDICATED IN THE CONTRACT DOCUMENTS.

PIPE FITTINGS

- FLANGE
- UNION
- ANCHOR
- PIPE GUIDE
- PIPE SLEEVE
- ECCENTRIC REDUCER
- CONCENTRIC REDUCER
- WATER PIPING CONNECTION
- ELBOW DOWN
- ELBOW UP
- TEE DOWN
- TEE UP
- PIPE CAP
- SOIL, STORM, OR WASTE PLUG
- VALVE IN VERTICAL

PIPE VALVES AND SPECIALTIES

- SHUT OFF VALVE
- GAS SHUT OFF VALVE
- GATE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- BALANCING VALVE
- CHECK VALVE
- PRESSURE REDUCING VALVE
- SOLENOID VALVE
- PRESSURE RELIEF VALVE
- 3-WAY MIXING VALVE
- TEMPERATURE BLENDING VALVE
- REDUCED PRESSURE BACKFLOW PREVENTER
- PIPELINE STRAINER
- DIAPHRAGM VALVE
- VALVE IN BOX
- DEMOLITION OF PIPING, DEVICE, ETC.
- IN-LINE PUMP
- PIPE FLEXIBLE CONNECTION
- EXPANSION JOINT
- FLOW SENSING DEVICE
- PRESSURE OR VACUUM SWITCH
- GAS REGULATOR
- HEAT TRACE TERMINATION POINT
- HEAT TRACE POWER CONNECTION POINT
- THERMOMETER
- PRESSURE GAUGE (WITH VALVE)
- WALL HYDRANT
- HOSE BIBB
- SLIDE-OXYGEN OR VACUUM BOTTLE
- GAS OUTLET
- GAS TERMINAL
- FILTER
- DIRECTION OF PITCH
- MECHANICAL SHOCKSTOP
- TRI CLAMP

DRAINS AND CLEANOUTS

- FLOOR DRAIN/FLOOR SINK
- ROOF DRAIN
- HUB DRAIN
- PIPE TRAP
- FIXTURE WASTE TRAP
- CLEANOUT
- FLOOR CLEANOUT

FIXTURE INSTALLATION

FIXTURE	BARRIER FREE DESIGN	NON-BARRIER FREE
WATER CLOSET	FLOOR TO RIM 17"	FLOOR TO RIM 15"
URINAL	FLOOR TO RIM 17" MIN. ONE PER ROOM	FLOOR TO RIM 24"
LAVATORY	FLOOR TO RIM 34" MAX. FLOOR TO UNDER APRON 29"	FLOOR TO RIM 31"
DRINKING FOUNTAIN	FLOOR TO SPOUT 36" MAX. FLOOR TO UNDER APRON 27"	FLOOR TO RIM 40"
SHOWER VALVE	FLOOR TO VALVE 42"	FLOOR TO VALVE 48"
SHOWER HEAD	FLOOR TO HEAD 60" ON HOSE ADJ. 48"	FLOOR TO HEAD 78" VARIES

PIPING SYSTEM LABELS

NEW	EXISTING	
ADW	XADW	ANIMAL DRINKING WATER
CA	XCA	LAB COMPRESSED AIR
CCW	XCCW	CLEAN COLD WATER
CDA	XCDA	CLEAN DRY AIR
CHR	XCHR	CHILLED WATER RETURN
CHS	XCHS	CHILLED WATER SUPPLY
CO2	XCO2	CARBON DIOXIDE
CS	XCS	COLD SOFT WATER
DCW	XDCW	DOMESTIC COLD WATER
DHR	XDHR	DOMESTIC HOT WATER RETURN
DHW	XDHW	DOMESTIC HOT WATER
DIW	XDIW	DEIONIZED WATER
HT	XHT	HEAT TRACE HOT WATER
HER	XHER	HELIUM RECOVERY
HV	XHV	HOUSEKEEPING VACUUM
LA	XLA	LAB COMPRESSED AIR (LOW PRESSURE)
LN2	XLN2	LIQUID NITROGEN
LVAC	XLVAC	LOCAL LAB VACUUM
N2(55)	XN2(55)	NITROGEN 55 PSI
N2(100)	XN2(100)	NITROGEN 100 PSI
NG(HP)	XNG(HP)	NATURAL GAS (HIGH PRESSURE)
NG(LP)	XNG(LP)	NATURAL GAS (LOW PRESSURE)
NP	XNP	NON-POTABLE WATER
NPCS	XNP	NON-POTABLE COLD SOFT WATER
O2	XO2	OXYGEN
ROR	XPWR	REVERSE OSMOSIS WATER RETURN
ROS	XPWS	REVERSE OSMOSIS WATER SUPPLY
SWR	XSWR	STORM WATER REUSE
TF	XTF	TRAP FILLER LINE
TW	XDTW	TEMPERED WATER
UPWR	XUPWR	ULTRA PURE WATER RETURN
UPWS	XUPWS	ULTRA PURE WATER SUPPLY
VAC	XVAC	LAB VACUUM

NEW	EXISTING	
	XSAN	WASTE OR SOIL LINE
SD	XSD	SUBSOIL DRAIN LINE
S	XS	STORM
OD	XOD	OVERFLOW DRAIN LINE
FM	XFM	FORCE MAIN
CWW	XCWW	CLEARWATER WASTE
IW	XIW	INDIRECT WASTE
CRW	XCRW	CORROSION RESISTANT WASTE
GW	XGW	GREASE WASTE
		UNDERFLOOR FOR WASTE OR SOIL, SUBSOIL, STORM & FORCE MAIN
	XV	VENT
CWV	XCWV	CLEARWATER VENT
CRV	XCRV	CORROSION RESISTANT VENT
ACE	XVACE	VACUUM EXHAUST

CIVIL UTILITIES SYSTEMS

NEW	EXISTING	
W	XW	WATER LINE
SAN	XSAN	SANITARY SEWER
STM	XSTM	STORM SEWER
FM	XFM	FORCE MAIN
F	XF	FIRE MAIN

NEW	EXISTING	
		SHUTOFF VALVE
PIV	XPIV	POST INDICATOR VALVE
		FIRE HYDRANT
		MANHOLE
		CATCH BASIN OR INLET
		CURB INLET

REFERENCE SYMBOLS

- REFER / X0.0 — GENERAL REFERENCE DESIGNATES SHEET NUMBER
- 1 / X0.0 — DETAIL REFERENCE TOP DESIGNATES DETAIL NUMBER BOTTOM DESIGNATES SHEET NUMBER
- 1 / X0.0 — SECTION REFERENCE TOP DESIGNATES SECTION NUMBER BOTTOM DESIGNATES SHEET NUMBER
- ELEVATION SYMBOL
- NEW CONNECTION TO EXISTING
- EQTYPE / EQIDEN — EQUIPMENT NAME AND NUMBER
- ### — LAB EQUIPMENT NUMBER
- # — SHEET KEYNOTE NUMBER
- REVISION NUMBER
- #### — CONSTRUCTION BULLETIN NUMBER

ABBREVIATIONS

A	-	AIR
ACC	-	ACCESS
ADB	-	ACID DILUTION BASIN
ADJ	-	ADJUSTABLE
AFF	-	ABOVE FINISHED FLOOR
ALT	-	ALTERNATE
AP	-	ACCESS PANEL
APPROX	-	APPROXIMATE
ARCH	-	ARCHITECTURAL
ASSY	-	ASSEMBLY
BLDG	-	BUILDING
BOP	-	BOTTOM OF PIPE ELEVATION
BOT	-	BOTTOM
BT	-	BATHTUB
BTU	-	BRITISH THERMAL UNIT
BTUH	-	BRITISH THERMAL UNITS PER HOUR
BTWN	-	BETWEEN
CA	-	COMPRESSED AIR
CFCI	-	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
CFM	-	CUBIC FEET PER MINUTE
CLG	-	CEILING
CMU	-	CONCRETE MASONRY UNIT
CO	-	CLEANOUT
CO2	-	CARBON DIOXIDE
CONN	-	CONNECTION/CONNECT
CONTR	-	CONTRACTOR
CSK	-	COUNTERSINK
CS	-	CUP SINK/COLD SOFT WATER
CW	-	COLD WATER
CU	-	COPPER
CRV	-	CORROSIVE RESISTANT VENT
CRVTR	-	CORROSIVE RESISTANT VENT THROUGH ROOF
CRW	-	CORROSIVE RESISTANT WASTE
CWW	-	CLEARWATER WASTE
D	-	DEPTH/DRAIN LINE
DCW	-	DOMESTIC COLD WATER
DET	-	DETAIL
DFU	-	DRAINAGE FIXTURE UNIT
DHR	-	DOMESTIC HOT WATER RETURN
DHW	-	DOMESTIC HOT WATER
DIA	-	DIAMETER
DIM	-	DIMENSION
DN	-	DOWN
DS	-	DOWNSPOUT
DWG	-	DRAWING
EA	-	EACH
EEW	-	EMERGENCY EYEWASH
EJ	-	EXPANSION JOINT
ELEC	-	ELECTRICAL
ELEV	-	ELEVATION
EQUIP	-	EQUIPMENT
ET	-	EXPANSION TANK
ETR	-	EXISTING TO REMAIN
ES	-	EMERGENCY SHOWER
EWC	-	ELECTRIC WATER COOLER
EXP	-	EXPANSION
EXT	-	EXTERIOR
FA	-	FROM ABOVE
FB	-	FROM BELOW
FD	-	FLOOR DRAIN
FLR	-	FLOOR
FM	-	FORCE MAIN
FP	-	FIREPROOF
FPM	-	FEET PER MINUTE
FT	-	FEET
FTG	-	FOOTING
G	-	GAS
GA	-	GAUGE
GAL	-	GALLON
GALV	-	GALVANIZED
GPM	-	GALLONS PER MINUTE
GW	-	GREASE WASTE
HB	-	HOSE BIBB
HD	-	HUB DRAIN
HER	-	HELIUM RECOVERY
HR	-	HOSE REEL
HT	-	HEAT TRACE HOT WATER
HTR	-	HEATER
HVAC	-	HEATING VENTILATING & AIR CONDITIONING
ID	-	INSIDE DIAMETER
IE	-	INVERT ELEVATION
IN	-	INCHES
IW	-	INDIRECT WASTE
L	-	LENGTH
LA	-	LABORATORY AIR
LAV	-	LAVATORY
LAS	-	LAB SINK
LS	-	LAB SINK
LTG	-	LIGHTING
LV	-	LABORATORY VACUUM
MAX	-	MAXIMUM
MB	-	MOP BASIN
MEZZ	-	MEZZANINE
MFR	-	MANUFACTURER
MH	-	MANHOLE
MIN	-	MINIMUM/MINUTE
MISC	-	MISCELLANEOUS
MTD	-	MOUNTED
MTG	-	MOUNTING
NIC	-	NOT IN CONTRACT
NO	-	NUMBER
NOM	-	NOMINAL
NPT	-	NATIONAL PIPE THREAD
NTS	-	NOT TO SCALE
OC	-	ON CENTER
OD	-	OUTSIDE DIAMETER/OVERFLOW DRAIN
OFCI	-	OWNER FURNISHED CONTRACTOR INSTALLED
OFOI	-	OWNER FURNISHED OWNER INSTALLED
P	-	PUMP
PIV	-	POST INDICATOR VALVE
PLBG	-	PLUMBING
PRESS	-	PRESSURE
PRV	-	PRESSURE REDUCING VALVE
PSF	-	POUNDS PER SQUARE FOOT
PSI	-	POUNDS PER SQUARE INCH
PSIG	-	POUNDS PER SQUARE INCH GAUGE
PW	-	PURE WATER
RAD	-	RADIUS
RD	-	ROOF DRAIN
REC	-	RECESSED
RECPT	-	RECEPTACLE
REQD	-	REQUIRED
RI	-	ROUGH-IN
RPM	-	REVOLUTIONS PER MINUTE
RV	-	RELIEF VALVE
S	-	STORM
SA	-	MECHANICAL SHOCK ARRESTOR
SAN	-	SANITARY
SCH	-	SCHEDULE
SD	-	SUBSOIL DRAIN
SF	-	SQUARE FEET
SH	-	SHOWER
SHT	-	SHEET
SPEC	-	SPECIFICATION
SQ	-	SQUARE
SR	-	SERVICE RECEPTOR
S/S	-	STAINLESS STEEL
STD	-	STANDARD
STM	-	STORM
STRU	-	STRUCTURAL/STRUCTURE
TD	-	TRENCH DRAIN
TEMP	-	TEMPERATURE
TOB	-	TOP OF BEAM
TOD	-	TOP OF DECK
TOJ	-	TOP OF JOIST
TOS	-	TOP OF SLAB/TOP OF STEEL
TF	-	TRAP FILLER
TP	-	TRAP PRIMER
TYP	-	TYPICAL
UR	-	URINAL
V	-	VENT/VACUUM
VAC	-	VACUUM
VCV	-	VACUUM INLET VALVE (HOUSEKEEPING VAC)
VEL	-	VELOCITY
VHP	-	VAPORIZED HYDROGEN PEROXIDE
VIB	-	VALVE-IN-BOX
VOL	-	VOLUME
VTR	-	VENT THRU ROOF
W	-	WASTE/WATER
W/	-	WITH
W/O	-	WITHOUT
WAGD	-	WASTE ANESTHETIC GAS DISPOSAL
WC	-	WATER CLOSET
WCO	-	WALL CLEANOUT
WGE	-	WASTE GAS EXHAUST
WH	-	WALL HYDRANT
WP	-	WATER PURIFIER (POINT OF USE)
WSFU	-	WATER SUPPLY FIXTURE UNIT
X	-	EXISTING
YCO	-	YARD CLEANOUT
ZVB	-	ZONE VALVE BOX

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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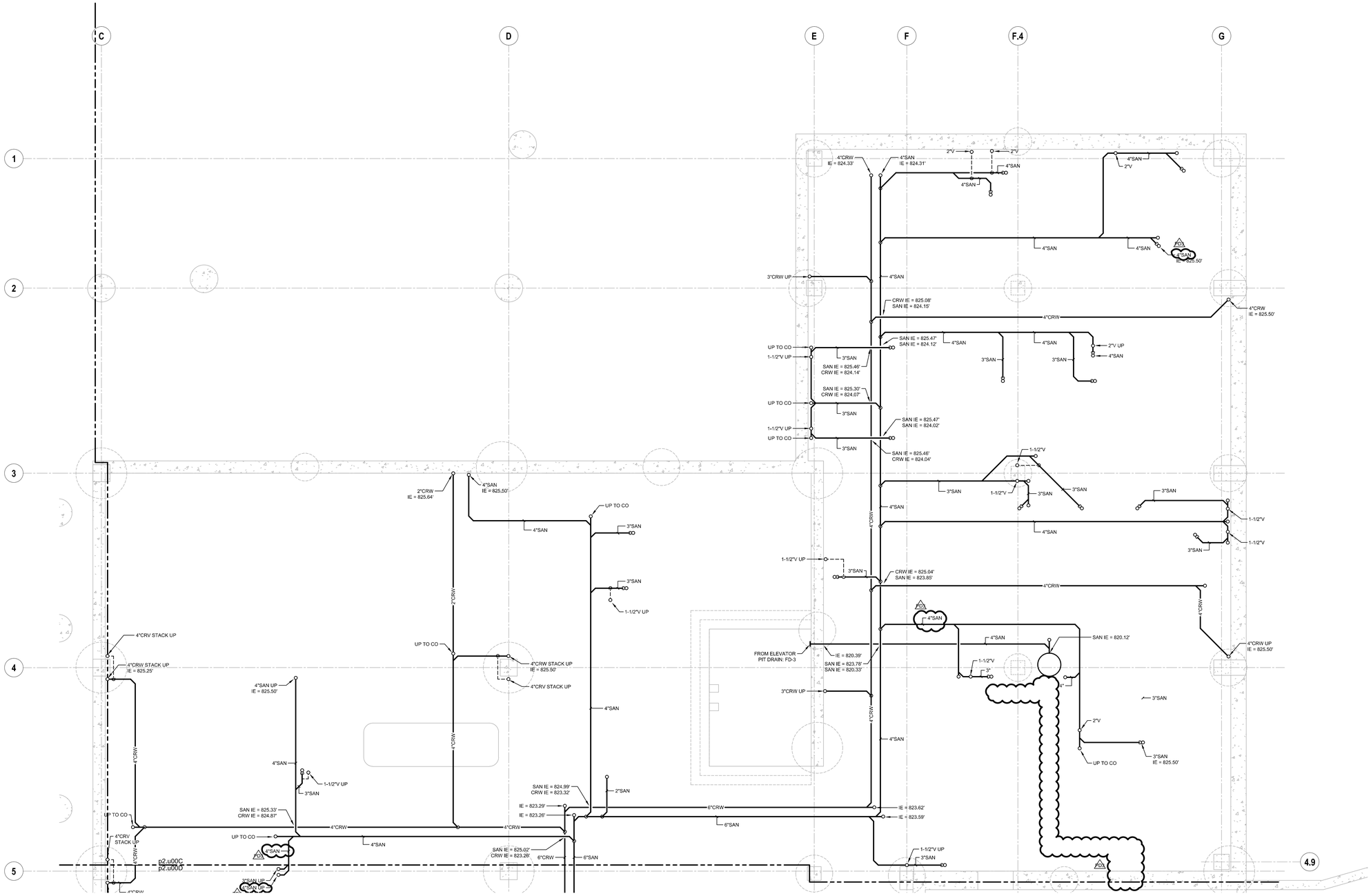
PLUMBING SYMBOLS AND ABBREVIATIONS

p0.01

GENERAL NOTES

1. ALL INVERT ELEVATIONS ARE BASED ON FFE = 627'-0"



1 **UNDERFLOOR - ZONE C**
SCALE: 1/4" = 1'-0"

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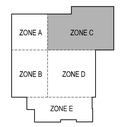
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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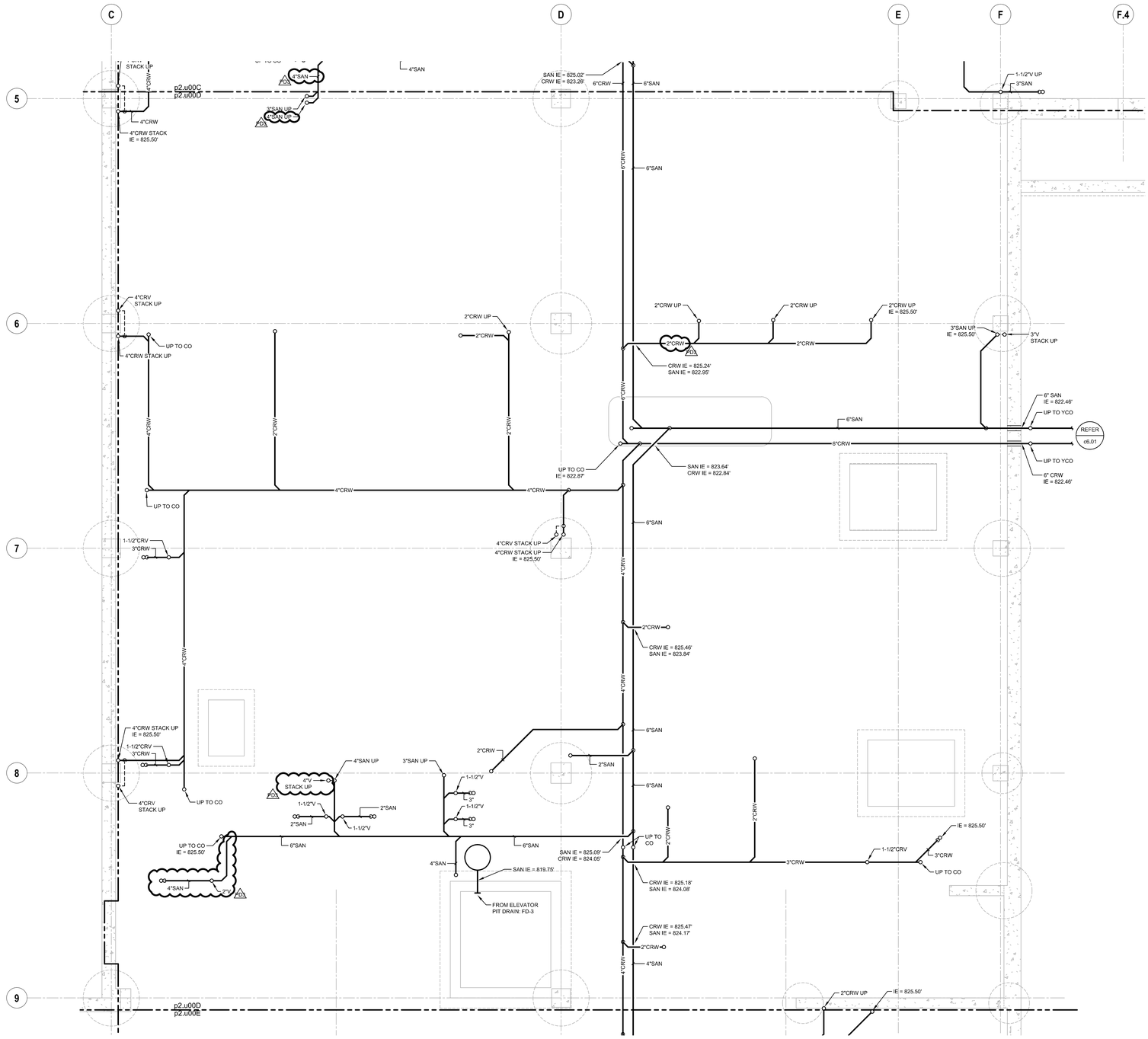
PIPING
UNDERFLOOR - ZONE C

p2.u00C

GENERAL NOTES

1. ALL INVERT ELEVATIONS ARE BASED ON FFE = 627'-0"



1 **UNDERFLOOR - ZONE D**
SCALE: 1/4" = 1'-0"

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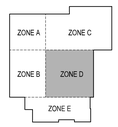
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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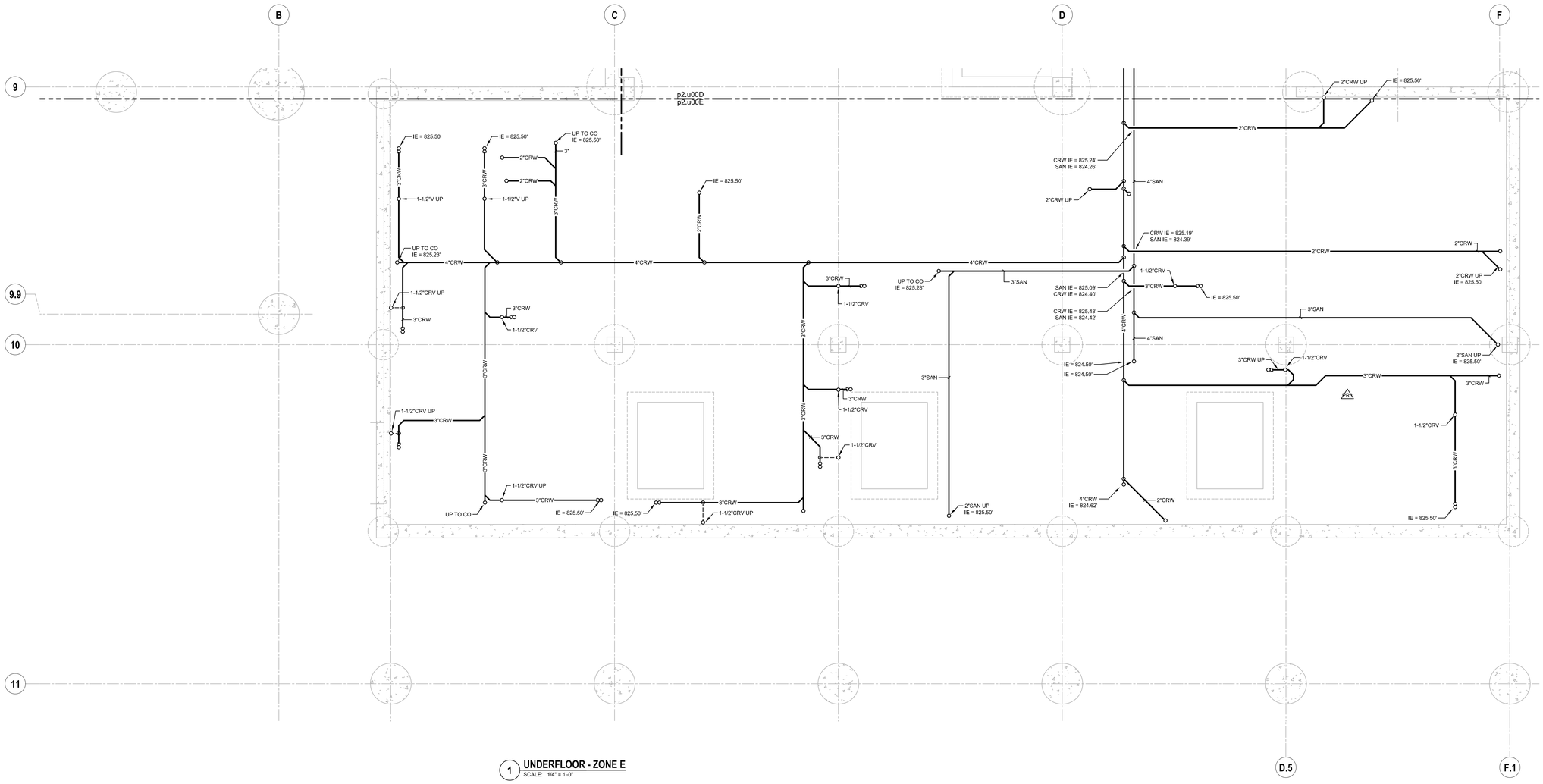
PIPING
UNDERFLOOR - ZONE D

p2.u00D

GENERAL NOTES

1. ALL INVERT ELEVATIONS ARE BASED ON FFE = 627'-0"



1 **UNDERFLOOR - ZONE E**
SCALE: 1/4" = 1'-0"

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Bid Package No. 2	02-24-2012
Proposal Request No. 3	04-06-2012

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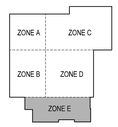
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
UNDERFLOOR - ZONE E

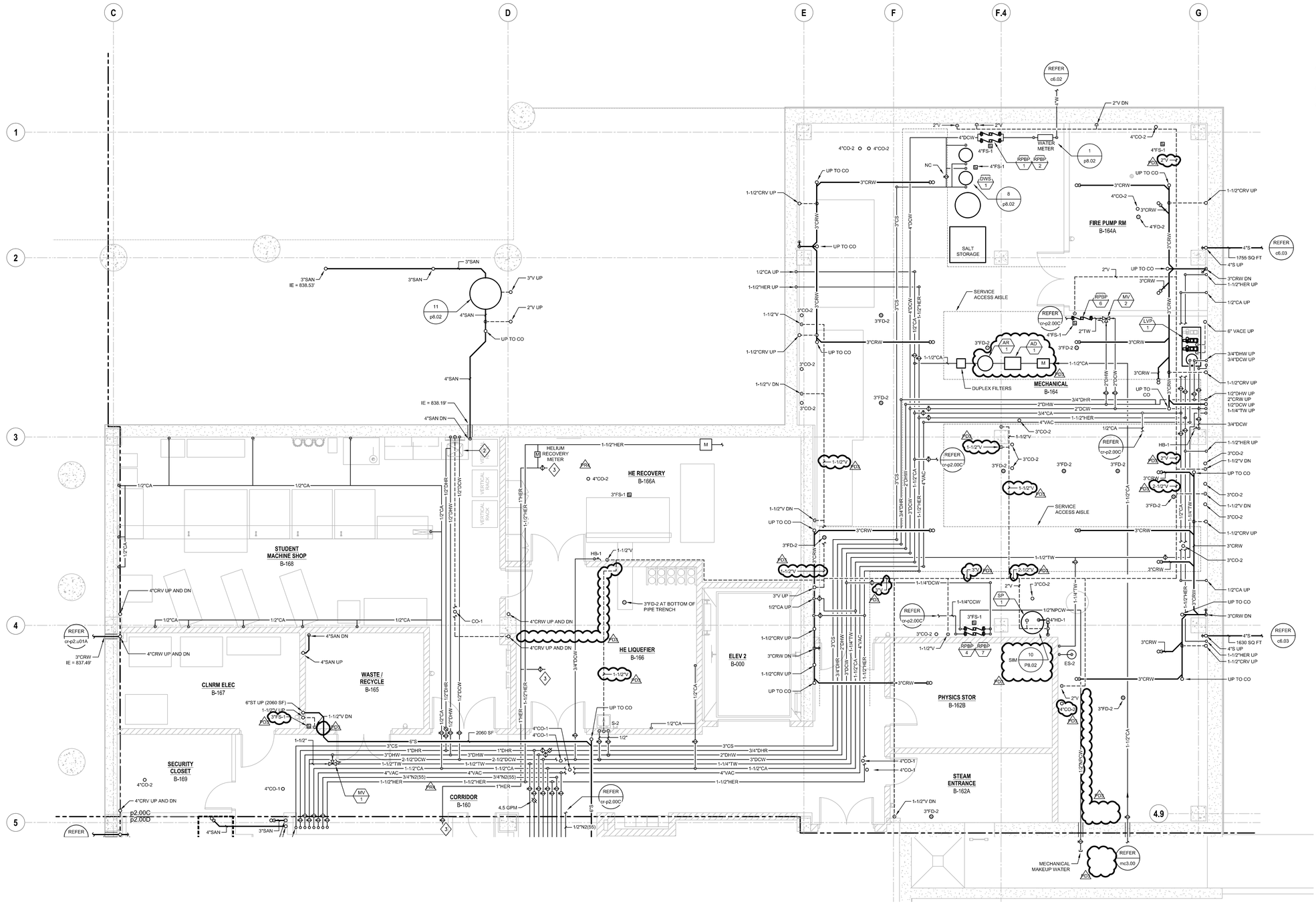
p2.u00E

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM
2. ALL INVERT ELEVATIONS ARE BASED ON FFE = 827'-0"

SHEET KEYNOTES

1. NOT USED.
2. PROVIDE ZURN Z1180 SOLIDS INTERCEPTOR OR EQUAL AT SINK.
3. PROVIDE OPEN END 1" HIER OVERHEAD FOR CONTINUATION BY OWNER.



1 **BASEMENT - ZONE C**
SCALE: 1/4" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Proposal Request No. 4	05-09-2012
Project Directive No. 3	05-15-2012

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Drawn SLC

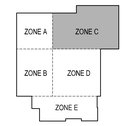
Checked LJH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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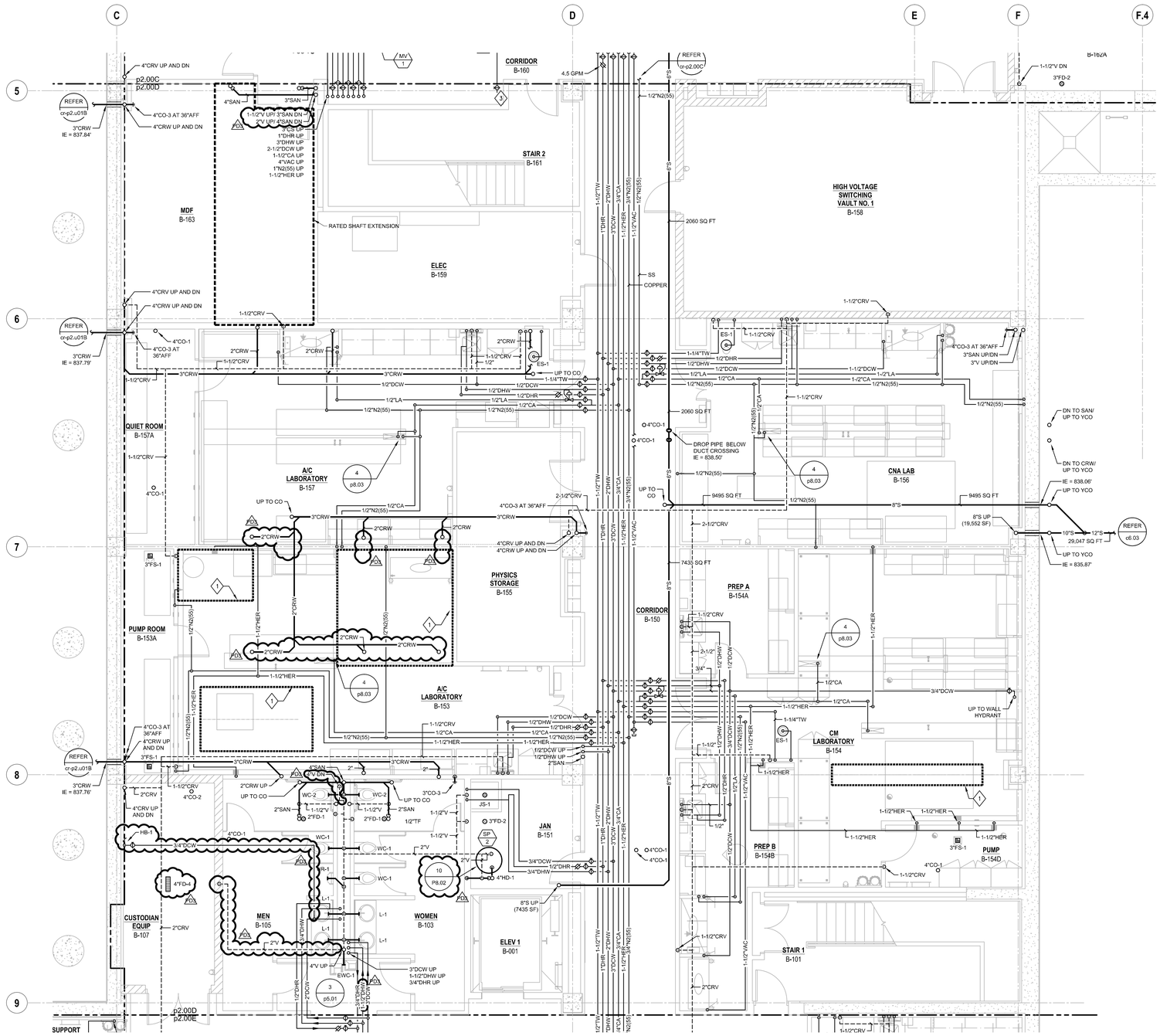
PIPING
BASEMENT - ZONE C

p2.00C



1 **BASEMENT - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM
2. ALL INVERT ELEVATIONS ARE BASED ON FFE = 827'-0"

SHEET KEYNOTES

1 PIPING AND DUCTWORK TO STAY CLEAR TO STRUCTURE WITHIN BOUNDARY.

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
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Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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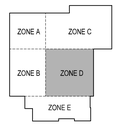
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
BASEMENT - ZONE D

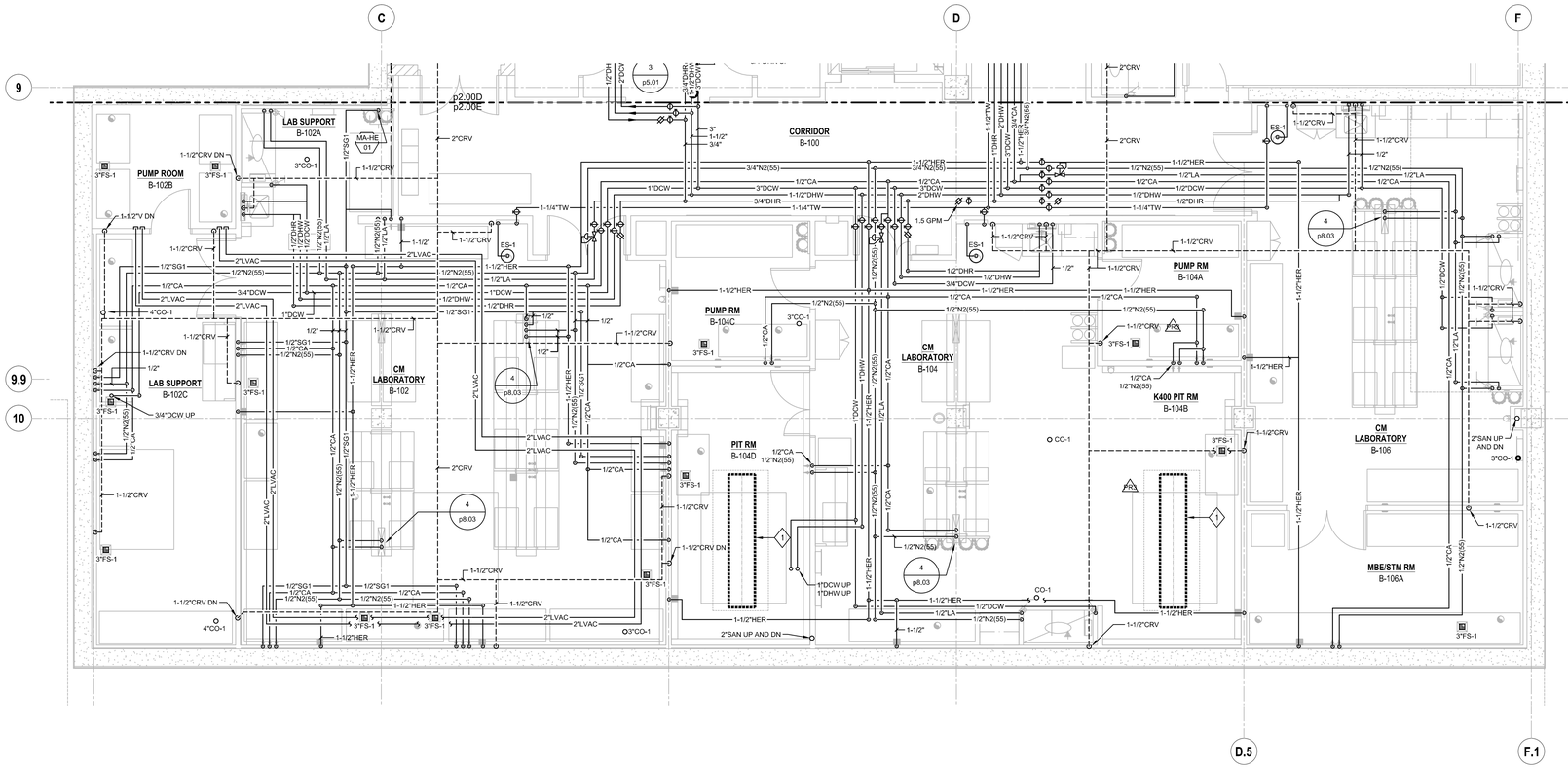
p2.00D

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1 PIPING AND DUCTWORK TO STAY CLEAR TO STRUCTURE WITHIN BOUNDARY.



1 **BASEMENT - ZONE E**
SCALE: 1/4" = 1'-0"

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By

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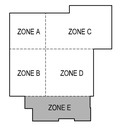
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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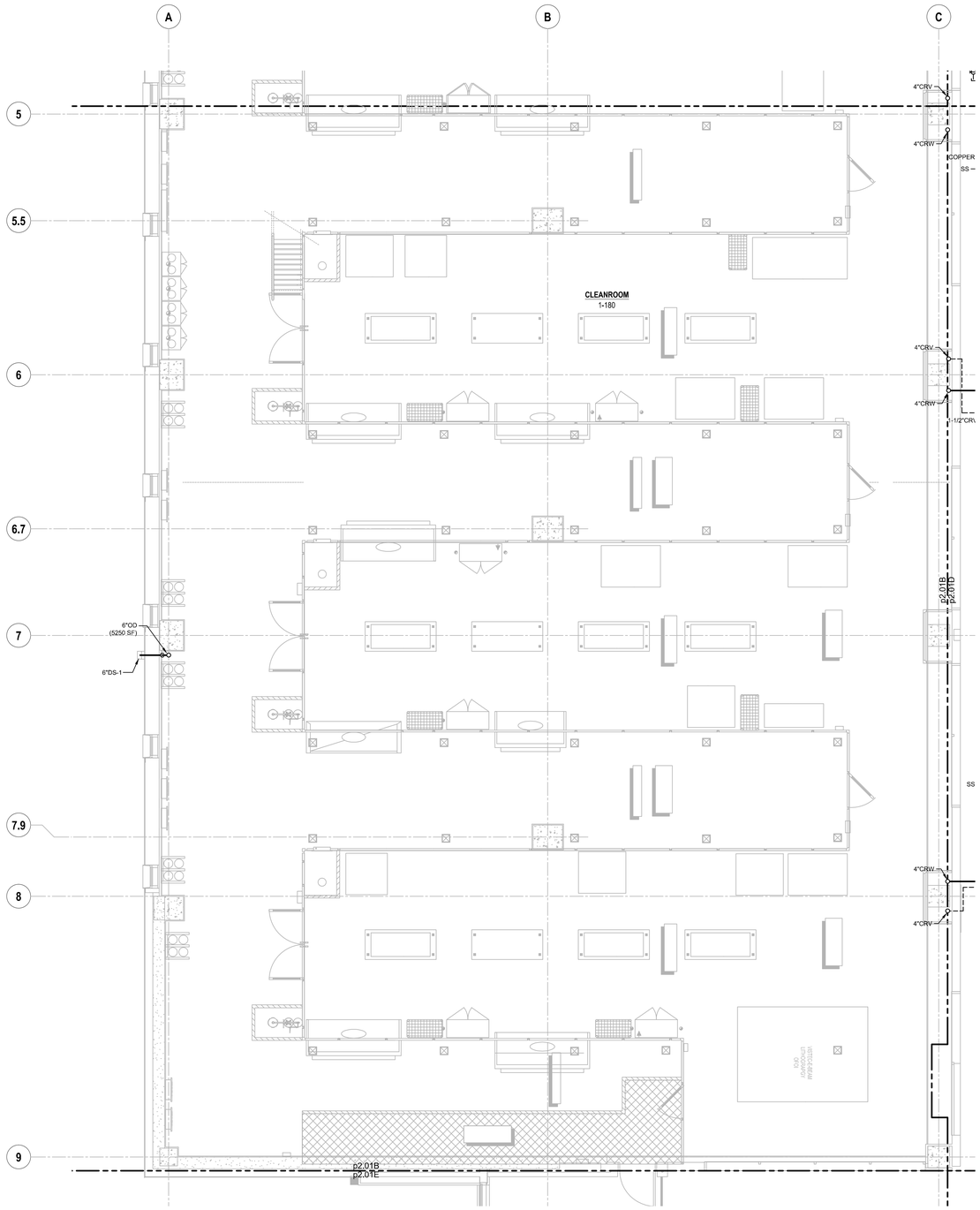
PIPING
BASEMENT - ZONE E

p2.00E

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM



1 **LEVEL 1 - ZONE B**
SCALE: 1/4" = 1'-0"

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By

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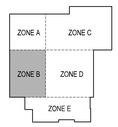
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
LEVEL 1 - ZONE B

p2.01B

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM
2. COORDINATE HIGH BAY PIPE ROUTING WITH ELECTRICAL. ELECTRICAL RACEWAY IS ROUTED AROUND PERIMETER AT 48"AFF.

SHEET KEYNOTES

1. VENT FROM FLAMMABLE WASTE RECEPTOR SHALL INDIVIDUALLY VENT THROUGH ROOF. VENT SHALL BE CAST IRON WITH NO-HUB CONNECTIONS.
2. NOT USED.
3. LN2 TO FILL STATION. FILL STATION BY LN2 VENDOR.
4. CONNECT TO HOSE REEL PROVIDED BY DIVISION 11.
5. PROVIDE COMPRESSED AIR QUICK DISCONNECTS EVENLY SPACED EVERY 10' ALONG HIGH BAY WALL. ROUTE HORIZONTAL COMPRESSED AIR PIPING AT 40"AFF.
6. PIPING AND EQUIPMENT WITHIN BOUNDARY BY LN2 VENDOR.

1 **LEVEL 1 - ZONE C**
SCALE: 1/4" = 1'-0"

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Low Voltage Consultant
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(651) 705-1242

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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Checked LJH
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

ZONE A | ZONE C | ZONE B | ZONE D | ZONE E

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PIPING
LEVEL 1 - ZONE C

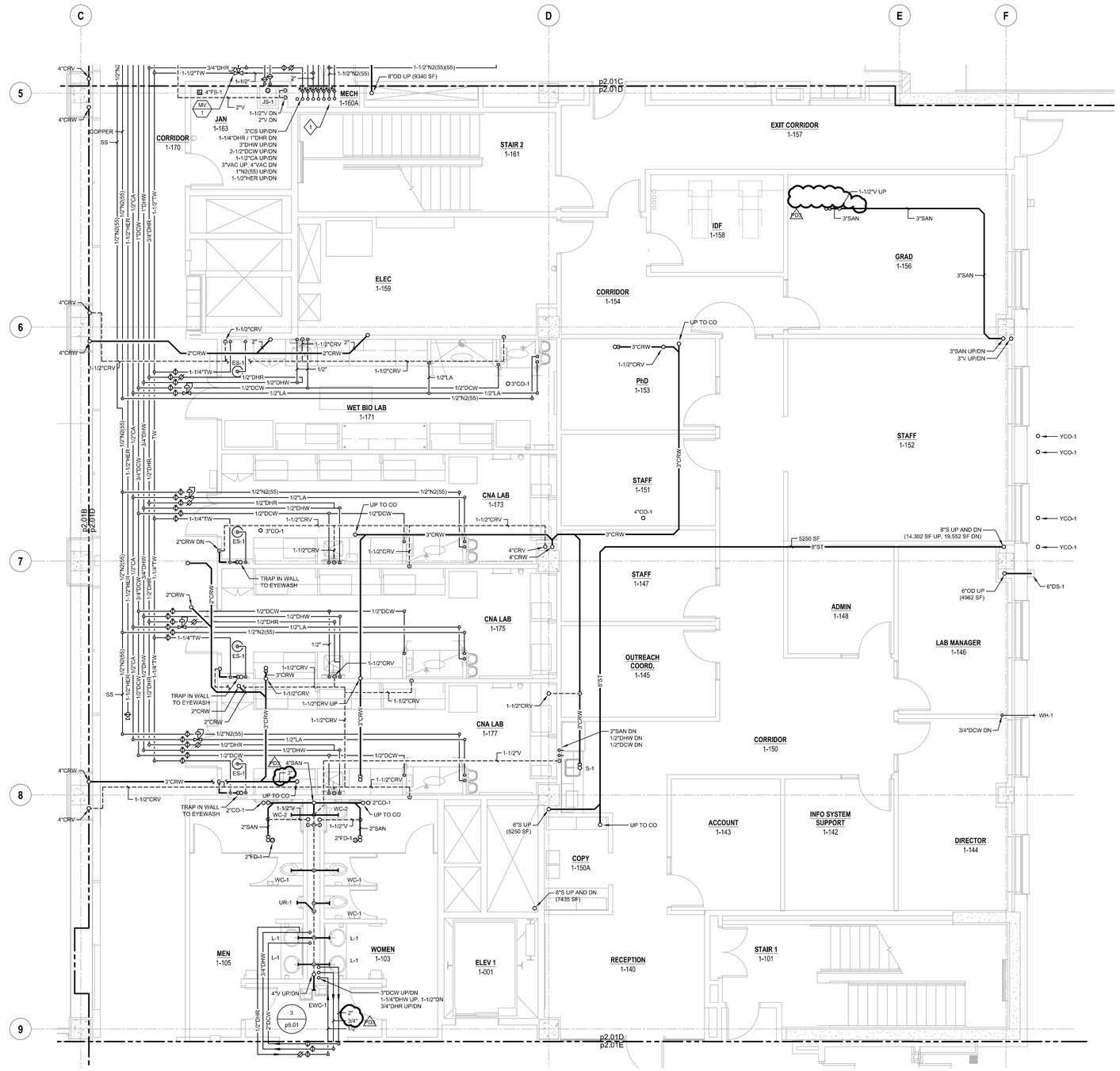
p2.01C

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1 VALVE TAKE-OFFS SHALL BE PROVIDED OFF THE RISER AT 30" AFF AND PROVIDE VALVES IN VERTICAL 42" AFF.



1 **LEVEL 1 - ZONE D**
SCALE: 1/4" = 1'-0"

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Project Directive No. 3	05-15-2012

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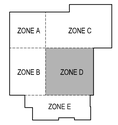
Checked LJH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
LEVEL 1 - ZONE D

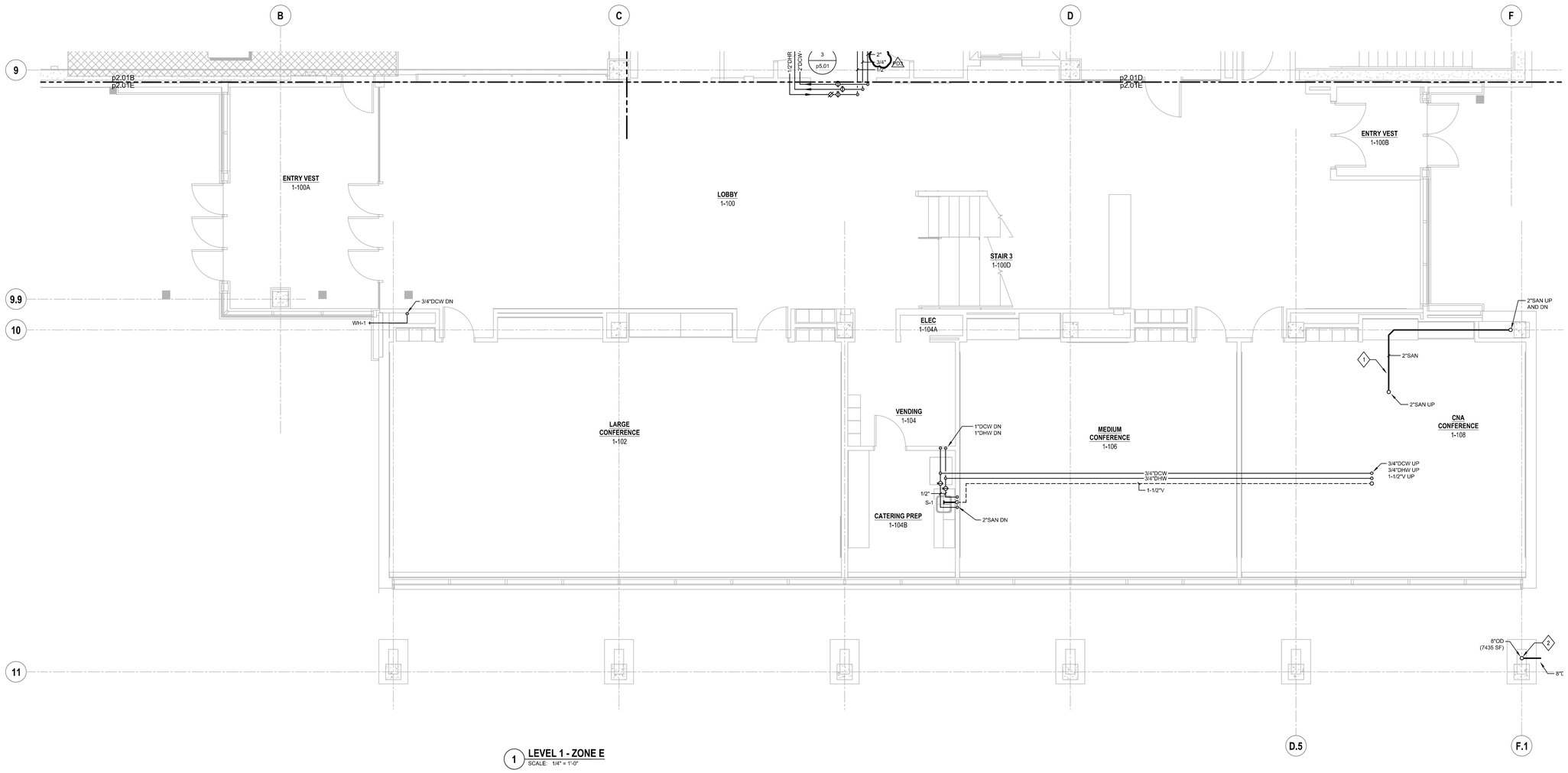
p2.01D

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1. INSULATE ALL STORM AND SANITARY PIPING LOCATED ABOVE CONFERENCE ROOMS TO MINIMIZE NOISE.
2. INSULATE OD PIPE IN EXTERIOR COLUMN ENCLOSURE TO PREVENT FREEZING.



1 **LEVEL 1 - ZONE E**
SCALE: 1/4" = 1'-0"

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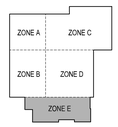
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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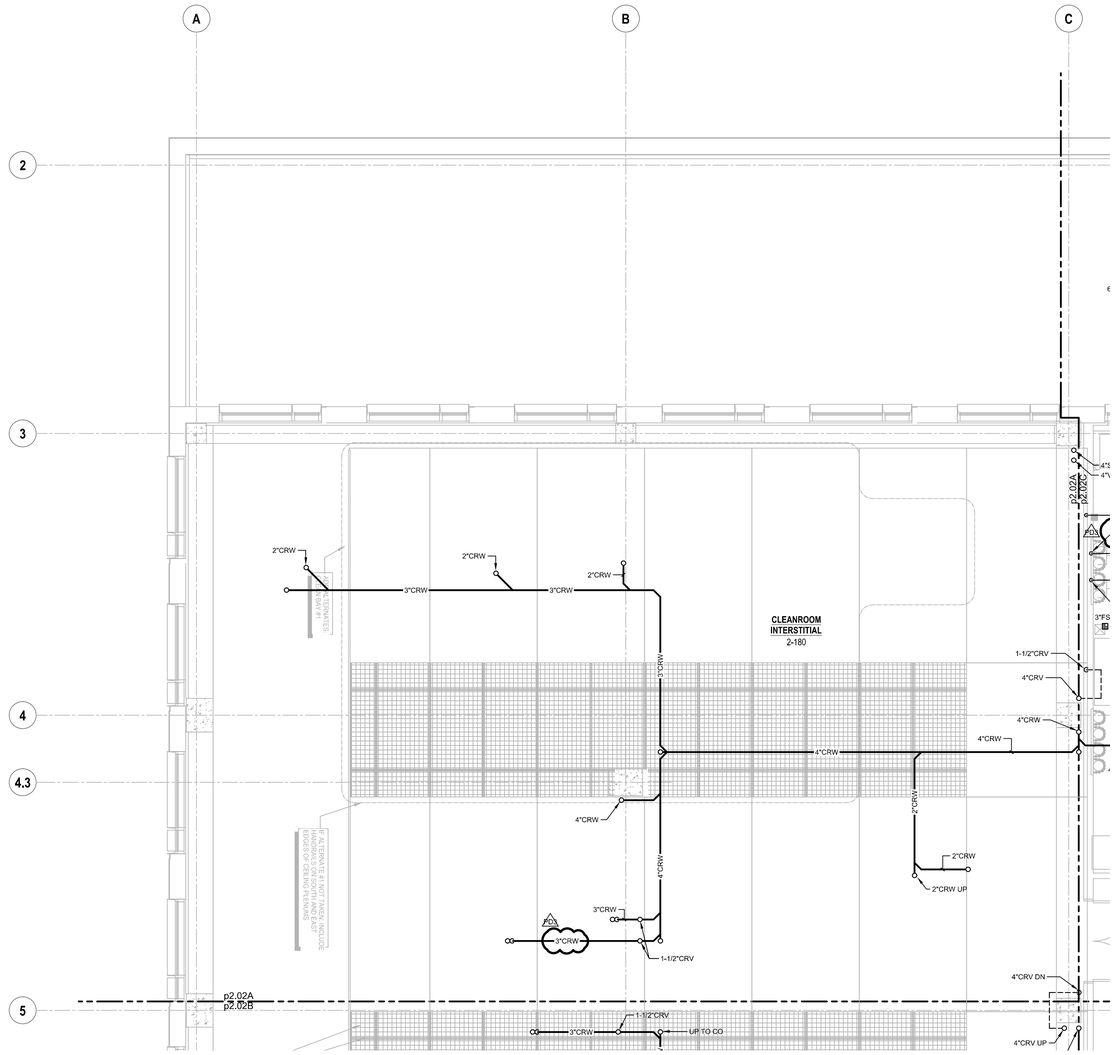
PIPING
LEVEL 1 - ZONE E

p2.01E



1 **LEVEL 2 - ZONE A**
SCALE: 1/4" = 1'-0"

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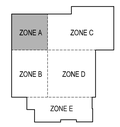

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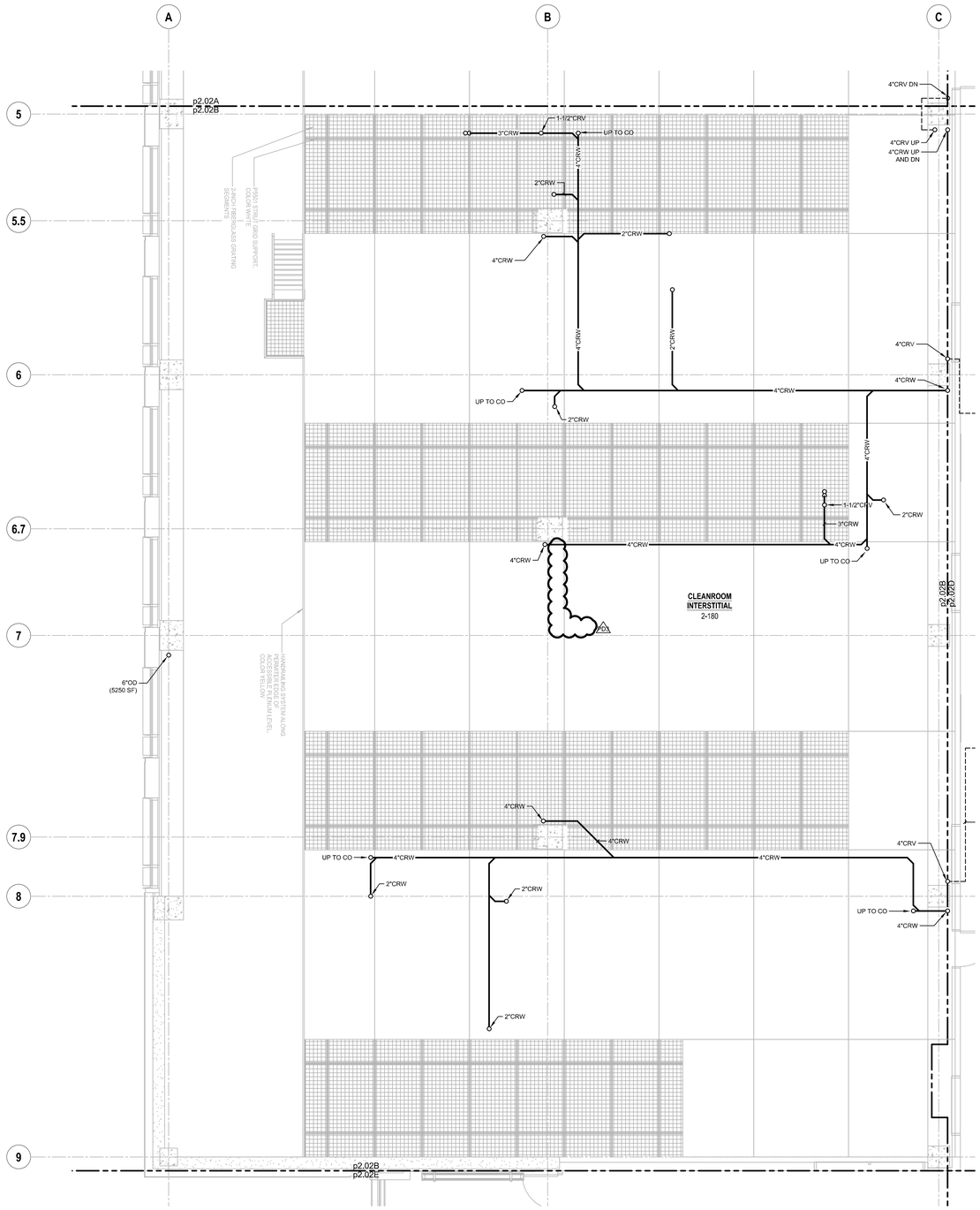
PIPING
LEVEL 2- ZONE A

p2.02A



1 **LEVEL 2 - ZONE B**
SCALE: 1/4" = 1'-0"

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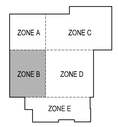

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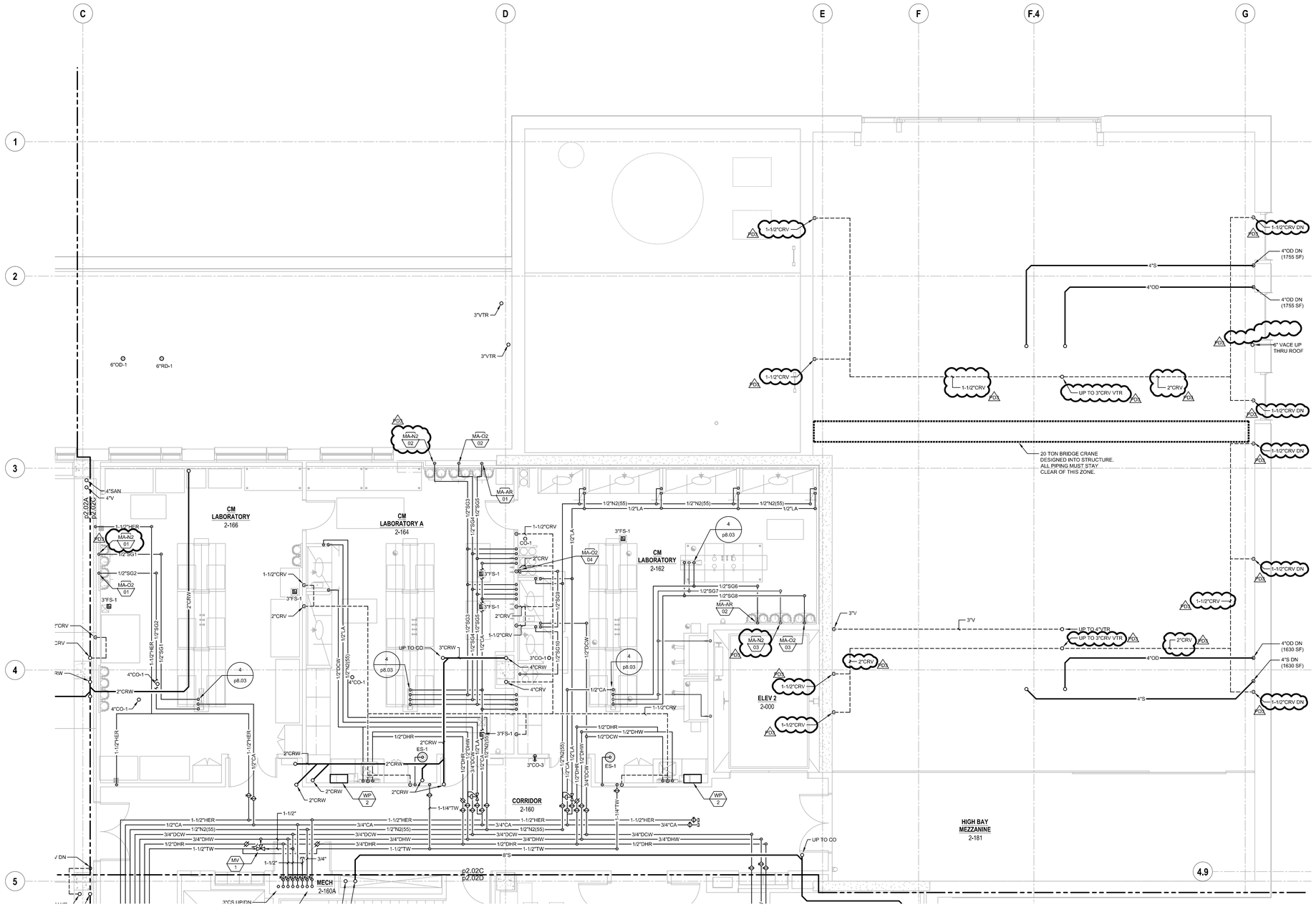
PIPING
LEVEL 2 - ZONE B

p2.02B

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM



1 **LEVEL 2 - ZONE C**
SCALE: 1/4" = 1'-0"

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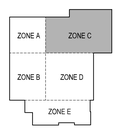
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
LEVEL 2 - ZONE C

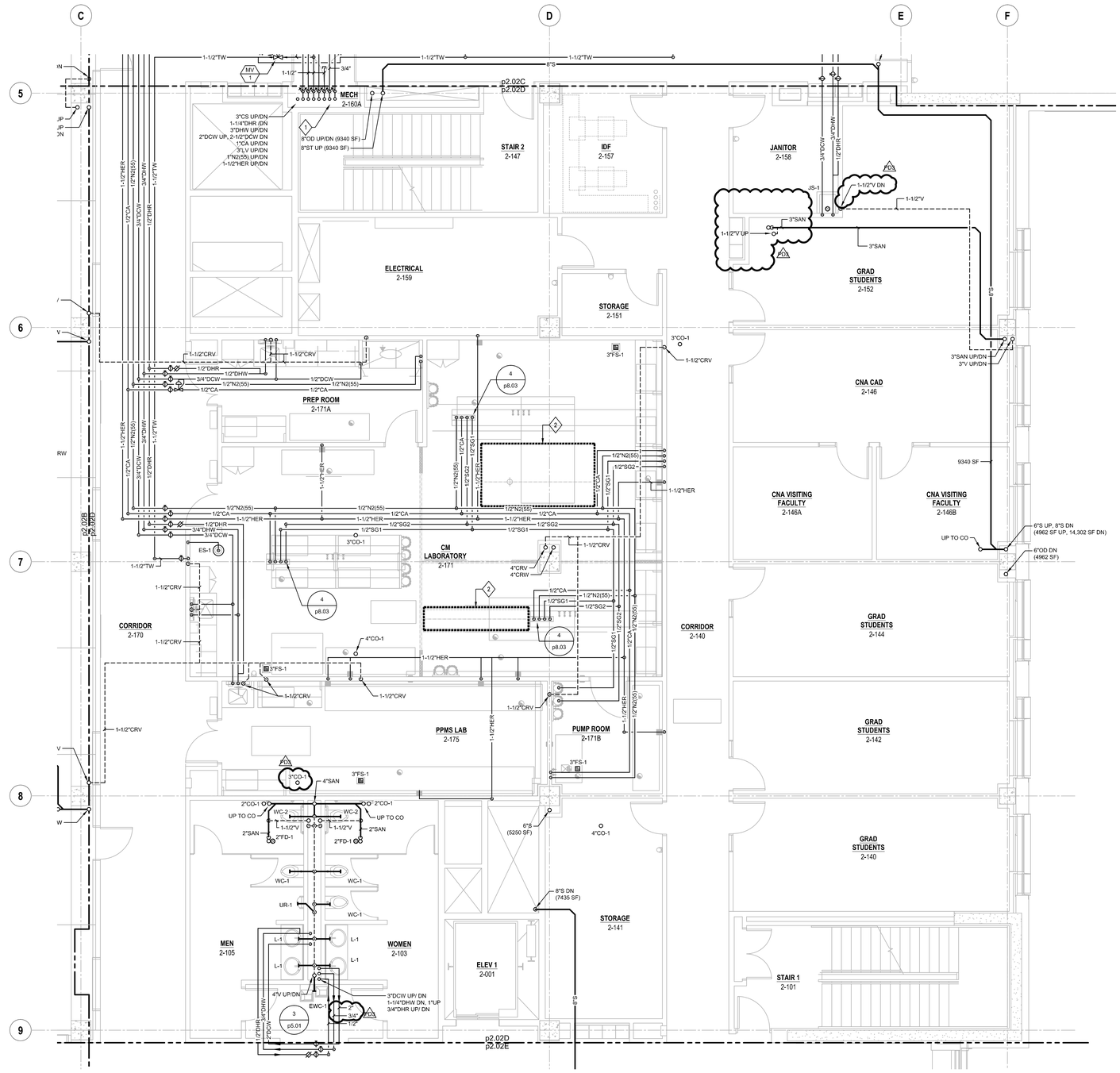
p2.02C

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1. VALVE TAKE-OFFS SHALL BE PROVIDED OFF THE RISER AT 30" AFF AND PROVIDE VALVES IN VERTICAL 42" AFF.
2. PIPING AND DUCTWORK TO STAY CLEAR TO STRUCTURE WITHIN BOUNDARY.



1 LEVEL 2 - ZONE D
SCALE: 1/4" = 1'-0"

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By

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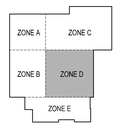
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
LEVEL 2 - ZONE D

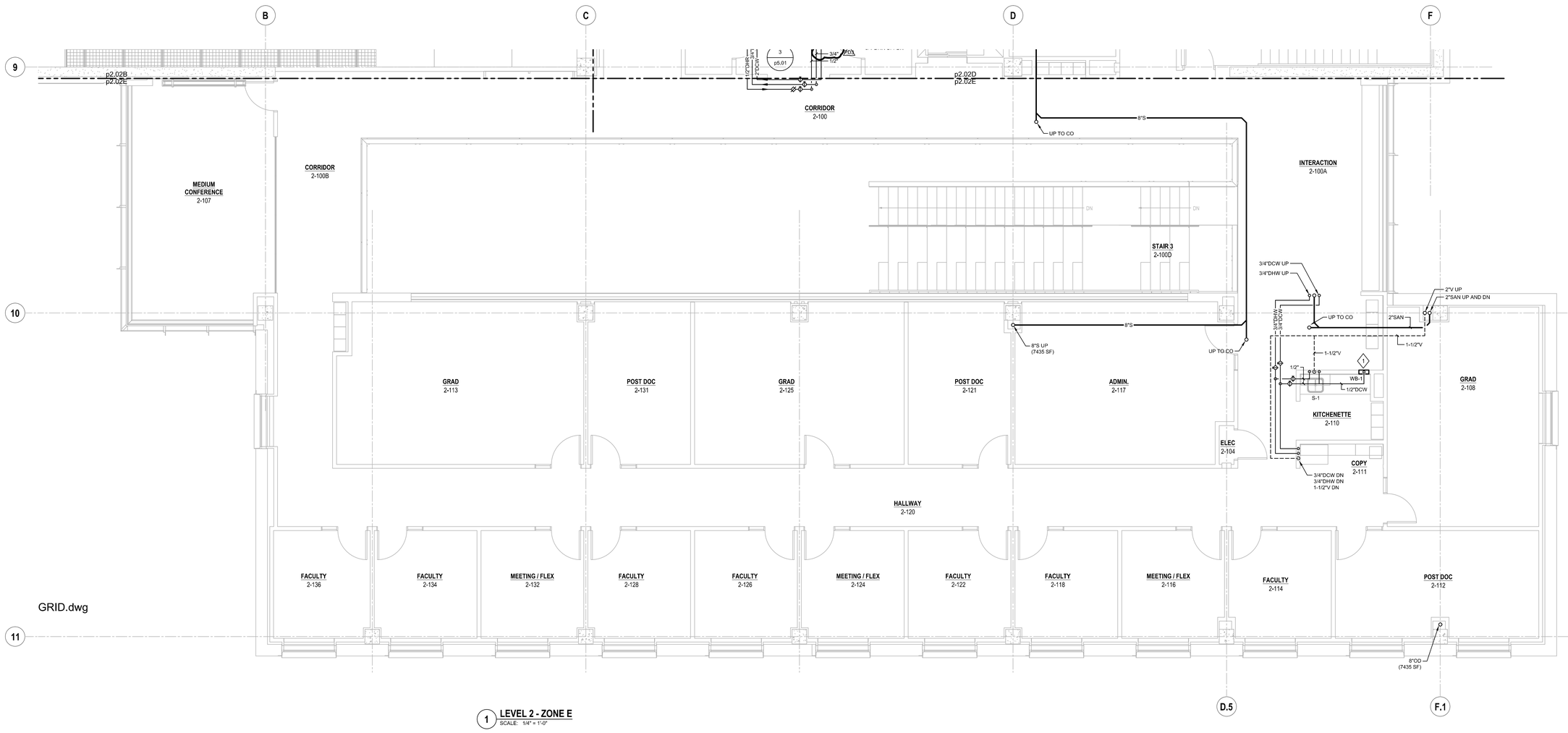
p2.02D

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1 COORDINATE WALL BOX LOCATION WITH ARCHITECTURAL.



1 **LEVEL 2 - ZONE E**
SCALE: 1/4" = 1'-0"

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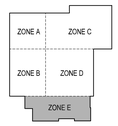

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PIPING
LEVEL 2 - ZONE E

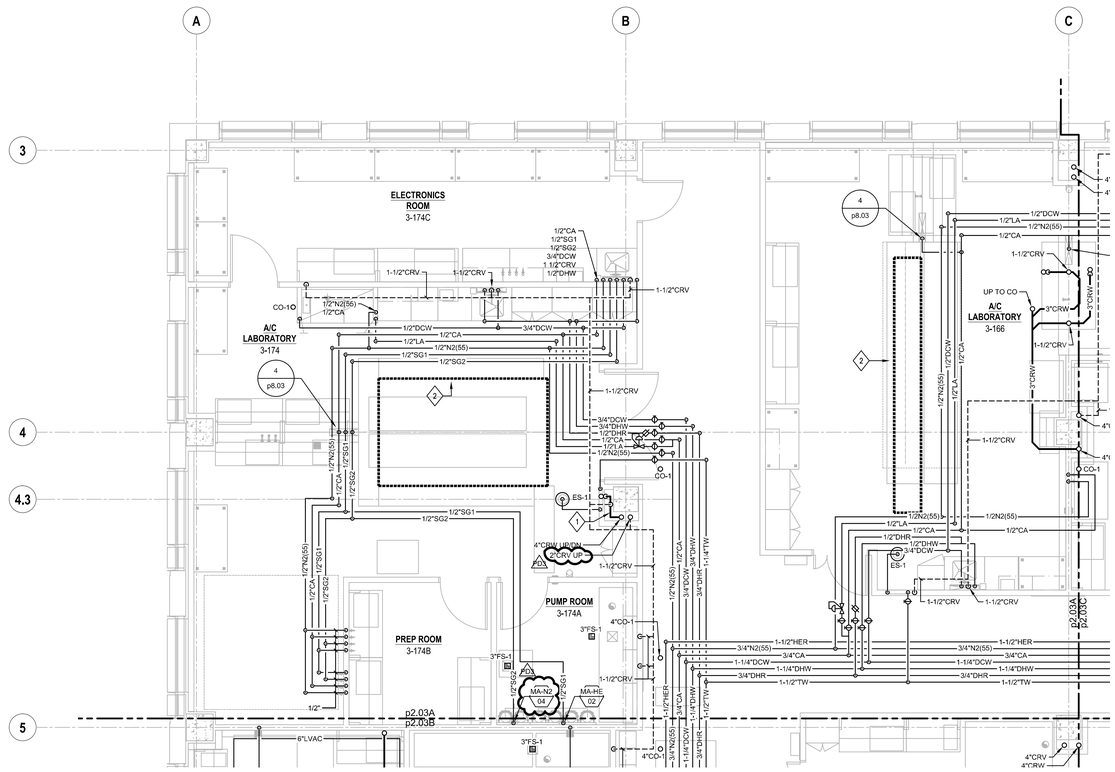
p2.02E

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1. OFFSET 2"CRW PIPE FROM EMERGENCY SHOWER IN FURRED OUT SPACE BEHIND WALL. CONNECT INTO 4"CRW RISER ON SOUTH SIDE OF COLUMN B/4.3.
2. PIPING AND DUCTWORK TO STAY CLEAR OF MANUAL CRANE RAIL ZONE.



1 **LEVEL 3 - ZONE A**
SCALE: 1/4" = 1'-0"

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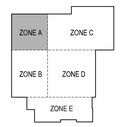

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PIPING
LEVEL 3 - ZONE A

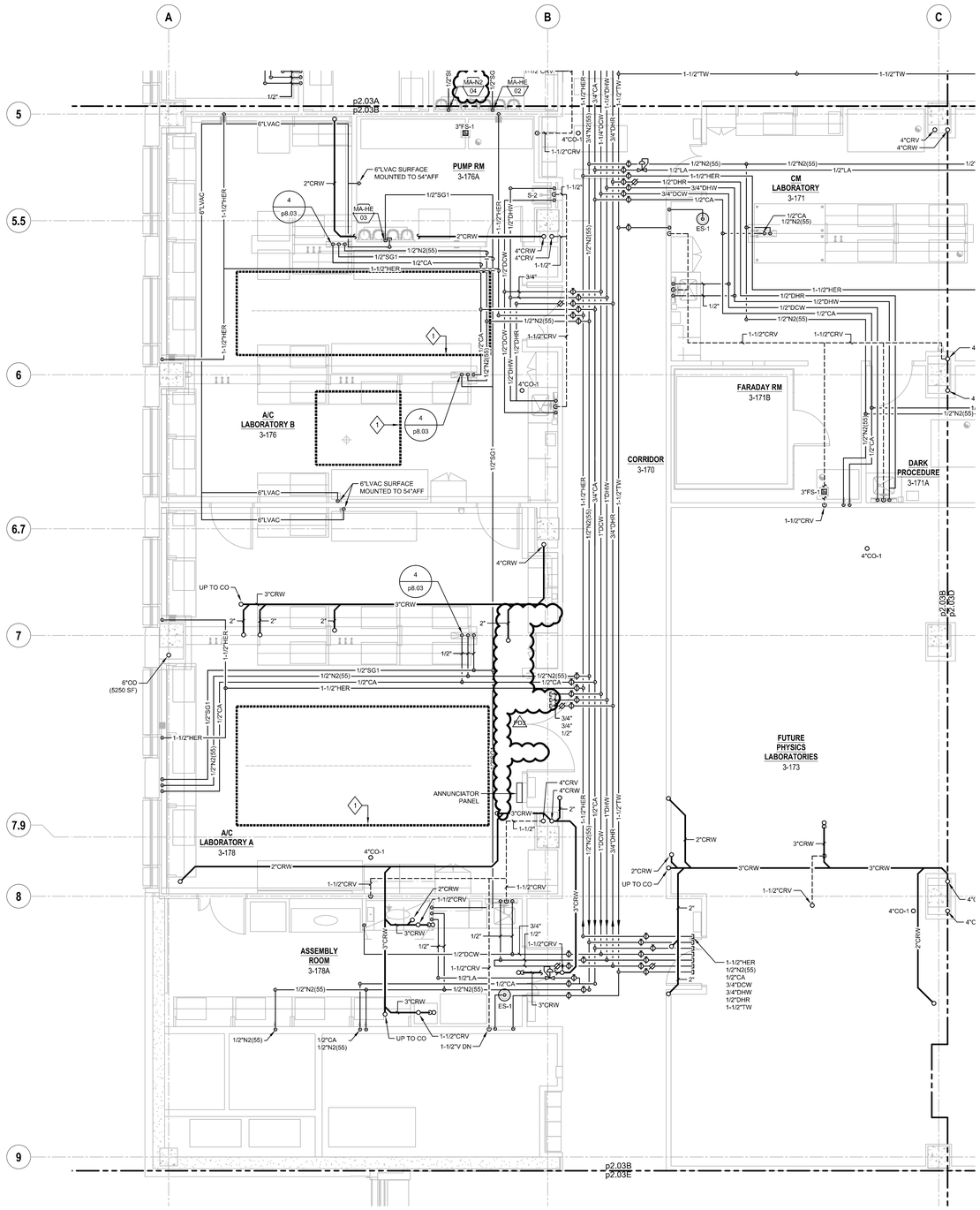
p2.03A

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1 PIPING AND DUCTWORK TO STAY CLEAR TO STRUCTURE WITHIN BOUNDARY.



1 **LEVEL 3 - ZONE B**
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Low Voltage Consultant
Elert & Associates
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Stillwater, MN 55082
(651) 705-1242

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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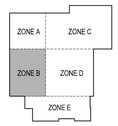
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
LEVEL 3 - ZONE B

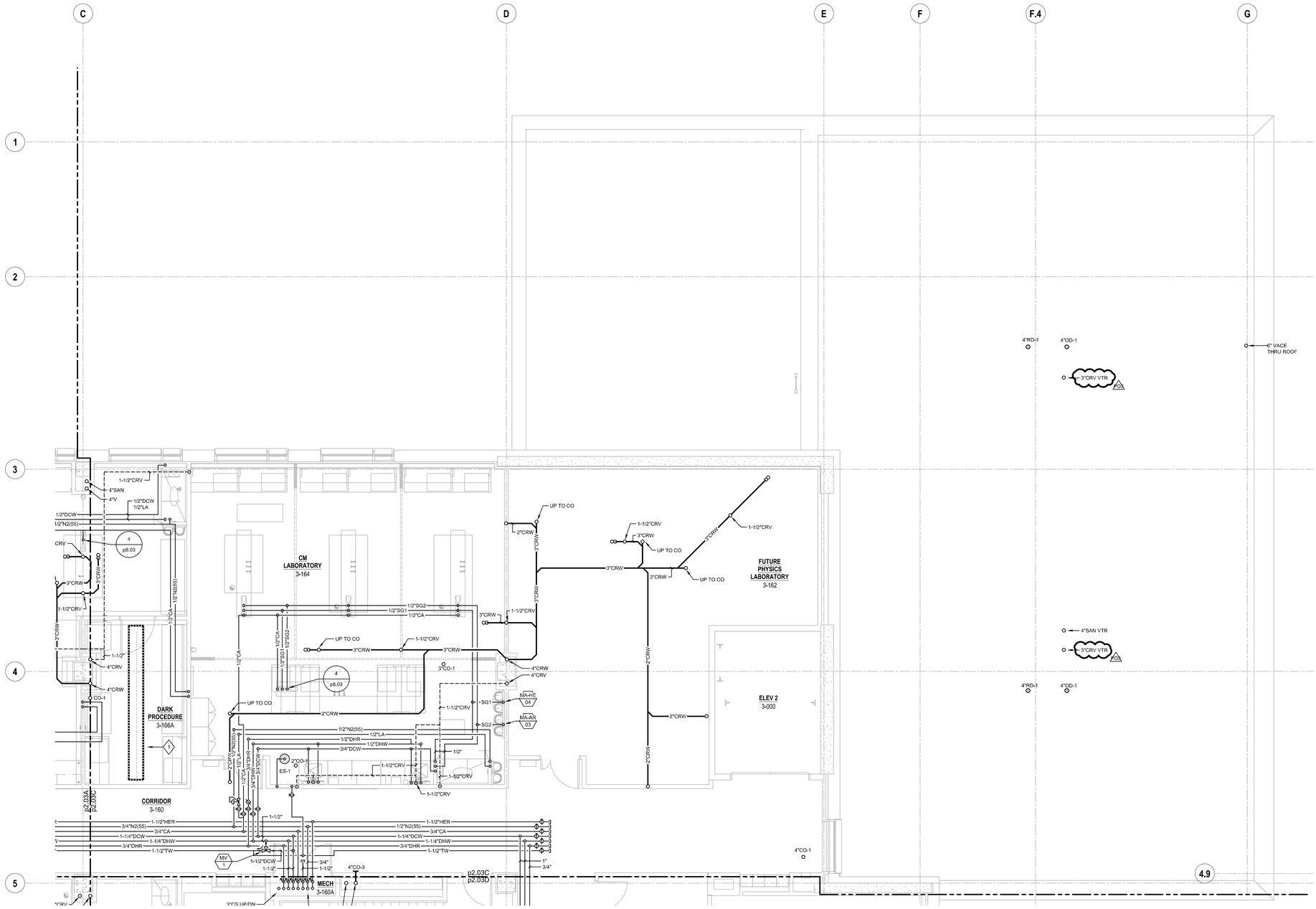
p2.03B

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1 PIPING AND DUCTWORK TO STAY CLEAR OF MANUAL CRANE RAIL ZONE.



1 **LEVEL 3 - ZONE C**
SCALE: 1/4" = 1'-0"

ARCHITECTURAL ALLIANCE
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400 Clifton Avenue South
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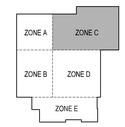
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
LEVEL 3 - ZONE C

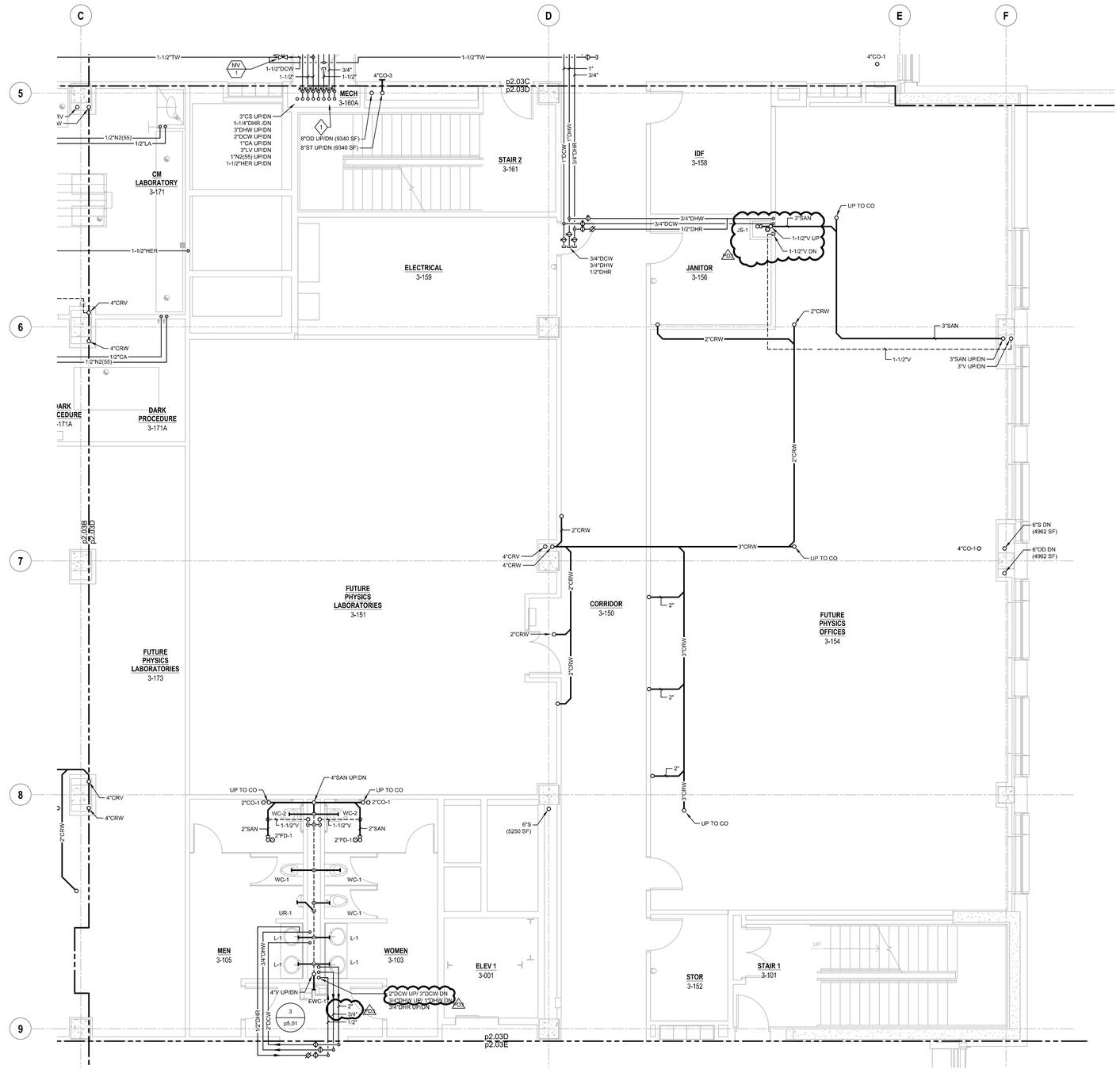
p2.03C

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1 VALVE TAKE-OFFS SHALL BE PROVIDED OFF THE RISER AT 30° AFF AND PROVIDE VALVES IN VERTICAL 42° AFF.



1 **LEVEL 3 - ZONE D**
SCALE: 1/4" = 1'-0"

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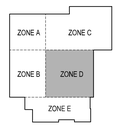
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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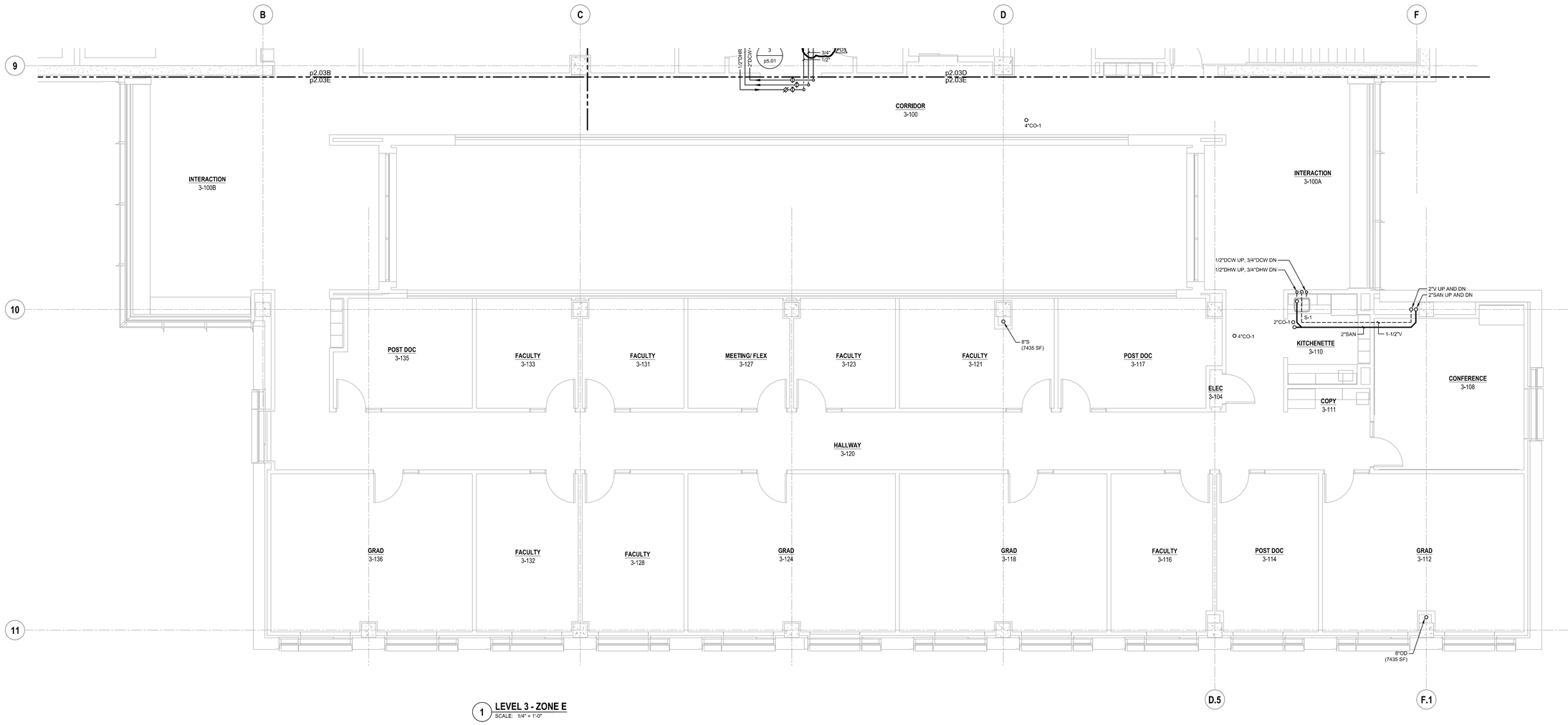
PIPING
LEVEL 3 - ZONE D

p2.03D

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM



1 **LEVEL 3 - ZONE E**
SCALE: 1/4" = 1'-0"

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Physics and Nanotechnology Building

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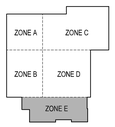

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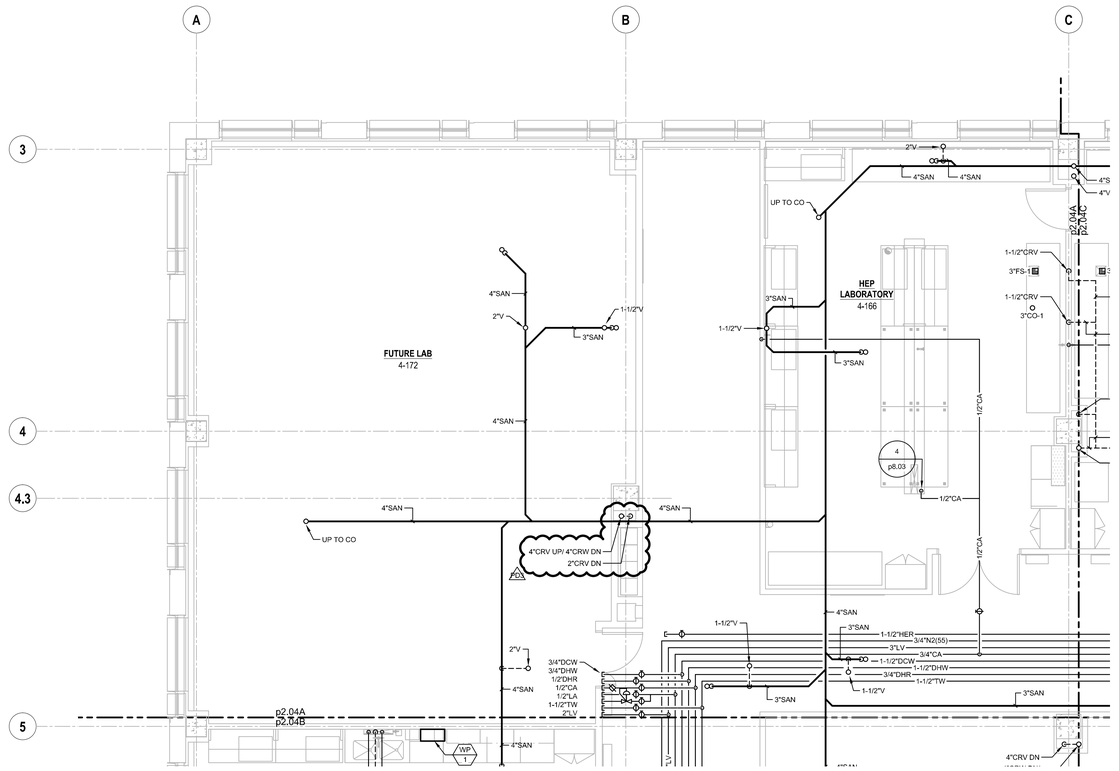
PIPING
LEVEL 3 - ZONE E

p2.03E

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM



1 **LEVEL 4 - ZONE A**
SCALE: 1/4" = 1'-0"

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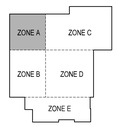
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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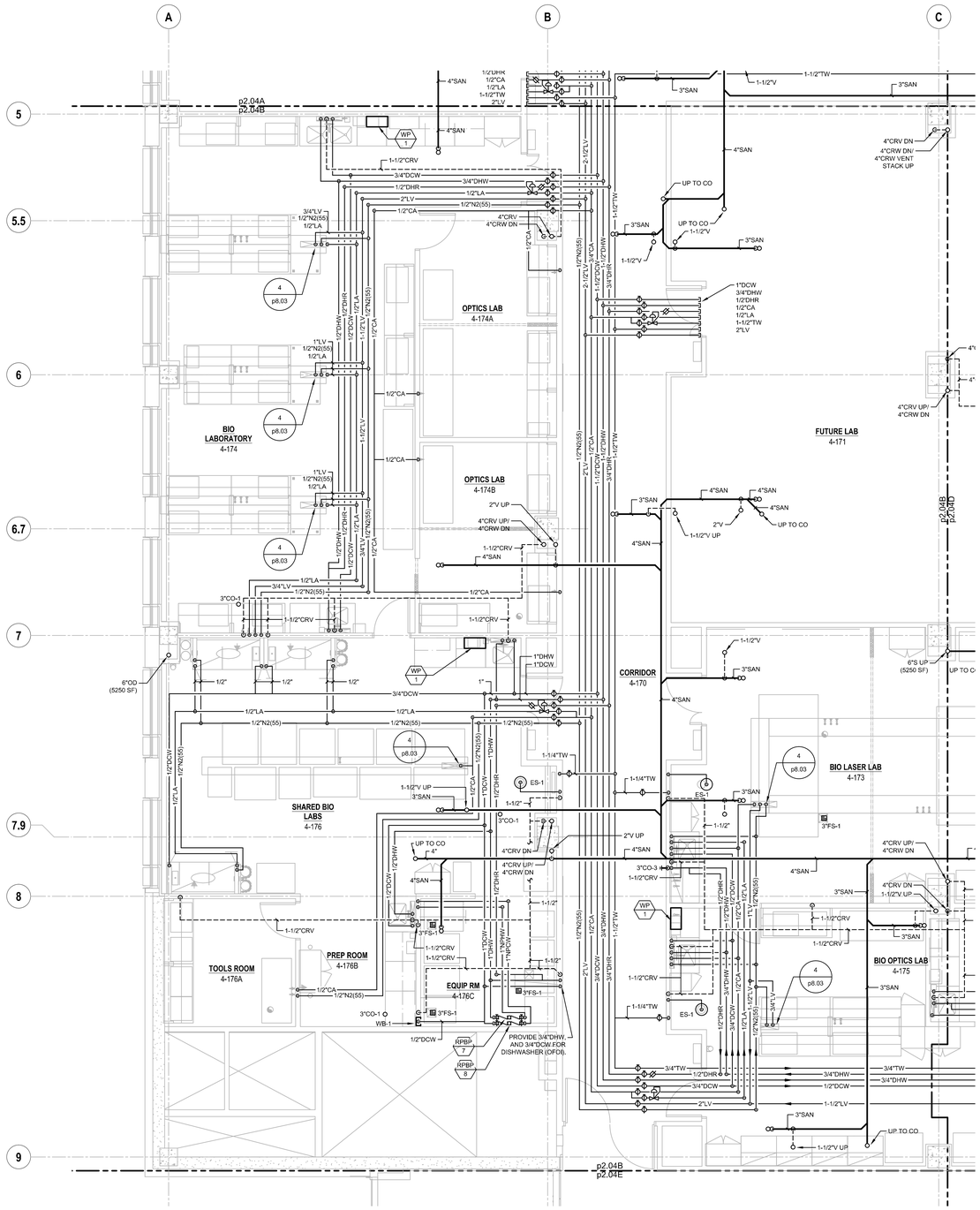
PIPING
LEVEL 4 - ZONE A

p2.04A

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM



1 **LEVEL 4 - ZONE B**
SCALE: 1/4" = 1'-0"

ARCHITECTURAL ALLIANCE
Architect of Record
400 Clifton Avenue South
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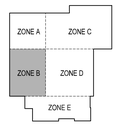
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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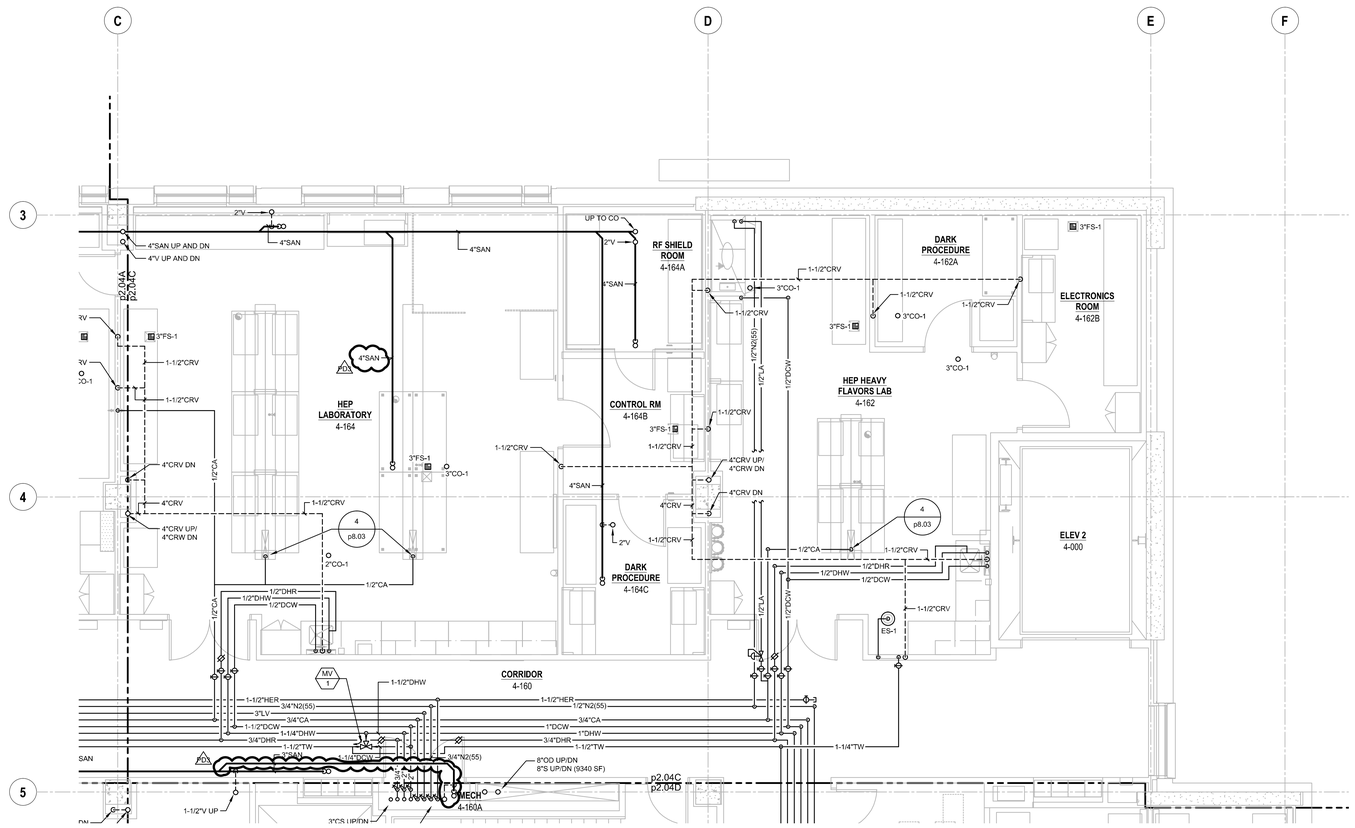
PIPING
LEVEL 4 - ZONE B

p2.04B

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM



1 **LEVEL 4 - ZONE C**
SCALE: 1/4" = 1'-0"

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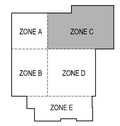
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
LEVEL 4 - ZONE C

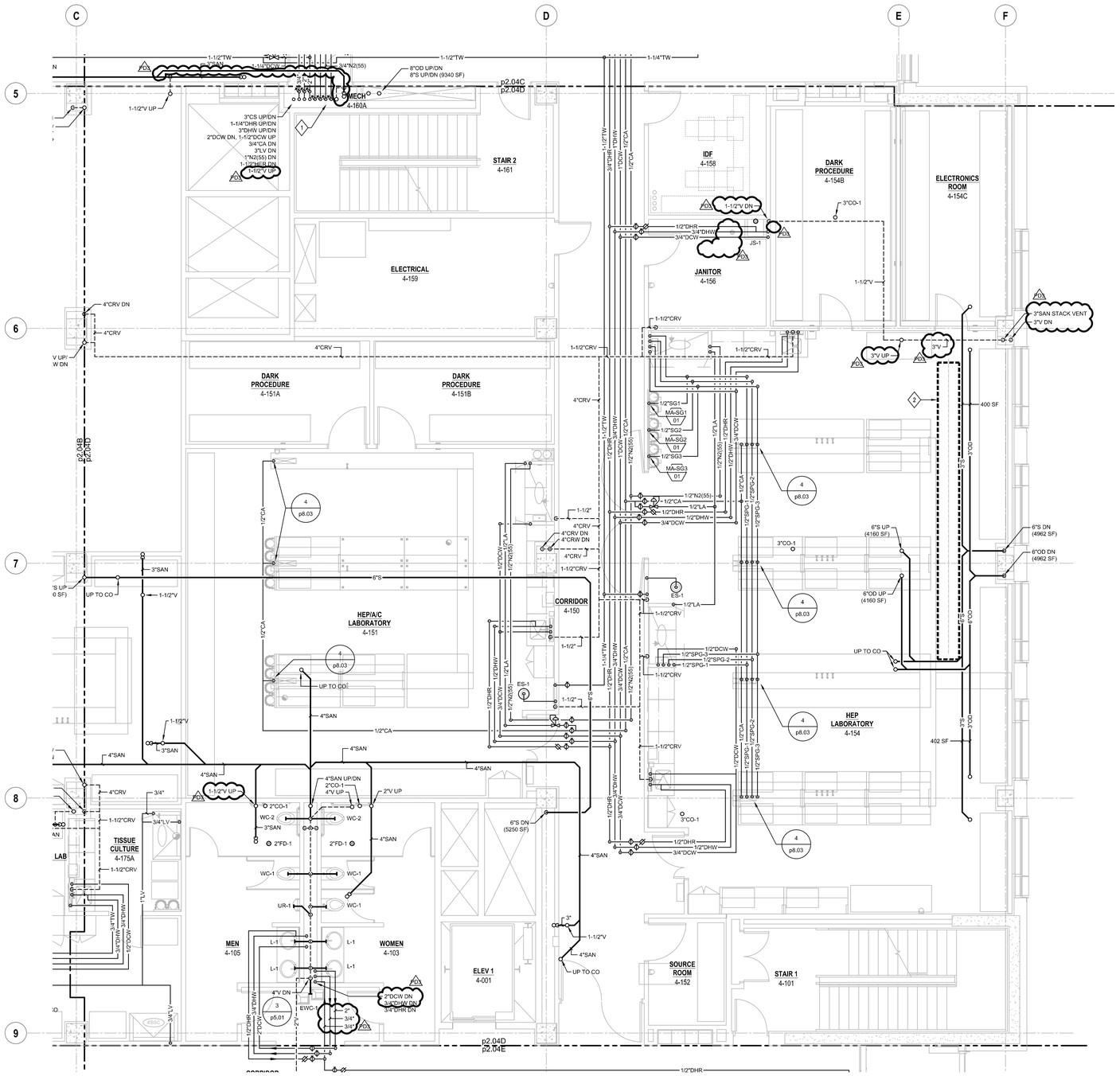
p2.04C

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1. PROVIDE VALVES IN VERTICAL 42" AFF.
2. PIPING AND DUCTWORK TO STAY CLEAR OF MANUAL CRANE RAIL ZONE.



1 **LEVEL 4 - ZONE D**
SCALE: 1/4" = 1'-0"

ARCHITECTURAL ALLIANCE
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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

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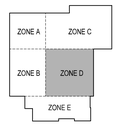
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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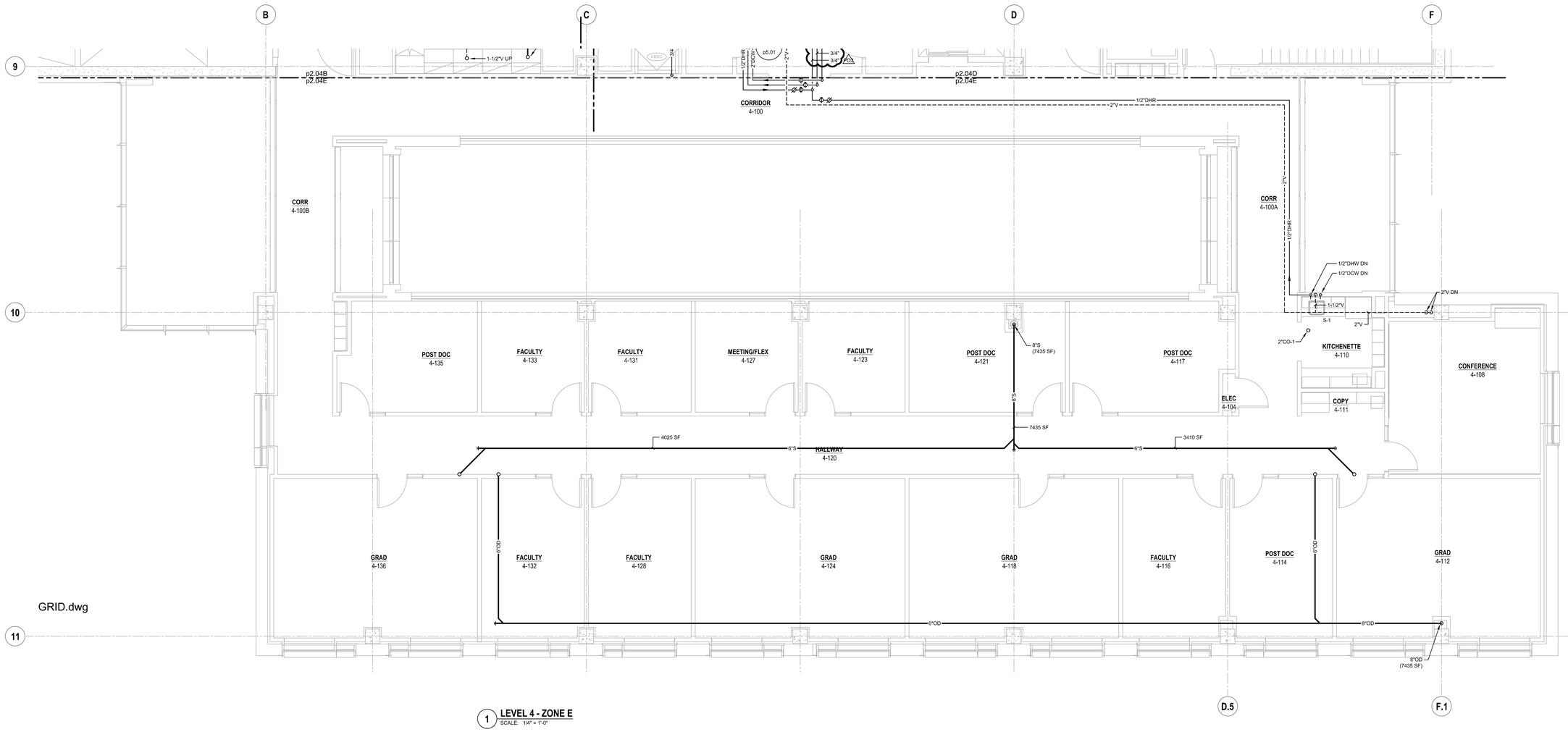
PIPING
LEVEL 4 - ZONE D

p2.04D

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM



GRID.dwg

1 **LEVEL 4 - ZONE E**
SCALE: 1/4" = 1'-0"

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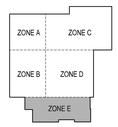

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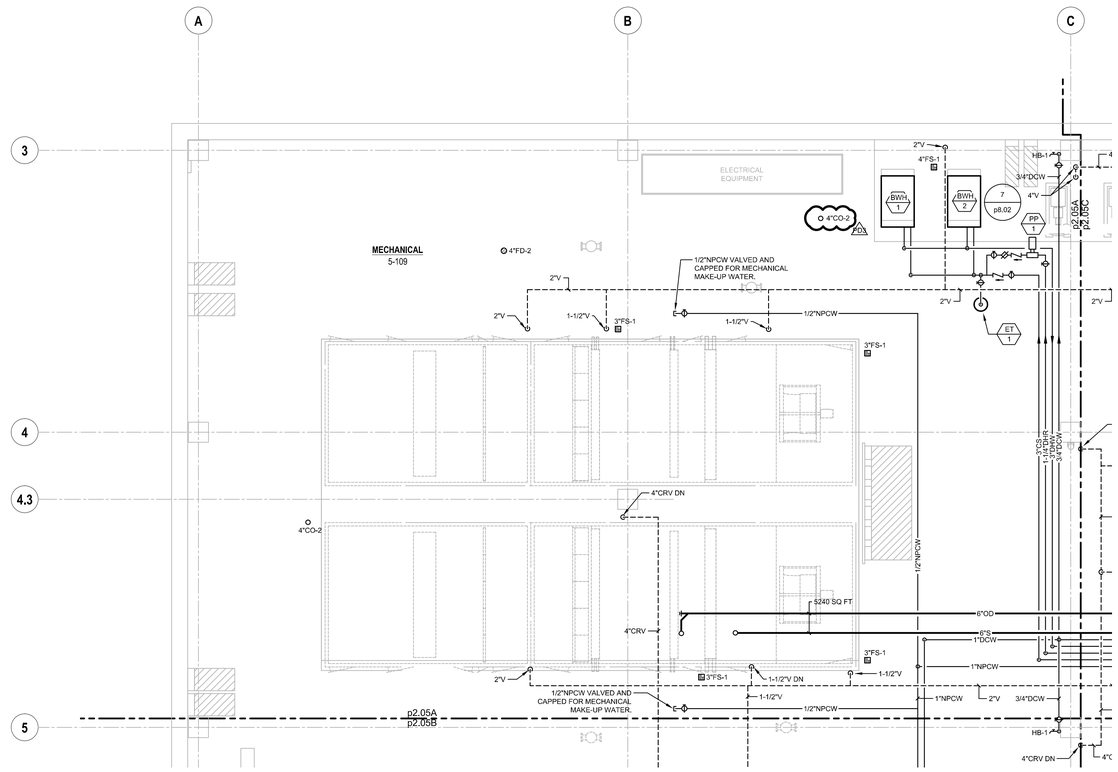
PIPING
LEVEL 4 - ZONE E

p2.04E



1 **PENTHOUSE - ZONE A**
SCALE: 1/4" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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Bid Package No. 2	02-24-2012
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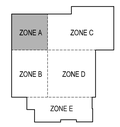
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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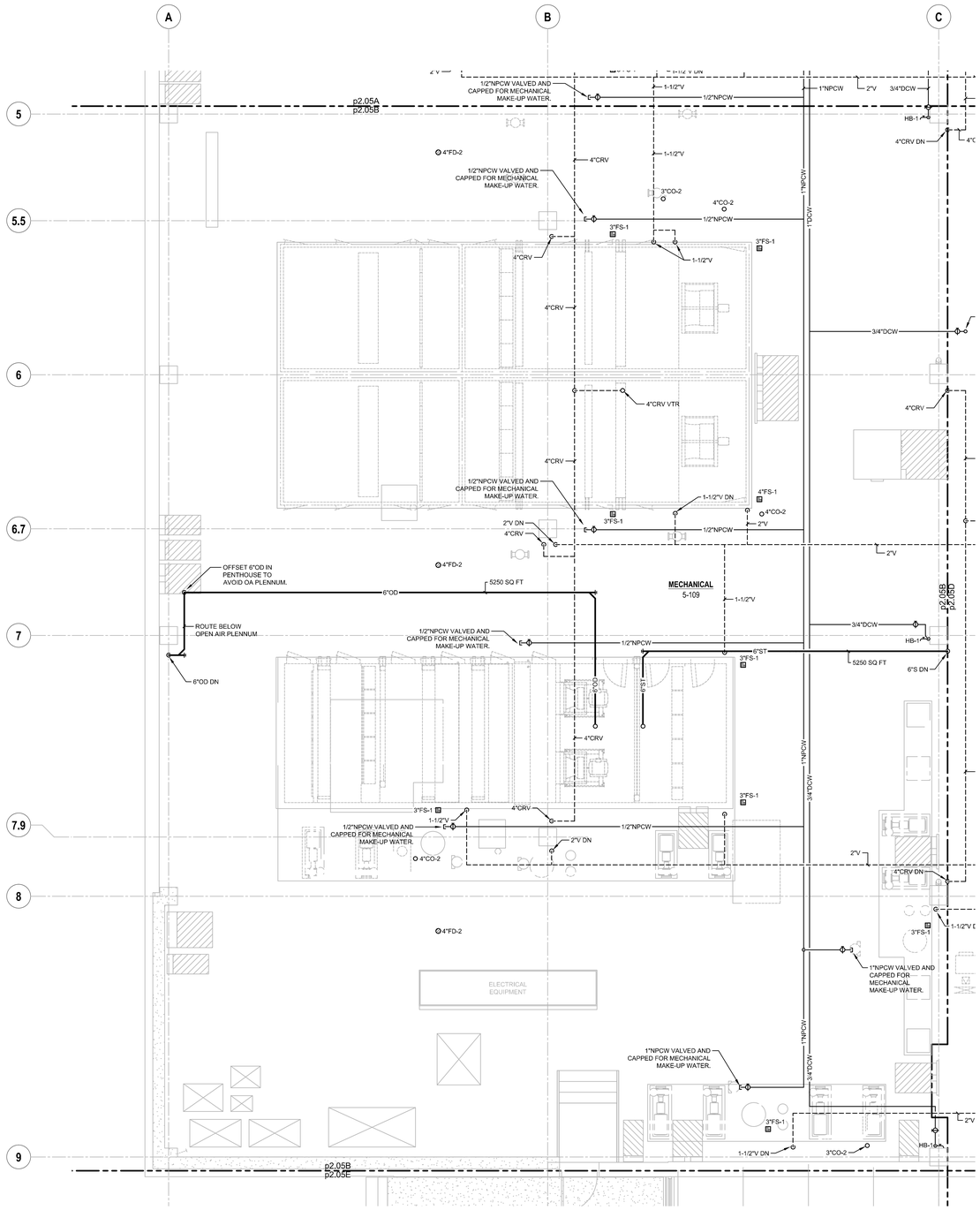
PIPING
PENTHOUSE - ZONE A

p2.05A



1 **PENTHOUSE - ZONE B**
SCALE: 1/4" = 1'-0"

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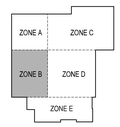

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PIPING
PENTHOUSE - ZONE B

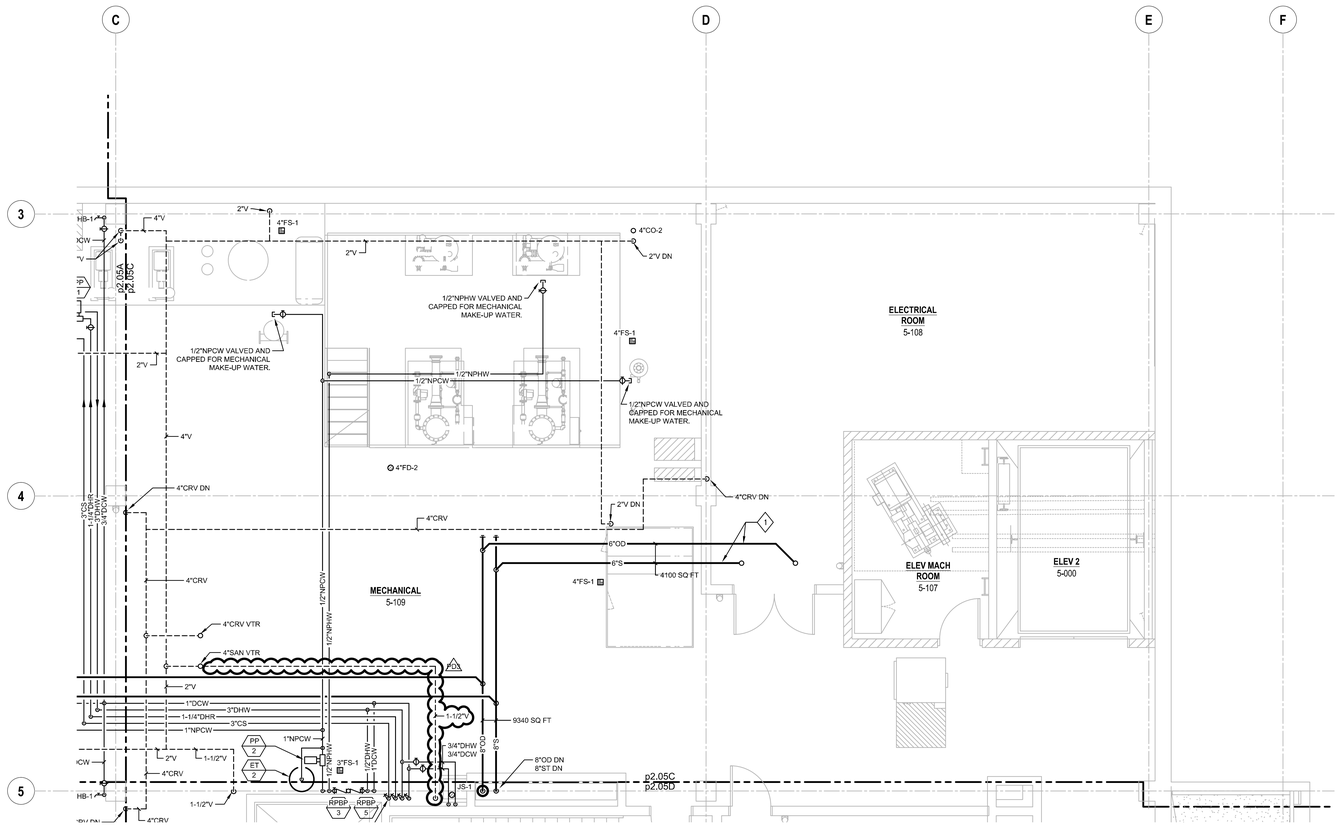
p2.05B

GENERAL NOTES

1. UNLESS OTHERWISE NOTED, BALANCING VALVES ARE SET AT 0.5 GPM

SHEET KEYNOTES

1. PROVIDE DRAIN PAIN BELOW STORM AND OVERFLOW PIPING ABOVE ELECTRICAL ROOM 5-108.
2. STACK RPBP-3, AND RPBP-5 VERTICALLY ALONG WALL.



1 **PENTHOUSE - ZONE C**
SCALE: 1/4" = 1'-0"

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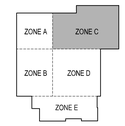
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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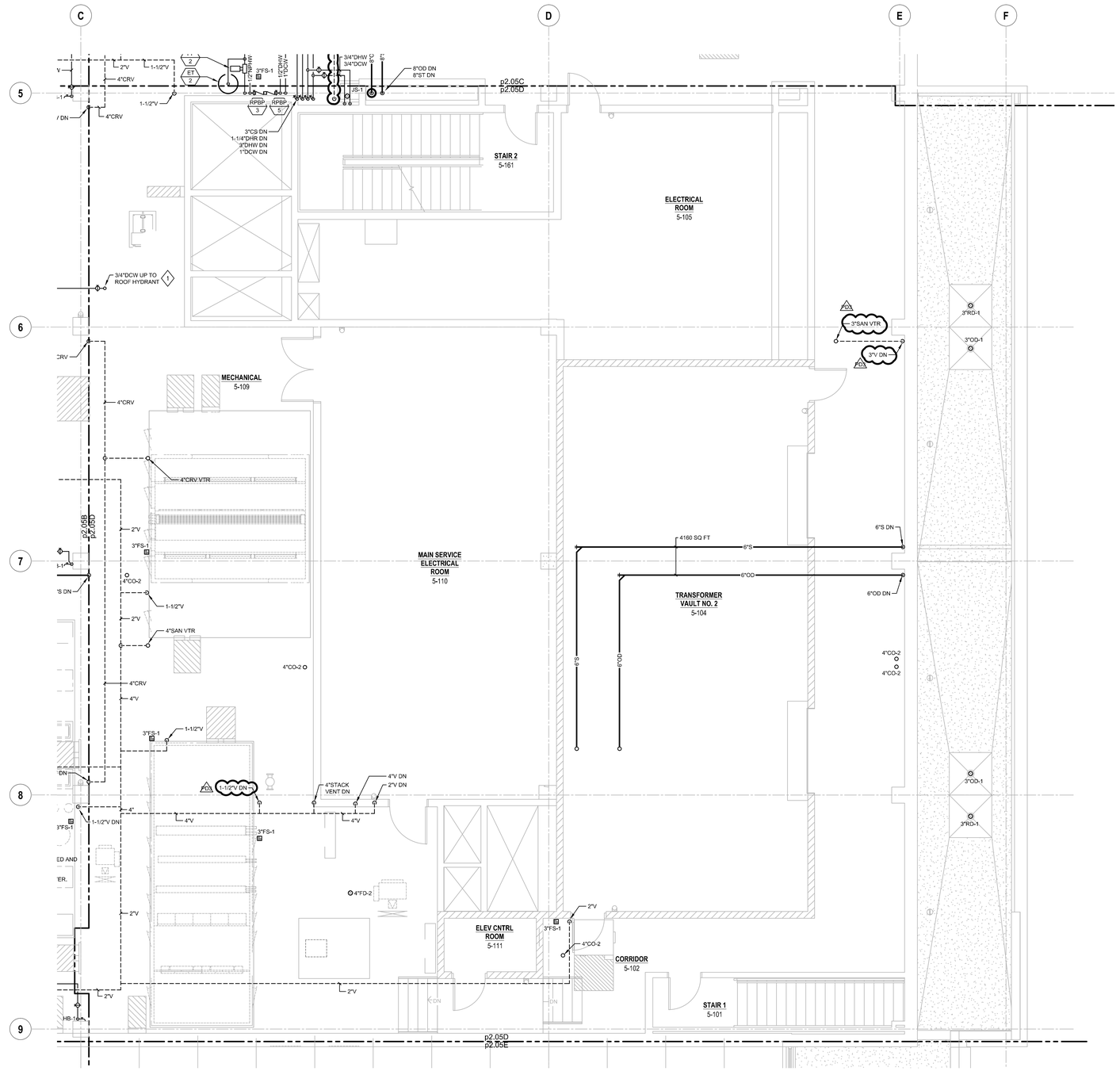
PIPING
PENTHOUSE - ZONE C

p2.05C



1 **PENTHOUSE - ZONE D**
SCALE: 1/4" = 1'-0"

SHEET KEYNOTES

1 ROUTE INDIRECT WASTE PIPING FROM ROOF HYDRANT DRAIN PORT TO LOCAL FLOOR SINK IN PENTHOUSE.

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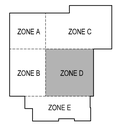
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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PIPING
PENTHOUSE - ZONE D

p2.05D

1 **PENTHOUSE - ZONE E**
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Physics and Nanotechnology Building

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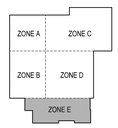

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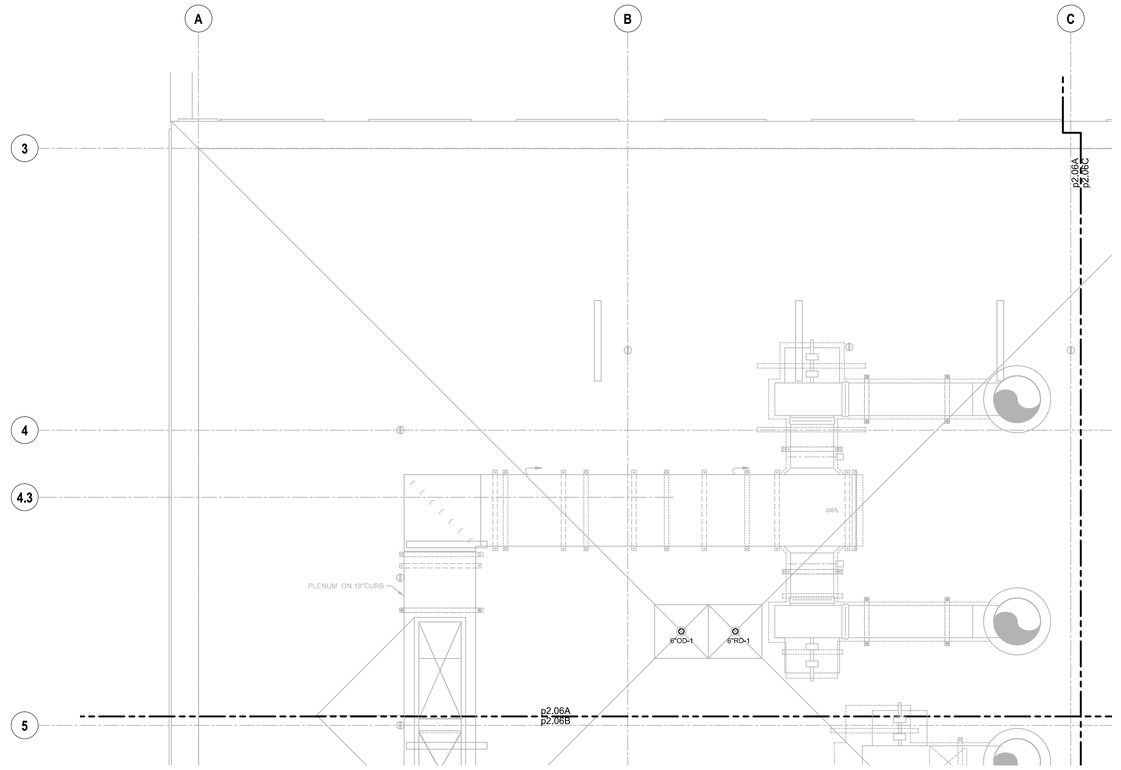
PIPING
PENTHOUSE - ZONE E

p2.05E



1 **ROOF - ZONE A**
SCALE: 1/4" = 1'-0"

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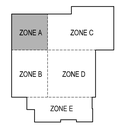

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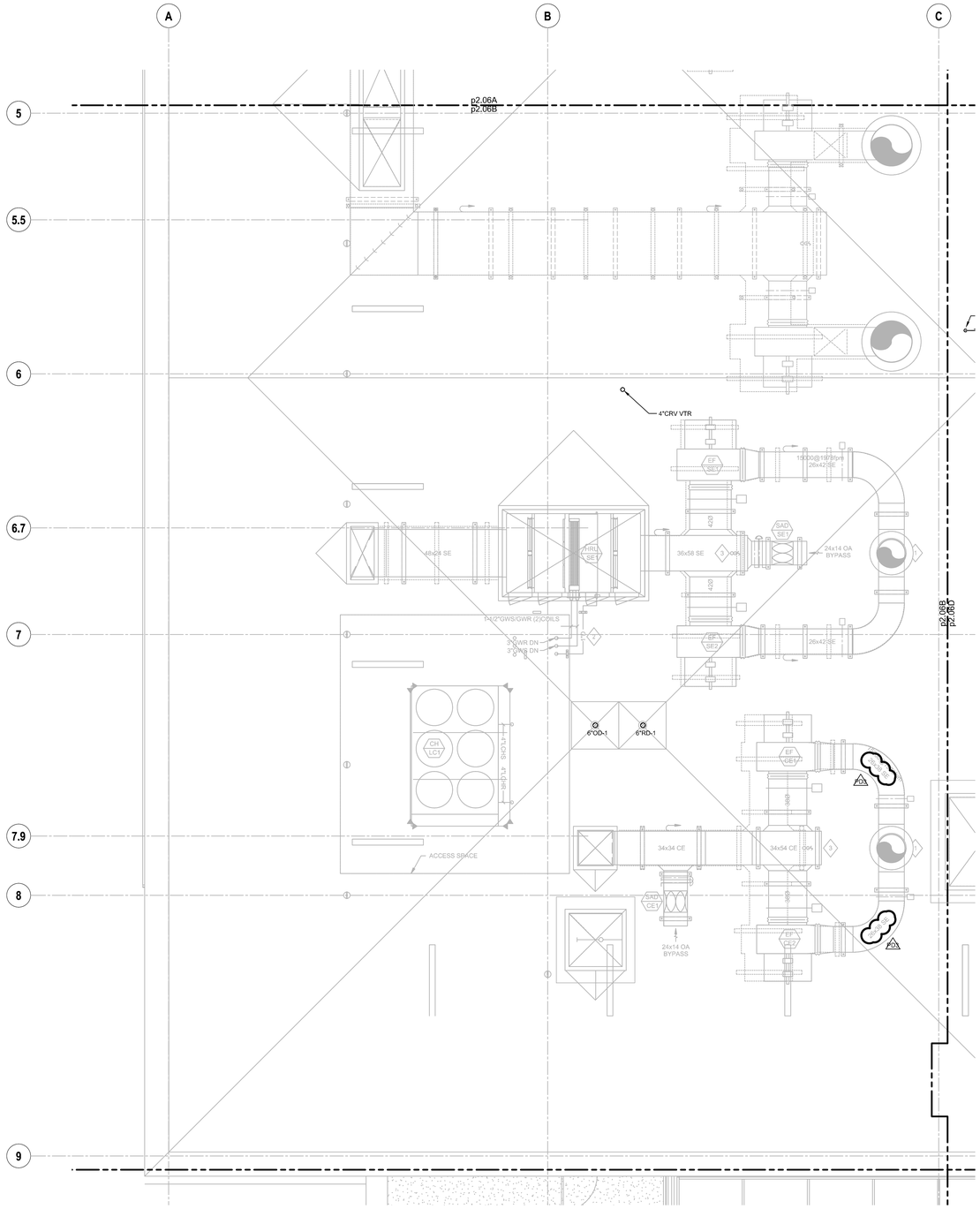
PIPING
ROOF - ZONE A

p2.06A



1 **ROOF - ZONE B**
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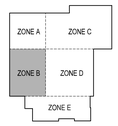

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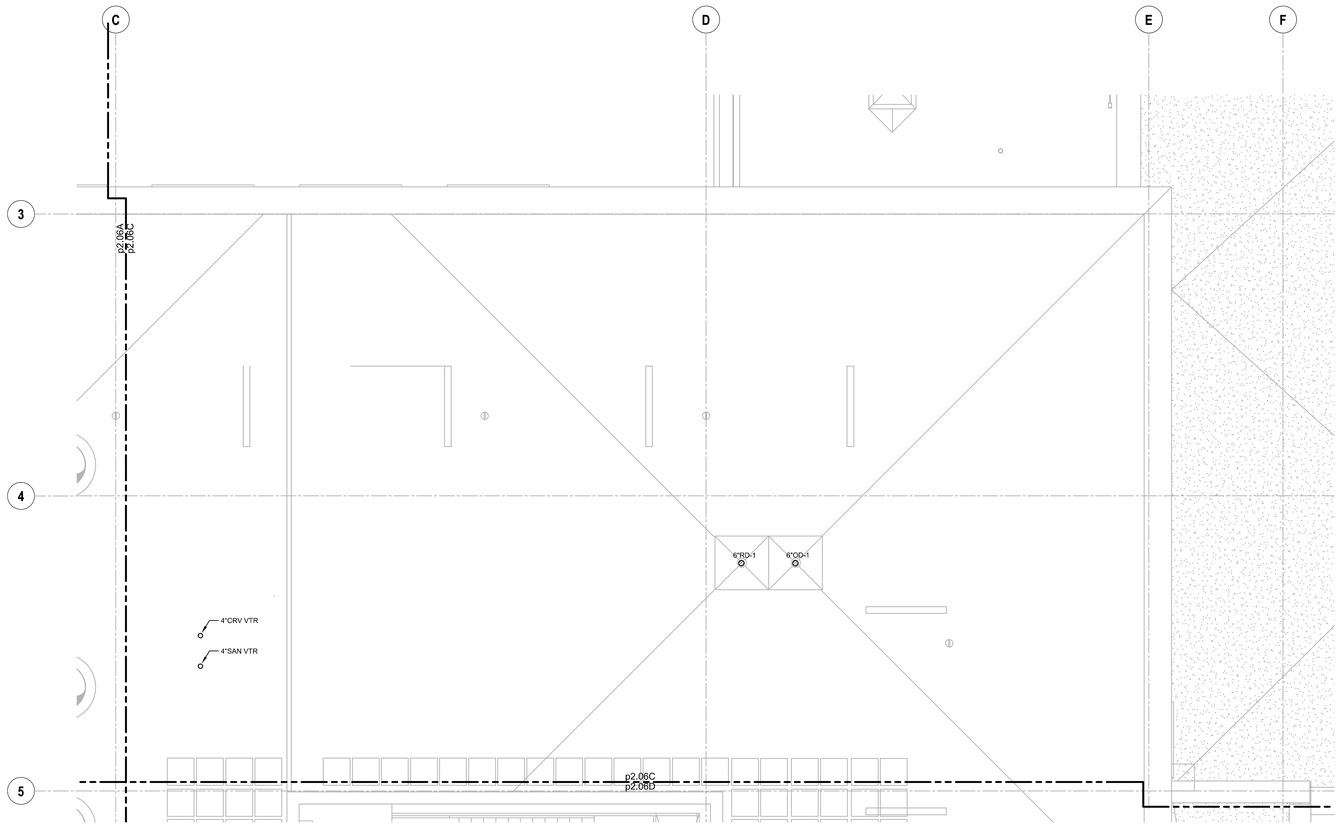
PIPING
ROOF - ZONE B

p2.06B



1 **ROOF - ZONE C**
SCALE: 1/4" = 1'-0"

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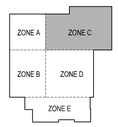

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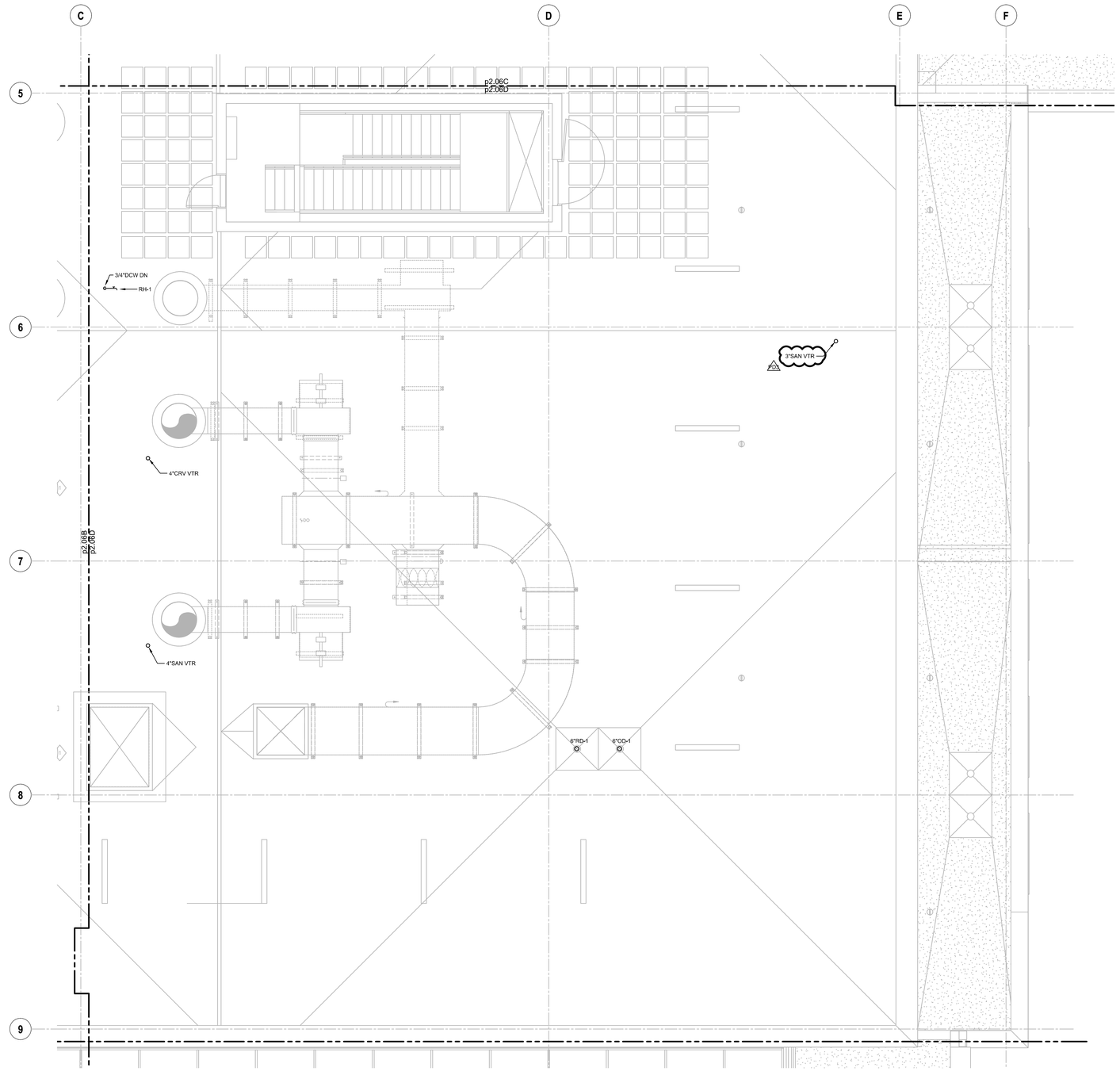
PIPING
ROOF - ZONE C

p2.06C



1 **ROOF - ZONE D**
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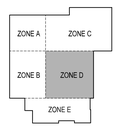

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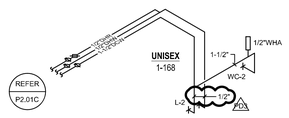
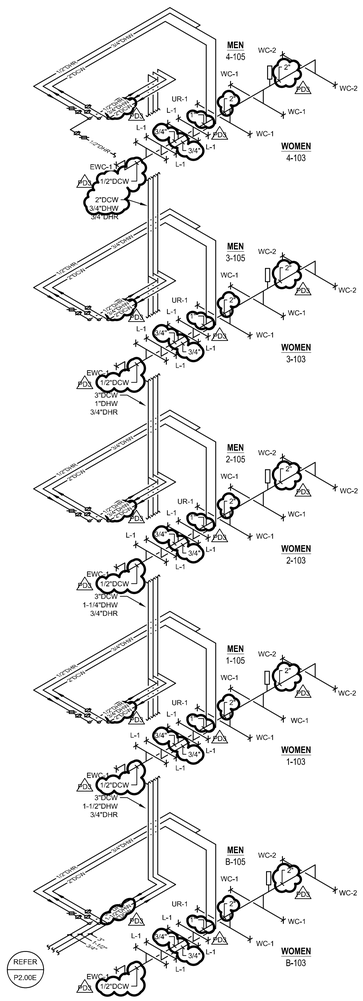
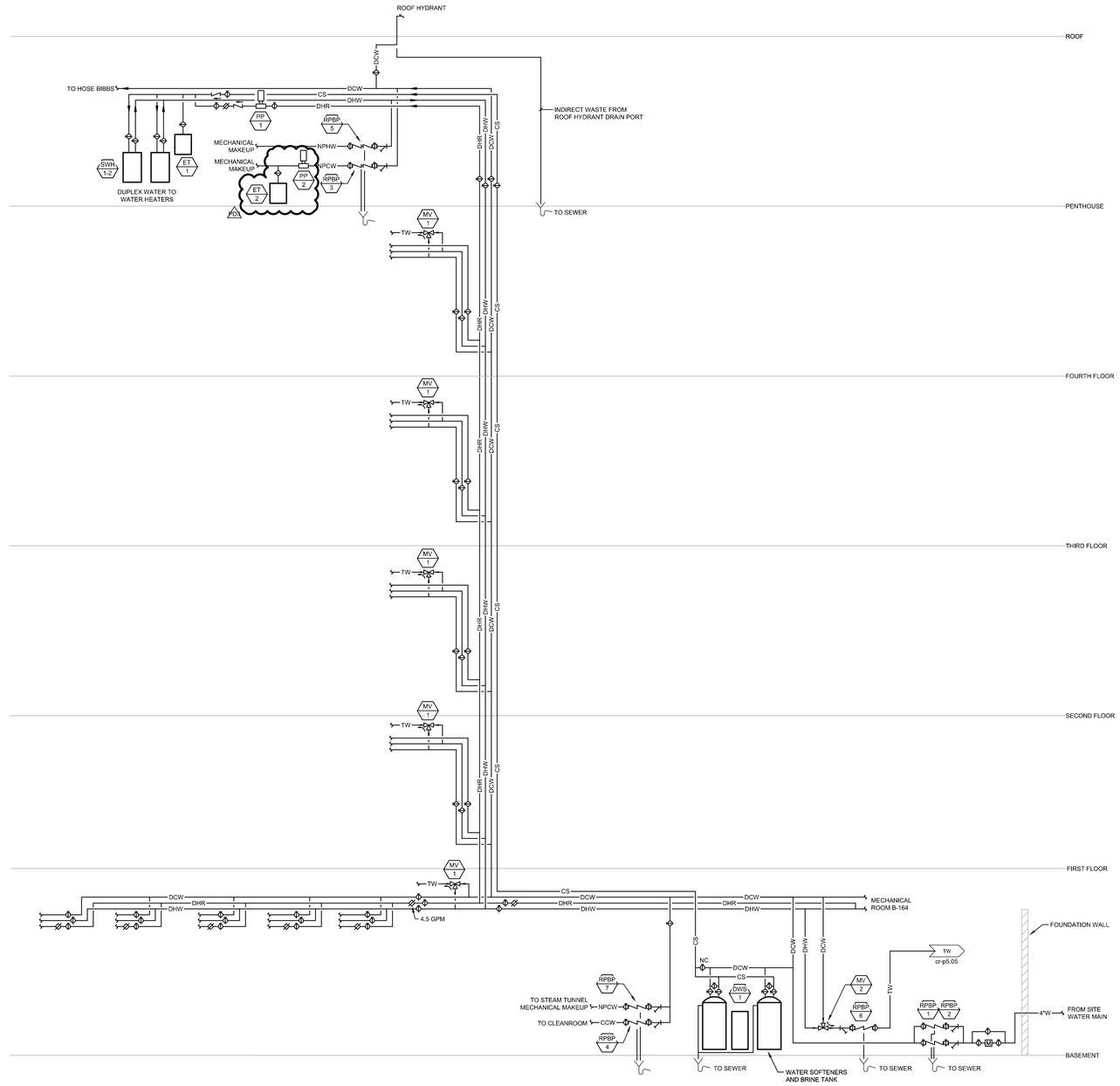
p2.06D



2 DOMESTIC WATER TOILET ROOM ISOMETRIC (UNISEX)
SCALE: NONE



3 DOMESTIC WATER TOILET ROOM ISOMETRIC
SCALE: NONE



1 DOMESTIC WATER FLOW DIAGRAM
SCALE: NONE

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Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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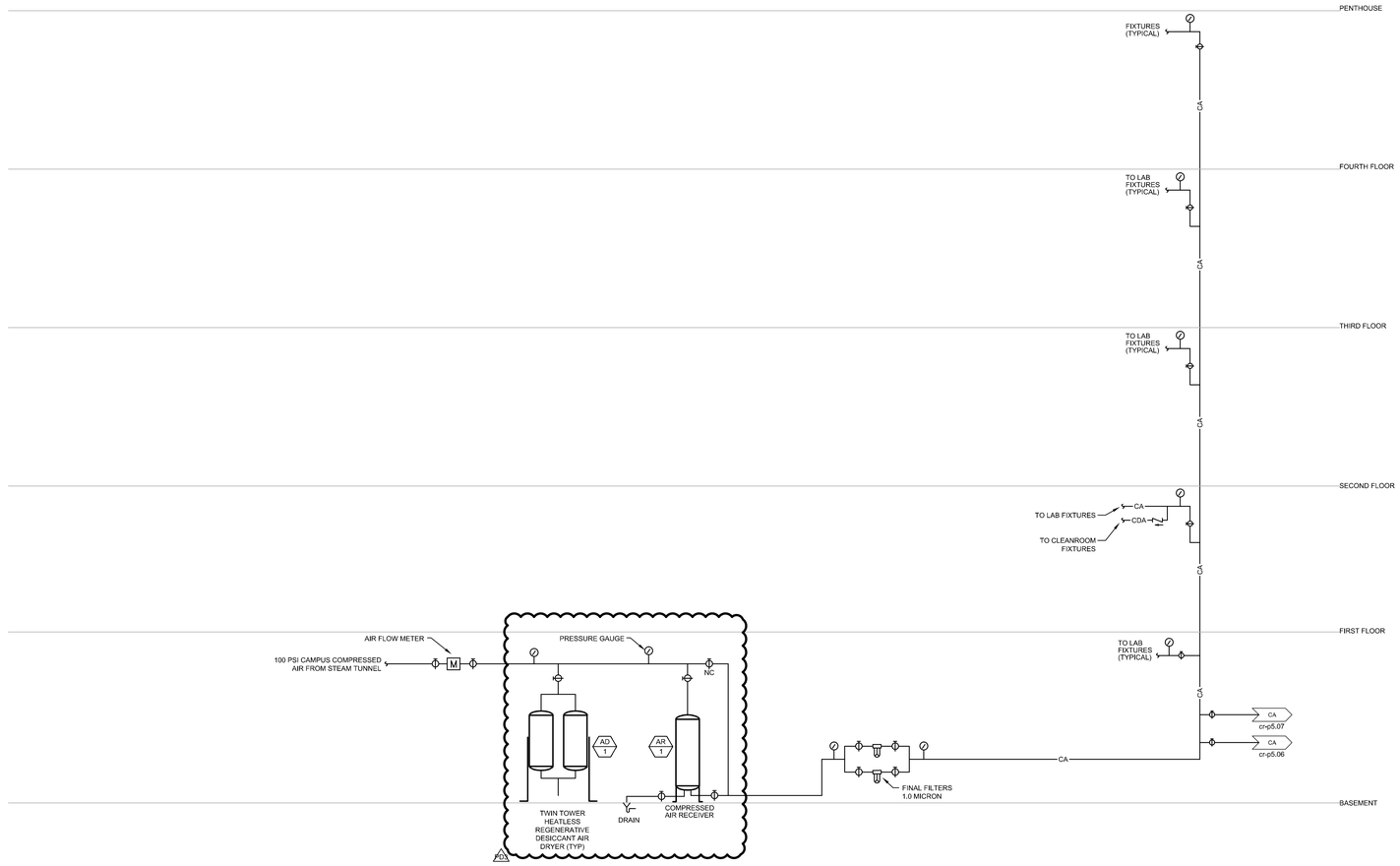
DOMESTIC WATER FLOW DIAGRAM

p5.01



1 **COMPRESSED AIR FLOW DIAGRAM**
SCALE: NONE

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400 Clifton Avenue South
Minneapolis, MN 55403
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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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Project

Physics and Nanotechnology Building

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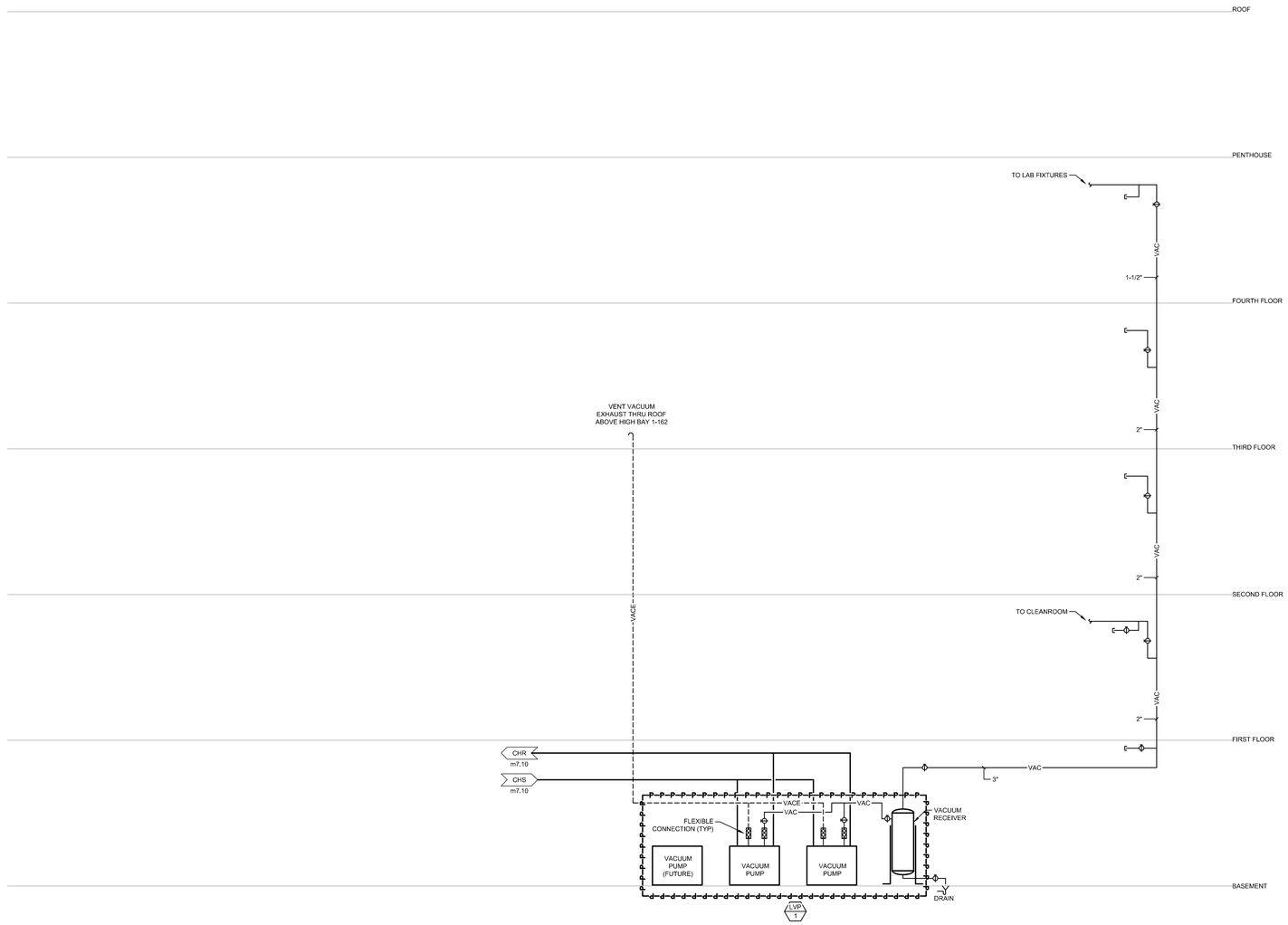
COMPRESSED AIR FLOW DIAGRAM

p5.02



1 **LAB VACUUM FLOW DIAGRAM**
SCALE: NONE

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LAB VACUUM
FLOW DIAGRAM

p5.03



1 **NITROGEN SYSTEM FLOW DIAGRAM**
SCALE: NONE

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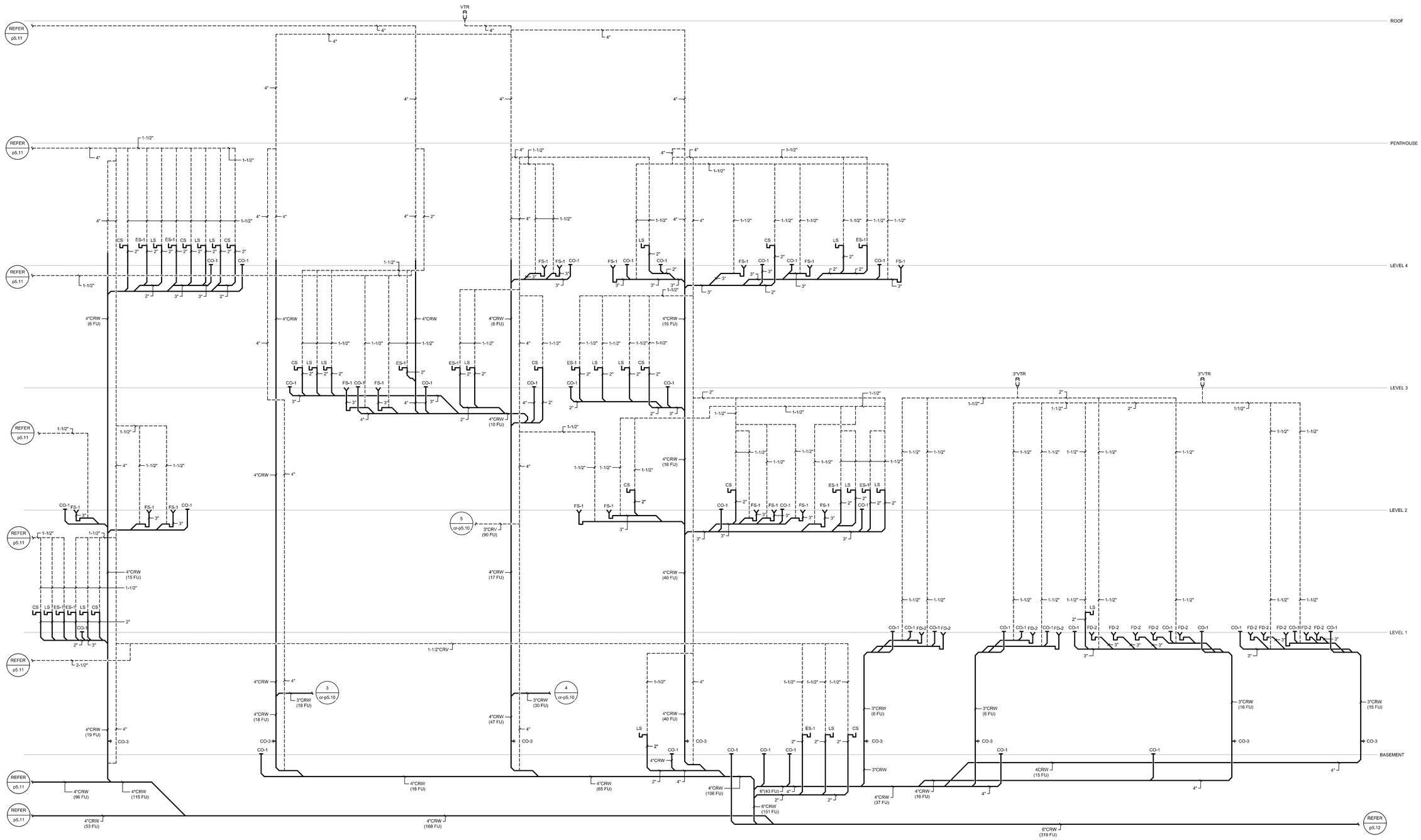
NITROGEN SYSTEM FLOW DIAGRAM

p5.04



1 CORROSION RESISTANT WASTE FLOW DIAGRAM
SCALE: NONE

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Date 05-11-2012 Reg. No. 25364

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Drawn SRR

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Date 04/05/12

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Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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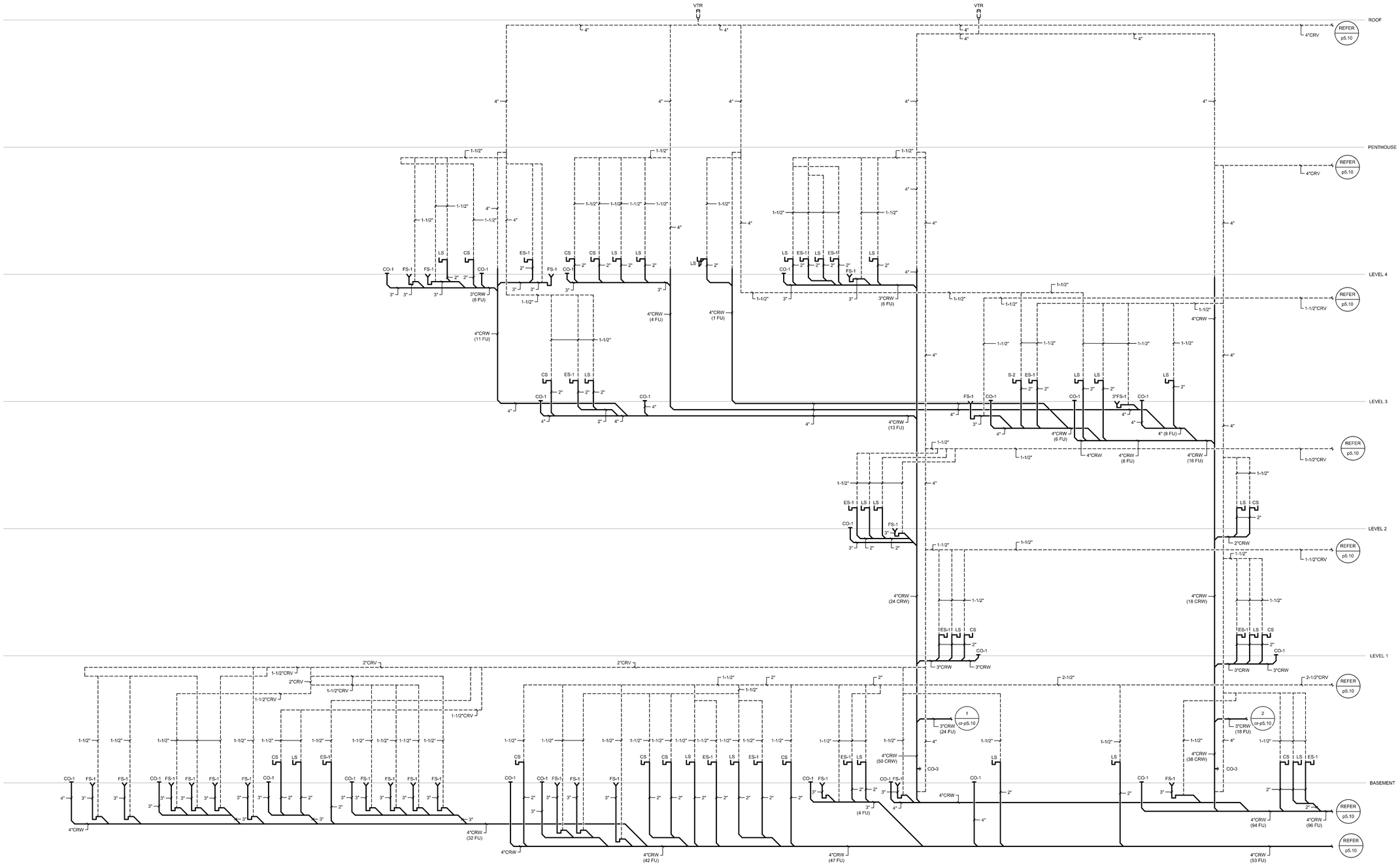
CORROSION RESISTANT WASTE FLOW DIAGRAM



1 **CORROSION RESISTANT WASTE FLOW DIAGRAM**
SCALE: NONE

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By

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Comm. No. 2039037

Drawn SRR

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Date 04/05/12

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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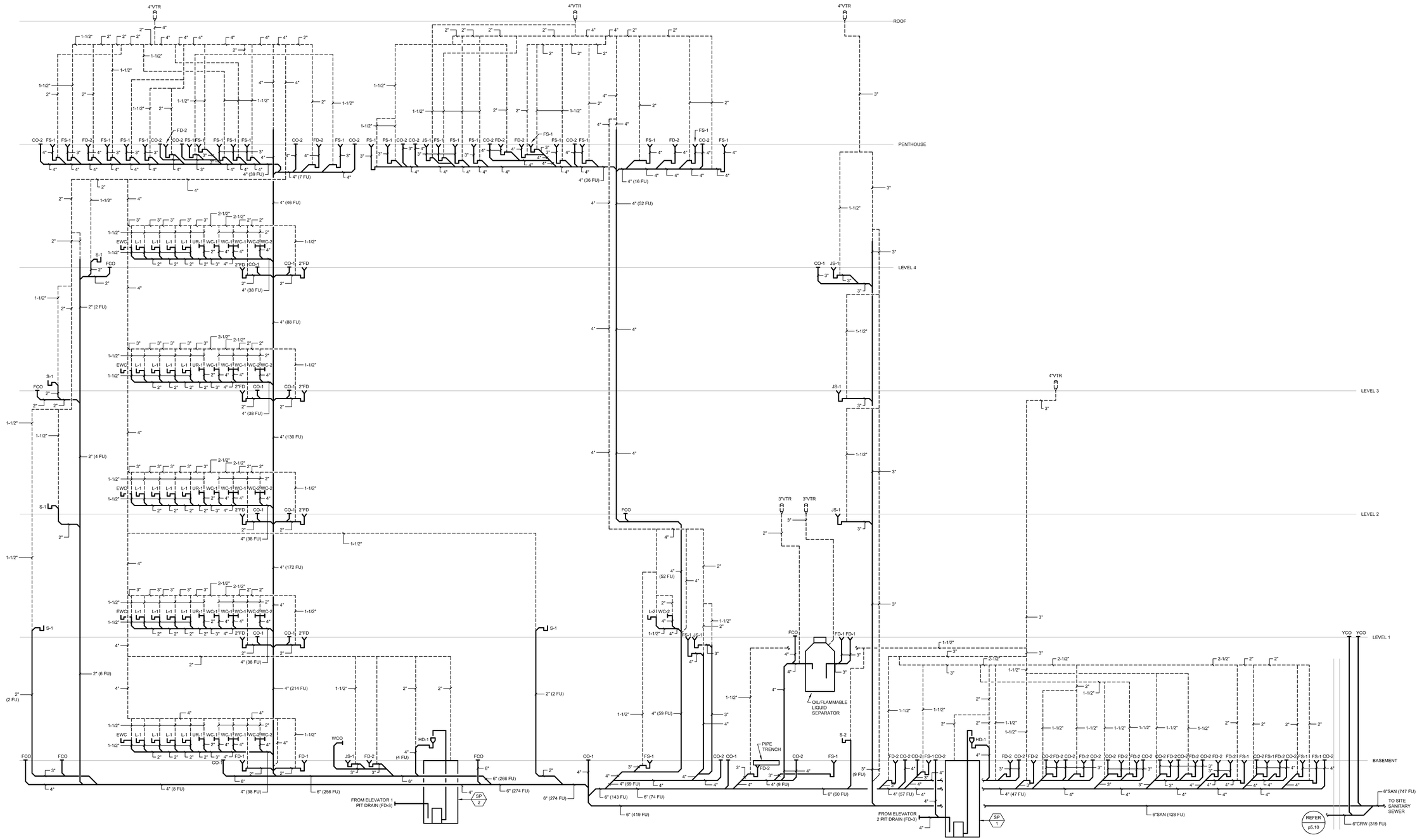
CORROSION RESISTANT WASTE FLOW DIAGRAM



1 SANITARY DRAINAGE FLOW DIAGRAM
SCALE: NONE

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By

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Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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SANITARY DRAINAGE FLOW DIAGRAM

1 STORM DRAINAGE FLOW DIAGRAM
SCALE: NONE

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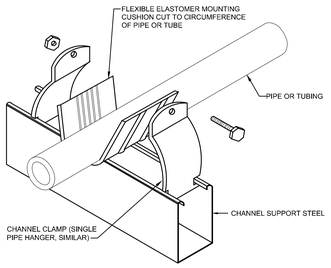
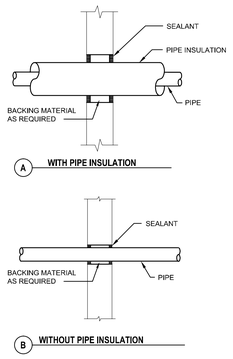
STORM DRAINAGE FLOW DIAGRAM

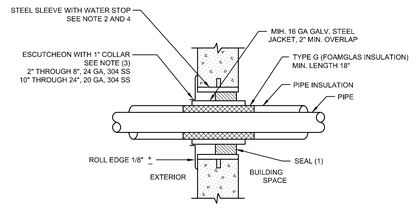


7 PIPE OR TUBING ISOLATION SUPPORT
SCALE: NOT TO SCALE



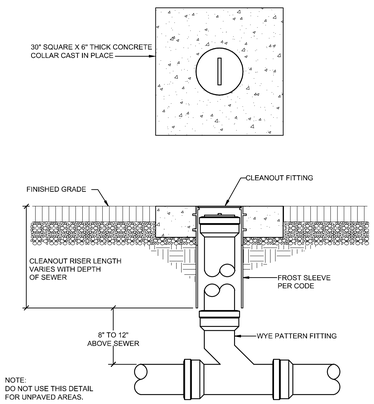
NOTE:
1. WHERE WALL IS FIRE RATED, APPLY FIRE STOPPING SYSTEM (COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION) MEETING THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.

4 PIPE THROUGH INTERIOR WALL
SCALE: NOT TO SCALE

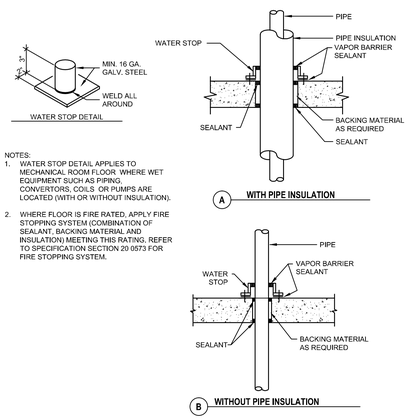


NOTES:
(1) "LINK-SEAL" MODULAR WALL AND CASING SEAL BY THUNDERLINE CORPORATION. USE 316 SS NUTS AND BOLTS.
(2) REFER TO SPECIFICATION SECTION 20 0000 FOR ADDITIONAL REQUIREMENTS.
(3) FASTEN TO WALL WITH EXPANSION ANCHORS & SS SCREWS. ESCUTCHEON NOT REQUIRED FOR BELOW GRADE APPLICATION.
(4) FOR CORE DRILLED HOLE, INSTALL "LINK-SEAL" SEAL BETWEEN PIPE AND OPENING WITHOUT SLEEVE. SIZE OPENING AS RECOMMENDED BY SEAL MANUFACTURER.
(5) FOR INSULATED PIPE, EXTEND INSULATION TO SEAL AT BOTH SIDES. ATTACH ESCUTCHEON TO INSULATION JACKET.

1 PIPE THROUGH EXTERIOR WALL INTO BUILDING SPACE
SCALE: NOT TO SCALE

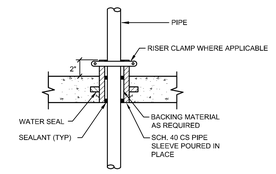


8 YARD CLEANOUT - PAVED AREAS
SCALE: NOT TO SCALE



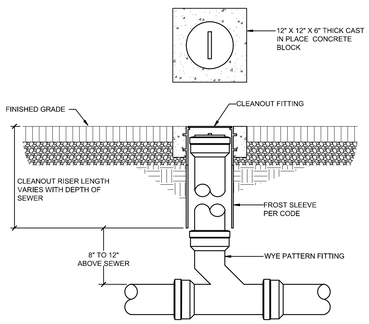
NOTES:
1. WATER STOP DETAIL APPLIES TO MECHANICAL ROOM FLOOR WHERE WET EQUIPMENT SUCH AS PIPING, CONVERTORS, COILS OR PUMPS ARE LOCATED (WITH OR WITHOUT INSULATION).
2. WHERE FLOOR IS FIRE RATED, APPLY FIRE STOPPING SYSTEM (COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION) MEETING THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.

5 PIPE THROUGH MECHANICAL ROOM FLOOR
SCALE: NOT TO SCALE

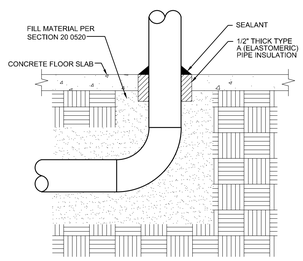


NOTES:
1. ALL PIPE PENETRATIONS THROUGH PENTHOUSE AND LAB AREA FLOORS SHALL UTILIZE THIS DETAIL. PENETRATIONS THROUGH MECHANICAL ROOM FLOOR REFER TO DETAIL 5.
2. WHERE FLOOR IS FIRE RATED, APPLY FIRE STOPPING SYSTEM (COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION) MEETING THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.

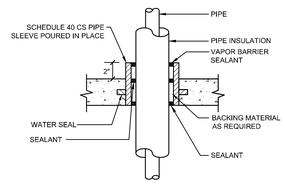
2 PIPE THROUGH FLOOR SLEEVE
SCALE: NOT TO SCALE (CAST IN PLACE WITHOUT PIPE INSULATION)



9 YARD CLEANOUT - UNPAVED AREAS
SCALE: NOT TO SCALE



6 PIPE THROUGH SLAB ON GRADE
SCALE: NOT TO SCALE



NOTES:
1. ALL PIPE PENETRATIONS THROUGH OFFICE AREA FLOORS SHALL UTILIZE THIS DETAIL. PENETRATIONS THROUGH MECHANICAL ROOM FLOOR REFER TO DETAIL 5.
2. WHERE FLOOR IS FIRE RATED, APPLY FIRE STOPPING SYSTEM (COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION) MEETING THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.

3 PIPE THROUGH FLOOR SLEEVE
SCALE: NOT TO SCALE (CAST IN PLACE WITH PIPE INSULATION)

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Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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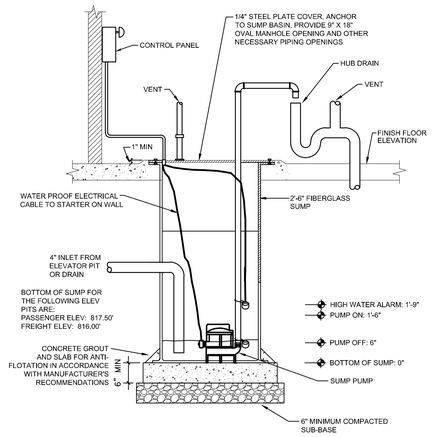
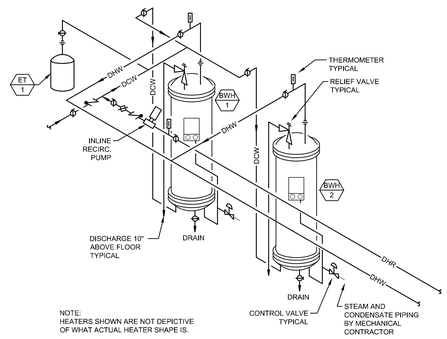
DETAILS

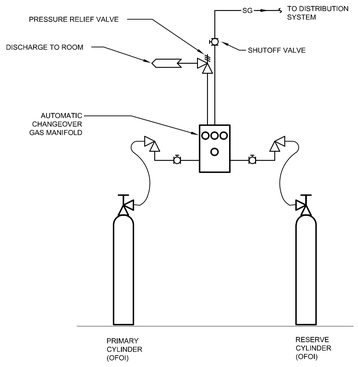
p8.01



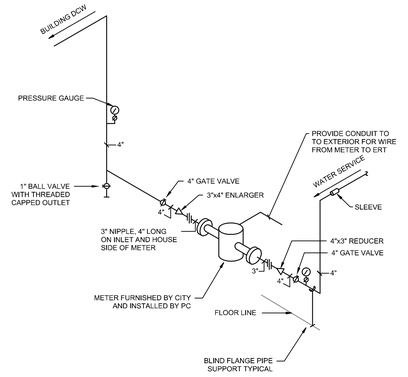
10 ELEVATOR PIT SUMP PUMP
SCALE: NOT TO SCALE



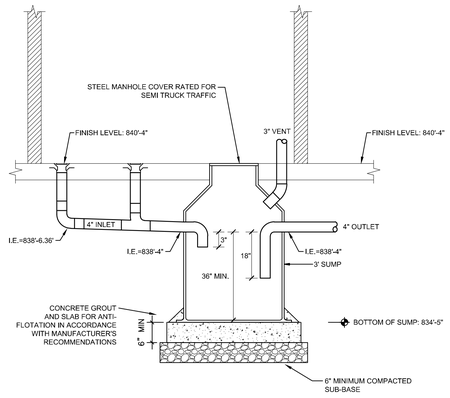
7 DOMESTIC WATER TO WATER HEATERS
SCALE: NOT TO SCALE



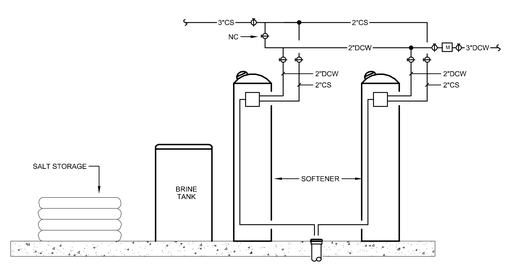
4 AUTOCHANGEOVER MANIFOLD
SCALE: NOT TO SCALE



1 WATER METER STATION
SCALE: NOT TO SCALE



11 OIL/FLAMMABLE LIQUID SEPARATOR
SCALE: NOT TO SCALE



8 DUPLEX WATER SOFTENERS
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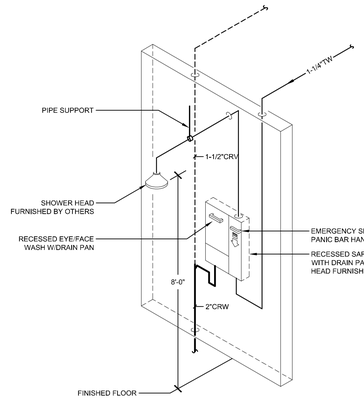

5 RECESSED EMERGENCY SHOWER/EYEWASH (ES-1)
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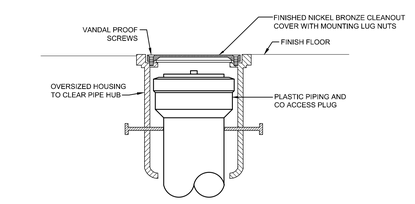

2 FINISHED FLOOR CLEANOUT - PLASTIC PIPE
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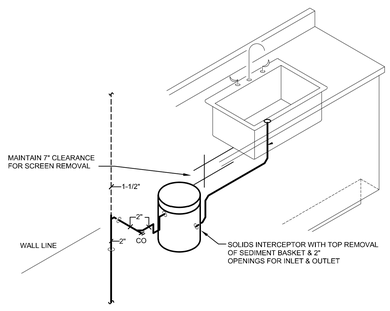

12 SOLIDS INTERCEPTOR
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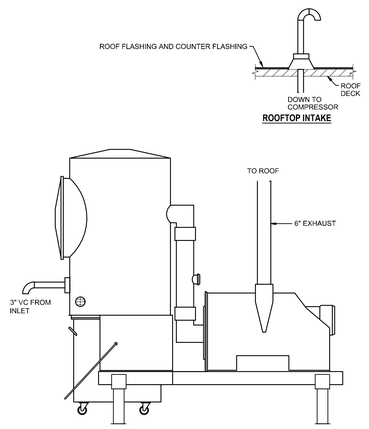

9 CENTRAL VACUUM CLEANING SYSTEM
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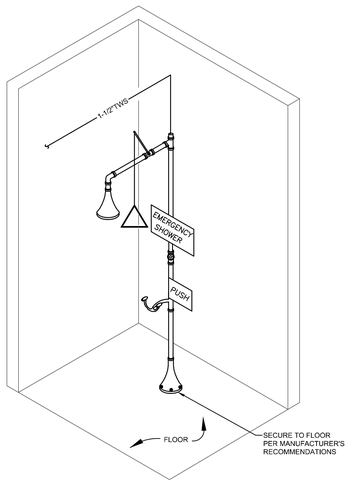
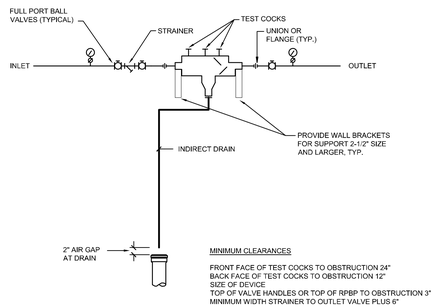


6 EMERGENCY SHOWER / EYEWASH (ES-2)
SCALE: NOT TO SCALE



3 REDUCED PRESSURE BACKFLOW PREVENTER
SCALE: NOT TO SCALE

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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Checked LJH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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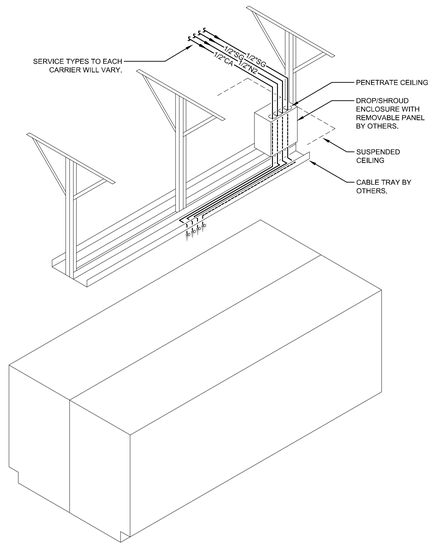
DETAILS



4 OVERHEAD SERVICE CARRIER
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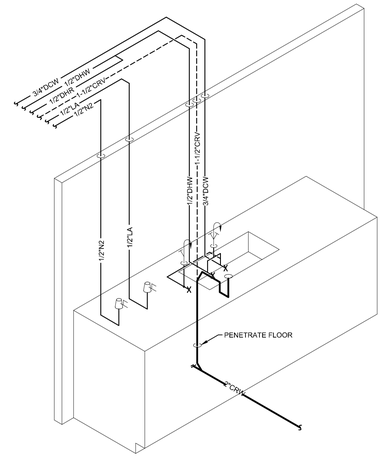

1 WALL LAB BENCH
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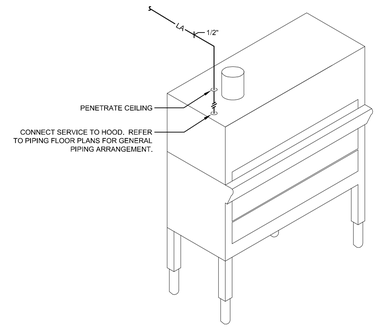

5 BIOSAFETY CABINET
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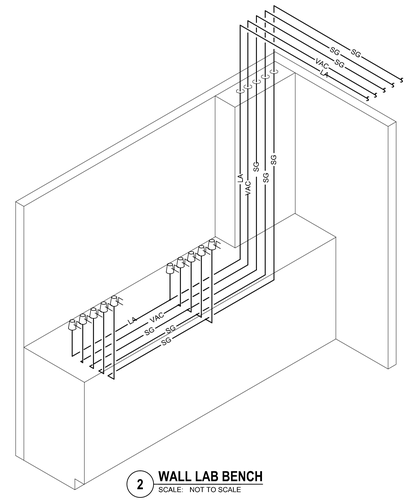
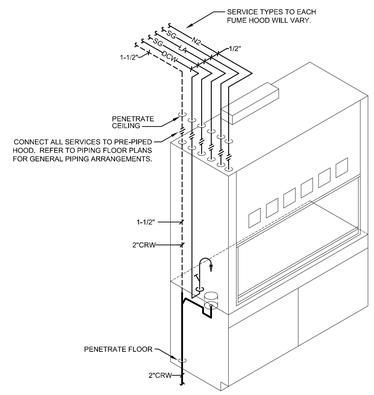


2 WALL LAB BENCH
SCALE: NOT TO SCALE



6 FUME HOOD
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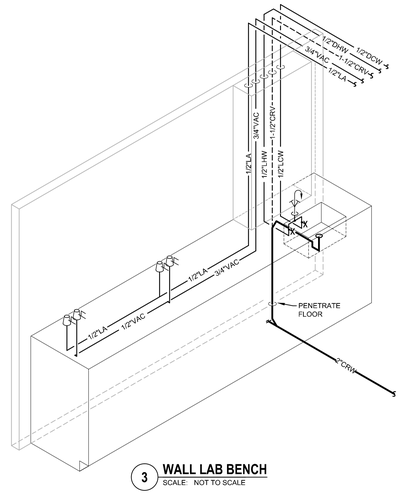

3 WALL LAB BENCH
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DETAILS

p8.03

WATER SOFTENERS

NUMBER	LOCATION	SERVICE	PEAK FLOW RATE (GPM)	PIPE SIZE (IN)	GRAINS PER REGENERATION	MAX. PRESSURE DROP AT PEAK FLOW RATE (PSI)	SOFTENER TANKS DIAMETER (IN)	HEIGHT (IN)	SIZE BASED ON	BRINE TANK (IN)	REMARKS
DWS-1	B-164	DCW	60	2"	224,000	15	24"	72	HELLENBRAND H200-240	24"	

SEMI-INSTANTANEOUS HOT WATER TO WATER HEATER

NUMBER	SERVICE	LOCATION	BOILER WATER SIDE FLOW (GPM)	EWT (°F)	LWT (°F)	DOMESTIC WATER SIDE FLOW (GPM)	EWT (°F)	LWT (°F)	BASIS OF DESIGN	REMARKS
BWH-1	DHW	PENTHOUSE	77	150	101	74	40	120	AERCO SPDW61	DOUBLE WALL
BWH-2	DHW	PENTHOUSE	77	150	101	74	40	120	AERCO SPDW61	DOUBLE WALL

VACUUM PUMPS

NUMBER	SERVICE	LOCATION	TYPE	CAPACITY (ACFM)	SUCTION PRESSURE (" Hg)	BASIS OF DESIGN SUCT (IN.)	DISCH (IN.)	MOTOR HP	RPM	VOLT	PH	MANUFACTURER AND MODEL	REMARKS
LVP-1	VAC	BASEMENT	DRY CLAW	247	28	-	-	15		460	3	BUSCH NC 400B	CUSTOM DUPLEX SYSTEM
				247	28	-	-	15		460	3		WITH VFD

PUMPS

MARK	LOCATION	SERVICE	TYPE	CAP. (GPM)	SUCTION PRESSURE (FT)	HEAD (FT)	DISCHARGE PRESSURE (FT)	SIZE (IN) SUCT.	DISCH.	MOTOR HP	RPM	VOLT	PH	VFD	REMARKS
PP-1	PENTHOUSE	DHW RECIRC	IN-LINE CENTRIFUGAL	20		20				1/6	1750	115	1	N	BELL AND GOSSETT SERIES PL
PP-2	PENTHOUSE	NPCW BOOSTER	IN-LINE CENTRIFUGAL	5		45				2/5	1750	115	1	N	BELL AND GOSSETT SERIES PL

SUMP PUMPS

NUMBER	SERVICE	LOCATION	TYPE	CAPACITY (GPM)	HEAD (FEET)	DISCHARGE SIZE (IN)	SOLIDS SIZE (IN)	MOTOR HP	RPM	VOLT	PH	BASIS OF DESIGN	REMARKS
SP-1		FREIGHT ELEV	2	58	14	2	NA	1		460	3	STANCORE SE-50 O/M	
SP-2		PASSENGER ELEV	2	62	12.5	2	NA	1		460	3	STANCORE SE-50 O/M	

PUMP TYPES:
1 = SUBMERSIBLE SEWAGE EJECTOR
2 = SUBMERSIBLE EFFLUENT PUMP

SPECIALTY GAS CHANGEOVER MANIFOLDS

TAG	ROOM NUMBER	CYLINDER TYPE	PRIMARY CYLINDERS	RESERVE CYLINDERS	AUTOMATIC CHANGEOVER	CHANGEOVER ALARM	SUPPLY PRESSURE (PSIG)	LAB FURNISHINGS PLAN DESIGNATION	SERVICE TYPE
MA-HE-01	B-102A	GAS	1	1	YES	LOCAL	55	SG1	HELIUM
MA-HE-02	3-174A	GAS	1	3	YES	LOCAL	55	SG1	HELIUM
MA-HE-03	3-176A	GAS	1	3	YES	LOCAL / REMOTE	55	SG1	HELIUM
MA-HE-04	3-164	GAS	1	1	YES	LOCAL	55	SG1	HELIUM
MA-AR-01	2-164	GAS	1	1	YES	LOCAL	55	SG5	ARGON
MA-AR-02	2-162	GAS	1	1	YES	LOCAL	55	SG6	ARGON
MA-AR-03	3-164	GAS	1	1	YES	LOCAL	55	SG2	ARGON
MA-N2-01	2-166	GAS	1	1	YES	LOCAL	55	SG1	NITROGEN
MA-N2-02	2-164	GAS	1	1	YES	LOCAL	55	SG3	NITROGEN
MA-N2-03	2-162	GAS	1	1	YES	LOCAL	55	SG7	NITROGEN
MA-N2-04	3-174A	GAS	1	1	YES	LOCAL	55	SG2	NITROGEN
MA-O2-01	2-166	GAS	1	1	YES	LOCAL	55	SG2	OXYGEN
MA-O2-02	2-164	GAS	1	1	YES	LOCAL	55	SG4	OXYGEN
MA-O2-03	2-162	GAS	1	1	YES	LOCAL	55	SG8	OXYGEN
MA-O2-04	2-162	GAS	1	1	YES	LOCAL	55	SG9	OXYGEN
MA-SG1-01	4-154	GAS	1	1	YES	LOCAL	55	SG1	UNKNOWN
MA-SG2-01	4-154	GAS	1	1	YES	LOCAL	55	SG2	UNKNOWN
MA-SG3-01	4-154	GAS	1	1	YES	LOCAL	55	SG3	UNKNOWN

FIXTURE PIPING

NUMBER	FIXTURE	WASTE (IN)	VENT (IN)	TRAP (IN)	COLD WATER (IN)	HOT WATER (IN)	TEMPERED WATER (IN)	REMARKS
WC-1	WATER CLOSET	4	1-1/2	-	1-1/2	-	-	WALL MOUNTED
WC-2	WATER CLOSET	4	1-1/2	-	1-1/2	-	-	WALL MOUNTED, ADA HEIGHT
L-1	LAVATORY	1-1/2	1-1/2	1-1/2	1/2	1/2	-	UNDERMOUNT
L-2	LAVATORY	1-1/2	1-1/2	1-1/2	1/2	1/2	-	WALL MOUNTED
UR-1	URINAL	2	1-1/2	2	3/4	-	-	WALL MOUNTED
EWC-1	ELECTRIC WATER COOLER	1-1/2	1-1/2	1-1/2	1/2	-	-	WALL MOUNTED, HI-LO
JS-1	JANITORS SINK	3	1-1/2	3	3/4	3/4	-	
S-1	SINK	2	1-1/2	2	1/2	1/2	-	SS, UNDERMOUNT
S-2	SINK	2	1-1/2	2	1/2	1/2	-	SS, WALL MOUNTED, GOOSENECK SPOUT, WRISTBLADE HANDLES
HB-1	HOSE BIBB	-	-	-	3/4	-	-	ASSE 1052
WH-1	WALL HYDRANT	-	-	-	3/4	-	-	FREEZELESS TYPE, IN-LINE VACUUM BREAKER
RH-1	ROOF HYDRANT	-	-	-	1	-	-	FREEZELESS TYPE, INTEGRAL BACKFLOW PREVENTION
WB-1	WALL BOX	-	-	-	1/2	-	-	

BACKFLOW PREVENTER (RPBP)

NUMBER	SERVICE	LOCATION	BASIS OF DESIGN MANUFACTURER	MODEL	SIZE (IN)	DETAIL REFERENCE	REMARKS
RPBP-1	DCW	B-164	WATTS	909	4"		SERVES BUILDING WATER MAIN
RPBP-2	DCW	B-164	WATTS	909	4"		SERVES BUILDING WATER MAIN
RPBP-3	NPCW	5-109	WATTS	909	1"		SERVES MECHANICAL MAKEUP IN PENTHOUSE
RPBP-4	CCW	B-164	WATTS	909	1-1/4"		SERVES CLEANROOM
RPBP-5	NPHW	5-109	WATTS	909	1/2"		SERVES MECHANICAL MAKEUP IN PENTHOUSE
RPBP-6	TW	B-164	WATTS	909	2"		SERVES CLEANROOM UTRA PURE WATER PRETREATMENT
RPBP-7	NPCW	B-164	WATTS	909	1/2"		SERVES MECHANICAL MAKEUP IN STEAM TUNNEL

DRAINS AND CLEANOUTS

NUMBER	BASIS OF DESIGN MANUFACTURER AND MODEL	DESCRIPTION
FD-1	J.R. SMITH 2005Y-B	GENERAL USE FLOOR DRAIN, CAST-IRON BODY, NICKEL BRONZE STRAINER, SEDIMENT BUCKET.
FD-2	J.R. SMITH 2110Y-B	MECHANICAL ROOM FLOOR DRAIN, CAST-IRON BODY, HEAVY DUTY GRATE, SEDIMENT BUCKET.
FD-3	ZURN Z187-FG	ELEVATOR PIT DRAIN, FLUSH GRATE.
FD-4	J.R. SMITH 2005-TNB	GENERAL USE FLOOR DRAIN, CAST-IRON BODY, RECTANGULAR, NICKEL BRONZE STRAINER.
FS-1	J.R. SMITH 2410-C-LSG	GENERAL USE FLOOR SINK, 10-INCH DEEP SUMP, FLASHING CLAMP AND LOOSE SET GRATE.
FS-2	NOT USED	
CO-1	J.R. SMITH 4020 SERIES	CAST-IRON, MEDIUM LOAD FLOOR CLEANOUT, NICKEL BRONZE COVER, WITHOUT FLASHING CLAMP.
CO-2	J.R. SMITH 4100 SERIES	CAST-IRON, HEAVY LOAD FLOOR CLEANOUT, NICKEL BRONZE COVER, WITHOUT FLASHING CLAMP.
CO-3	J.R. SMITH #4530	STAINLESS STEEL WALL CLEANOUT
RD-1	J.R. SMITH 1015Y-C	LARGE DOME ROOF DRAIN, UNDERDECK CLAMP, ALUMINUM DOME.
OD-1	J.R. SMITH 1080-C	LARGE DOME ROOF DRAIN, UNDERDECK CLAMP, ALUMINUM DOME, 2-INCH EXTENSION.
DS-1	J.R. SMITH 1770	CAST BRONZE DOWNSPOUT NOZZLE W/BIRDSCREEN.
YCO	WADE W-8300-MF-SERIES	YARD CLEANOUT

BLADDER TANKS

TAG	SYSTEM	TANK VOLUME (GAL.)	MIN. ACCEP. VOLUME (GAL.)	DIMENSIONS (INCHES) DIA.	HEIGHT	SYSTEM CONN.	AIR CHARGE PRESSURE (PSIG)	REMARKS
ET-1	DHW	6.4	3.2	12	13.375	0.75	40	AMTROL #ST-12-C
ET-2	NPCW	79	10	22	56	1	30	AMTROL #WX-255

AIR DRYERS

TAG	LOCATION	SERVICE	CAPACITY (SCFM)	OPERATING PRESSURE (PSIG)	RATED PRESSURE (PSIG)	PRESS. DEWPT. (°F)	AIR CONNECTIONS INLET (IN)	OUTLET (IN)	POWER VOLT	PH	REMARKS
AD-1	Mech B-164	CA	100	100	300	-40	1.5	1.5	120	1	

AIR RECEIVER TANK

TAG	SYSTEM	TANK VOLUME (GAL)	RATED PRESSURE (PSI)	DIMENSIONS (INCHES) DIA.	HEIGHT	SYSTEM CONN.	REMARKS
AR-1	DHW	240	175	30	84	2	

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SCHEDULES

MECHANICAL SYMBOLS AND ABBREVIATIONS

NOTE: SYMBOLS INDICATED HERE AND NOT USED IN THE CONTRACT DOCUMENTS DO NOT APPLY TO THIS PROJECT. ADDITIONAL SYMBOLS MAY BE INDICATED IN THE CONTRACT DOCUMENTS.

GENERAL

ADJ	-	ADJUSTABLE
AFF	-	ABOVE FINISHED FLOOR
AL	-	ALUMINUM
ALT	-	ALTERNATE
AP	-	ACCESS PANEL
BE	-	BIOSAFETY CABINET EXHAUST
BBD	-	BOILER BLOW DOWN
BOD	-	BOTTOM OF DUCT
BOP	-	BOTTOM OF PIPE
BSC	-	BIOSAFETY CABINET
BTU	-	BRITISH THERMAL UNIT
BTUH	-	BRITISH THERMAL UNITS PER HOUR
CA	-	COMBUSTION AIR
CAV	-	CONSTANT AIR VOLUME
CE	-	CORROSIVE EXHAUST
CFCI	-	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CFM	-	CUBIC FEET PER MINUTE
CL	-	CENTERLINE
CLG	-	CEILING
COND	-	CONDENSATE/CONDENSER
COP	-	CENTER OF PIPE
CS	-	CARBON STEEL
CSC	-	CORROSIVE STORAGE CABINET
CU	-	COPPER
CW EA	-	CAGEWASH EXHAUST AIR
DB	-	DRY BULB
DDC	-	DIRECT DIGITAL CONTROL
DEF	-	DEFLECTION
DX	-	DIRECT EXPANSION
EA	-	EXHAUST AIR
EAT	-	ENTERING AIR TEMPERATURE
EC	-	ELECTRICAL CONTRACTOR
EDR	-	EQUIVALENT DIRECT RADIATION
EGE	-	EMERGENCY GENERATOR EXHAUST
EL	-	ELEVATION
ESP	-	EXTERNAL STATIC PRESSURE
ETR	-	EXISTING TO REMAIN
EWT	-	ENTERING WATER TEMPERATURE
EXH	-	EXHAUST
FA	-	FRESH AIR INTAKE/ FIELD ADJUSTABLE
FAT	-	FINAL AIR TEMPERATURE
FC	-	FAIL CLOSED
FE	-	FUME HOOD EXHAUST
FLA	-	FULL LOAD AMPS
FLR	-	FLOOR
FO	-	FAIL OPEN
FPI	-	FINS PER INCH
FPM	-	FEET PER MINUTE
FPS	-	FEET PER SECOND
GA	-	GAUGE
GC	-	GENERAL CONTRACTOR
GE	-	GENERAL EXHAUST
GPM	-	GALLONS PER MINUTE
GS	-	GALVANIZED STEEL
HP	-	HORSE POWER/HIGH POINT
IA	-	INSTRUMENT AIR
IE	-	INVERT ELEVATION
KE	-	KITCHEN EXHAUST
KO	-	KNOCK-OUT
LAT	-	LEAVING-AIR TEMPERATURE
LE	-	LABORATORY EXHAUST
LWT	-	LEAVING WATER TEMPERATURE
MBH	-	THOUSANDS OF BTU PER HOUR
MC	-	MECHANICAL CONTRACTOR
MEP	-	MECHANICAL, ELECTRICAL AND PIPING
MER	-	MECHANICAL EQUIPMENT ROOM
NA	-	NOT APPLICABLE
NC	-	NORMALLY CLOSED
NIC	-	NOT IN CONTRACT
NO	-	NORMALLY OPEN
NPS	-	NOMINAL PIPE SIZE
NPT	-	NATIONAL PIPE THREAD
NTS	-	NOT TO SCALE
OA	-	OUTSIDE AIR
OC	-	ON CENTER
OED	-	OPEN END DUCT
OFCI	-	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	-	OWNER FURNISHED, OWNER INSTALLED
OV	-	OUTLET VELOCITY
PA	-	PLANT AIR
PC	-	PLUMBING CONTRACTOR
PCF	-	POUNDS PER CUBIC FOOT
PD	-	PRESSURE DROP
PH	-	PHASE
PP	-	POLYPROPYLENE
PSF	-	POUNDS PER SQUARE FOOT
PSI	-	POUNDS PER SQUARE INCH
PSIA	-	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	-	POUNDS PER SQUARE INCH GAUGE
RA	-	RETURN AIR
RI	-	RADIOISOTOPE EXHAUST
RPM	-	REVOLUTIONS PER MINUTE
SA	-	SUPPLY AIR
SCH	-	SCHEDULE
SE	-	SOLVENT EXHAUST
SOG	-	SLAB ON GRADE
SP	-	STATIC PRESSURE
SS	-	STAINLESS STEEL
SSC	-	SOLVENT STORAGE CABINET
TA	-	TRANSFER AIR
TBR	-	TO BE REMOVED
TOB	-	TOP OF BEAM
TOD	-	TOP OF DUCT/TOP OF DECK
TOJ	-	TOP OF JOIST
TOP	-	TOP OF PIPE
TOS	-	TOP OF SLAB
TSP	-	TOTAL STATIC PRESSURE
V	-	VOLTS
VAV	-	VARIABLE AIR VOLUME
VIV EA	-	VIVARIUM EXHAUST AIR
VP	-	VELOCITY PRESSURE
VTR	-	VENT THRU ROOF
WB	-	WET BULB
WC	-	WATER COLUMN
WG	-	WATER GAUGE
X	-	EXISTING

EQUIPMENT

AC	-	AIR CONDITIONING UNIT/ AIR COMPRESSOR
ACC	-	AIR COOLED CONDENSER
ACCU	-	AIR COOLED CONDENSING UNIT
ACU	-	AIR CONDITIONING UNIT
AHU	-	AIR HANDLING UNIT
AFM	-	AIR FLOW METER
AMD	-	AIR MIXING DEVICE
AS	-	AIR SEPARATOR
AT	-	AIR TERMINAL DEVICE
B	-	BOILER
BBS	-	BOILER BLOWDOWN SEPARATOR
BFS	-	BOILER FEEDWATER SYSTEM
BF	-	CHEMICAL BATCH FEEDER
BH	-	BOOSTER HUMIDIFIER
C	-	CONVECTOR
CE	-	CORROSIVE EXHAUST
CC	-	COOLING COIL
CH	-	CHILLER
CP	-	CONDENSATE PUMP/ CONTROL PANEL
CT	-	COOLING TOWER
CUH	-	CABINET UNIT HEATER
CV	-	CONVERTOR
DC	-	DUST COLLECTOR
DH	-	DEHUMIDIFIER
EF	-	EXHAUST FAN
EH	-	EXHAUST HOOD/ ELECTRIC HEATER
EJ	-	EXPANSION JOINT
ET	-	EXPANSION TANK
EV	-	EXHAUST VALVE
F	-	FILTER
FCU	-	FAN COIL UNIT
FD	-	FLOOR DRAIN
FOP	-	FUEL OIL PUMP
FOT	-	FUEL OIL TANK
FR	-	FIN TUBE RADIATION
FT	-	FLASH TANK
FU	-	FURNACE
H	-	HUMIDIFIER
HC	-	HEATING COIL
HP	-	HEAT PUMP
HRC	-	HEAT RECOVERY COIL
HR	-	HOSE REEL
HRD	-	HEAT RECLAIM DEVICE
HT	-	HEAT TRACE
HX	-	HEAT EXCHANGER
IH	-	INTAKE HOOD
MCC	-	MOTOR CONTROL CENTER
P	-	PUMP
PLC	-	PROGRAMMABLE LOGIC CONTROLLER
RAH	-	ROOFTOP AIR HANDLING UNIT
RC	-	REHEAT COIL
RCP	-	RADIANT CEILING PANEL
REF	-	ROOF EXHAUST FAN
RF	-	RETURN FAN
RH	-	RELIEF HOOD
SAD	-	SOUND ATTENUATING DEVICE
SD	-	SUCTION DIFFUSER
SF	-	SUPPLY FAN
SG	-	STEAM GENERATOR
ST	-	STORAGE TANK/STEAM TRAP
T	-	TANK
TCP	-	TEMPERATURE CONTROL PANEL
TXV	-	THERMAL EXPANSION VALVE
UH	-	UNIT HEATER
UST	-	UNDERGROUND STORAGE TANK
UV	-	UNIT VENTILATOR
V	-	VALVE
VFD	-	VARIABLE FREQUENCY DRIVE
WCC	-	WATER COOLED CONDENSER
WF	-	WATER FILTER
WMG	-	WIRE MESH GRILLE

FIELD MOUNTED CONTROLS

- SPACE THERMOSTAT
- SPACE HUMIDISTAT
- NIGHT CYCLE CONTROL THERMOSTAT
- ASPIRATING THERMOSTAT
- THERMOSTAT WITH INSULATING BASE
- TEMPERATURE SENSOR
- HUMIDITY SENSOR
- PRESSURE SENSOR
- DUCT SMOKE DETECTOR
- CARBON DIOXIDE SENSOR
- DEW POINT SENSOR
- PRESSURE DIFFERENTIAL SENSOR
- OXYGEN SENSOR

ACTUATORS

- MANUAL
- GENERAL
- MODULATING
- MODULATING WITH PILOT POSITIONER
- SOLENOID
- ELECTRIC MOTOR DRIVEN
- TWO POSITION SPRING RETURN
- DOUBLE ACTING TWO POSITION
- FUSIBLE LINK

DAMPERS

- MANUAL BALANCING DAMPER
- CONTROL DAMPER
- BACKDRAFT DAMPER
- 3-4 HOUR RATED FIRE DAMPER
- 1-2 HOUR RATED FIRE DAMPER
- SMOKE DAMPER
- COMBINATION FIRE/SMOKE DAMPER
- OPPOSED BLADE DAMPER
- PARALLEL BLADE DAMPER
- GENERAL

(XX) DEFINES FAIL POSITION OR NORMAL POSITION.
FC = FAIL CLOSED (CONTROL VALVE OR DAMPER)
FO = FAIL OPEN (CONTROL VALVE OR DAMPER)
NC = NORMALLY CLOSED (CONTROL VALVE OR DAMPER)
NO = NORMALLY OPEN (CONTROL VALVE OR DAMPER)

EQUIPMENT IDENTIFICATION LETTERS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS (2)		ALARM		
B	BURNER FLAME				
C	CONDUCTIVITY (ELECTRICAL)	CONTROL		CONTROLLER	CLOSED
D	DENSITY (MASS) OR SPECIFIC GRAVITY	DIFFERENTIAL			
E	VOLTAGE (EMF)		PRIMARY ELEMENT		
F	FLOW RATE	RATIO (FRACTION) (4)			
G	GAGING (DIMENSIONAL)		GLASS		
H	HAND (MANUALLY INITIATED)				HIGH
I	CURRENT (ELECTRICAL)		INDICATOR		
J	POWER	SCAN			
K	TIME OR TIME-SCHEDULE (3)	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY	MOMENTARY			MIDDLE OR INTERMEDIATE
N					
O			ORIFICE (RESTRICTION) (1)		OPEN
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY OR EVENT	INTEGRATE OR TOTALIZE			
R	RADIOACTIVITY	REGULATING	RECORDER OR PRINTER		
S	SPEED OR FREQUENCY/ PILOT SOLENOID	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMITTER	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VISCOSITY			VALVE, DAMPER, OR LOUVER	
W	WEIGHT OR FORCE		WELL		
X	STATUS ON/OFF	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	VIBRATION	Y AXIS		RELAY OR CONVERTER	
Z	POSITION (LIMIT)	Z AXIS		DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

NOTES:

(1) RESTRICTION ORIFICE FO.

(2) ANALYSIS: MARK APPROPRIATE ABBREVIATION SHALL BE MARKED OUTSIDE OF THE CIRCLE.

(3) TIMERS KC.

(4) RATIO RELAY FFM: RATIO RECEIVER CONTROLLER FFC.

COMMON INSTRUMENTATION DEVICES

- TI — OR — TEMPERATURE INDICATOR (THERMOMETER) WITH THERMOWELL
- TI — TEMPERATURE INDICATOR (THERMOMETER) WITHOUT WELL (DIRECT INSERTION)
- TW — THERMOWELL
- TE — TEMPERATURE ELEMENT (DIRECT INSERTION)
- TS — STRAP ON PIPE TEMPERATURE INSTRUMENT (AQUASTAT)
- TT — TE — TEMPERATURE ELEMENT WITH WITH TRANSMITTER AND THERMOWELL
- PI — OR — PRESSURE INDICATOR (PRESSURE GAUGE) WITH GAUGE VALVE
- GAUGE CONNECTION WITH GAUGE VALVE
- PDT — PRESSURE DIFFERENTIAL TRANSMITTER
- PT — PRESSURE TRANSMITTER
- FE — OR — FLOW ELEMENT (FLOW SENSOR)
- FT — FE — FLOW ELEMENT WITH TRANSMITTER (FLOW METER)
- FI — FLOW INDICATOR/FLOW METER
- FS — OR — FLOW SWITCH

DUCTWORK SPECIALTIES

- DUCT REHEAT COIL
- TEST HOLE
- ACCESS DOOR
- FLEXIBLE DUCT
- DUCT FLEXIBLE CONNECTION
- POINT OF CHANGE IN DUCT CONSTRUCTION BY PRESSURE CLASS

MISCELLANEOUS

- POINT OF NEW CONNECTION TO EXISTING
- VIBRATION ISOLATOR

SPECIAL DESIGNATION

- EQUIPMENT (PUMP INDICATED)
- SPECIALTY ITEMS (I.E. GAUGE FILTER, ETC.)
- PLAN CONTINUATION REFERENCE
- SECTION DESIGNATION (TOP DESIGNATES SECTION NUMBER, BOTTOM DESIGNATES ON WHICH SHEET SECTION APPEARS)
- MATCHLINE DESIGNATION
- DETAIL REFERENCE (TOP=DETAIL NO., BOTTOM=DRAWING NO. SHOWN ON)
- DETAIL REFERENCE (TOP= DETAIL NO.; BOTTOM=SHEET NO. IN DETAIL MANUAL)
- REVISION REFERENCE
- GENERAL OR SPECIAL NOTES REFERENCE
- ROOM NUMBER DESIGNATION
- CONSTRUCTION BULLETIN REVISION NUMBER

DUCTWORK

SINGLE	DOUBLE	
	OR	RECTANGULAR/ROUND BRANCH TAKE-OFF (SA) OR ROUND/ROUND BRANCH TAKE-OFF (SA)
		ROUND/ROUND BRANCH TAKE OFF (RA, EA)
		RECTANGULAR/ROUND BRANCH TAKE OFF (RA, EA)
		45° LATERAL BRANCH
R=1.5W	W	RADIUS TEE
		SQUARE TEE WITURNING VANES (FOR LOW PRESSURE SA DIVERGING ONLY)
45°	1/4 W BUT NOT LESS THAN 6" W	BULLHEAD TEE (FOR LOW PRESSURE SA DUCTWORK ONLY)
		15° MAX. FOR DIVERGING, 25° MAX FOR CONVERGING TRANSITION - ECCENTRIC
		15° MAX. FOR DIVERGING, 25° MAX FOR CONVERGING TRANSITION - CONCENTRIC
		EXISTING DUCT TO REMAIN
		EXISTING DUCT TO BE REMOVED
		FLOW DIRECTION DESIGNATION
	OR	LINE CONTINUATION BREAK (RECTANGULAR, ROUND)
		SUPPLY AIR (SA) OR OUTDOOR AIR (OA) DUCT (SOLID LINE WITH FILL OR HATCH TYPICAL FOR SUPPLY AND OUTDOOR AIR UP, BROKEN LINE DOWN)
		RETURN AIR (RA), RELIEF AIR, OR TRANSFER AIR (TA) DUCT (SOLID LINE WITH FILL OR HATCH TYPICAL FOR RETURN, RELIEF AND TRANSFER AIR UP, BROKEN LINE DOWN)
		EXHAUST AIR (EA) DUCT (SOLID LINE WITH FILL OR HATCH TYPICAL FOR EXHAUST AIR UP, BROKEN LINE DOWN)
		DUCT RISE/DROP W/90° ELBOWS (SUPPLY RECTANGULAR DUCT SHOWN)
D	D	DUCT RISE (R)/DROP(D) W/45° ELBOWS (RECTANGULAR DUCTS)
		DUCT RISE/DROP W/90° ELBOWS (ROUND DUCTS)
		DUCT RISE/DROP W/90° ELBOWS (OVAL DUCTS)
D	D	DUCT RISE(R)/DROP(D) W/45° ELBOWS (ROUND OR OVAL DUCTS)
W R=1.5W		RADIUS ELBOW
SQUARE ELBOW OR	W R=1.5W RADIUS ELBOW	SINGLE LINE SYMBOL INDICATES EITHER RADIUS OR SQUARE ELBOW (REFER TO SPEC. SECTION 15850 PART 3 FOR ADDITIONAL REQUIREMENTS INCLUDING TURNING VANES)
45° W	1/4 W BUT NOT LESS THAN 6"	SQUARE/RECTANGULAR BRANCH TAKE-OFF (SA, RA, OR EA)

DIFFUSER NOTATION

DUCT SIZE IN INCHES
(NET INSIDE DIMENSIONS)
(ROUND SHOWN)
Ø INDICATES ROUND.
⇔INDICATES OVAL.
FIRST FIGURE: SIDE SHOWN
SECOND FIGURE: SIDE NOT SHOWN

SUPPLY AIR DUCT

DIFFUSER AIR PATTERN
1 ARROW: 1 WAY
2 ARROWS: 2 WAY
3 ARROWS: 3 WAY
4 ARROWS: 4 WAY
NO ARROWS: 4 WAY

CD-1 450 — CEILING DIFFUSER (CD) IDENTIFICATION
≤100 SA — AIR QUANTITY (CFM)

GRILLE, REGISTER NOTATION

EXHAUST AIR DUCT, RETURN AIR DUCT (RA)

DUCT SIZE IN INCHES
(NET INSIDE DIMENSIONS)
FIRST FIGURE: SIDE SHOWN
SECOND FIGURE: SIDE NOT SHOWN

12x6 EA — G-1 250

NECK SIZE IN INCHES
RETURN OR EXHAUST GRILLE (G)
SUPPLY GRILLE (SG)
LINEAR DIFFUSER (LD)
LINEAR RET/EXH GRILLE (LR)
TRANSFER GRILLE (TG)
AIR QUANTITY (CFM)

PIPING SYSTEM LABELS

- LPS — LOW PRESSURE STEAM
- LPC — LOW PRESSURE CONDENSATE
- HPS(XX) — HIGH PRESSURE STEAM
- HPC — HIGH PRESSURE CONDENSATE
- CPD — CONDENSATE PUMP DISCHARGE
- HWS — HOT WATER SUPPLY
- HWR — HOT WATER RETURN
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- PCHS — PROCESS CHILLED WATER SUPPLY
- PCHR — PROCESS CHILLED WATER RETURN
- VENT
- D — DRAIN
- CCC — COOLING COIL CONDENSATE
- ECHS — EQUIPMENT PROCESS CHILLED WATER SUPPLY
- ECHR — EQUIPMENT PROCESS CHILLED WATER RETURN
- LCHS — LOW TEMPERATURE CHILLED WATER SUPPLY
- LCHR — LOW TEMPERATURE CHILLED WATER RETURN
- ACHS — CLEAN ROOM AHU CHILLED WATER SUPPLY
- ACHR — CLEAN ROOM AHU CHILLED WATER RETURN
- BCHS — CHILLED BEAM CHILLED WATER SUPPLY
- BCHR — CHILLED BEAM CHILLED WATER RETURN
- CHS — CHILLED WATER SUPPLY
- CHR — CHILLED WATER RETURN

(XX) = SYSTEM PRESSURE IN PSIG

PIPING SPECIALTIES

- GENERAL PIPELINE STRAINER WITHOUT DRAIN
- GENERAL PIPELINE STRAINER WITH DRAIN
- STEAM & CONDENSATE PIPELINE STRAINER
- WATER SYSTEM PIPELINE STRAINER
- SUCTION DIFFUSER
- DUPLEX STRAINER
- BASKET STRAINER
- FLANGE
- UNION
- 2" AND SMALLER, CAP OR PLUG; 2-1/2" AND LARGER, BLIND FLANGE
- INVERTED BUCKET TRAP
- FLOAT AND THERMOSTATIC TRAP
- THERMOSTATIC TRAP
- EXPANSION JOINT
- PIPE FLEXIBLE CONNECTION
- BALL JOINT
- NOISE SUPPRESSOR
- SHOCK SUPPRESSOR
- FILTER/REGULATOR
- THERMOMETER
- PRESSURE GAUGE (WITH GAUGE VALVE)
- FLOW SENSOR
- FLOW SWITCH
- AUTOMATIC AIR VENT
- MANUAL AIR VENT
- THERMOSTATIC AIR VENT
- TEST PLUG (PRESSURE/TEMP.)
- CONCENTRIC OR ECCENTRIC REDUCER
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- DIRECTION OF PITCH (DOWN)
- DIRECTION OF FLOW
- PIPE GUIDE
- PIPE SLEEVE
- ANCHOR
- BALL JOINT

VALVES

- BUTTERFLY VALVE
- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- SHUTOFF VALVE (BUTTERFLY VALVE FOR 2 1/2" AND LARGER, BALL VALVE FOR 2" AND SMALLER)
- GAUGE VALVE
- PLUG VALVE
- BALANCING VALVE
- THERMAL EXPANSION VALVE
- SPRING CHECK VALVE
- SWING CHECK VALVE
- DIAPHRAGM VALVE
- 2-WAY SOLENOID VALVE
- 2-WAY CONTROL VALVE (VALVE BODY AS SPECIFIED)
- 3-WAY MIXING VALVE WITH ARROW INDICATING FAIL POSITION
- 3-WAY DIVERTING VALVE WITH ARROW INDICATING FAIL POSITION
- 4-WAY VALVE WITH ARROW INDICATING FAIL POSITION
- TRIPLE DUTY VALVE
- DRAIN VALVE
- DRAIN VALVE WITH CAP
- LOCKSHIELD VALVE
- PRESSURE REDUCING VALVE-PRV (DOWNSTREAM SETPOINT)
- AIR-LOADED PRESSURE REDUCING VALVE-PRV (DOWNSTREAM SETPOINT)
- PRESSURE REDUCING VALVE-PRV (UPSTREAM SETPOINT)
- GAS REGULATOR
- REDUCED PRESSURE BACKFLOW PREVENTER (RPBP)
- PRESSURE RELIEF VALVE (RV) OR SAFETY VALVE (SV)
- VACUUM RELIEF/VACUUM BREAKER
- RUPTURE DISK PRESSURE RELIEF
- RUPTURE DISK VACUUM RELIEF
- FLOAT OPERATED VALVE
- QUICK OPENING VALVE
- GAS SHUTOFF VALVE
- ANGLE VALVE

(XX)=DEFINES FAIL POSITION OR NORMAL POSITION
FC=FAIL CLOSED (CONTROL VALVE OR DAMPER)
FO=FAIL OPEN (CONTROL VALVE OR DAMPER)
NC=NORMALLY CLOSED (CONTROL VALVE OR DAMPER)
NO=NORMALLY OPEN (CONTROL VALVE OR DAMPER)

PIPING

SINGLE	DOUBLE	
		ELBOW DOWN
		ELBOW UP
		BOTTOM CONNECTION (45° OR 90°)
		TOP CONNECTION (45° OR 90°)
D	D	45° PIPE RISE(R) /DROP(D)
	N/A	TEE (REFER TO SPECIFICATION FOR SIDE, TOP OR BOTTOM TEE)
		EXISTING PIPING TO REMAIN
		EXISTING PIPING TO BE REMOVED
		FLOW DIRECTION DESIGNATION
		LINE CONTINUATION BREAK

DUCTWORK AT DIFFUSERS AND GRILLES

SINGLE LINE-HARD OR FLEXIBLE CONNECTION	DOUBLE LINE-HARD OR FLEXIBLE CONNECTION	
		SQUARE/RECTANGULAR SUPPLY DIFFUSER, GRILLE OR REGISTER
		ROUND DIFFUSER
		RETURN REGISTER OR GRILLE (HORIZONTAL MOUNT)
		EXHAUST REGISTER OR GRILLE (HORIZONTAL MOUNT)
		EXHAUST OR RETURN REGISTER OR GRILLE (VERTICAL MOUNT)
		SUPPLY REGISTER OR GRILLE (VERTICAL MOUNT)

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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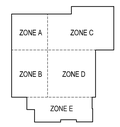
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL SYMBOLS AND ABBREVIATIONS

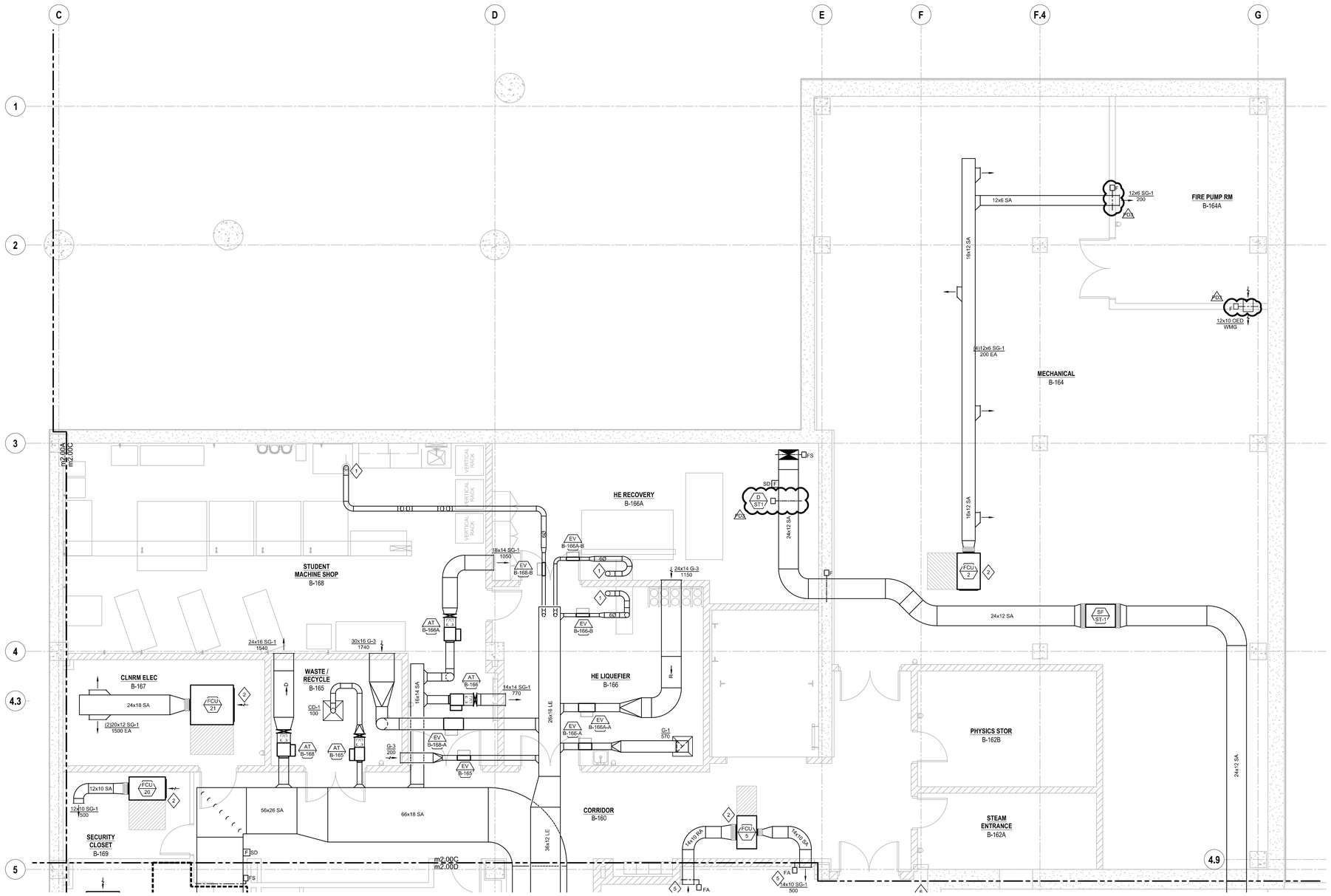
m0.01

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKEOFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK. LOCATE BALANCING DAMPER AS CLOSE TO BRANCH TAKEOFF AS POSSIBLE.
2. DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES SHALL BE SAME AS NECK SIZE UNLESS NOTED OR DETAILED OTHERWISE.
3. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET UNLESS OTHERWISE NOTED.
4. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
5. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO DIFFUSERS, REGISTERS, AND GRILLES UNLESS NOTED OTHERWISE IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER, REGISTER, OR GRILLE. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCT REQUIREMENTS.

SHEET KEYNOTES

1. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
2. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.



1 **BASEMENT - ZONE C**
SCALE: 1/4" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

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Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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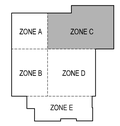
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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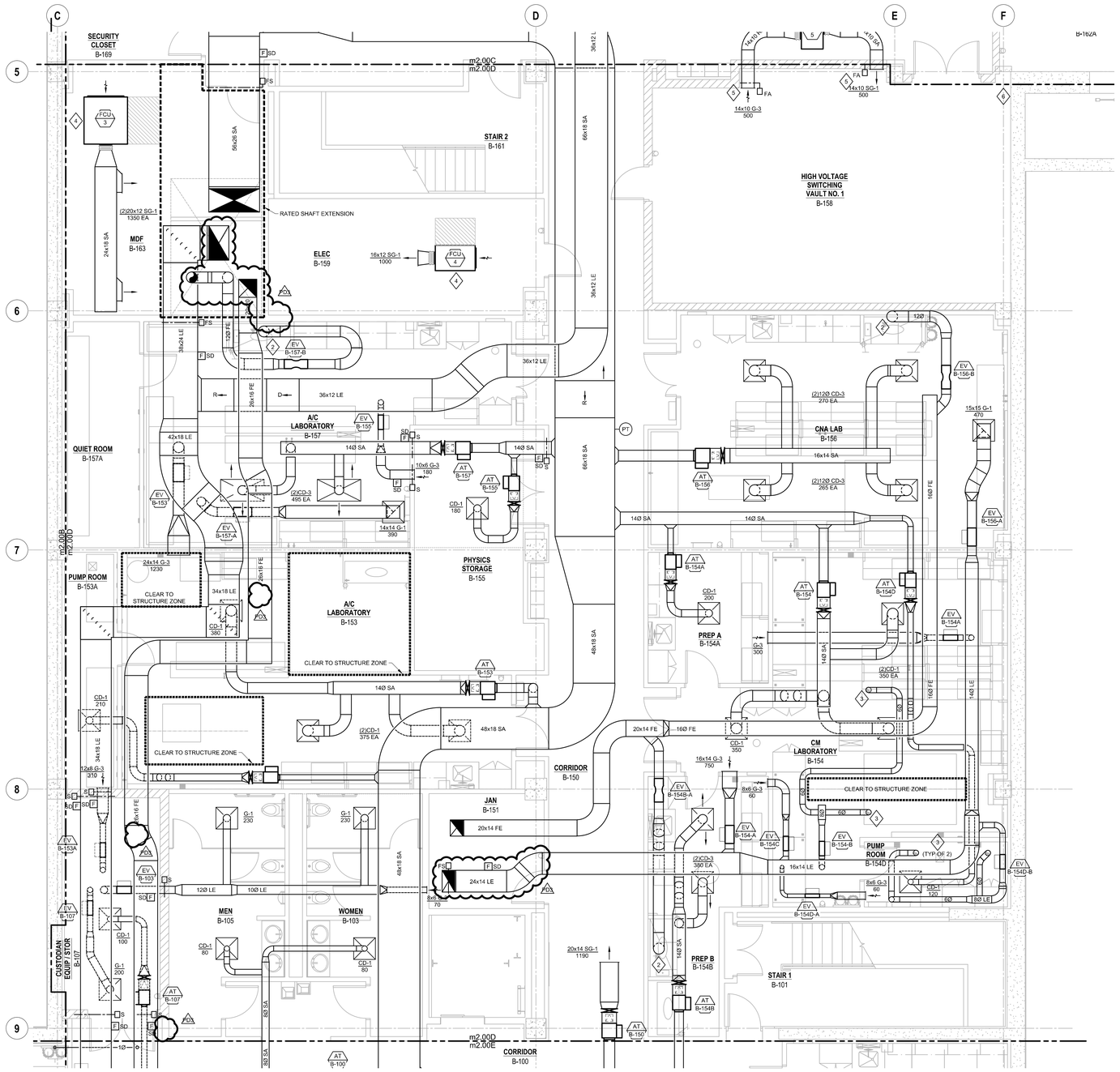
MECHANICAL
BASEMENT - ZONE C

m2.00C



1 **BASEMENT - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKEOFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK. LOCATE BALANCING DAMPER AS CLOSE TO BRANCH TAKEOFF AS POSSIBLE.
2. DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES SHALL BE SAME AS NECK SIZE UNLESS NOTED OR DETAILED OTHERWISE.
3. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET UNLESS OTHERWISE NOTED.
4. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
5. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO DIFFUSERS, REGISTERS, AND GRILLES UNLESS NOTED OTHERWISE IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER, REGISTER, OR GRILLE. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCT REQUIREMENTS.

SHEET KEYNOTES

1. NOT USED.
2. 12Ø FE DN TO 8' FUME HOOD. BALANCE TO 800 CFM.
3. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
4. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.
5. FIRE DAMPER TO BE ACCESSIBLE FOR INSPECTION AND MAINTENANCE FROM OUTSIDE THE VAULT.
6. PROVIDE ON-OFF SWITCH FOR FCU-5

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(612) 455-2204

Low Voltage Consultant
Elert & Associates
140 Third Street South
Stillwater, MN 55082
(651) 705-1242

I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.
For AFFILIATED ENGINEERS, INC.
By
Name MICHAEL J. BROGE
Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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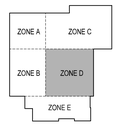
Comm. No. 2009037
Drawn TMM
Checked RLH
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
BASEMENT - ZONE D

m2.00D

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKEOFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK. LOCATE BALANCING DAMPER AS CLOSE TO BRANCH TAKEOFF AS POSSIBLE.
2. DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES SHALL BE SAME AS NECK SIZE UNLESS NOTED OR DETAILED OTHERWISE.
3. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET UNLESS OTHERWISE NOTED.
4. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
5. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO DIFFUSERS, REGISTERS, AND GRILLES UNLESS NOTED OTHERWISE IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER, REGISTER, OR GRILLE. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCT REQUIREMENTS.

SHEET KEYNOTES

1. NOT USED. (VOL)
2. 12Ø FE DN TO 8' FUME HOOD. BALANCE TO 800 CFM.
3. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.

1 **BASEMENT - ZONE E**
SCALE: 1/4" = 1'-0"

ARCHITECTURAL ALLIANCE
Architect of Record
400 Clifton Avenue South
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(612) 871-5703

ZIMMER GUNSUL FRASCA ARCHITECTS
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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Proposal Request No. 3	04-06-2012
Project Directive No. 3	05-15-2012

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Comm. No. 2009037

Drawn TMM

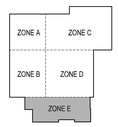
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
BASEMENT - ZONE E

m2.00E

GENERAL NOTES

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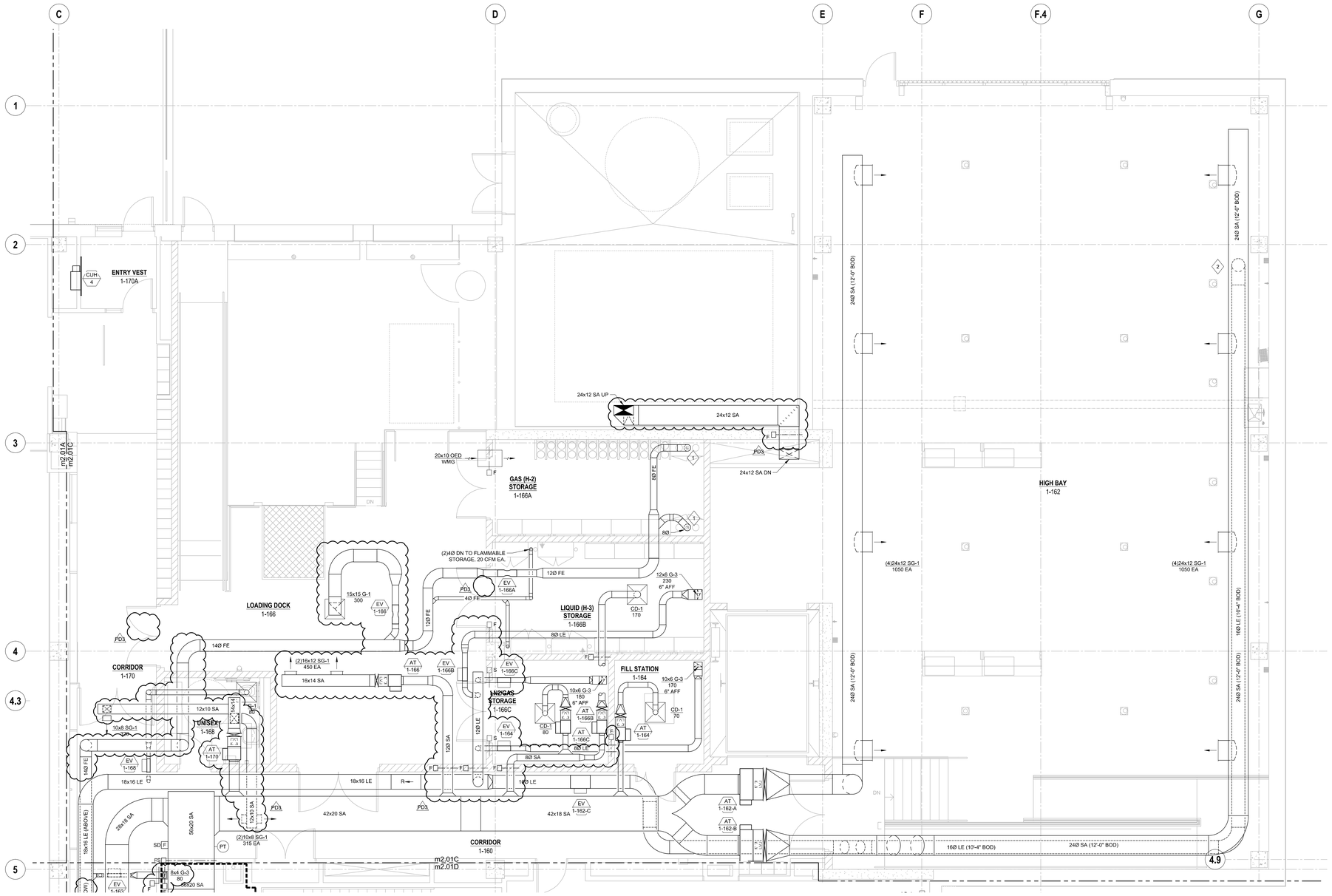
SHEET KEYNOTES

1. 8Ø FE DN TO GAS CYLINDER. BALANCE TO 250 CFM.
2. 16Ø LE DN TO SNORKEL. SNORKEL PROVIDED BY OTHERS. BALANCE TO 2000 CFM.
3. NOT USED. PD3



1 **LEVEL 1 - ZONE C**
SCALE: 1/4" = 1'-0"

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Comm. No. 2039037

Drawn TMM

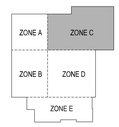
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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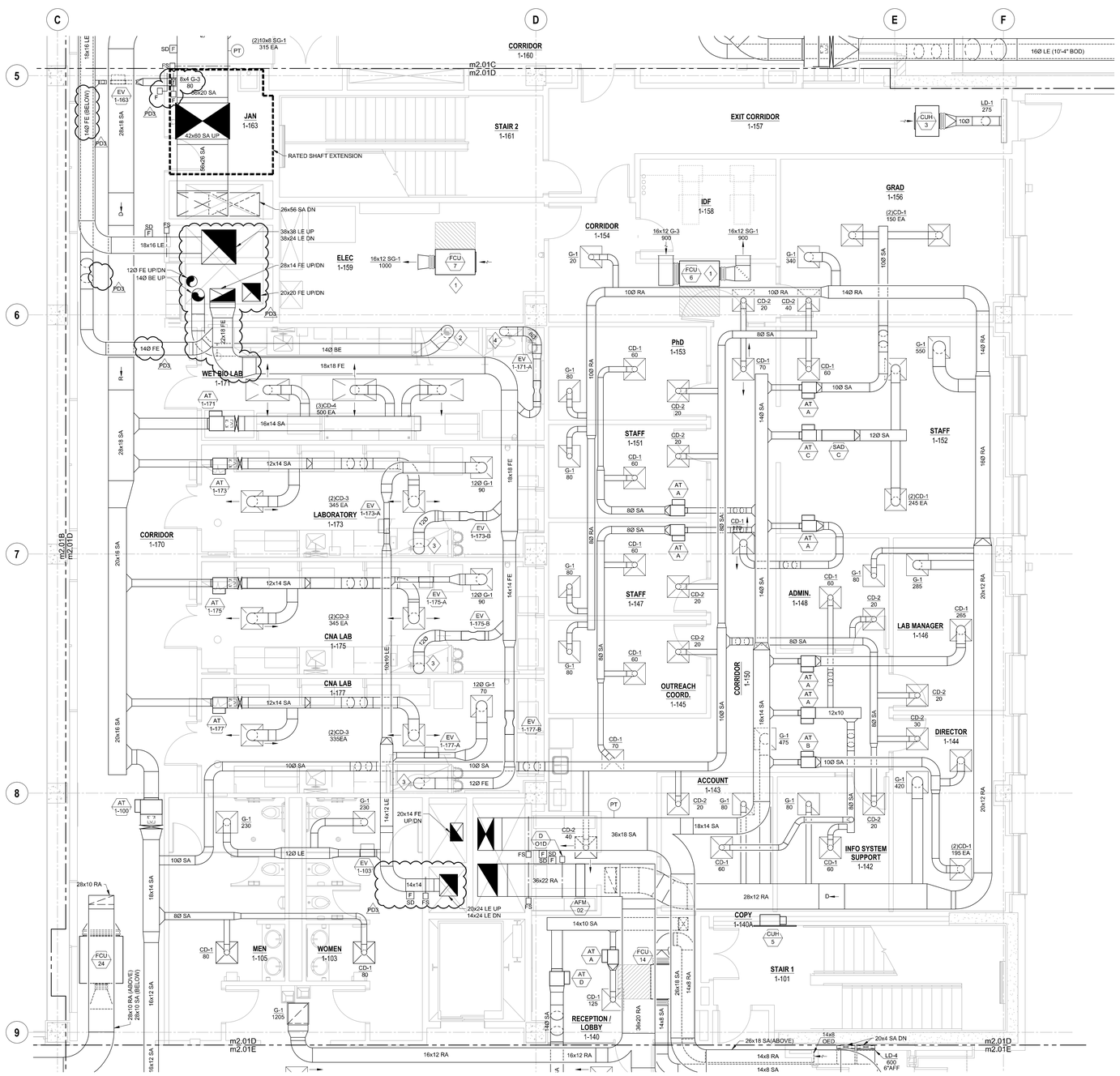
MECHANICAL
LEVEL 1 - ZONE C

m2.01C



1 **LEVEL 1 - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

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SHEET KEYNOTES

1. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.
2. REDUCE TO 12Ø BE AT 6' BIO SAFETY CABINET CONNECTION. BALANCE TO 1200 CFM.
3. 12Ø FE DN TO 6' FUME HOOD. BALANCE TO 800 CFM.
4. 8Ø FE DN TO 4' FUME HOOD, BALANCE TO 500 CFM.
5. NOT USED. PD3

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By

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Drawn TMM

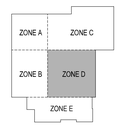
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 1 - ZONE D

m2.01D

GENERAL NOTES

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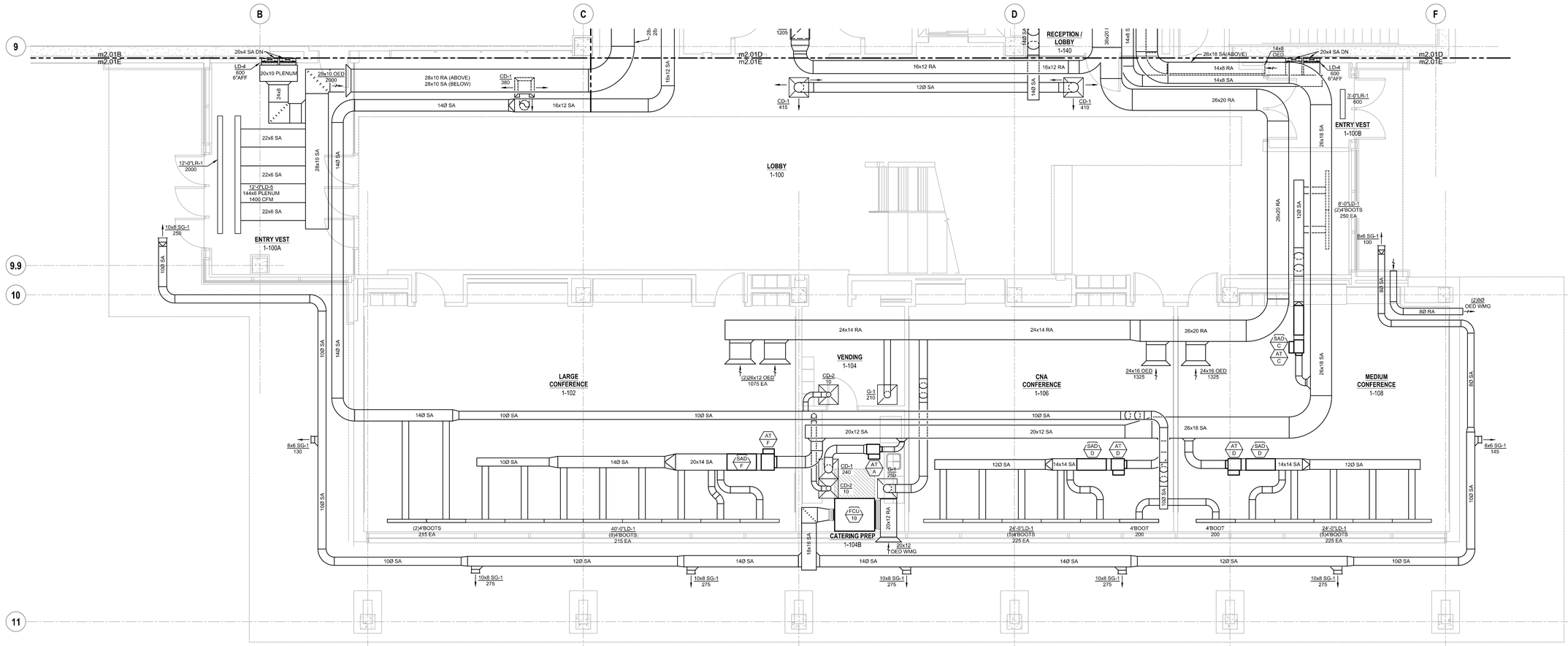

1 **LEVEL 1 - ZONE E**
SCALE: 1/4" = 1'-0"

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Drawn TMM

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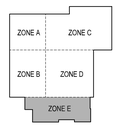
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 1 - ZONE E

m2.01E

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKEOFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK. LOCATE BALANCING DAMPER AS CLOSE TO BRANCH TAKEOFF AS POSSIBLE.
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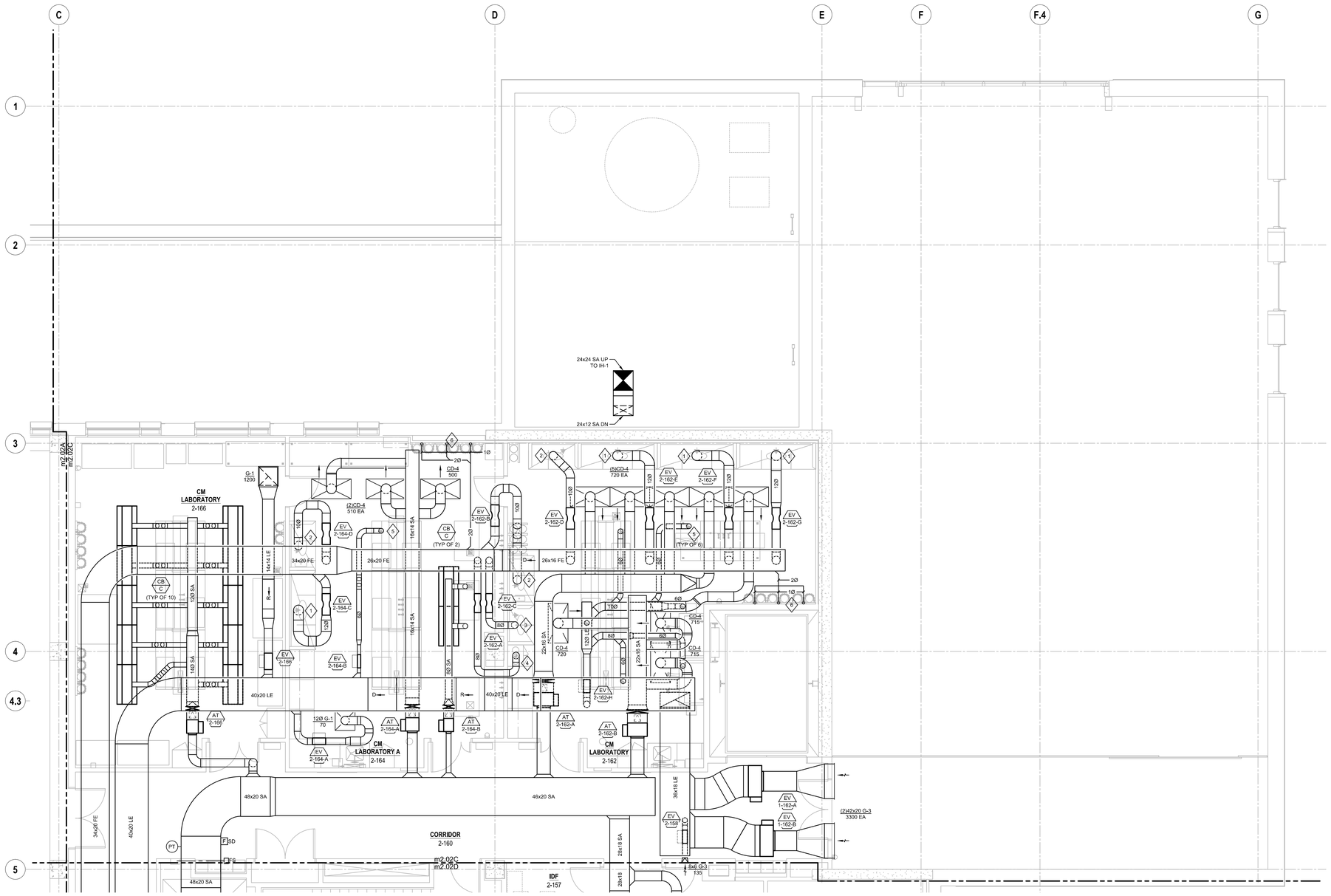
SHEET KEYNOTES

1. 12Ø FE DN TO 8' FUME HOOD. BALANCE TO 1100 CFM.
2. 10Ø FE DN TO 5' FUME HOOD. BALANCE TO 650 CFM.
3. 8Ø FE DN TO 4' FUME HOOD. BALANCE TO 500 CFM.
4. 8Ø FE DN TO GAS CYLINDER. BALANCE TO 250 CFM.
5. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
6. 1Ø DN TO GAS MANIFOLD VENT.



1 **LEVEL 2 - ZONE C**
SCALE: 1/4" = 1'-0"

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By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

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Bid Package No. 2	02-24-2012

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Comm. No. 2030037

Drawn TMM

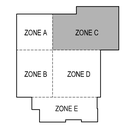
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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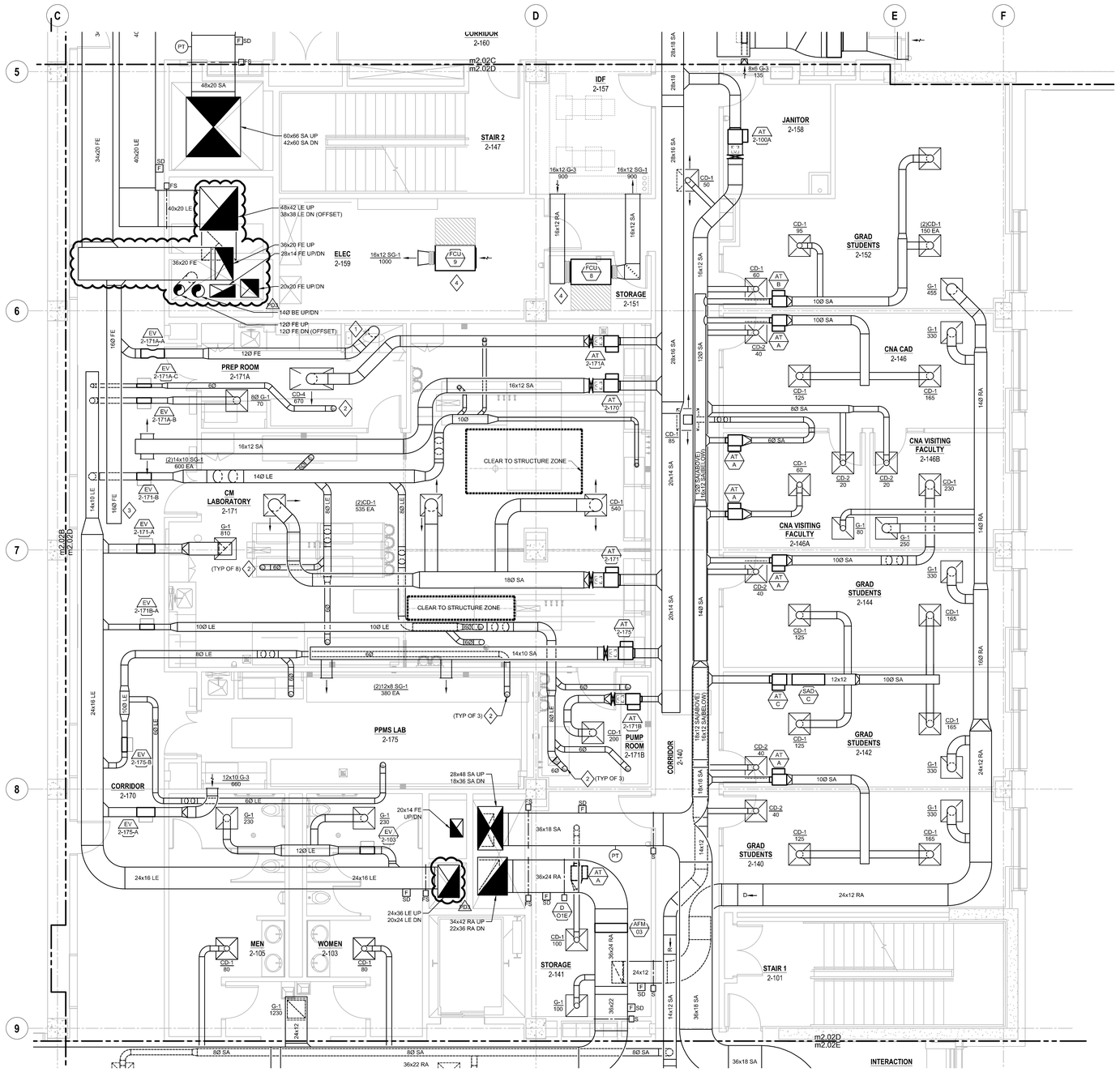
MECHANICAL
LEVEL 2 - ZONE C

m2.02C



1 **LEVEL 2 - ZONE D**
SCALE: 1/4" = 1'-0"

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SHEET KEYNOTES

1. 12Ø FE DN TO 6" FUME HOOD. BALANCE TO 800 CFM.
2. REDUCE TO 14Ø LE AT SNORKEL CONNECTION. BALANCE TO 100 CFM.
3. DUCTWORK SIZED AND LOCATED FOR FUTURE CONNECTIONS.
4. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.

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Drawn	TMM
Checked	RLH
Date	12/16/11

Project

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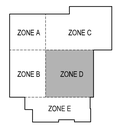

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MECHANICAL
LEVEL 2 - ZONE D

m2.02D

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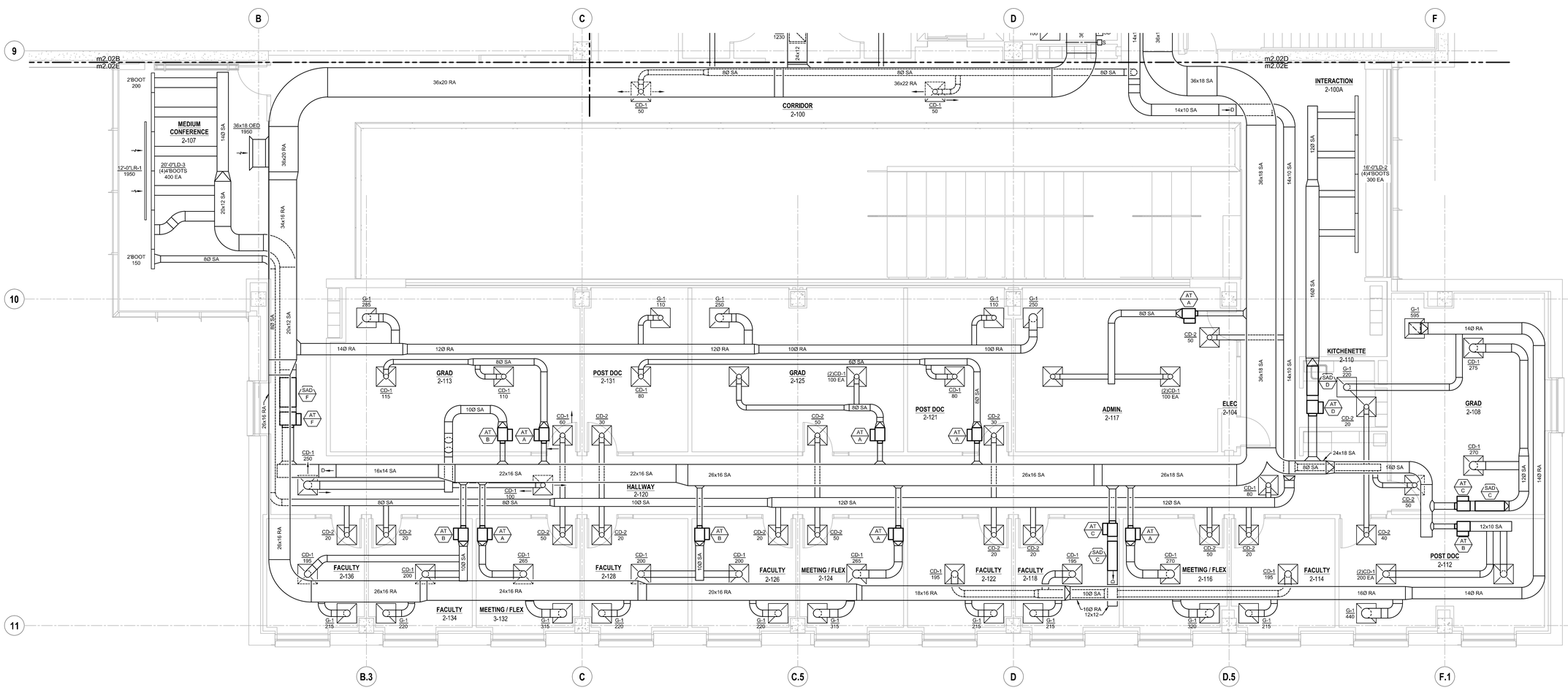

1 **LEVEL 2 - ZONE E**
SCALE: 1/4" = 1'-0"

ARCHITECTURAL ALLIANCE
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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

Issued for	Date
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Bid Package No. 2	02-24-2012

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Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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MECHANICAL
LEVEL 2 - ZONE E

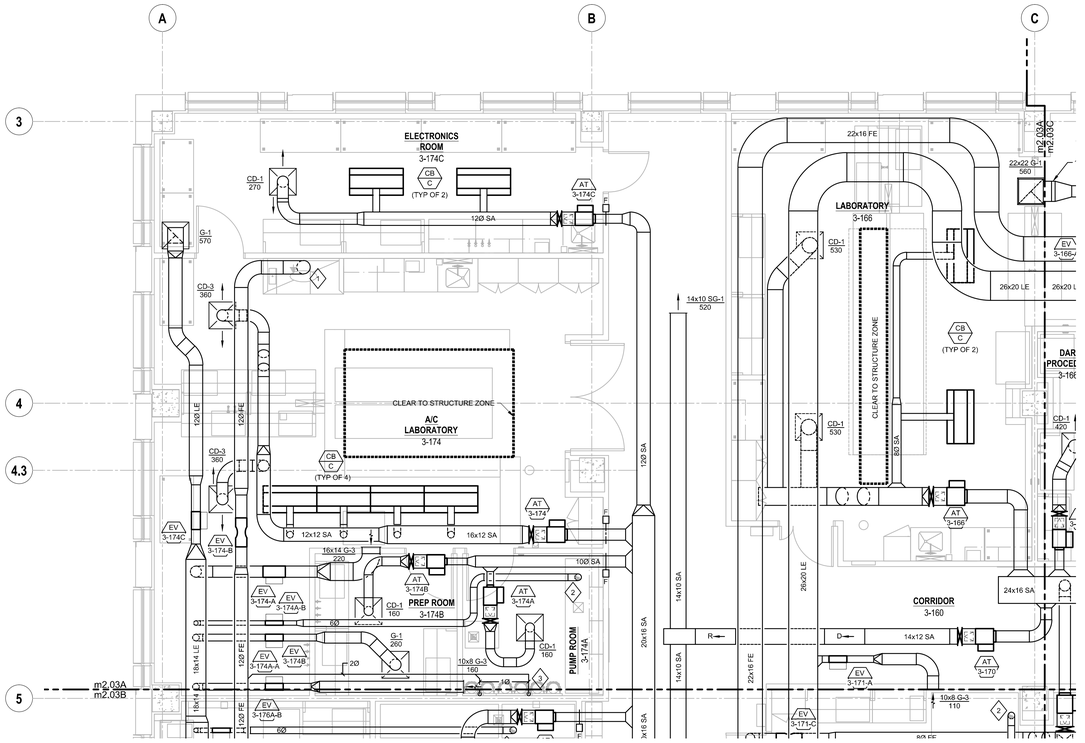
m2.02E

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKEOFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK. LOCATE BALANCING DAMPER AS CLOSE TO BRANCH TAKEOFF AS POSSIBLE.
2. DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES SHALL BE SAME AS NECK SIZE UNLESS NOTED OR DETAILED OTHERWISE.
3. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET UNLESS OTHERWISE NOTED.
4. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
5. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO DIFFUSERS, REGISTERS, AND GRILLES UNLESS NOTED OTHERWISE IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER, REGISTER, OR GRILLE. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCT REQUIREMENTS.

SHEET KEYNOTES

1. 12Ø FE DN TO 6' FUME HOOD. BALANCE TO 800 CFM.
2. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
3. 1Ø DN TO GAS MANIFOLD VENT.



1 **LEVEL 3 - ZONE A**
SCALE: 1/4" = 1'-0"

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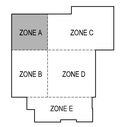
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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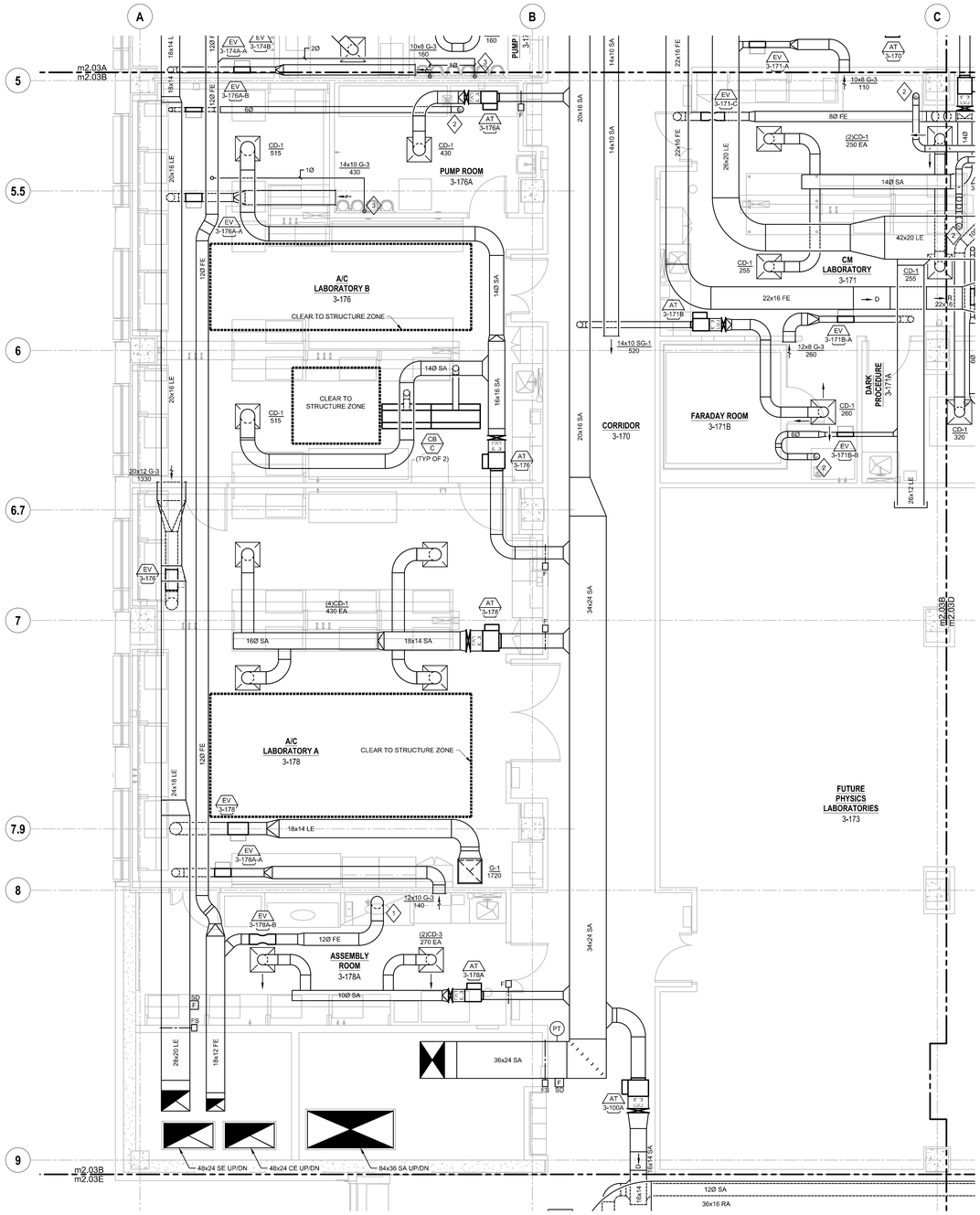
MECHANICAL
LEVEL 3 - ZONE A

m2.03A



1 **LEVEL 3 - ZONE B**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

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SHEET KEYNOTES

1. 12Ø FE DN TO 6' FUME HOOD. BALANCE TO 800 CFM.
2. REDUCE TO 14Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
3. 1Ø DN TO GAS MANIFOLD VENT.

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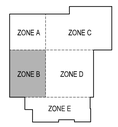
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 3 - ZONE B

m2.03B

GENERAL NOTES

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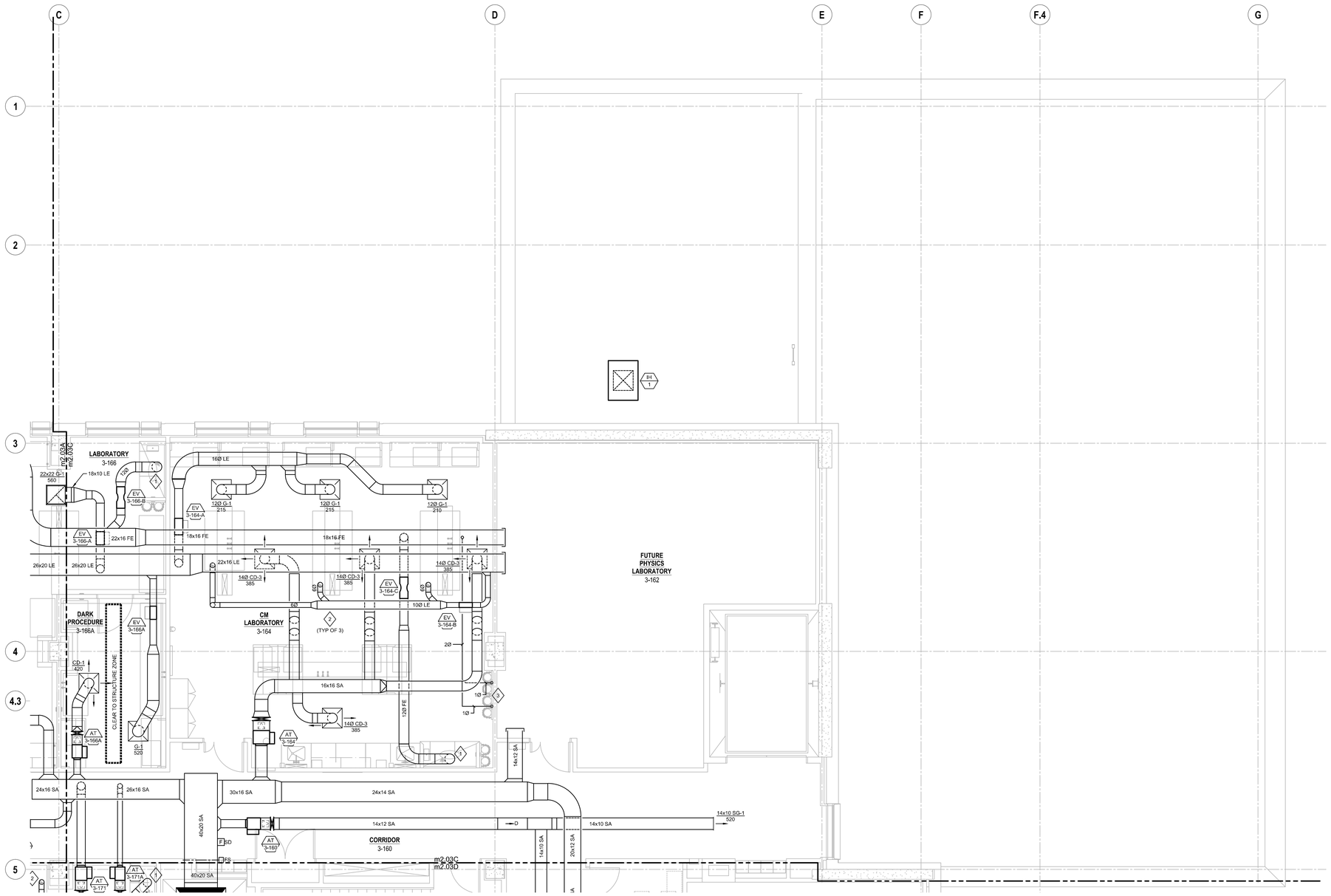
SHEET KEYNOTES

1. 12Ø FE DN TO 6' FUME HOOD. BALANCE TO 800 CFM.
2. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
3. 1Ø DN TO GAS MANIFOLD VENT.



1 **LEVEL 3 - ZONE C**
SCALE: 1/4" = 1'-0"

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By

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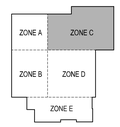
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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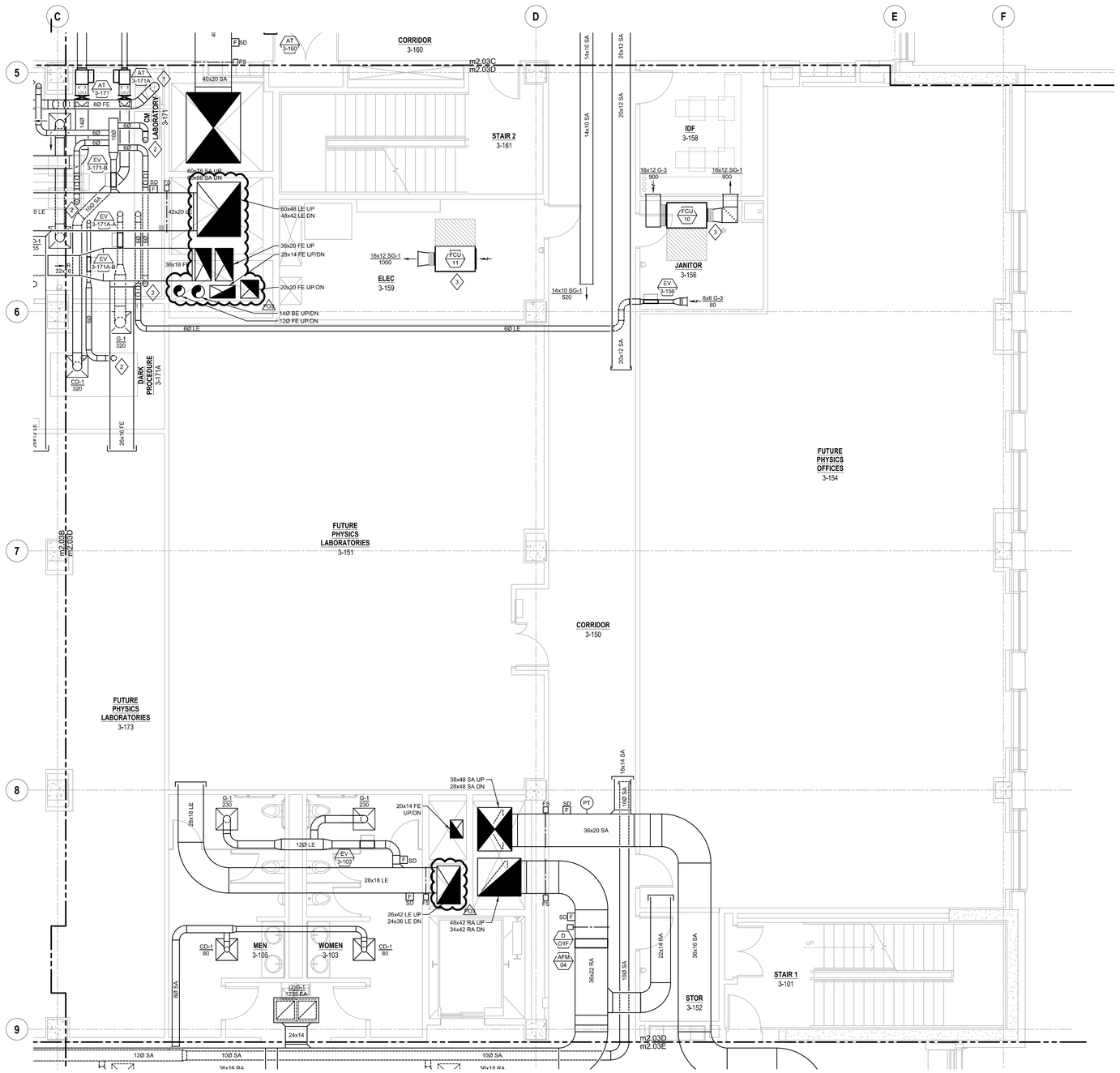
MECHANICAL
LEVEL 3 - ZONE C

m2.03C



1 **LEVEL 3 - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

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SHEET KEYNOTES

1. 8Ø FE DN TO 4' FUME HOOD. BALANCE TO 500 CFM.
2. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
3. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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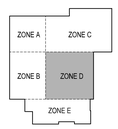
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 3 - ZONE D

m2.03D

GENERAL NOTES

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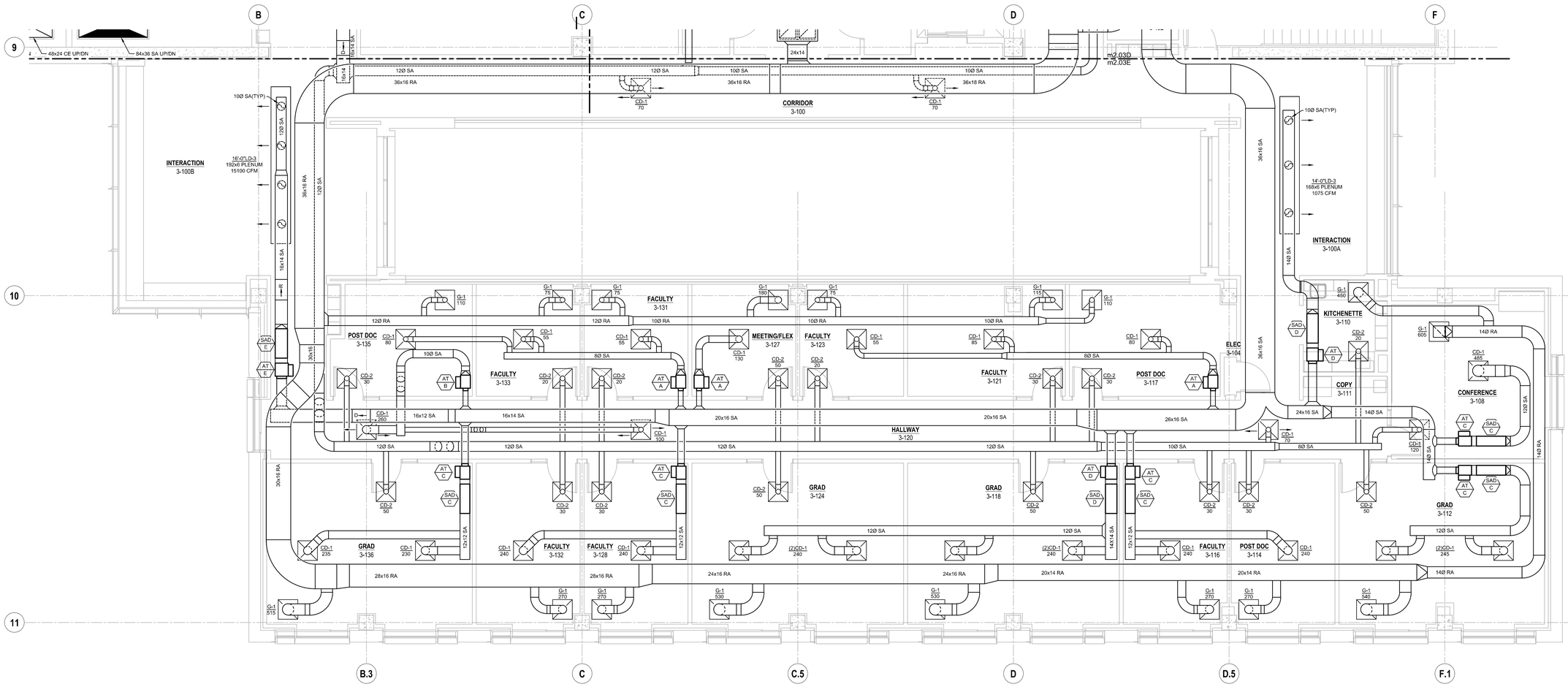

1 **LEVEL 3 - ZONE E**
SCALE: 1/4" = 1'-0"

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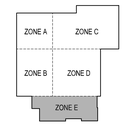
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 3 - ZONE E

m2.03E

GENERAL NOTES

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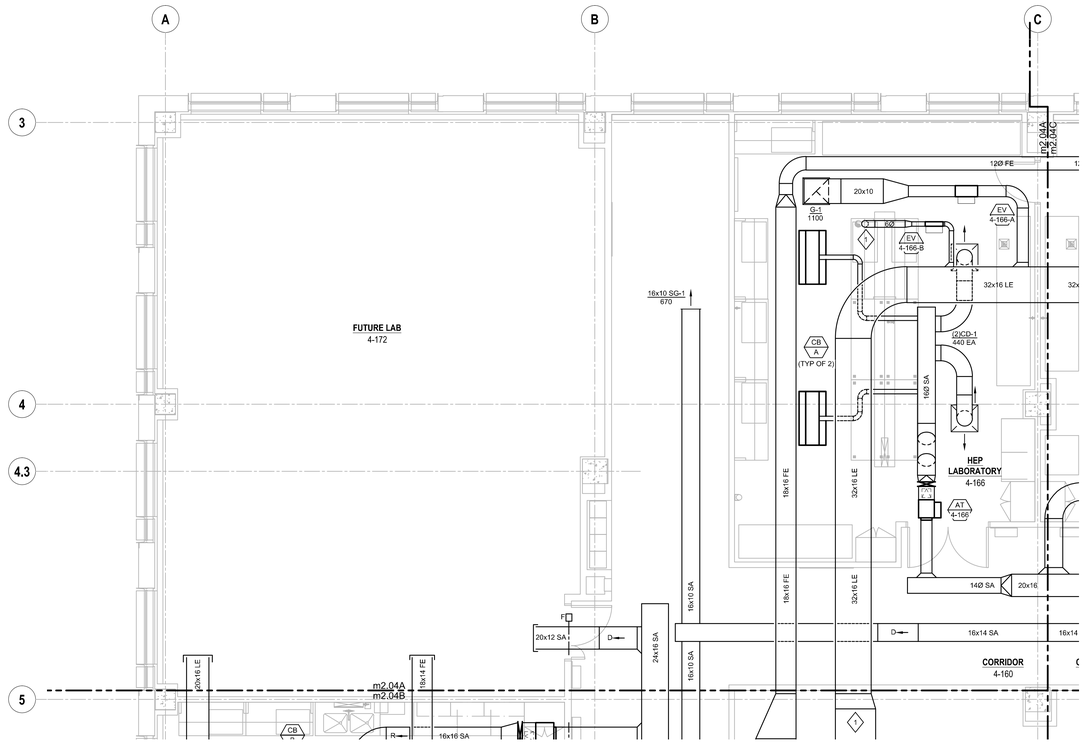
SHEET KEYNOTES

1 REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.



1 **LEVEL 4 - ZONE A**
SCALE: 1/4" = 1'-0"

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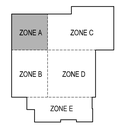

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MECHANICAL
LEVEL 4 - ZONE A

m2.04A

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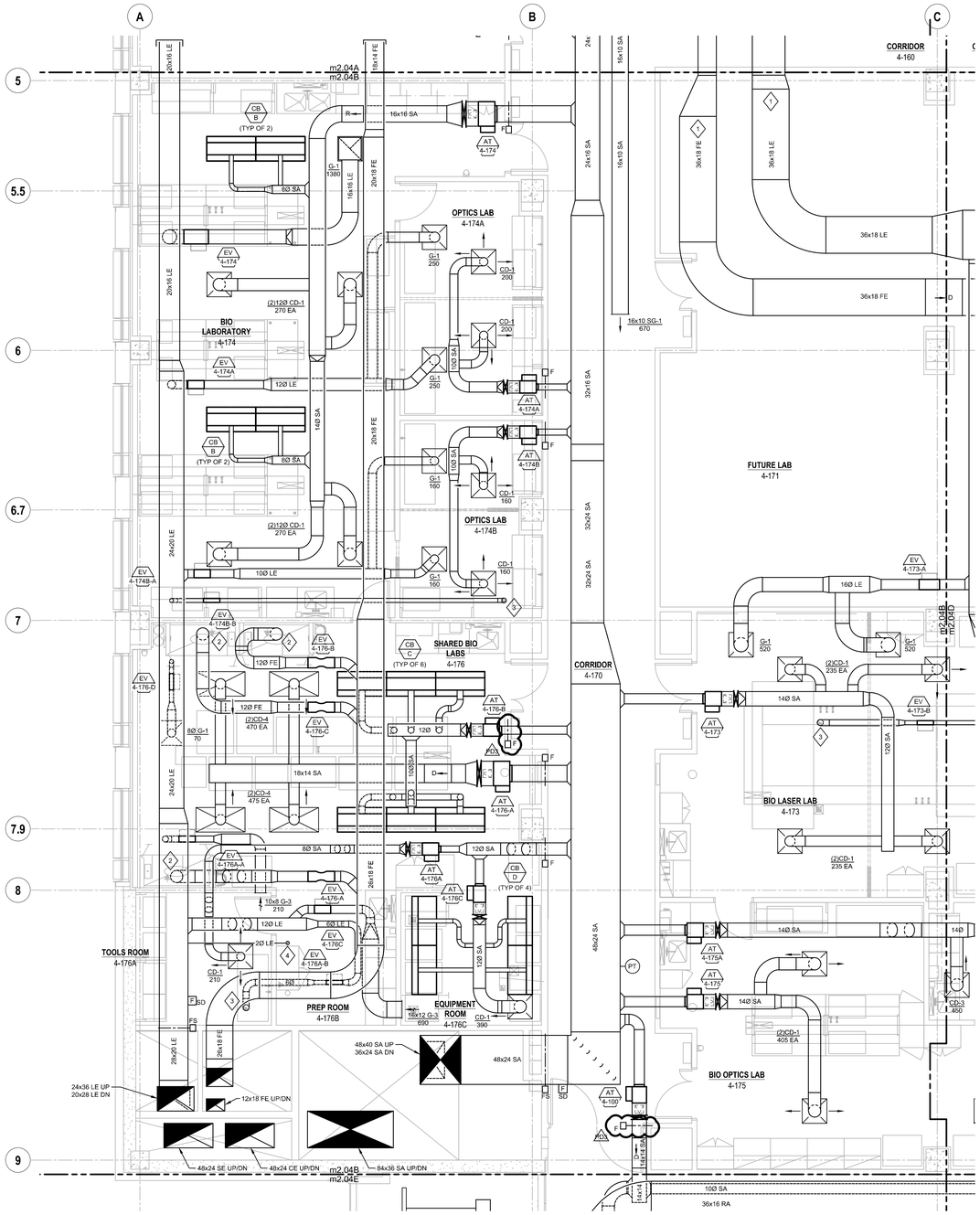
SHEET KEYNOTES

1. DUCTWORK SIZED AND LOCATED FOR FUTURE CONNECTIONS.
2. 12Ø FE DN TO 6' FUME HOOD, BALANCE TO 800 CFM.
3. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.
4. 2Ø DN TO FLAMMABLE STORAGE CABINET. BALANCE TO 20 CFM.



1 **LEVEL 4 - ZONE B**
SCALE: 1/4" = 1'-0"

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(651) 705-1242

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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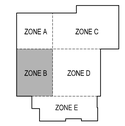
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 4 - ZONE B

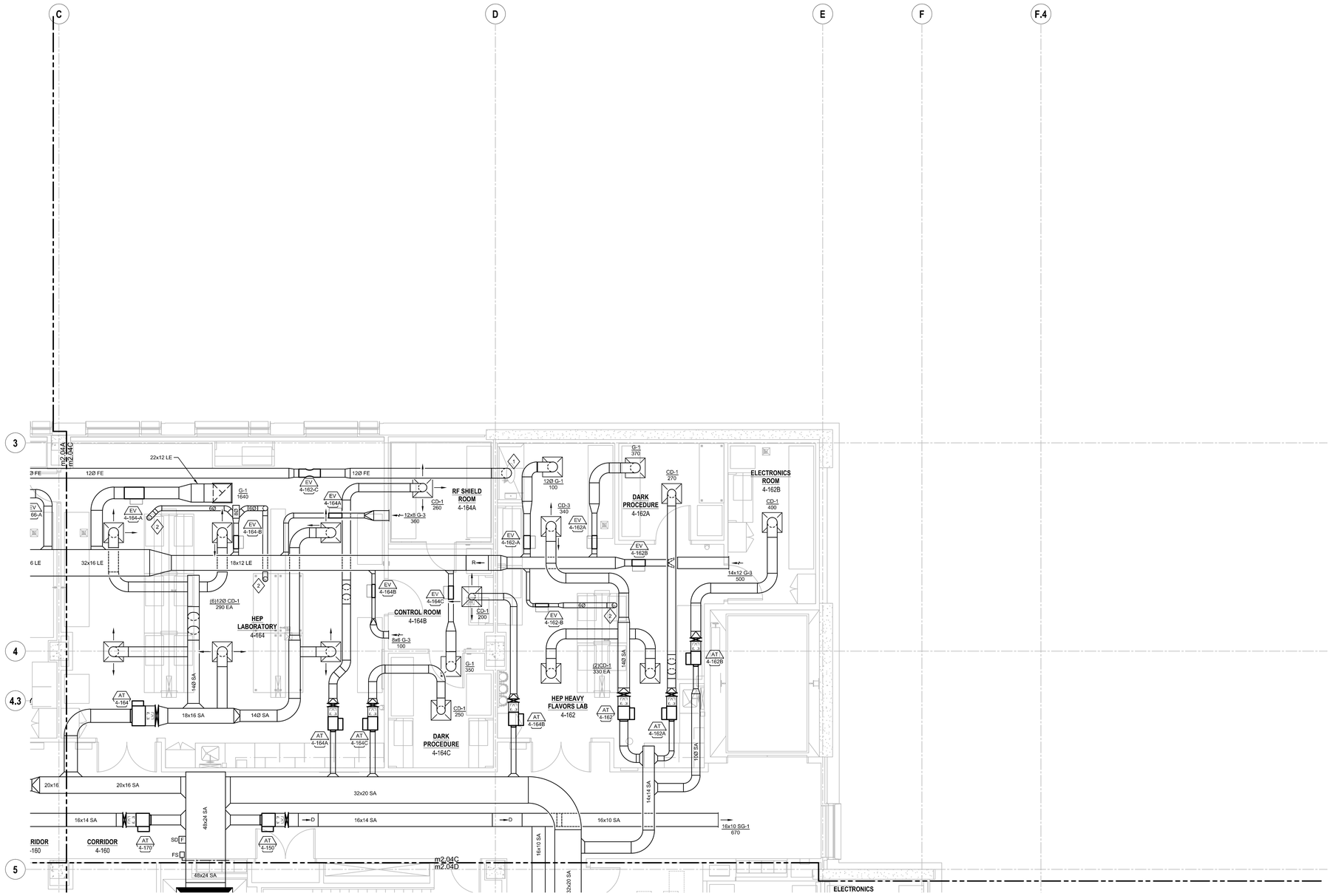
m2.04B

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKEOFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK. LOCATE BALANCING DAMPER AS CLOSE TO BRANCH TAKEOFF AS POSSIBLE.
2. DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES SHALL BE SAME AS NECK SIZE UNLESS NOTED OR DETAILED OTHERWISE.
3. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET UNLESS OTHERWISE NOTED.
4. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
5. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO DIFFUSERS, REGISTERS, AND GRILLES UNLESS NOTED OTHERWISE IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER, REGISTER, OR GRILLE. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCT REQUIREMENTS.

SHEET KEYNOTES

1. 12Ø FE DN TO 6' FUME HOOD, BALANCE TO 800 CFM.
2. REDUCE TO 4Ø LE AT SNORKEL CONNECTION, BALANCE TO 100 CFM.



1 **LEVEL 4 - ZONE C**
SCALE: 1/4" = 1'-0"

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By

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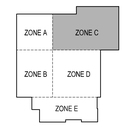
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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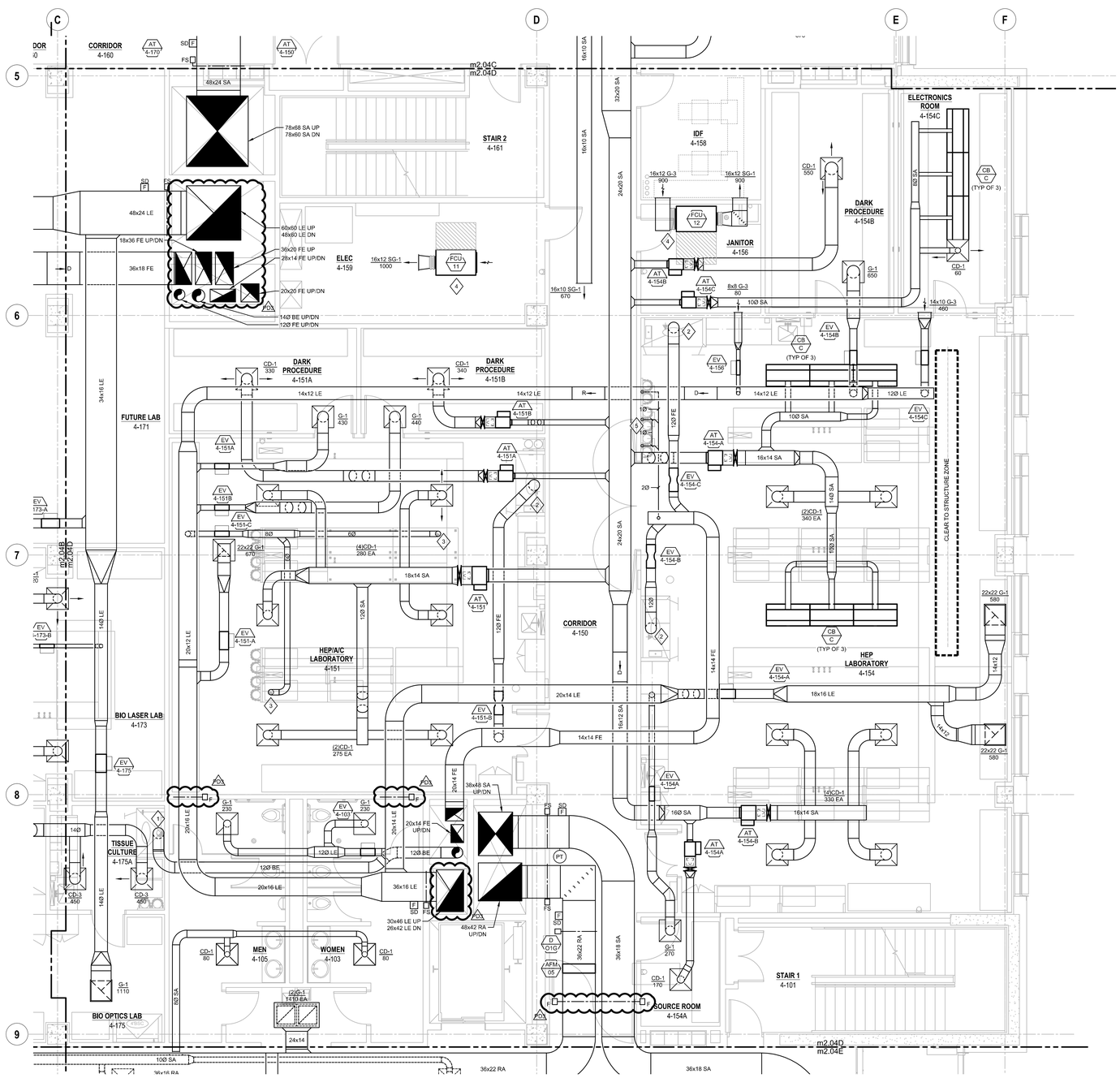
MECHANICAL
LEVEL 4 - ZONE C

m2.04C



1 **LEVEL 4 - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKEOFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK. LOCATE BALANCING DAMPER AS CLOSE TO BRANCH TAKEOFF AS POSSIBLE.
2. DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES SHALL BE SAME AS NECK SIZE UNLESS NOTED OR DETAILED OTHERWISE.
3. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET UNLESS OTHERWISE NOTED.
4. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
5. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO DIFFUSERS, REGISTERS, AND GRILLES UNLESS NOTED OTHERWISE IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER, REGISTER, OR GRILLE. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCT REQUIREMENTS.

SHEET KEYNOTES

1. 10Ø BE DN TO 4' BIO SAFETY CABINET. BALANCE TO 800 CFM.
2. REDUCE TO 10Ø BE AT 5' BIO SAFETY CABINET CONNECTION. BALANCE TO 800 CFM.
3. REDUCE TO 4Ø LE AT SNORKEL CONNECTION. BALANCE TO 100 CFM.
4. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.
5. 1Ø DN TO GAS MANIFOLD VENT.

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Comm. No. 2039037

Drawn TMM

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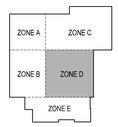
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 4 - ZONE D

m2.04D

GENERAL NOTES

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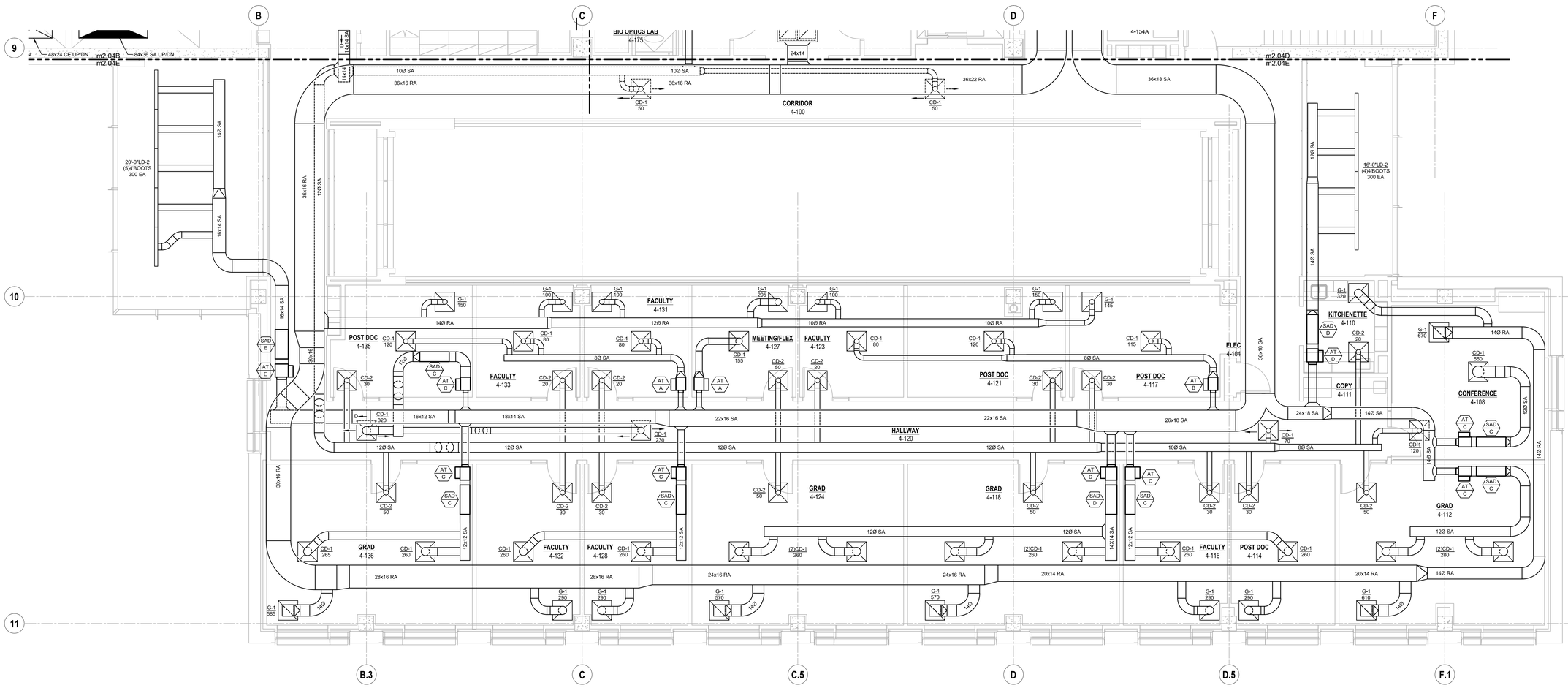

1 **LEVEL 4 - ZONE E**
SCALE: 1/4" = 1'-0"

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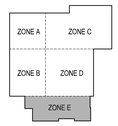
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 4 - ZONE E

m2.04E

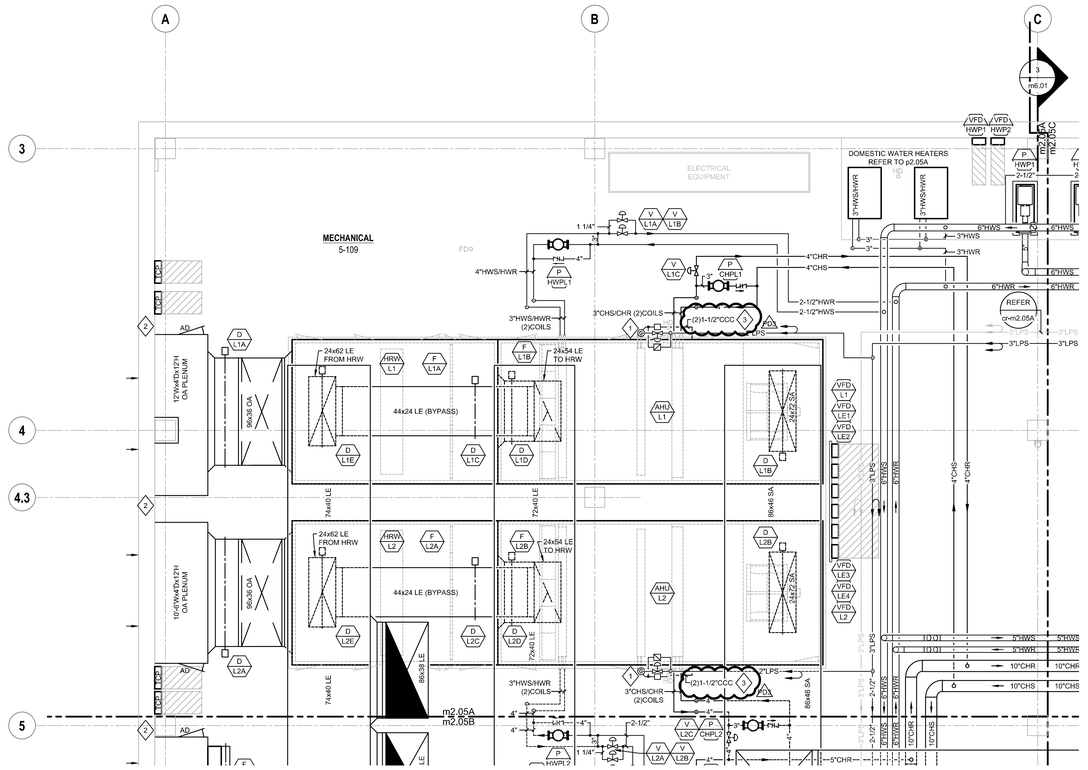
GENERAL NOTES

1. ALL LPC PIPING TO BE 1" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1. RUN 1"LPC FROM HUMIDIFIER DISTRIBUTION GRID AND STEAM GENERATOR TO AFTER COOLER. PC TO PROVIDE 1/2"NPCW TO AFTER COOLER. RUN 2"DRAIN TO NEAREST FLOOR DRAIN. REFER TO DETAILS.
2. BLANK-OFF UNUSED PORTIONS OF LOUVER WITH INSULATED SHEET METAL PANEL.
3. PROVIDE (2) 1-1/2"CCC. FROM PRIMARY DRAIN PAN AND SECONDARY DRAIN PAN OR SECOND DRAIN CONNECTION TO PRIMARY DRAIN PAN.

FDO



1 **PENTHOUSE - ZONE A**
SCALE: 1/4" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

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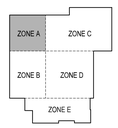
Checked	RLH
Date	12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
PENTHOUSE - ZONE A

m2.05A

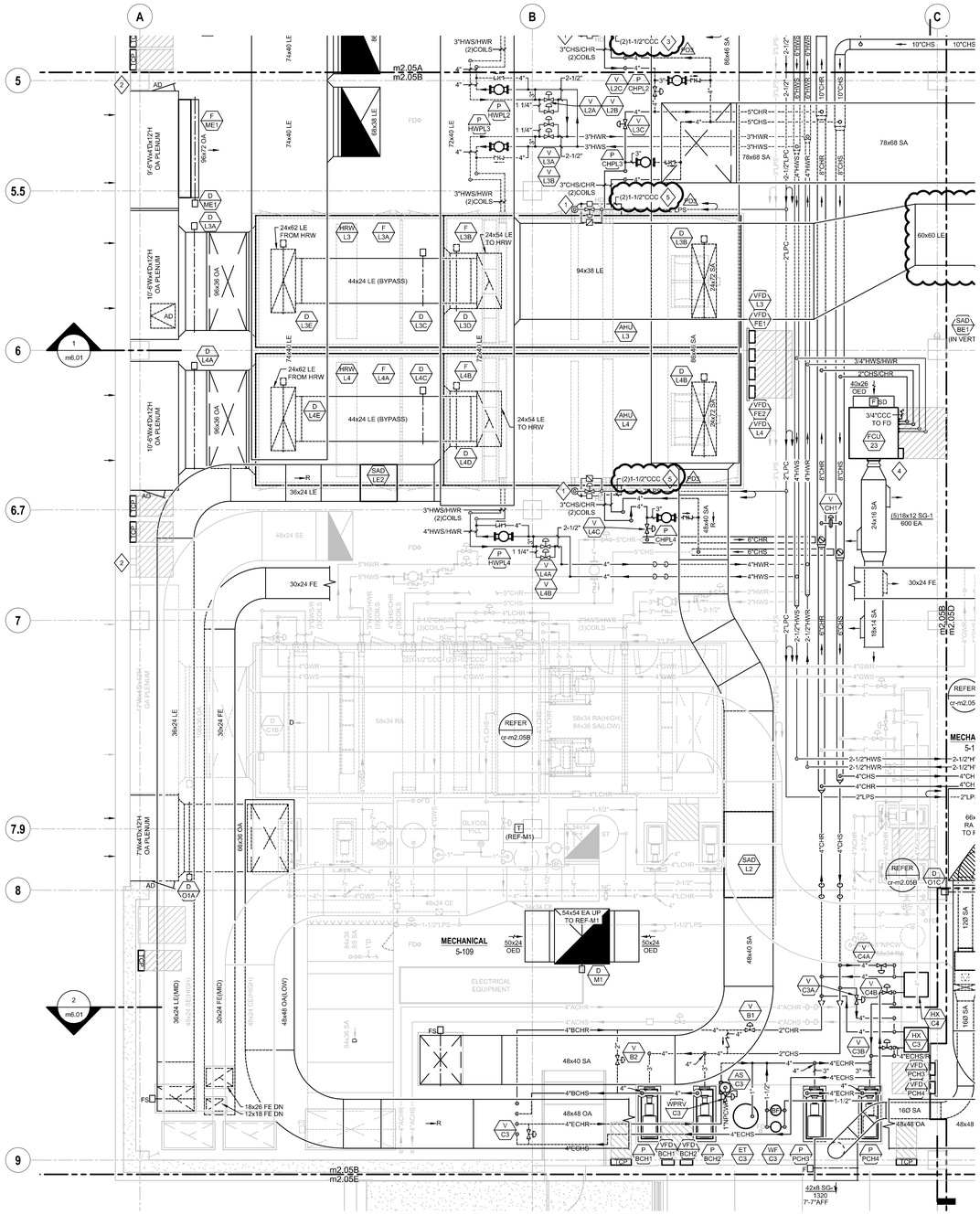
GENERAL NOTES

1. ALL LPC PIPING TO BE 1" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1. RUN 1"LPC FROM HUMIDIFIER DISTRIBUTION GRID AND STEAM GENERATOR TO AFTER COOLER. PC TO PROVIDE 1/2"NPCW TO AFTER COOLER. RUN 2"DRAIN TO NEAREST FLOOR DRAIN. REFER TO DETAILS.
2. BLANK-OFF UNUSED PORTIONS OF LOUVER WITH INSULATED SHEET METAL PANEL.
3. NOT USED.
4. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW EACH HOT UNITS. PROVIDE MOISTURE DETECTOR.
5. PROVIDE (2) 1-1/2"CCC. FROM PRIMARY DRAIN PAN AND SECONDARY DRAIN PAN OR SECOND DRAIN CONNECTION TO PRIMARY DRAIN PAN.

FDS

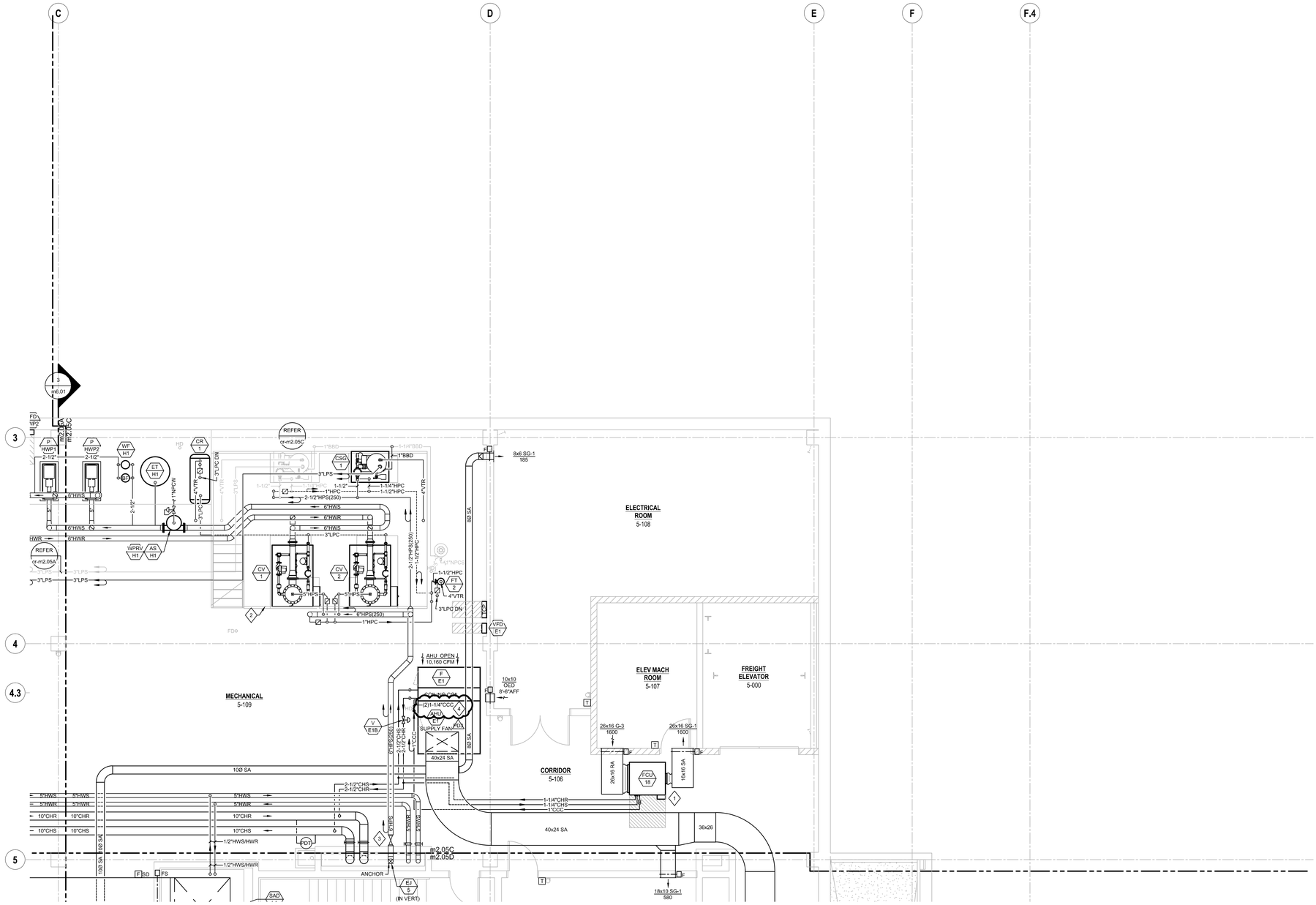

A
B
C
5
5.5
6
6.7
7
7.9
8
9
m2.05A
m2.05B
m2.05C
m2.05D
m2.05E
m6.01
2
MECHANICAL
5-109
ELECTRICAL EQUIPMENT
REFER
cr-m2.05B
REFER
cr-m2.05C
REFER
cr-m2.05D
(REF-M1)
54x54 EA UP TO REF-M1
50x24 OED
24x62 LE FROM HRW
24x54 LE TO HRW
44x24 LE (BYPASS)
94x38 LE
60x60 LE
78x68 SA
86x48 SA
48x40 SA
48x48 OA
48x48 SE
30x24 FE
36x24 LE
36x24 LE(MID)
30x24 FE(MID)
48x48 OA(LOW)
58x34 RA
58x34 RA(HIGH)
84x36 SA(LOW)
42x8 SG-1
1320
7'-7"AFF
5(U)18x12 SG-1
600 EA
24x16 SA
18x14 SA
16Ø SA
128 SA
160 SA
3"HWS/HWR (2)COILS
3"CHS/CHR (2)COILS
4"HWS/HWR
(2)1-1/2"CCC
10"CHS
5"CHS
3"HWR
3"HWS
2-1/2"
1 1/4"
2-1/2"HWS
2-1/2"HWR
4"CHS
4"CHR
2"LPS
2"LPC
6"CHR
6"CHS
8"CHR
8"CHS
10"CHR
10"CHS
4"HWR
4"HWS
3"HWS
3"HWR
5"CHR
5"CHS
2"HWR
2"HWS
4"LCHR
4"LCHS
4"LHR
4"LHS
4"GWR
4"GWS
4"CWR
4"CWS
4"BCHR
4"BCHS
4"ECHR
4"ECHS
4"ACHR
4"ACHS
2"CHR
2"CHS
3"HWS/HWR
2"CHS/CHR
3/4"CCC TO FD
3/4"HWS/HWR
4"HWR
4"HWS
2"LPS
2"LPC
2-1/2"HWS
2-1/2"HWR
4"CHS
4"CHR
2"LPS
2"LPC
2-1/2"LPC
2-1/2"HWS
2-1/2"HWR
4"HWS
4"HWR
8"CHR
8"CHS
10"CHR
10"CHS
4"CHR
4"CHS
2"LPS
2"LPC
4"HWS
4"HWR
2"HWS
2"HWR

GENERAL NOTES

1. ALL LPC PIPING TO BE 1" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.
2. REFER TO STRUCTURAL DRAWINGS FOR EQUIPMENT ACCESS PLATFORM. MECHANICAL CONTRACTOR SHALL COORDINATE FINAL PLATFORM DIMENSIONS BASED ON FINAL MANUFACTURER SELECTION OF EQUIPMENT WITH DIVISION 5 CONTRACTOR.
3. PROVIDE ACCESS PANEL FOR EJ-5.
4. PROVIDE (2) 1-1/4"CCC, FROM PRIMARY DRAIN PAN AND SECONDARY DRAIN PAN OR SECOND DRAIN CONNECTION TO PRIMARY DRAIN PAN.



1 PENTHOUSE - ZONE C
SCALE: 1/4" = 1'-0"

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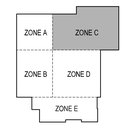
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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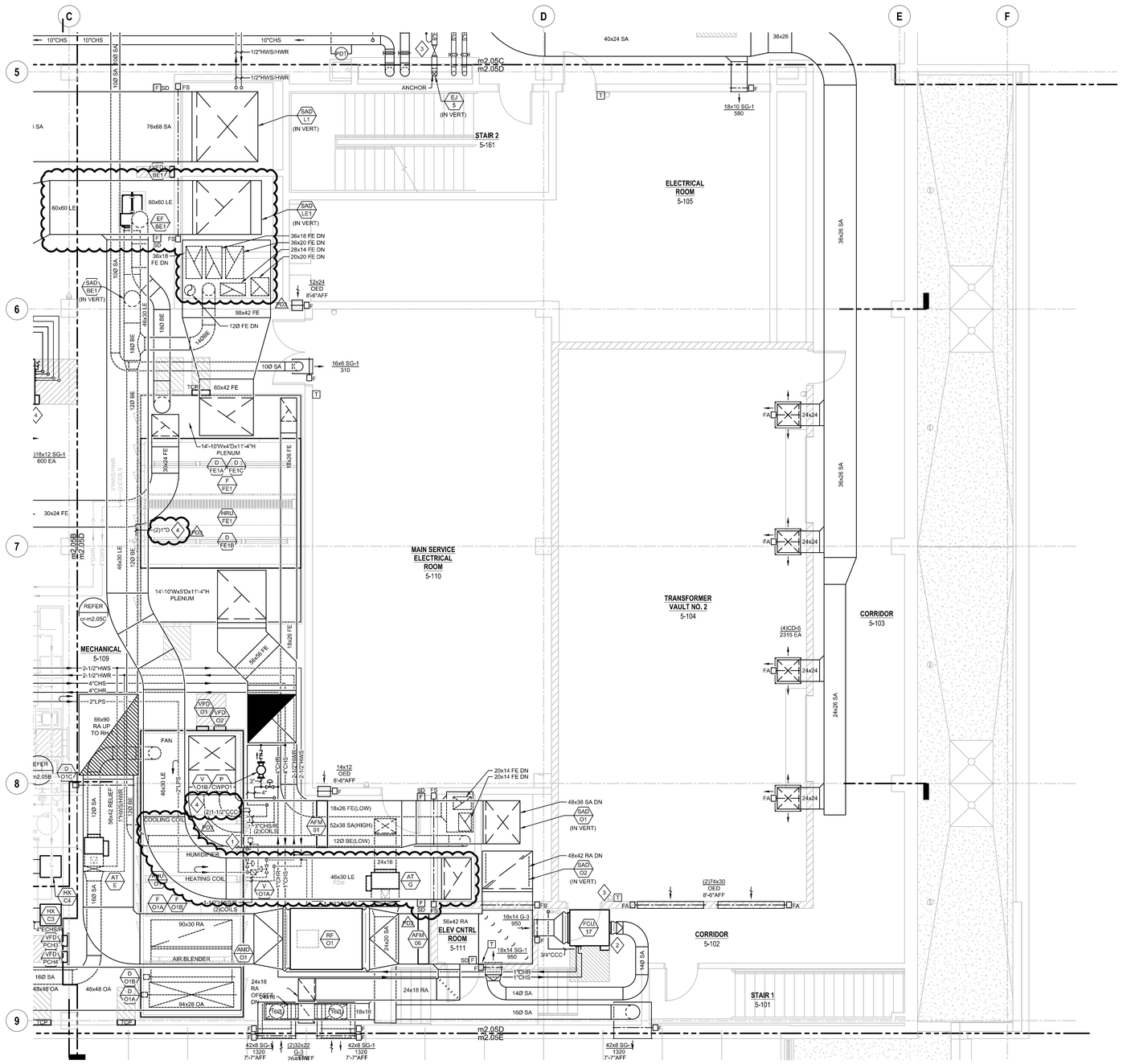
MECHANICAL
PENTHOUSE - ZONE C

m2.05C



1 **PENTHOUSE - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

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SHEET KEYNOTES

1. RUN 1"LPC FROM HUMIDIFIER DISTRIBUTION GRID AND STEAM GENERATOR TO AFTER COOLER. PC TO PROVIDE 1/2"NPCW TO AFTER COOLER. RUN 2"DRAIN TO NEAREST FLOOR DRAIN. REFER TO DETAILS.
2. PROVIDE 304 STAINLESS STEEL DRAIN PAN BELOW FAN COIL UNITS. PROVIDE MOISTURE DETECTOR.
3. PROVIDE ON-OFF SWITCH FOR AHU-E1.
4. PROVIDE (2) 1"D, FROM PRIMARY DRAIN PAN AND SECONDARY DRAIN PAN OR SECOND DRAIN CONNECTION TO PRIMARY DRAIN PAN.

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

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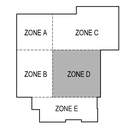
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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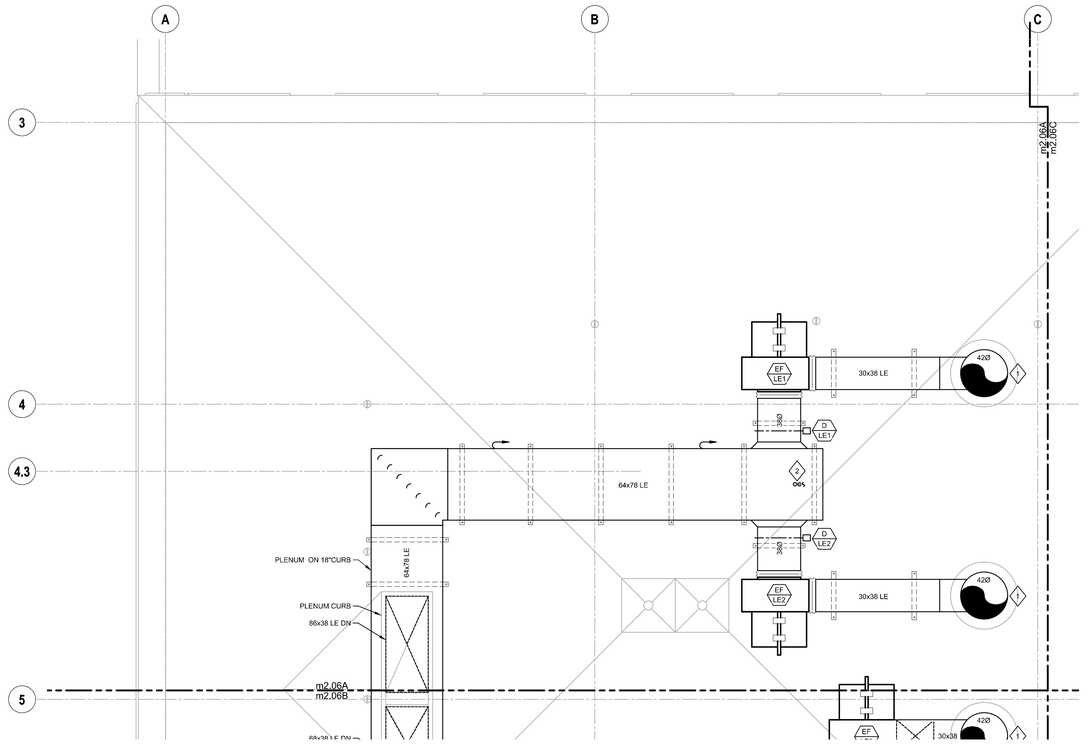
MECHANICAL
PENTHOUSE - ZONE D

m2.05D

SHEET KEYNOTES

1. TERMINATE EXHAUST STACK 20'-0" ABOVE ROOF.
2. PROVIDE 1"DRAIN WITH INSULATED AND HEAT TRACED P-TRAP. REFER TO DETAIL 12/m8.02.



1 **ROOF - ZONE A**
SCALE: 1/4" = 1'-0"

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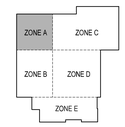
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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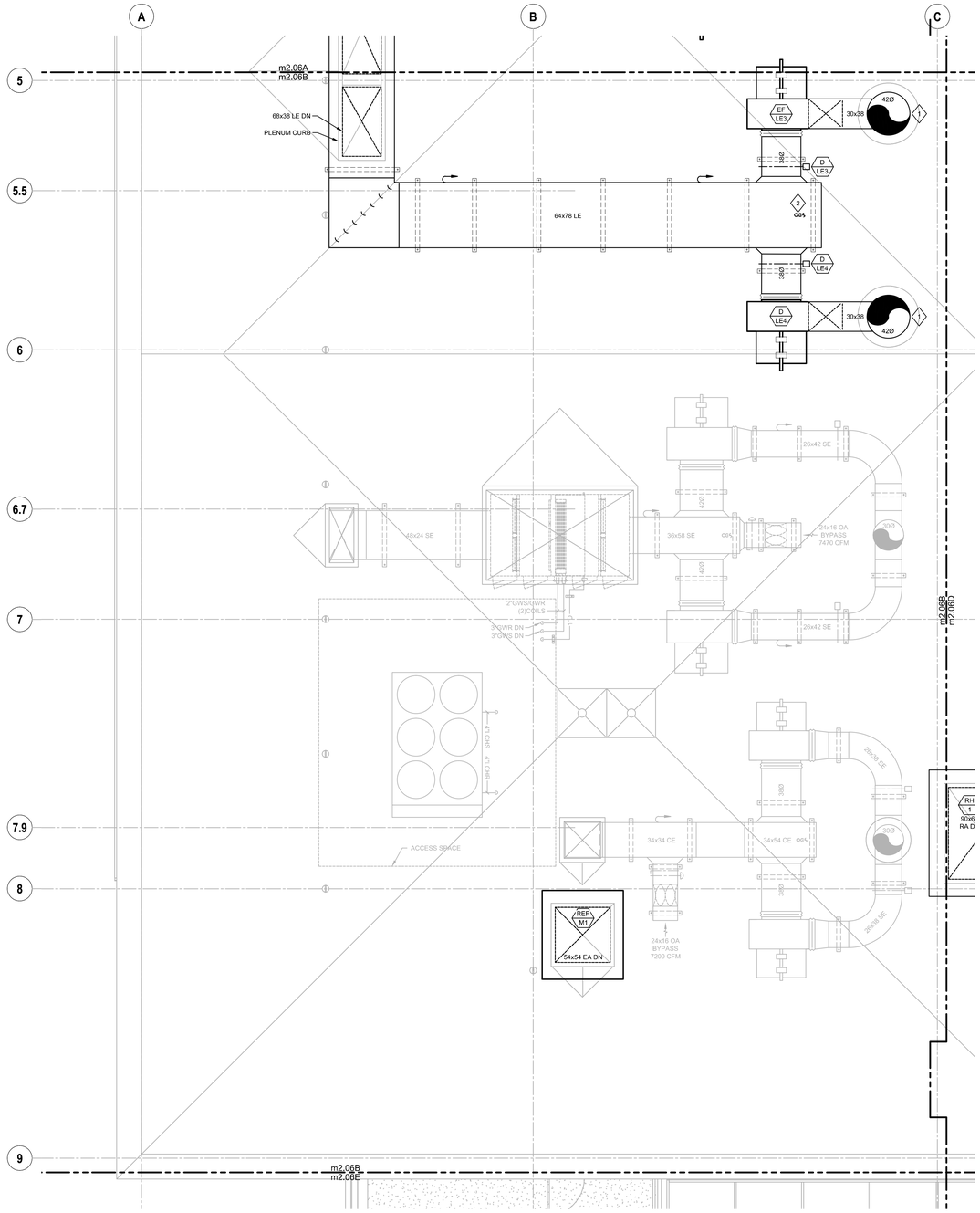
MECHANICAL
ROOF - ZONE A

m2.06A



1 **ROOF - ZONE B**
SCALE: 1/4" = 1'-0"

SHEET KEYNOTES

1. TERMINATE EXHAUST STACK 20'-0" ABOVE ROOF.
2. PROVIDE 1"DRAIN WITH INSULATED AND HEAT TRACED P-TRAP. REFER TO DETAIL 12/m8.02.

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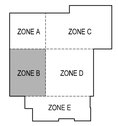
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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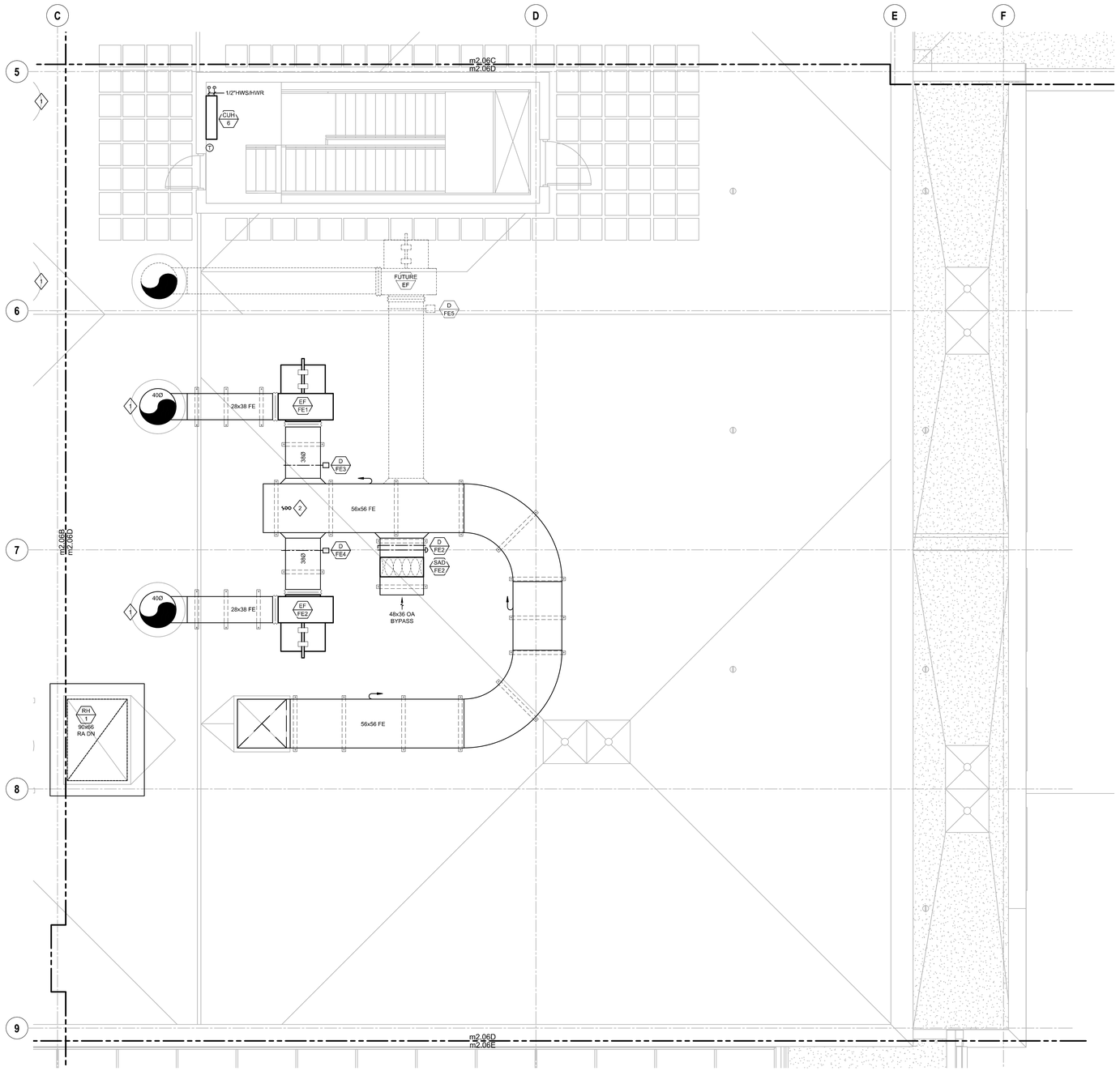
MECHANICAL
ROOF - ZONE B

m2.06B



1 **ROOF - ZONE D**
SCALE: 1/4" = 1'-0"

SHEET KEYNOTES

1. TERMINATE EXHAUST STACK 20'-0" ABOVE ROOF.
2. PROVIDE 1"DRAIN WITH INSULATED AND HEAT TRACED P-TRAP. REFER TO DETAIL 12/m8.02.

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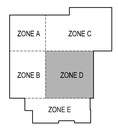
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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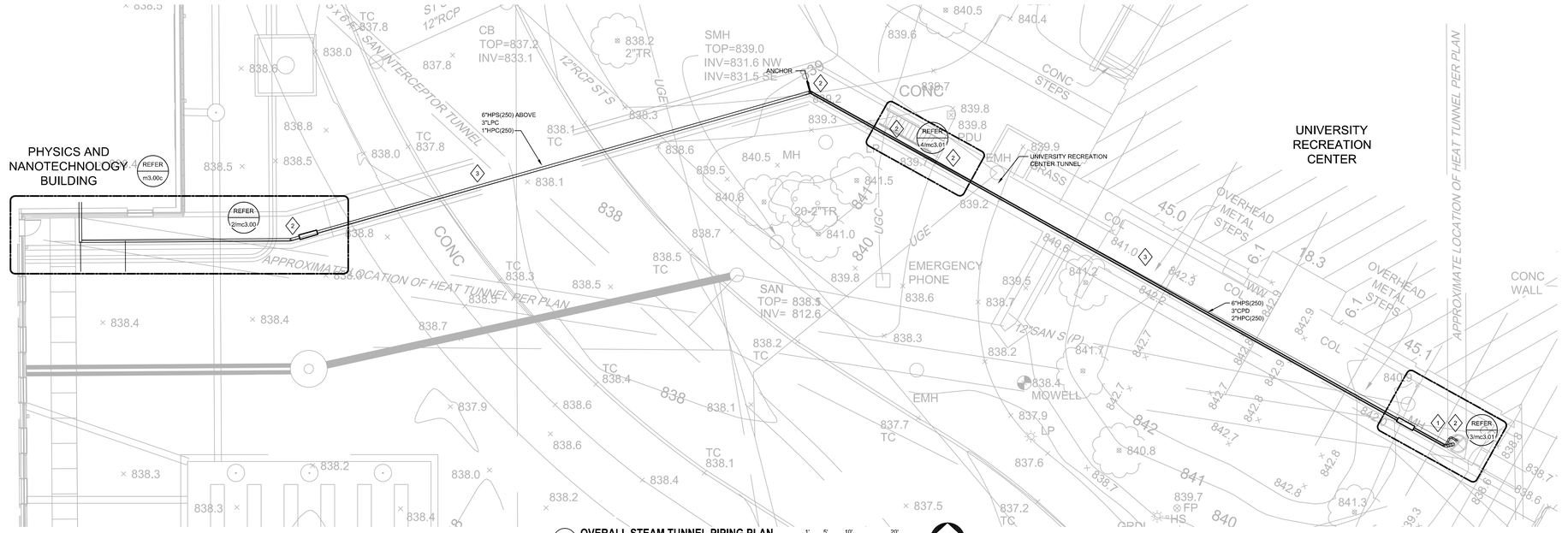
MECHANICAL
ROOF - ZONE D

m2.06D



1 **OVERALL STEAM TUNNEL PIPING PLAN**
SCALE: 1" = 10'-0"

GRAPHIC SCALE 1" 5' 10' 20'

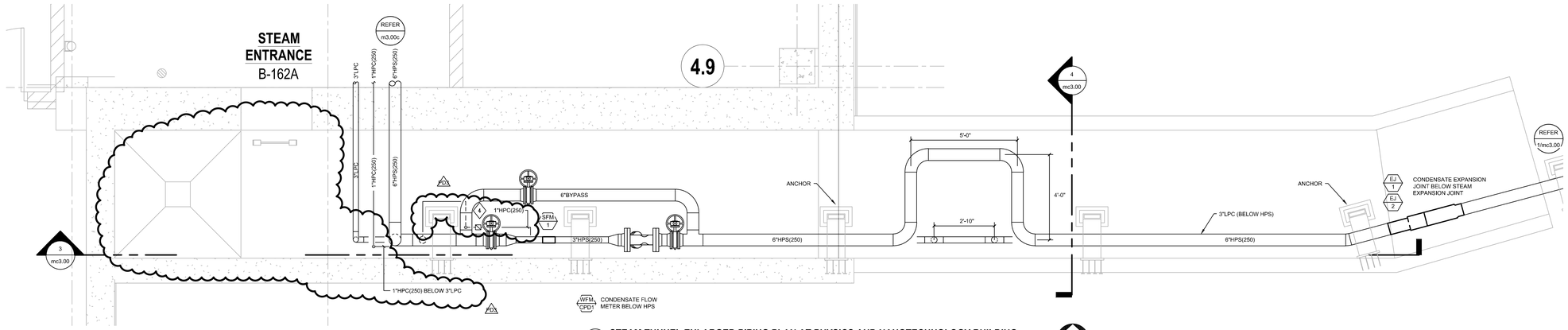
NORTH

GENERAL NOTES

1. REFER TO CIVIL PLANS AND PROFILES FOR ADDITIONAL INFORMATION.
2. PIPING SUPPORT STEEL PROVIDED BY MECHANICAL CONTRACTOR, INSTALLED BY GENERAL CONTRACTOR. REFER TO SHEET m8.06 FOR STRUCTURAL SUPPORT DETAILS.

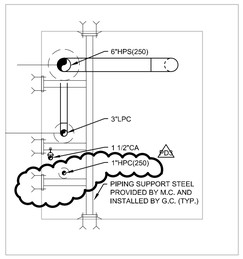
SHEET KEYNOTES

1. CONNECT 6" HPS(250) AND 3"LPC TO EXISTING STEAM AND CONDENSATE FITTINGS IN STEAM TUNNEL SOUTH OF UNIVERSITY RECREATION CENTER (BLDG. NO. 169). CONTRACTOR TO FIELD VERIFY EXISTING PIPING AND FITTING LOCATIONS.
2. TEST ALL WELDS ASSOCIATED WITH STEAM AND CONDENSATE ELBOWS.
3. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS IN EXISTING UNIVERSITY REC CENTER TUNNEL.
4. CONTRACTOR SHALL INSTALL STEAM TRAPS AND SPECIALTIES FOR MAXIMUM ACCESSIBILITY.

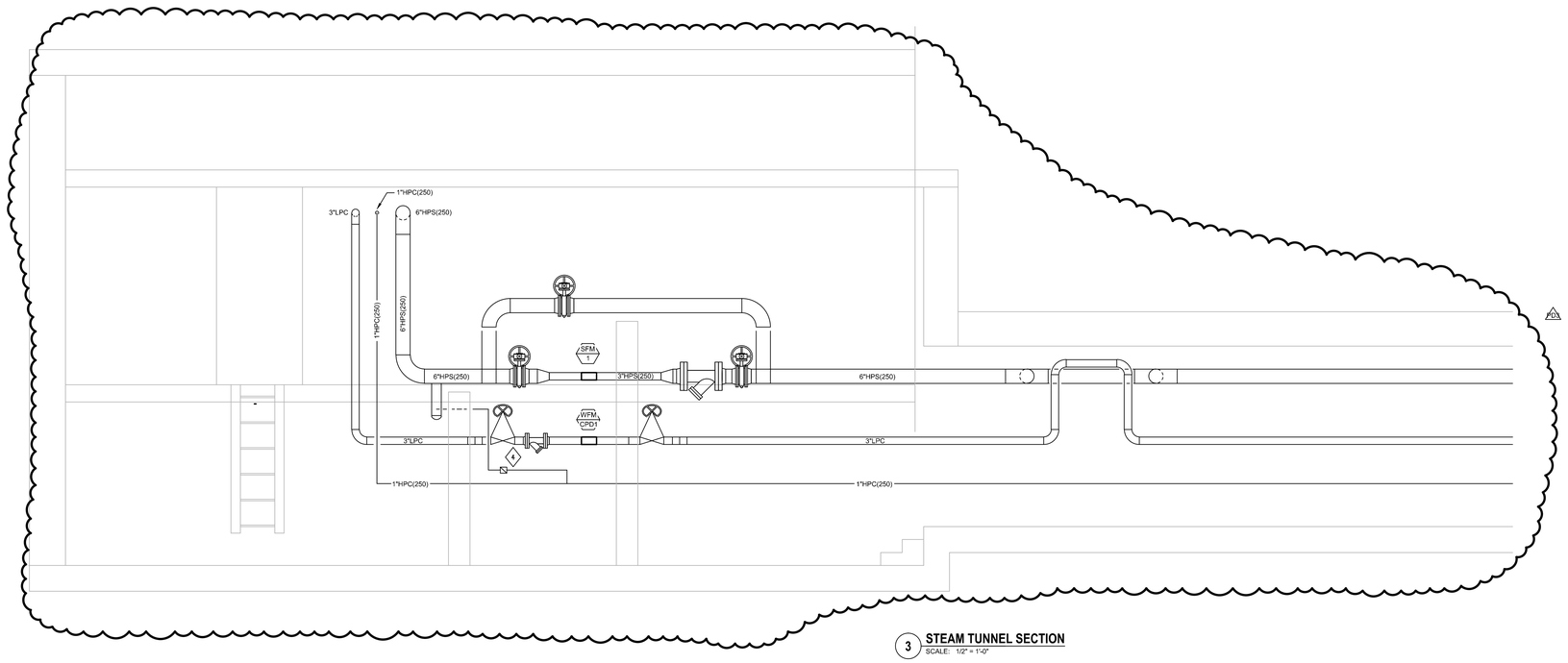


2 **STEAM TUNNEL ENLARGED PIPING PLAN AT PHYSICS AND NANOTECHNOLOGY BUILDING**
SCALE: 1/2" = 1'-0"

NORTH



4 **STEAM TUNNEL SECTION**
SCALE: 1/2" = 1'-0"



3 **STEAM TUNNEL SECTION**
SCALE: 1/2" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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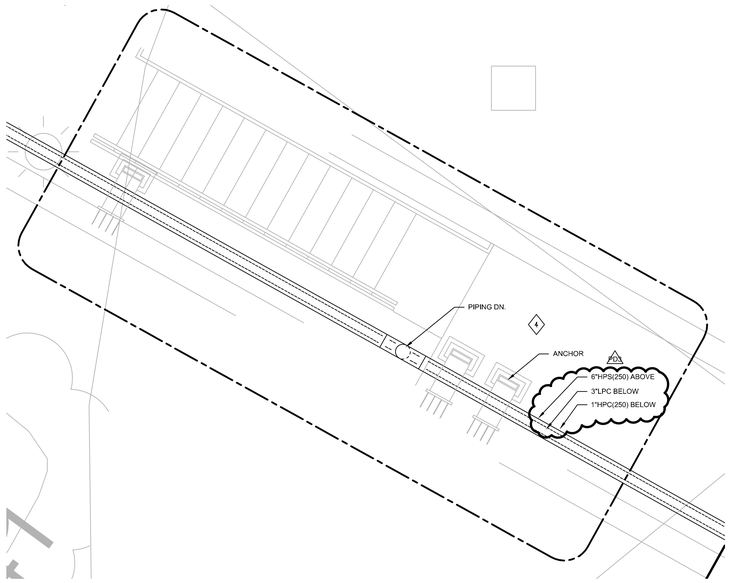
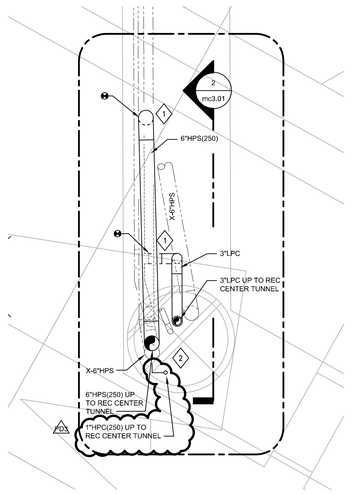
STEAM TUNNEL PIPING PLANS AND SECTIONS

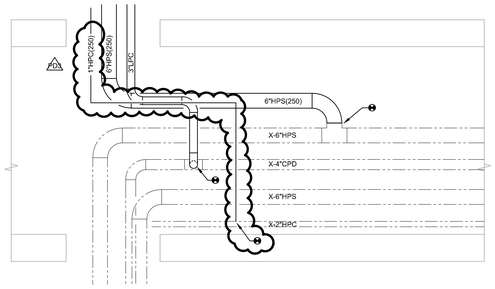
mc3.00



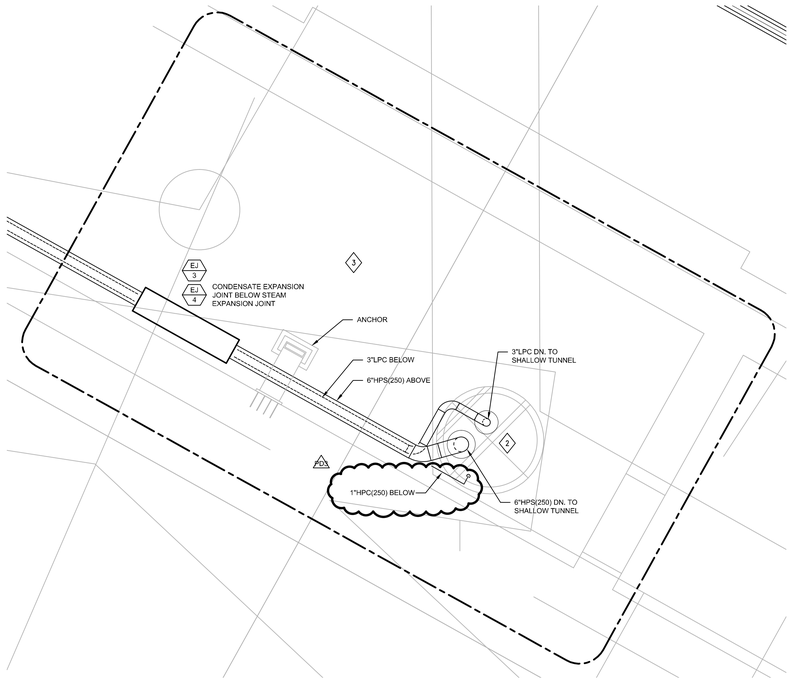
4 **TUNNEL ENLARGED PIPING PLAN**
SCALE: 1/2" = 1'-0"



1 **SHALLOW HEAT TUNNEL ENLARGED PIPING PLAN**
SCALE: 1/2" = 1'-0"



2 **SHALLOW HEAT TUNNEL PARTIAL SECTION**
SCALE: 1/2" = 1'-0"



3 **TUNNEL ENLARGED PIPING PLAN**
SCALE: 1/2" = 1'-0"

GENERAL NOTES

1. REFER TO CIVIL PLANS AND PROFILES FOR ADDITIONAL INFORMATION.
2. PIPING SUPPORT STEEL PROVIDED BY MECHANICAL CONTRACTOR. REFER TO SHEET mc8.03 FOR STRUCTURAL SUPPORT DETAILS.
3. REFER TO SHEET MC3.02 FOR STEAM AND CONDENSATE TUNNEL SUPPORT, GUIDE, AND ANCHOR PLAN.

SHEET KEYNOTES

1. CONNECT 6" HPS(250) AND 3"CPD TO EXISTING STEAM AND CONDENSATE FITTINGS IN STEAM SHALLOW TUNNEL SOUTH OF UNIVERSITY RECREATION CENTER (BLDG. NO. 169). CONTRACTOR TO FIELD VERIFY EXISTING PIPING AND FITTING LOCATIONS, AND SHALLOW TUNNEL LOCATION AND HEIGHT PRIOR TO FABRICATING PIPING.
2. CONTRACTOR TO FIELD VERIFY SHAFT AND SHALLOW TUNNEL ACCESS LOCATION IN REC CENTER TUNNEL.
3. CONTRACTOR TO FIELD VERIFY EXISTING TUNNEL CONSTRUCTION PRIOR TO FABRICATING PIPING AND STRUCTURAL SUPPORTS.
4. CONTRACTOR TO FIELD VERIFY EXISTING TUNNEL AND STAIR CONSTRUCTION PRIOR TO FABRICATING PIPING AND STRUCTURAL SUPPORTS.

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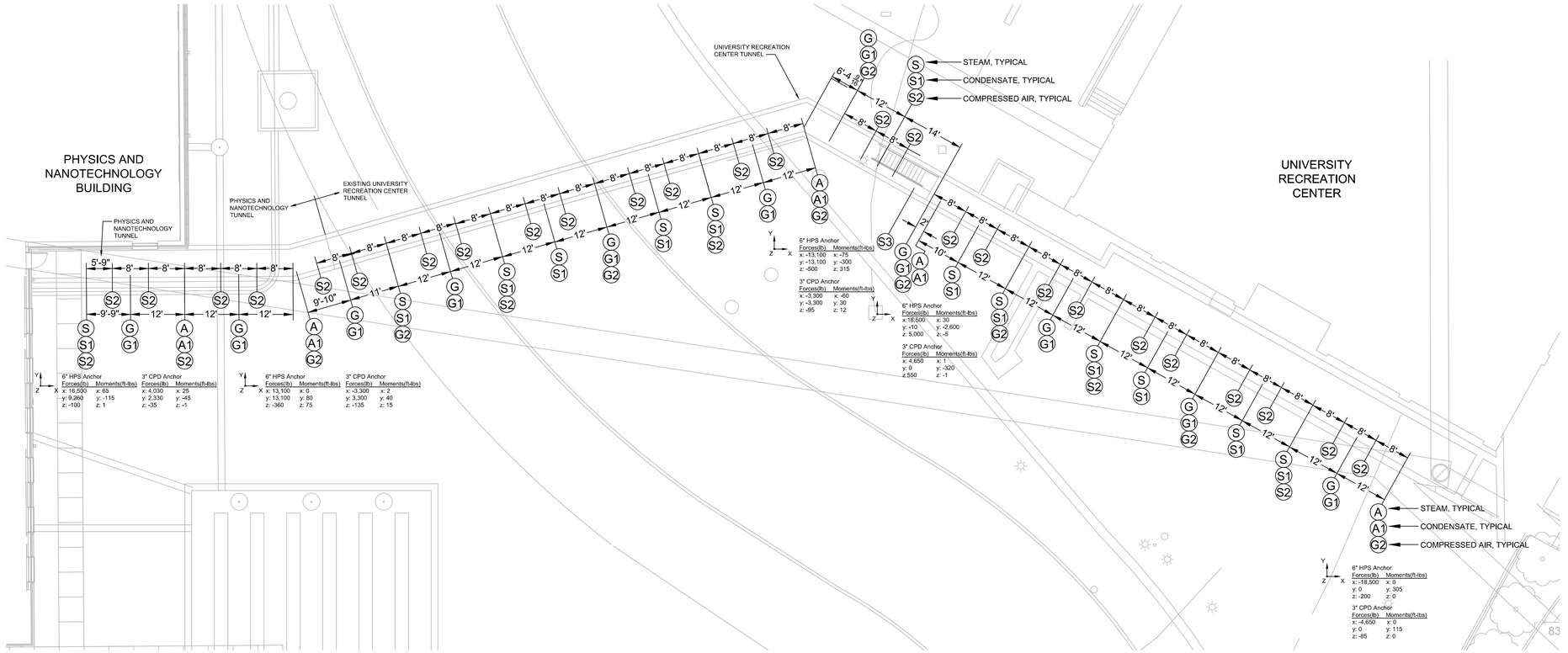
STEAM TUNNEL PIPING PLANS AND SECTIONS

mc3.01



1 STEAM AND CONDENSATE TUNNEL SUPPORTS, GUIDES AND ANCHORS PLAN

SCALE: 1" = 10'-0"

GRAPHIC SCALE 1' 5' 10' 20'

NORTH

GENERAL NOTES

1. CONTRACTOR SHALL DESIGN ANCHOR STEEL TO WITHSTAND FORCE SHOWN ON DETAILS. SUBMIT CALCULATIONS TO MECHANICAL ENGINEER AND STRUCTURAL ENGINEER TO REVIEW.
2. ALL STEEL TO BE HOT DIPPED GALVANIZED.
3. ALL FIELD WELDS TO BE CLEANED OF SLAG AND DEBRIS AND PAINTED WITH ZINC RICH PAINT COMPATIBLE WITH GALVANIZING.
4. ANCHOR PLATES AT WALL, CEILING AND FLOOR SHALL BE DRILLED EPOXY RESIN ANCHORS AND UTILIZE 3/4" (MINIMUM) BOLTS. EMBED LENGTH NOT GREATER THAN 3/4 DEPTH OF CONCRETE STRUCTURE.
5. PROVIDE 1" THICK (MINIMUM) GROUT UNDER FLOOR BASE PLATE.
6. ALL PIPING WELDS SHALL BE CLEANED, PRIMED AND PAINTED.
7. S SUPPORT STEAM
   S1 SUPPORT CONDENSATE
   S2 SUPPORT COMPRESSED AIR
   S3 SUPPORT HIGH PRESSURE STEAM
   SPRING SUPPORT
   A ANCHOR STEAM
   A1 ANCHOR CONDENSATE
   G GUIDE STEAM
   G1 GUIDE CONDENSATE
   G2 GUIDE COMPRESSED AIR
8. DRILL AND EPOXY HANGER SUPPORTS FOR COMPRESSED AIR PIPING AS INDICATED.

SHEET KEYNOTES

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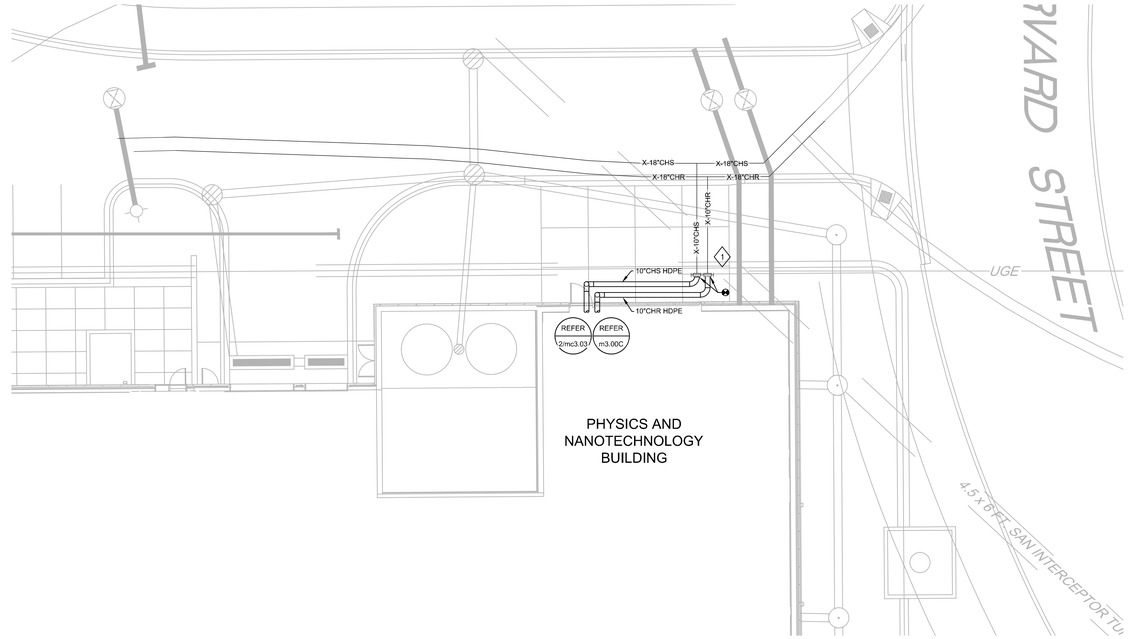
STEAM TUNNEL PIPING
PLANS AND SECTIONS

mc3.02



1 **CHILLED WATER PIPING BUILDING CONNECTION PLAN**
SCALE: 1" = 10'-0"

1" 5' 10' 20'
GRAPHIC SCALE

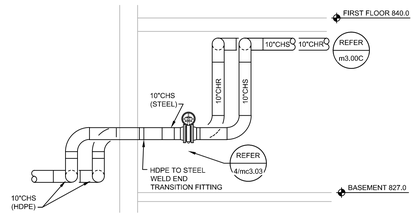
NORTH

GENERAL NOTES

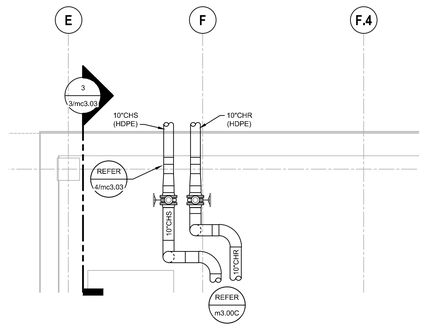
1. REFER TO CIVIL PLANS AND PROFILES FOR ADDITIONAL INFORMATION.

SHEET KEYNOTES

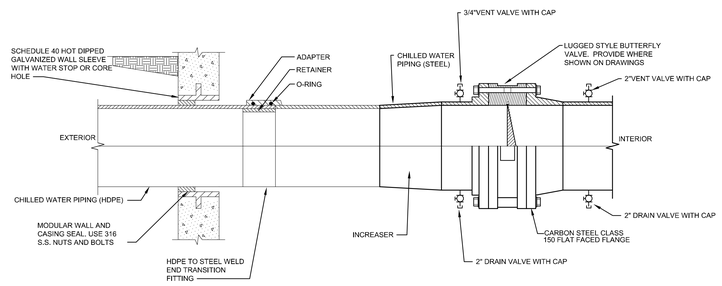
1 CONTRACTOR TO FIELD VERIFY EXISTING HDPE CHILLED WATER PIPING LOCATION, SIZE, AND ARRANGEMENT.



3 **CHILLED WATER PIPING BUILDING CONNECTION SECTION**
SCALE: 1/4" = 1'-0"



2 **CHILLED WATER PIPING BUILDING CONNECTION ENLARGED PLAN**
SCALE: 1/4" = 1'-0"



4 **CHILLED WATER PIPING PENETRATION DETAIL**
SCALE: NONE

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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CHILLED WATER PIPING
BUILDING CONNECTION PLAN

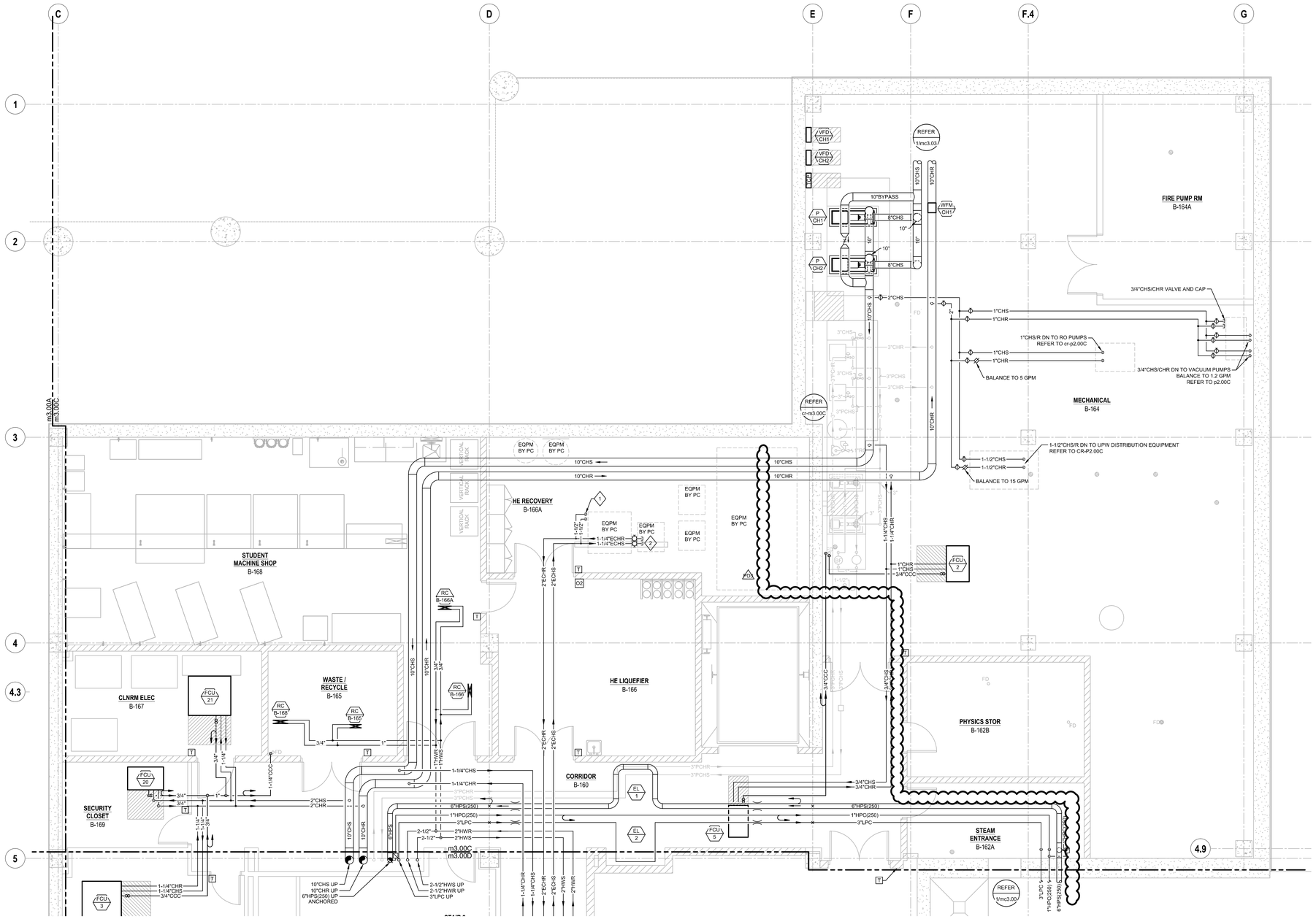
mc3.03

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1. 1-1/2" ECHS/R DOWN TO SCREW COMPRESSOR BY PC, BALANCE TO 15 GPM.
2. 1" ECHS/R DOWN TO RECOVERY COMPRESSOR BY PC, BALANCE TO 5 GPM.



1 **BASEMENT - ZONE C**
SCALE: 1/4" = 1'-0"

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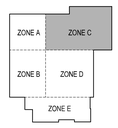
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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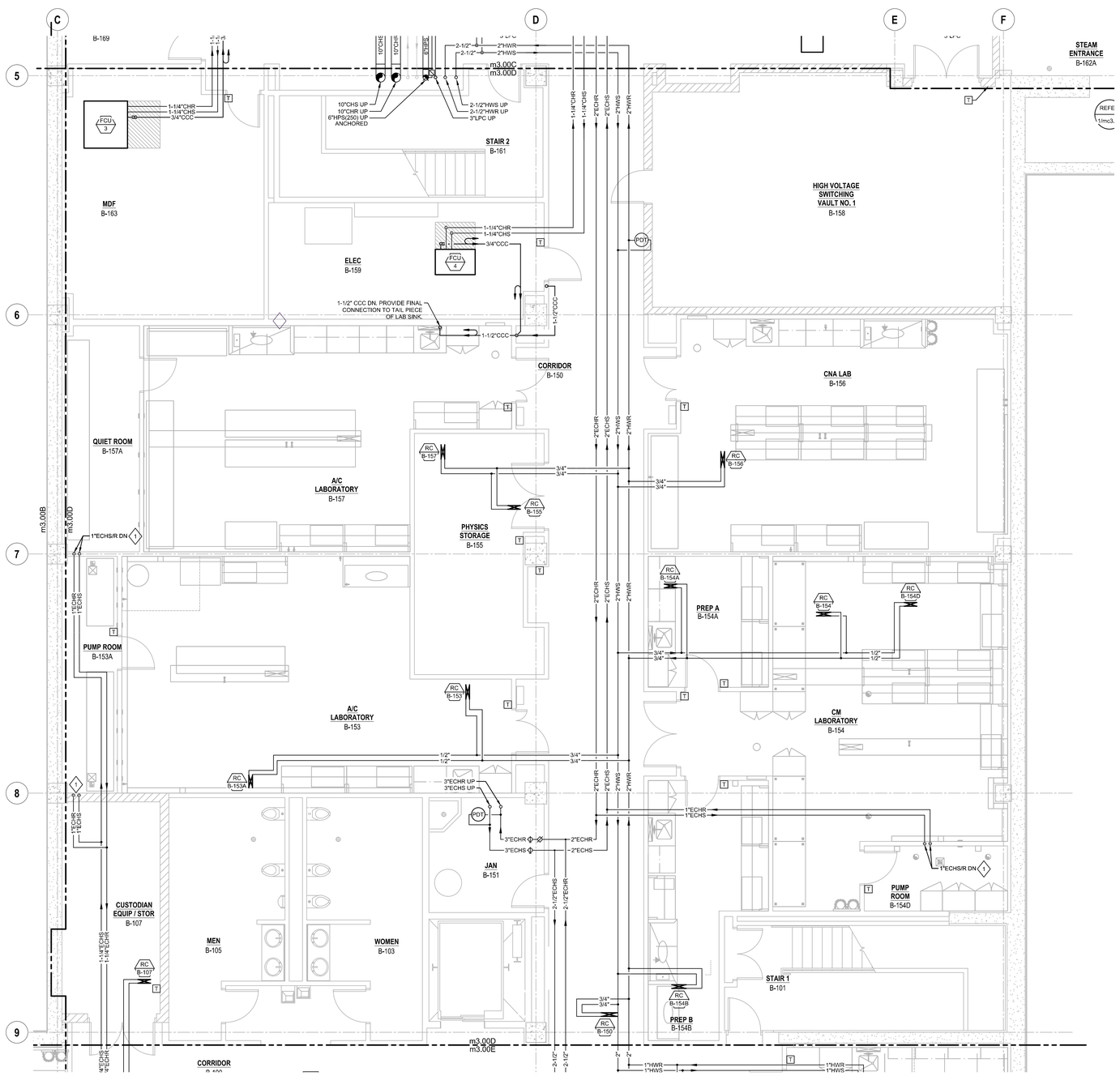
MECHANICAL
BASEMENT - ZONE C

m3.00C



1 **BASEMENT - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1. 1" ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.

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By

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Bid Package No. 2	02-24-2012

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Project

Physics and Nanotechnology Building

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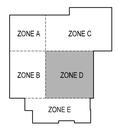

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MECHANICAL
BASEMENT - ZONE D

m3.00D

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
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SHEET KEYNOTES

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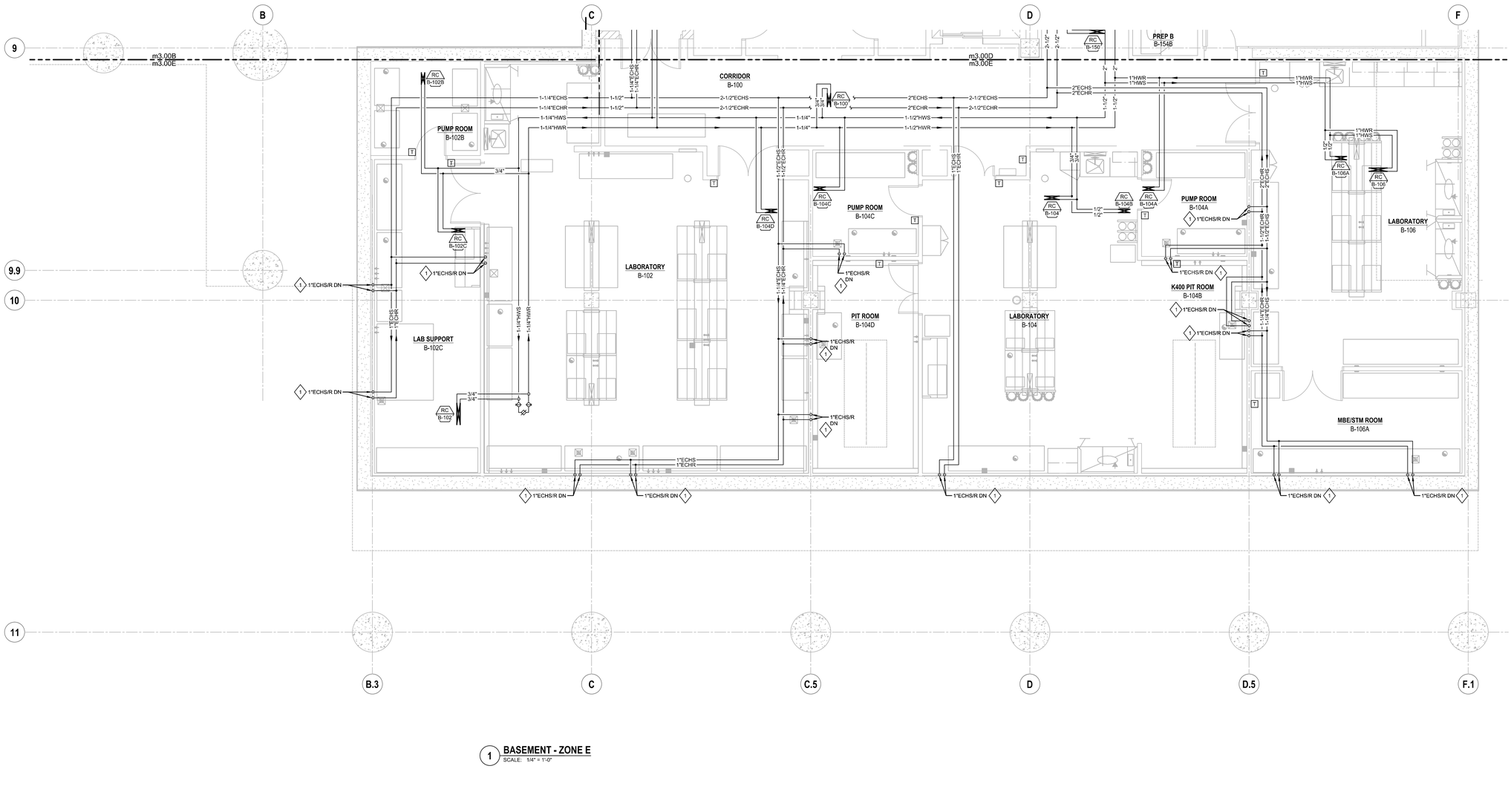

1 **BASEMENT - ZONE E**
SCALE: 1/4" = 1'-0"

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Bid Package No. 2	02-24-2012
Proposal Request No. 3	04-06-2012

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Drawn TMM

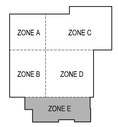
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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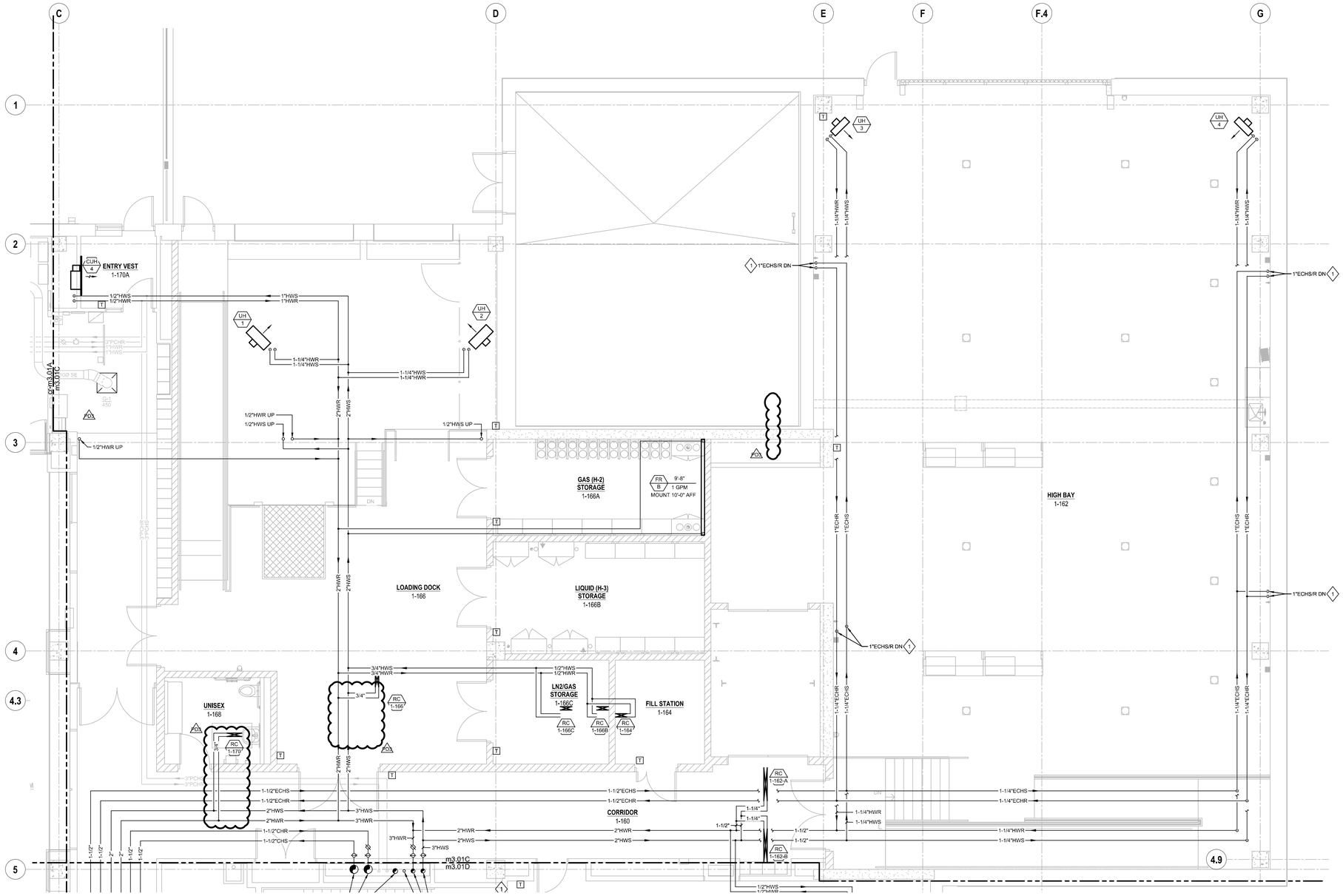
MECHANICAL
BASEMENT - ZONE E

m3.00E



1 **LEVEL 1 - ZONE C**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 1" ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.

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By

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Date 02-24-2012 Reg. No. 25364

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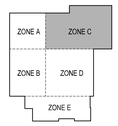
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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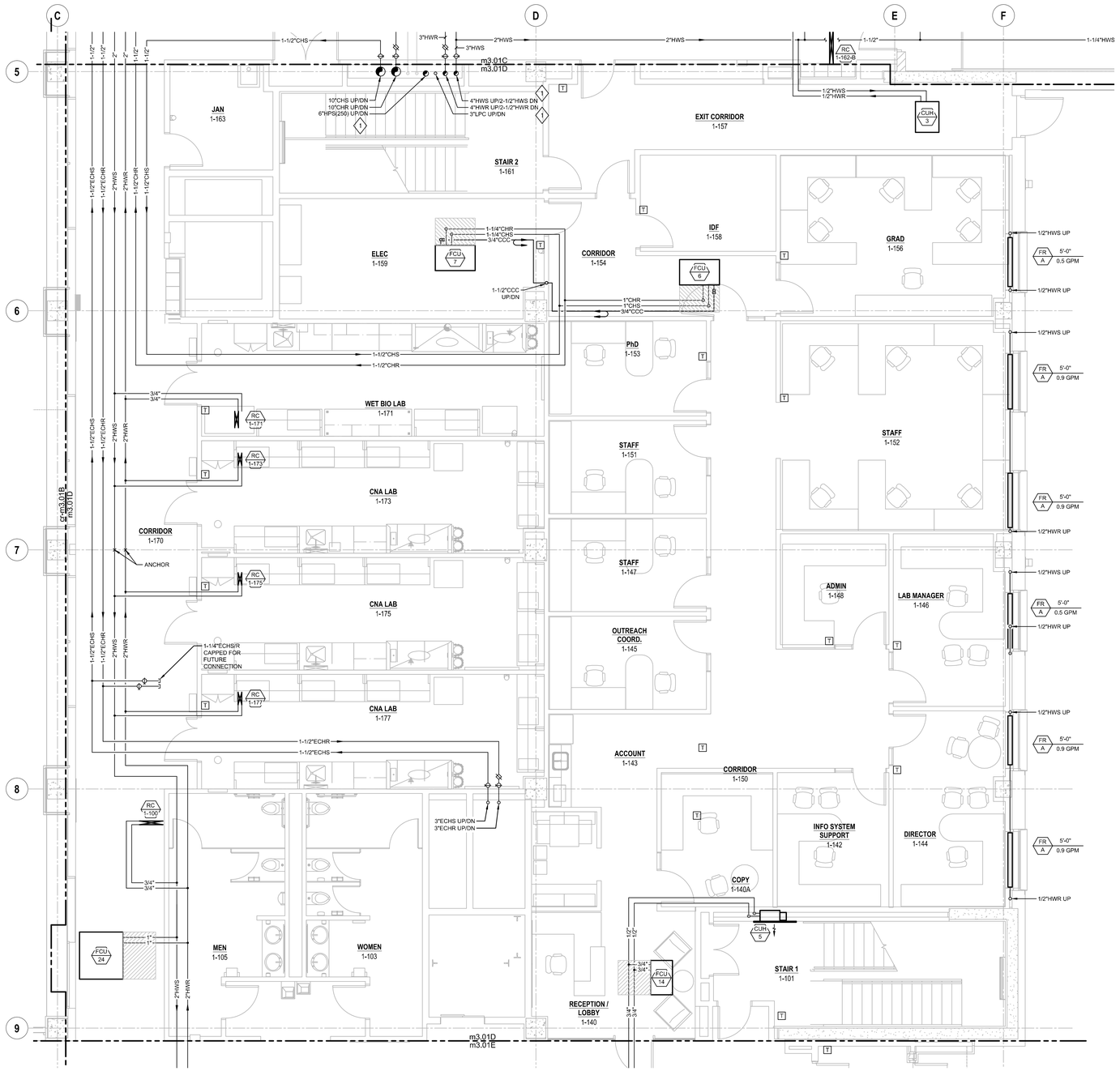
MECHANICAL
LEVEL 1 - ZONE C

m3.01C



1 **LEVEL 1 - ZONE D**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 PROVIDE PIPE GUIDES.

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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Bid Package No. 2	02-24-2012

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Drawn TMM

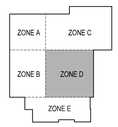
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 1 - ZONE D

m3.01D

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 LOCATE TEMPERATURE SENSOR IN FCU-19 RETURN AIR DUCT.

1 **LEVEL 1 - ZONE E**
SCALE: 1/4" = 1'-0"

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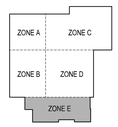

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MECHANICAL
LEVEL 1 - ZONE E

m3.01E

GENERAL NOTES

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SHEET KEYNOTES

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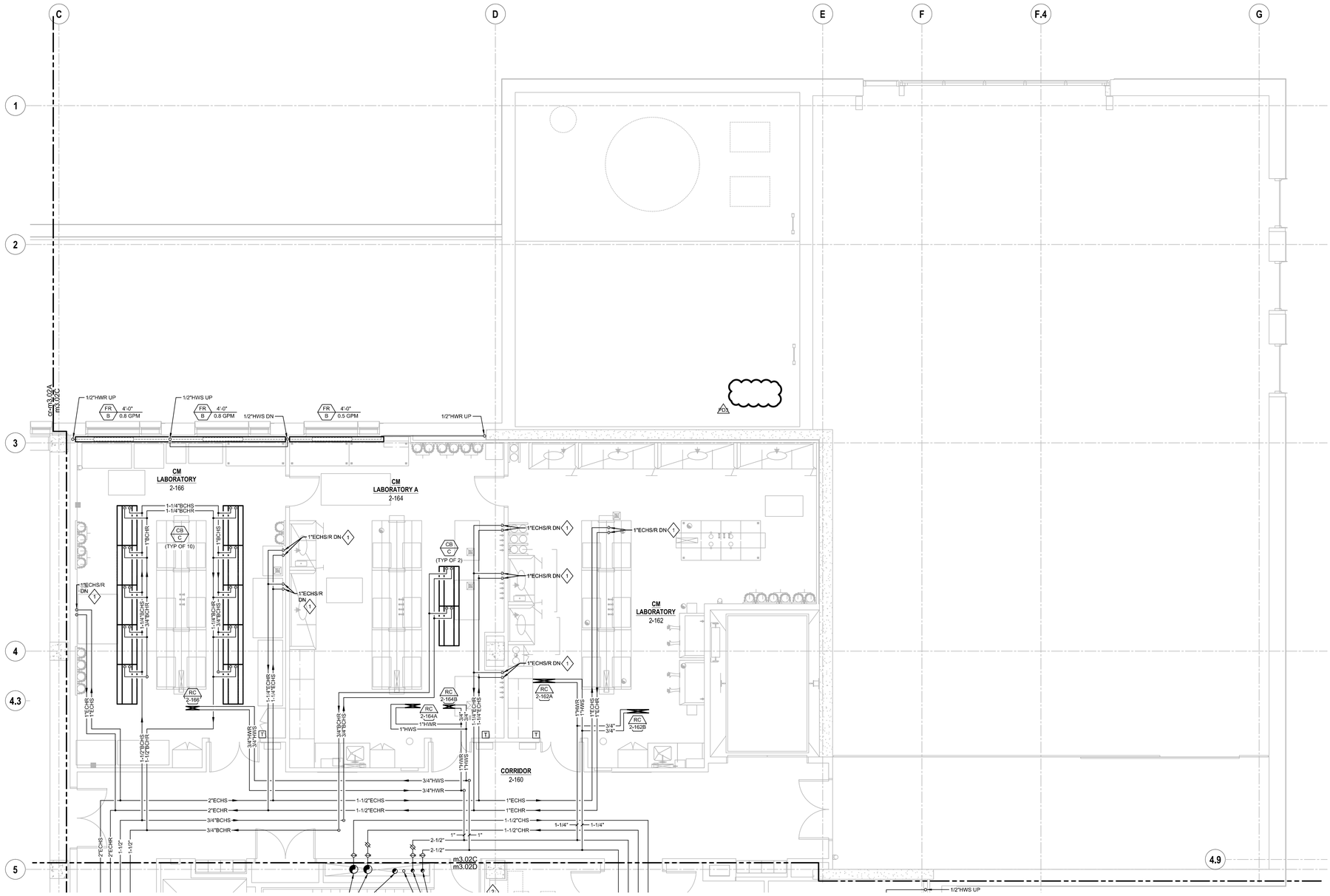

1 **LEVEL 2 - ZONE C**
SCALE: 1/4" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

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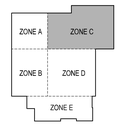
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 2 - ZONE C

m3.02C

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
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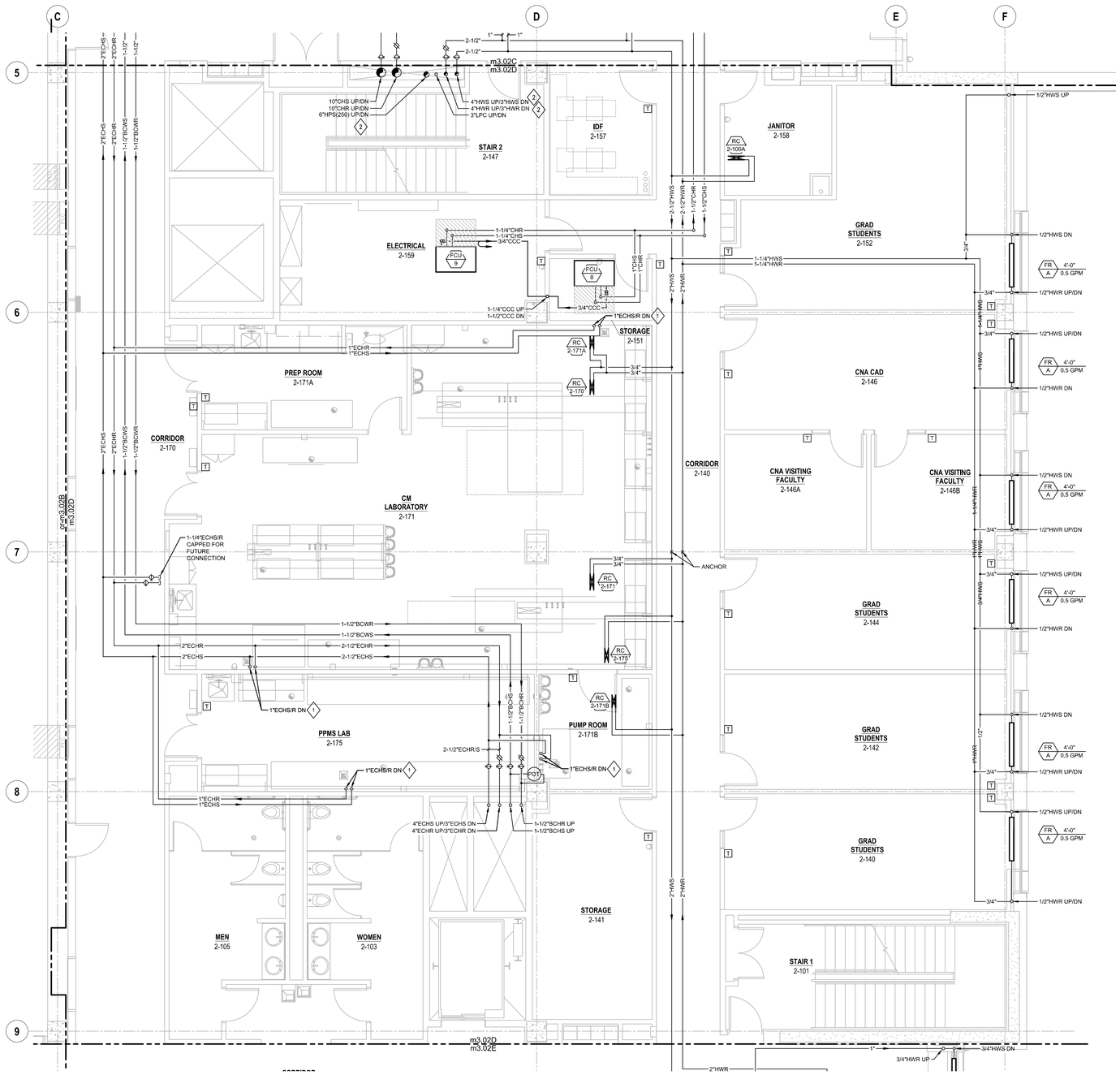
SHEET KEYNOTES

1. 1" ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.
2. PROVIDE PIPE GUIDES.



1 **LEVEL 2 - ZONE D**
SCALE: 1/4" = 1'-0"

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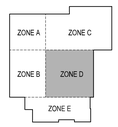
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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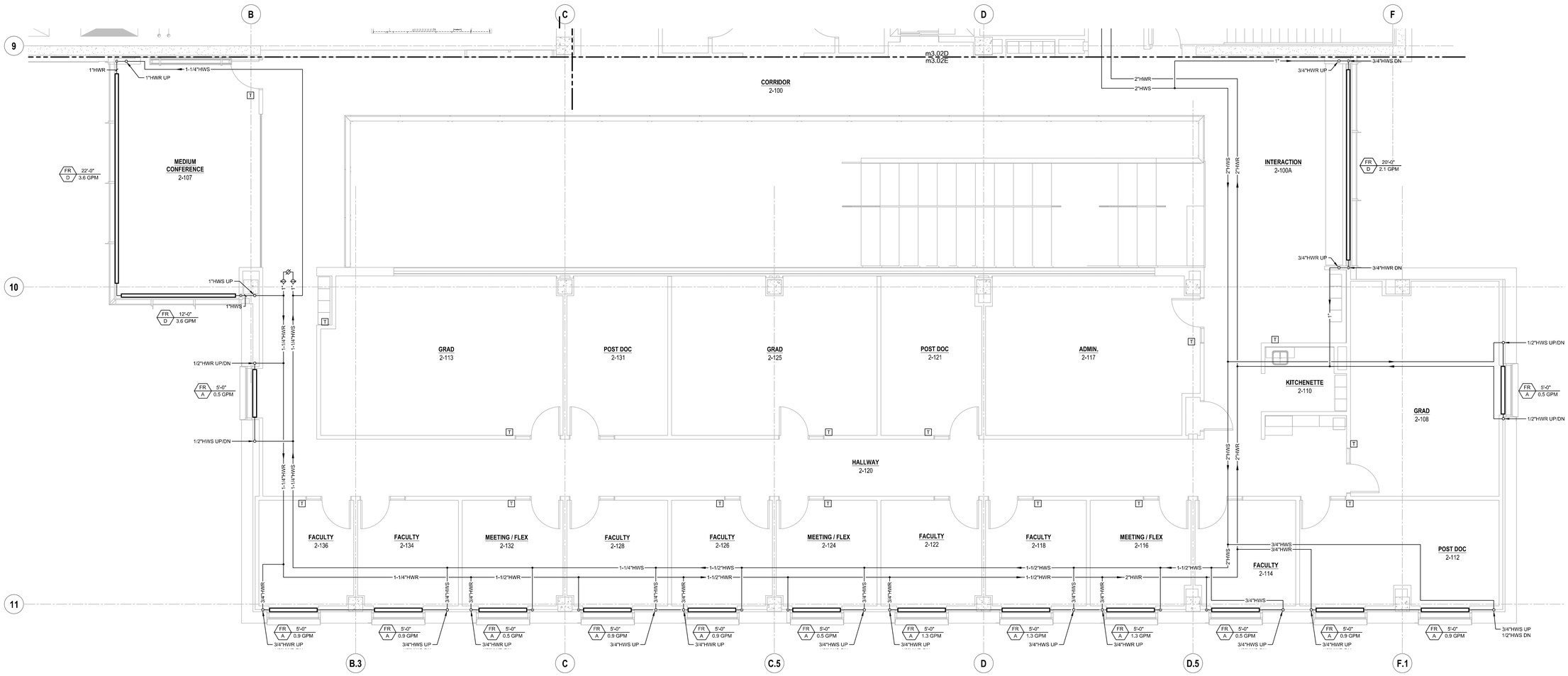
MECHANICAL
LEVEL 2 - ZONE D

m3.02D

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.



1 **LEVEL 2 - ZONE E**
SCALE: 1/4" = 1'-0"

ARCHITECTURAL ALLIANCE
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ZIMMER GUNSUL FRASCA ARCHITECTS
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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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Comm. No. 2039037

Drawn TMM

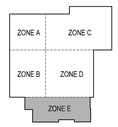
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 2 - ZONE E

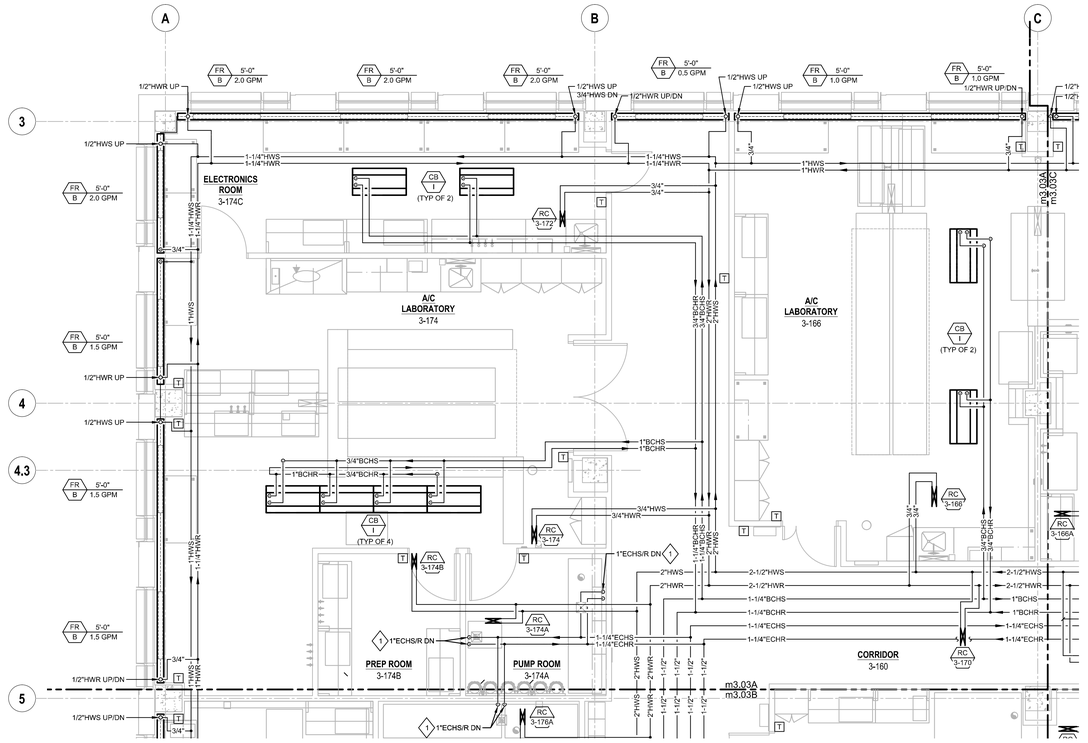
m3.02E

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 1" ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.



1 **LEVEL 3 - ZONE A**
SCALE: 1/4" = 1'-0"

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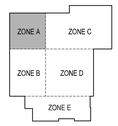
Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 3 - ZONE A

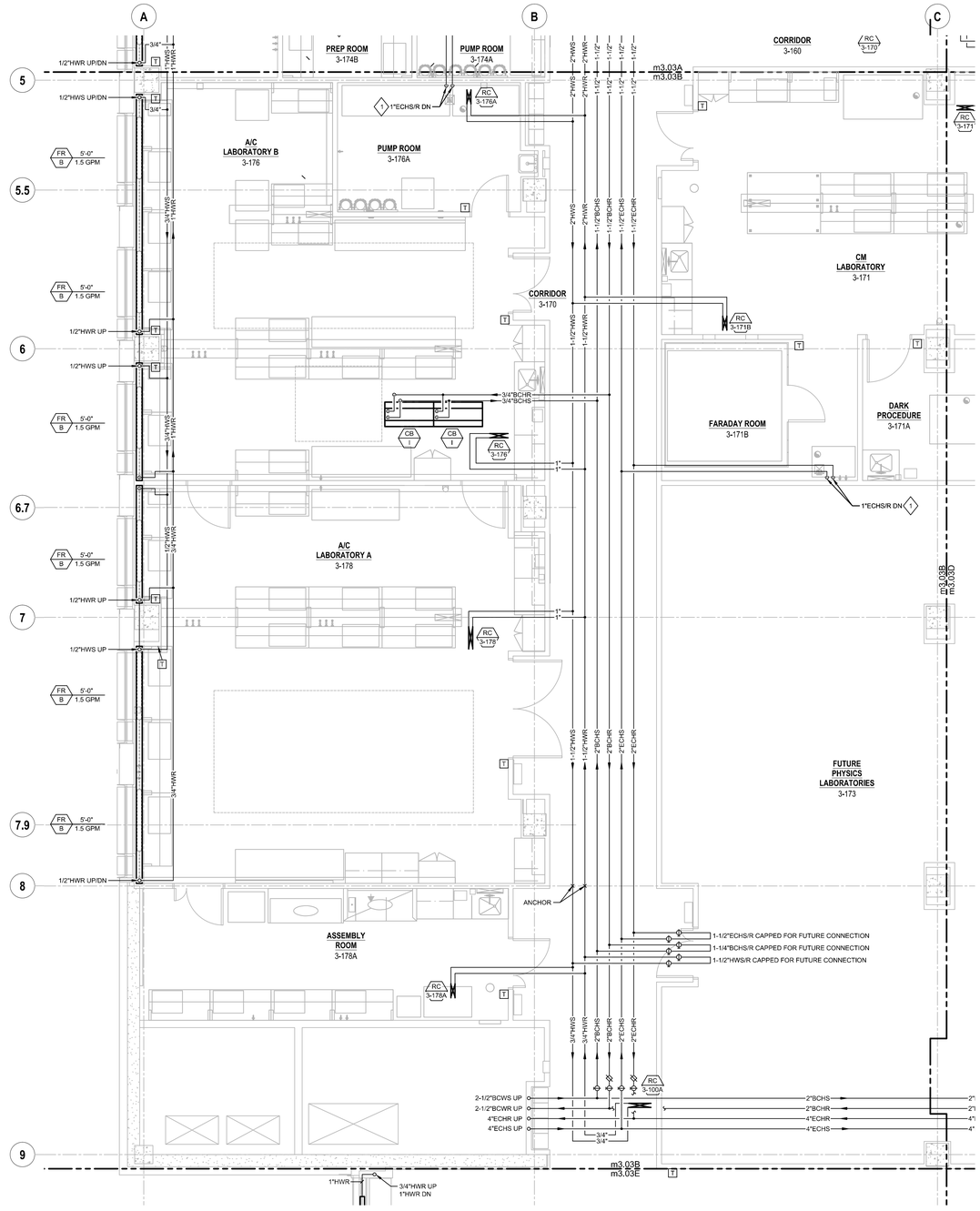
m3.03A

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 1" ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.



1 **LEVEL 3 - ZONE B**
SCALE: 1/4" = 1'-0"

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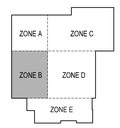
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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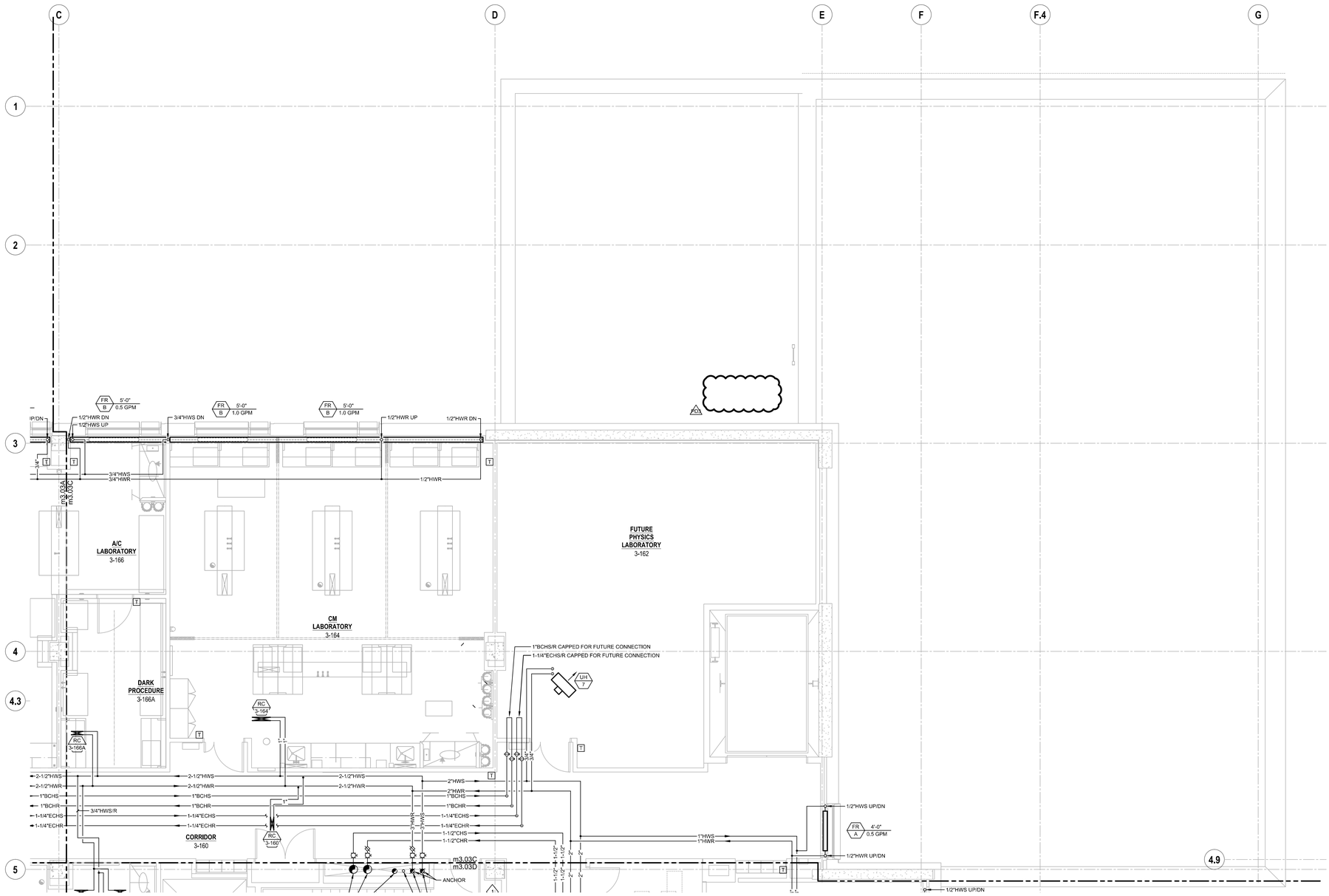
MECHANICAL
LEVEL 3 - ZONE B

m3.03B



1 **LEVEL 3 - ZONE C**
SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

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Date 02-24-2012 Reg. No. 25364

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Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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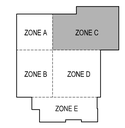
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 3 - ZONE C

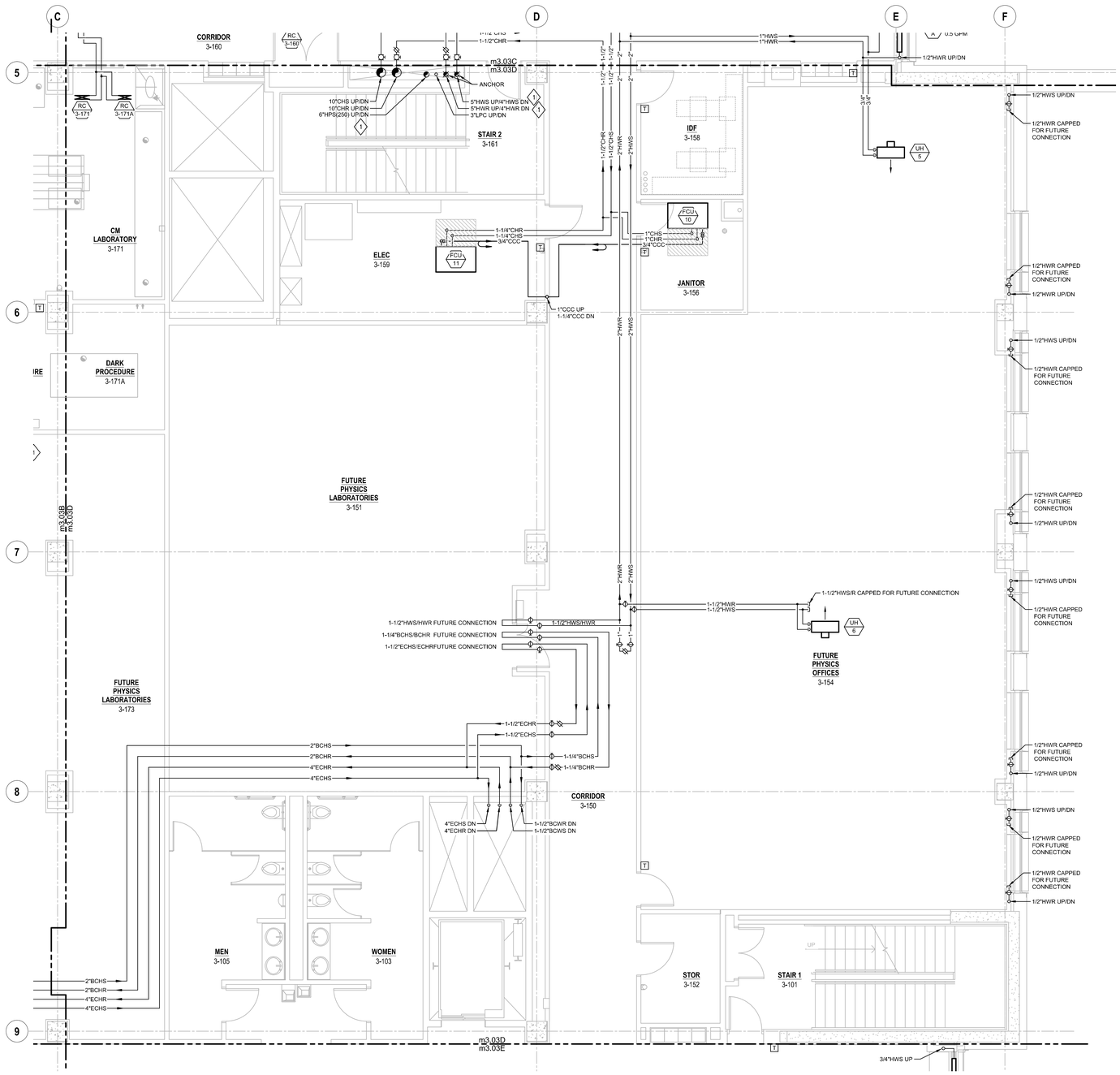
m3.03C

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 PROVIDE PIPE GUIDES.



1 **LEVEL 3 - ZONE D**
SCALE: 1/4" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

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Drawn TMM

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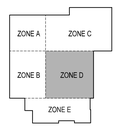
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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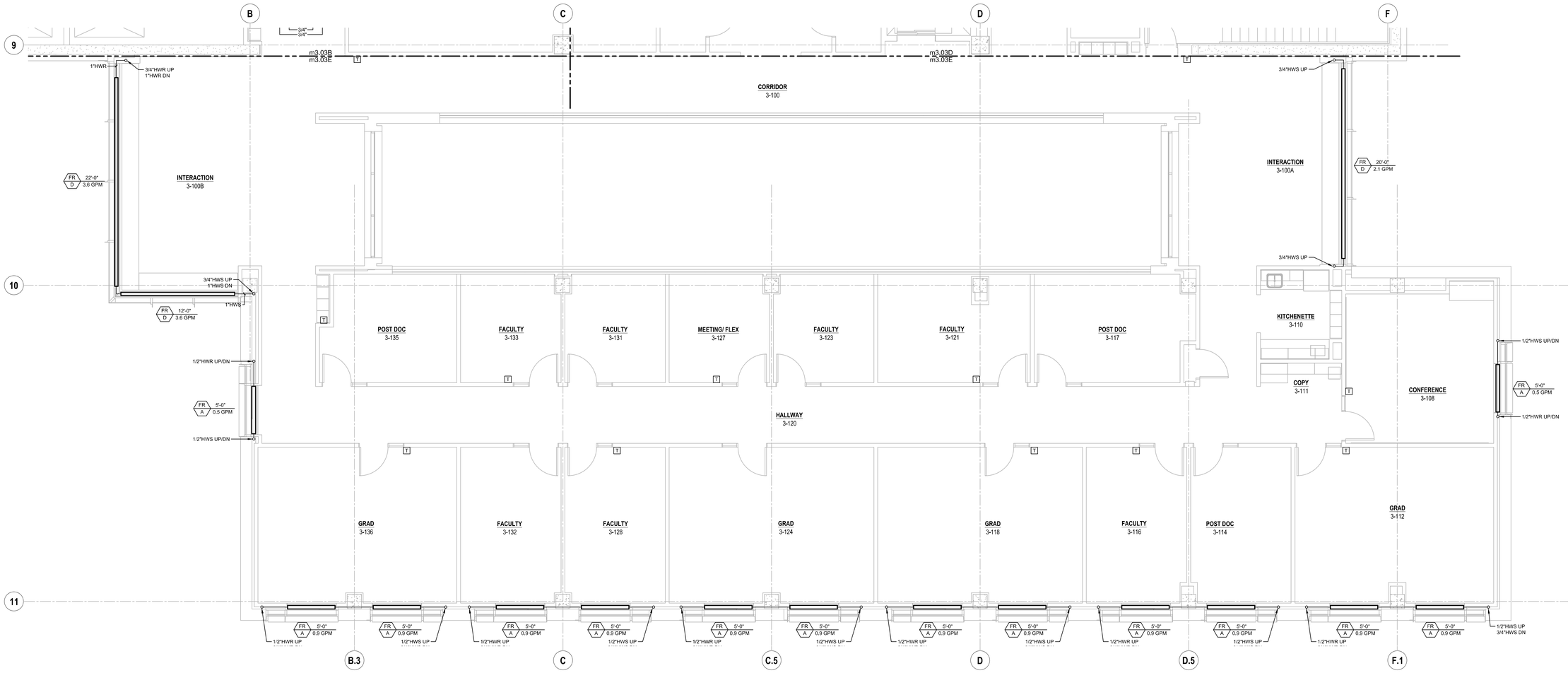
MECHANICAL
LEVEL 3 - ZONE D

m3.03D

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.



1 **LEVEL 3 - ZONE E**
SCALE: 1/4" = 1'-0"

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Physics and Nanotechnology Building

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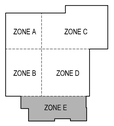

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MECHANICAL
LEVEL 3 - ZONE E

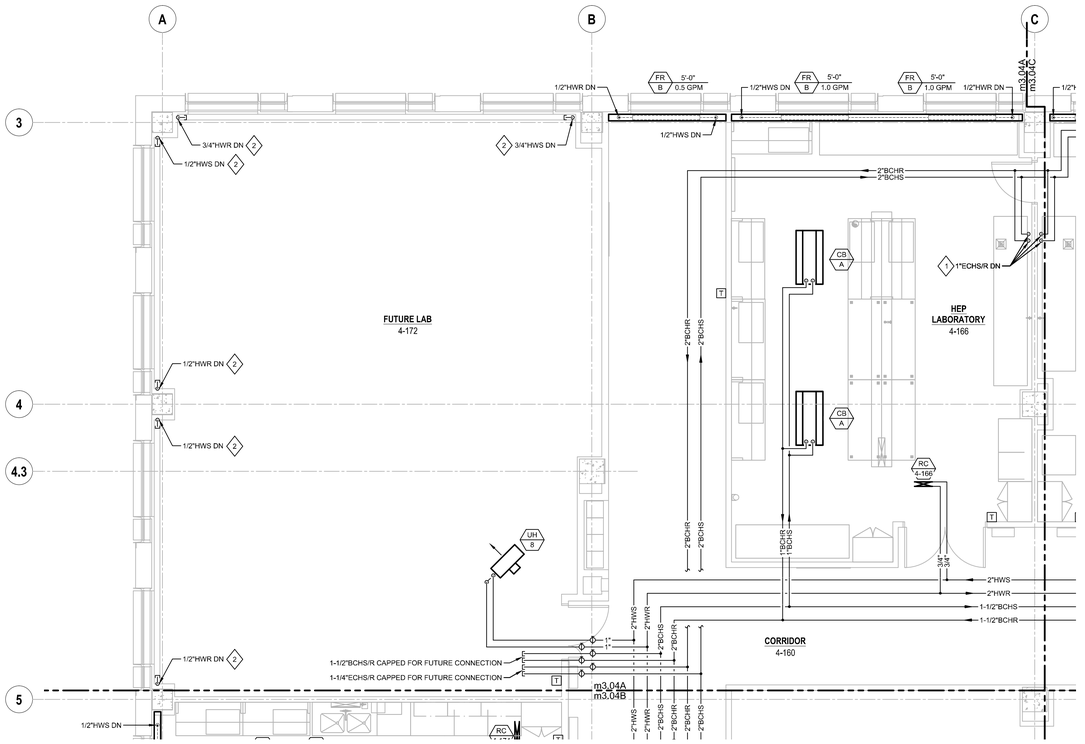
m3.03E

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1. 1"ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.
2. EXTEND 3/4"HWS/R 6" AFF AND CAP FOR FUTURE CONNECTION.



1 **LEVEL 4 - ZONE A**
SCALE: 1/4" = 1'-0"

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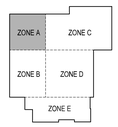

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MECHANICAL
LEVEL 4 - ZONE A

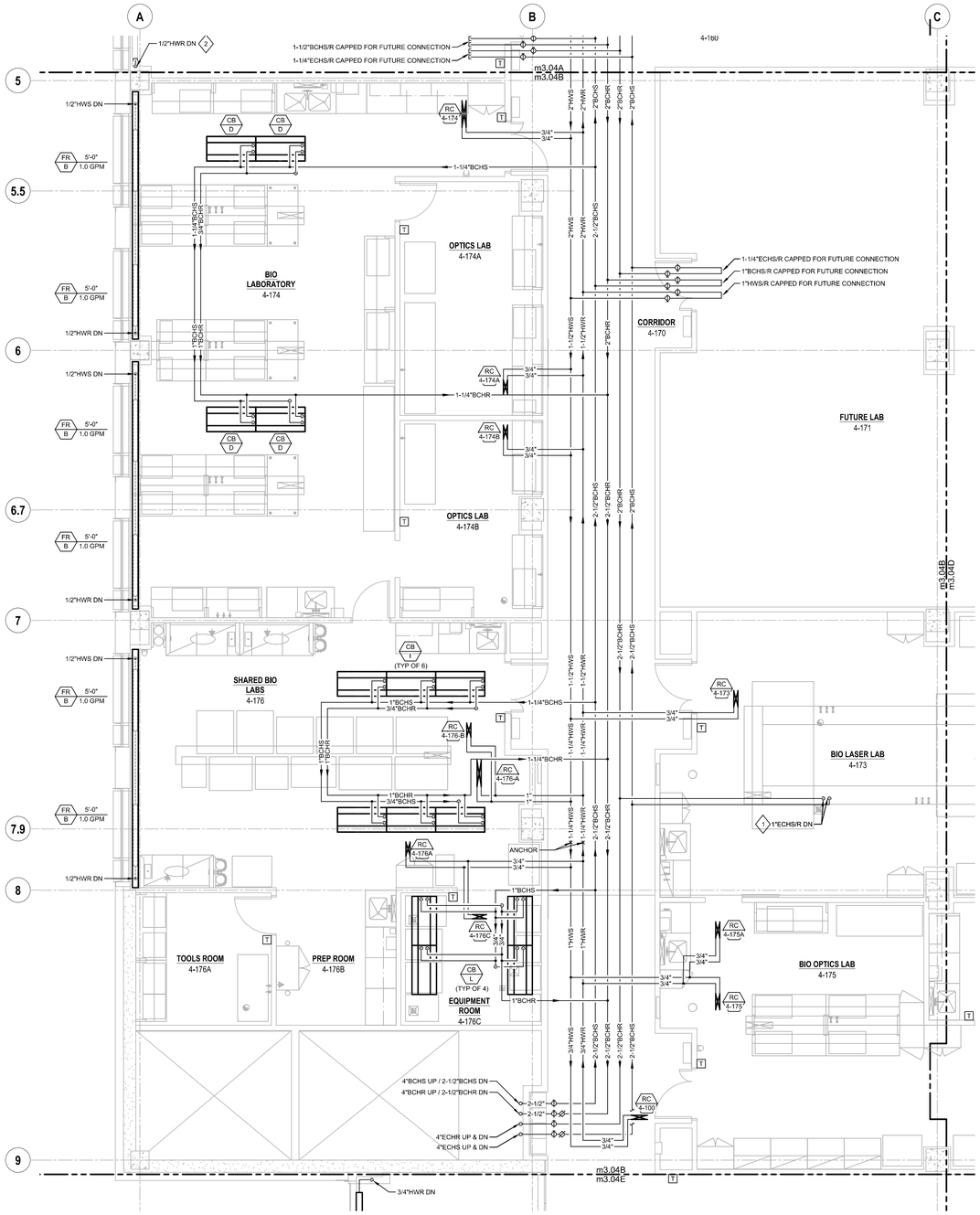
m3.04A

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 1" ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.



1 **LEVEL 4 - ZONE B**
SCALE: 1/4" = 1'-0"

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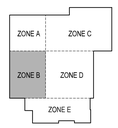

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MECHANICAL
LEVEL 4 - ZONE B

m3.04B

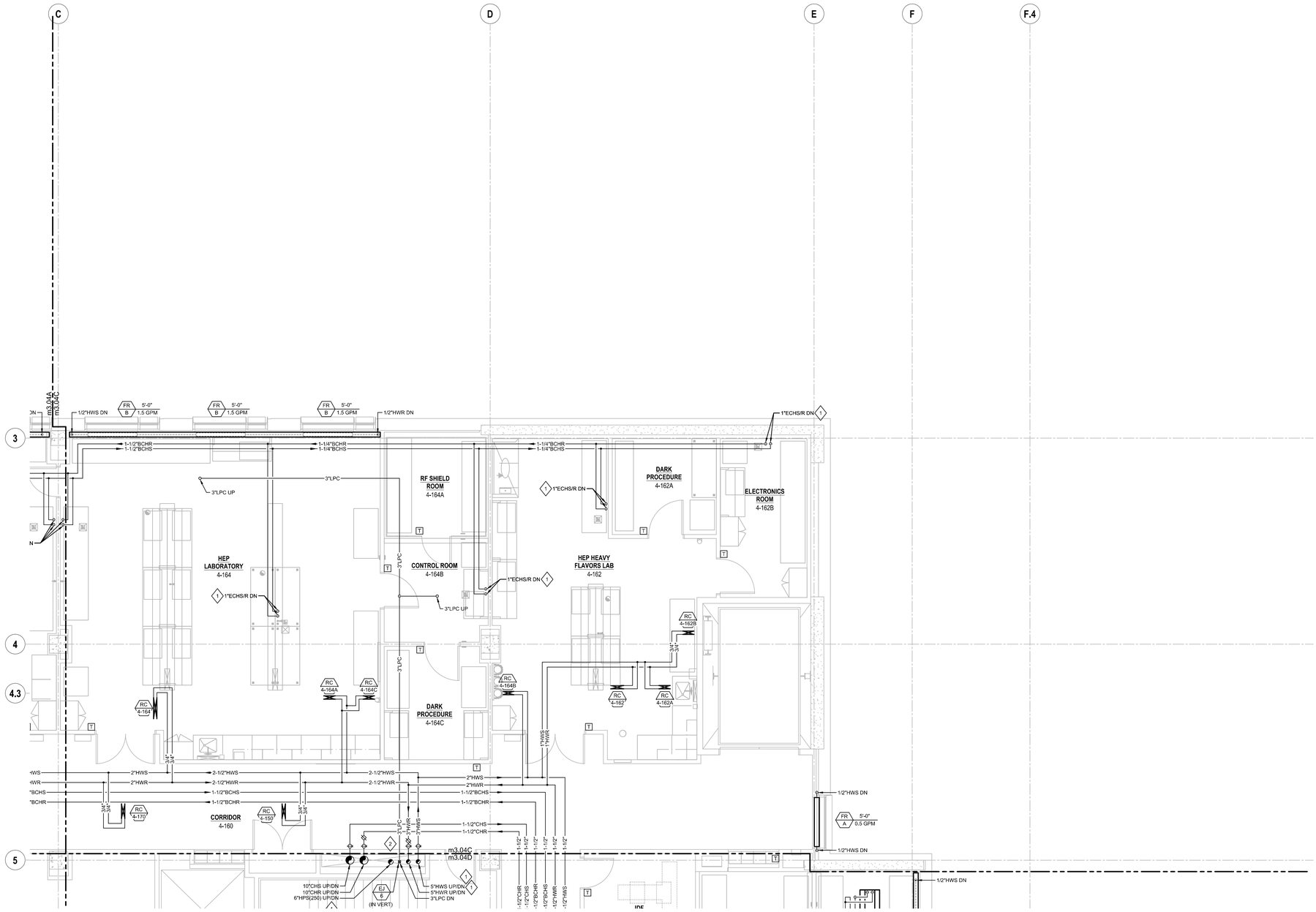
GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 1"ECHS/R DOWN TO QUICK CONNECT ASSEMBLY BY OTHERS.

2 PROVIDE ACCESS PANEL ABOVE CEILING FOR EJ-6.



1 **LEVEL 4 - ZONE C**
SCALE: 1/4" = 1'-0"

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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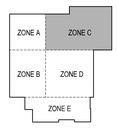
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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MECHANICAL
LEVEL 4 - ZONE C

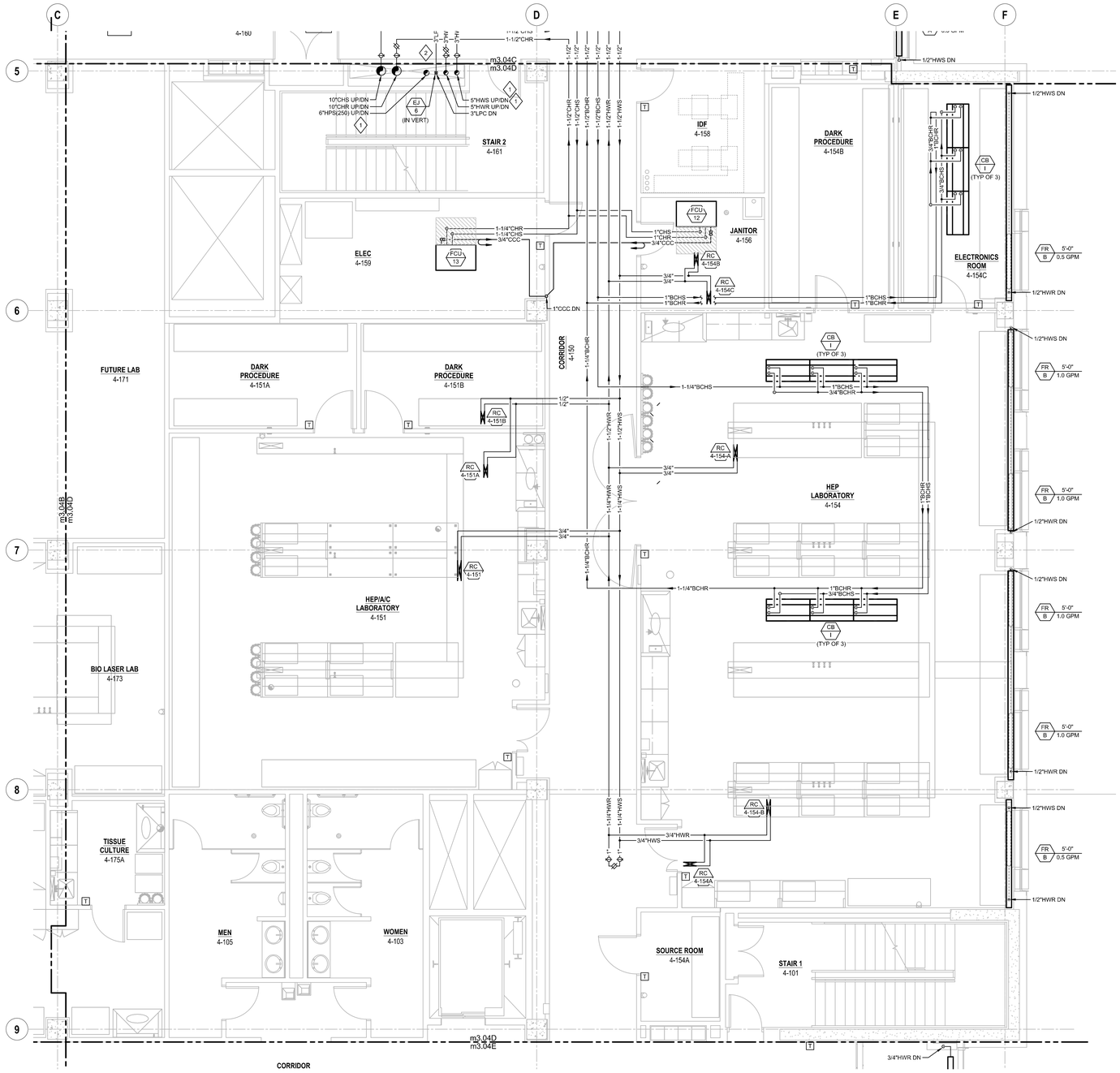
m3.04C

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

1 PROVIDE PIPE GUIDES.



1 **LEVEL 4 - ZONE D**
SCALE: 1/4" = 1'-0"

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Date 02-24-2012 Reg. No. 25384

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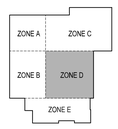
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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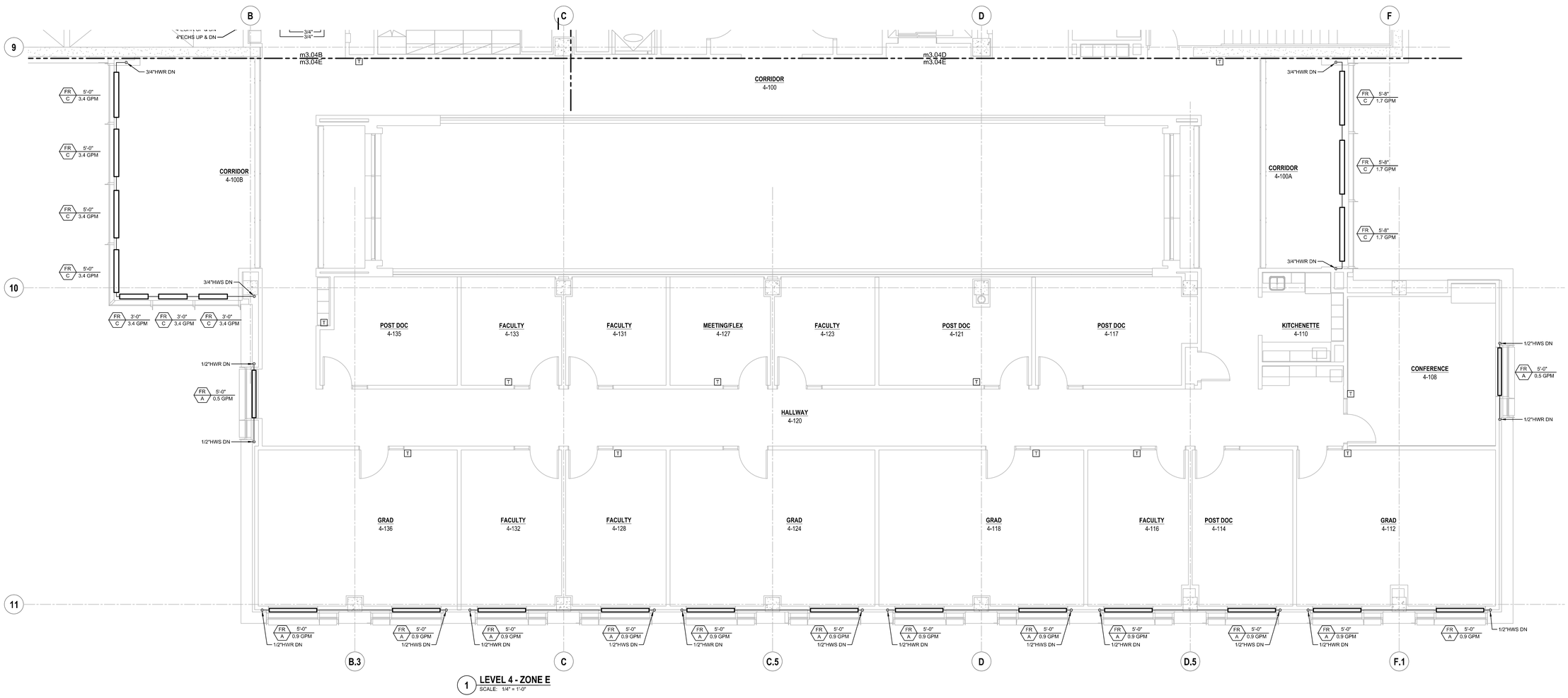
MECHANICAL
LEVEL 4 - ZONE D

m3.04D

GENERAL NOTES

1. PIPING TO TERMINAL HEATING DEVICES SHALL BE 1/2" UNLESS OTHERWISE NOTED.
2. PIPING TO CHILLED BEAMS SHALL BE 3/4" UNLESS OTHERWISE NOTED.



1 **LEVEL 4 - ZONE E**
SCALE: 1/4" = 1'-0"

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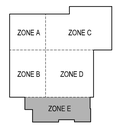
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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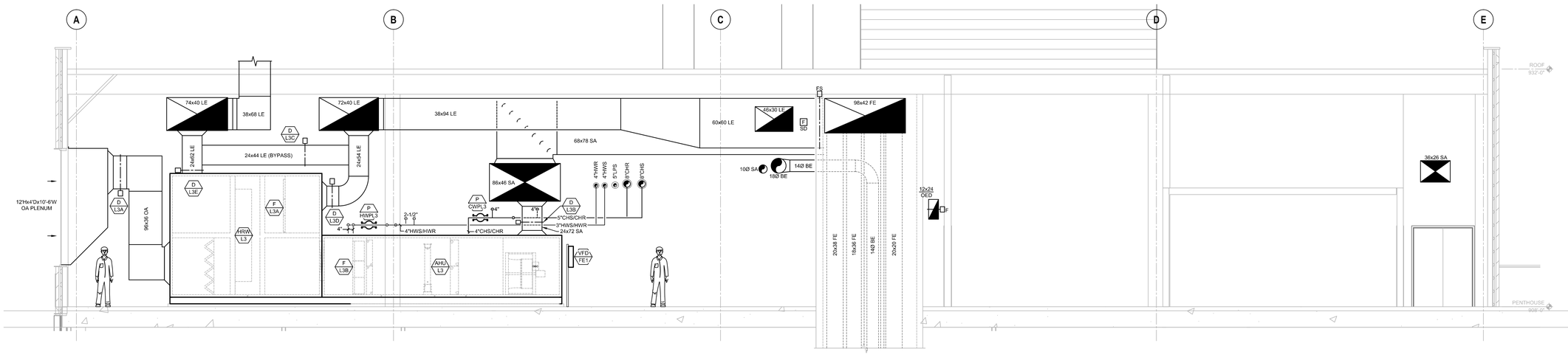
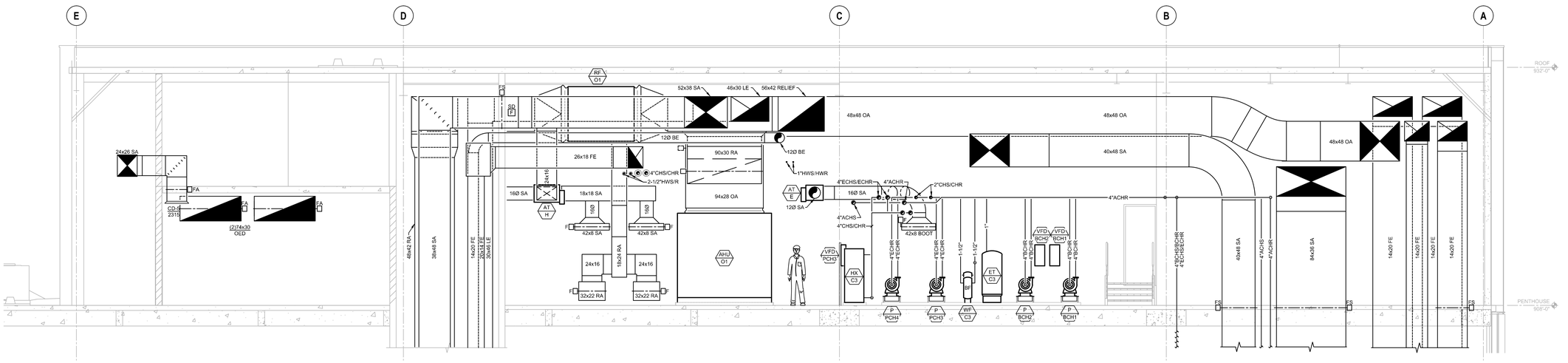
MECHANICAL
LEVEL 4 - ZONE E

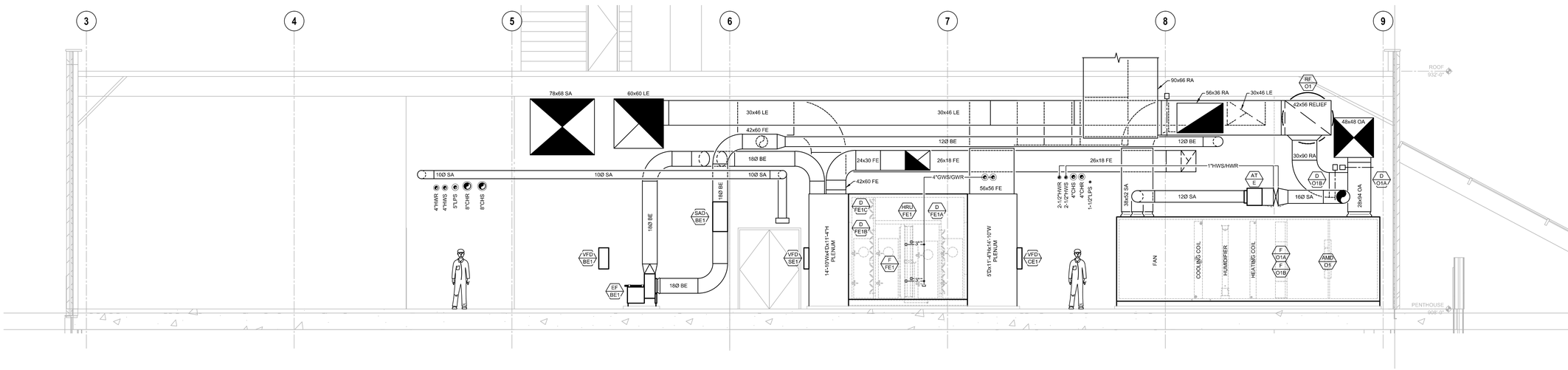
m3.04E



1 SECTION LOOKING NORTH AT COLUMN 6
SCALE: 1/4" = 1'-0"



2 SECTION LOOKING SOUTH AT AND NEAR COLUMN 8
SCALE: 1/4" = 1'-0"



3 SECTION LOOKING EAST AT COLUMN C
SCALE: 1/4" = 1'-0"

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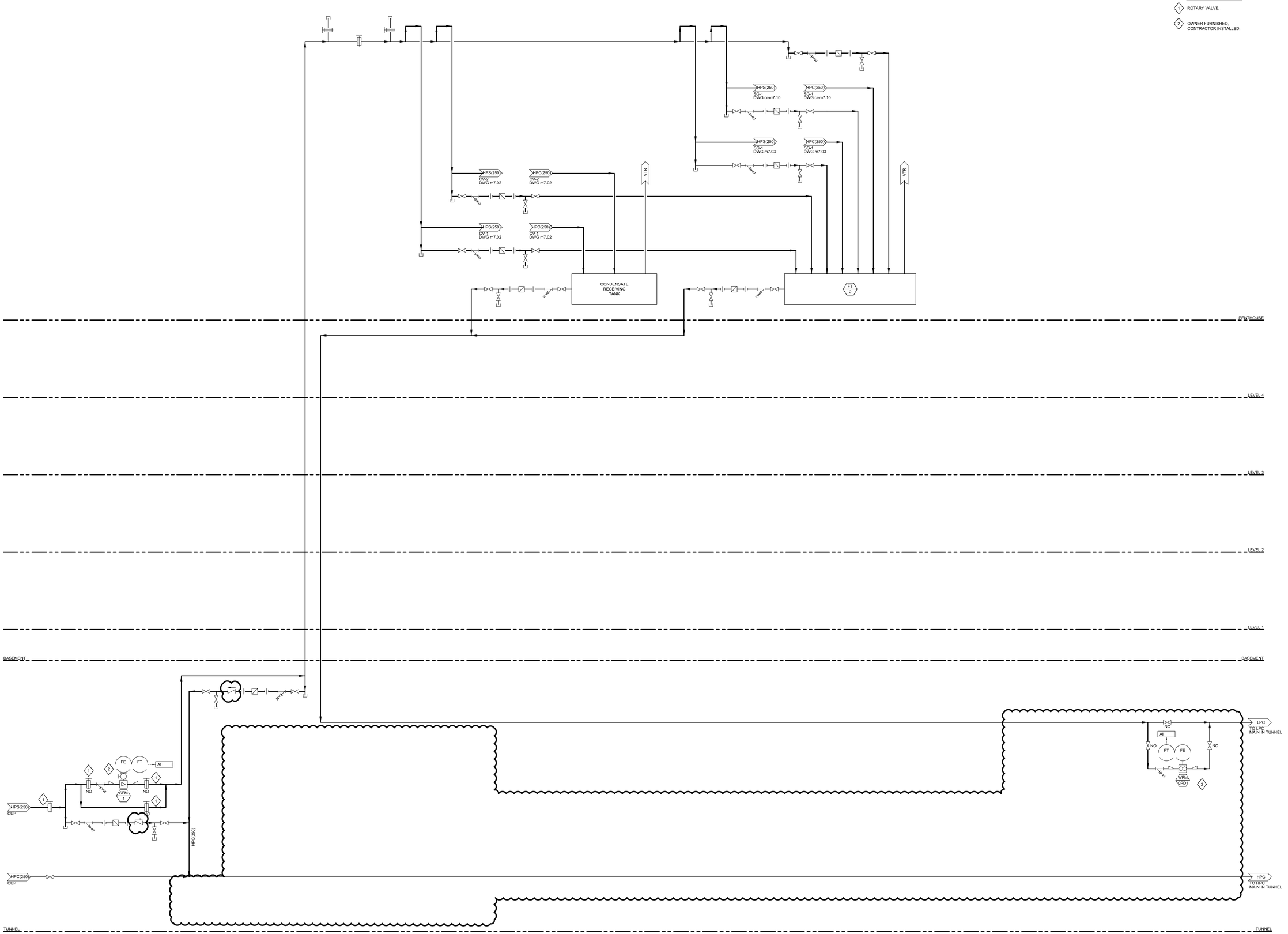
SECTIONS

m6.01



GENERAL NOTES

1. THE CONTROL/FLOW DIAGRAM IS ONLY INTENDED TO PROVIDE CONTROL AND INSTRUMENTATION RELATED INFORMATION. REFER TO MECHANICAL DETAILS FOR VALVING, DAMPERING AND ASSOCIATED SPECIALTIES' INSTALLATION REQUIREMENTS.

2. CONTROL/FLOW DIAGRAM INCLUDES GENERAL ARRANGEMENT OF SYSTEM COMPONENTS. REFER TO FLOOR PLANS AND EQUIPMENT SCHEDULES FOR COMPONENT QUANTITIES.

SHEET KEYNOTES

1 ROTARY VALVE.

2 OWNER FURNISHED, CONTRACTOR INSTALLED.

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Date 02-24-2012 Reg. No. 25364

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Bid Package No. 2	02-24-2012
Project Directive No. 3	05-11-2012

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Project

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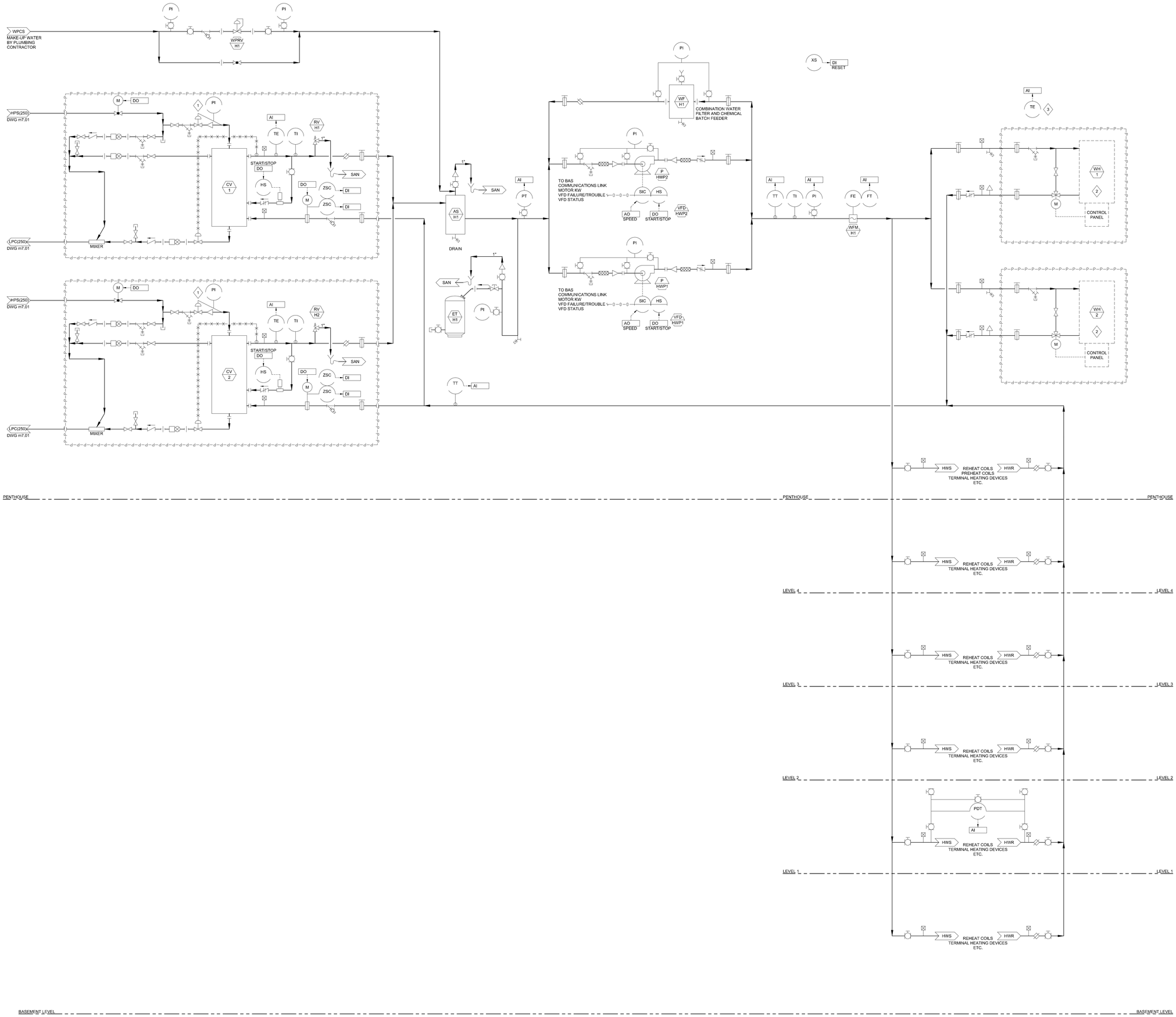
STEAM AND CONDENSATE SYSTEM CONTROL/ FLOW DIAGRAM

m7.01



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2. CONTROL/FLOW DIAGRAM INCLUDES GENERAL ARRANGEMENT OF SYSTEM COMPONENTS. REFER TO FLOOR PLANS AND EQUIPMENT SCHEDULES FOR COMPONENT QUANTITIES.
3. ALL DEVICES WITH MANUAL RESET TO BE LOCATED WITHIN 6 FEET OF THE FLOOR OR OTHERWISE ACCESSIBLE WITHOUT THE USE OF A LADDER.

SHEET KEYNOTES

1. REGULATING VALVE FURNISHED BY HEAT EXCHANGER MANUFACTURER.
2. WATER HEATERS PROVIDED BY PIPING CONTRACTOR.
3. PROVIDE TEMPERATURE SENSOR IN COMMON SUPPLY LINE FROM DOMESTIC HOT WATER HEATERS FOR REMOTE MONITORING VIA BAS.

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By

Name MICHAEL J. BROGE

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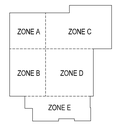
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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HEATING HOT WATER SYSTEM CONTROL/ FLOW DIAGRAM

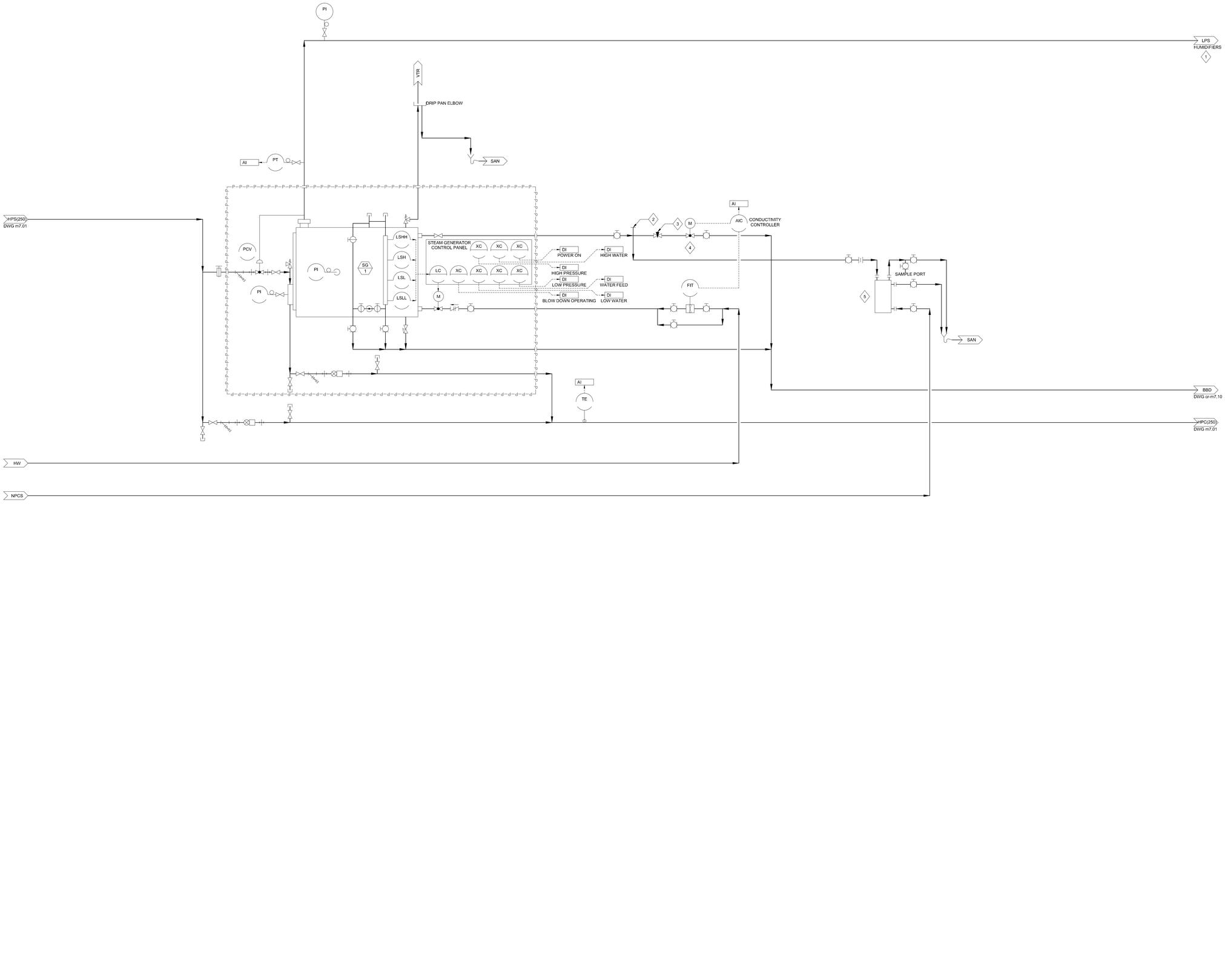
m7.02

GENERAL NOTES

1. ALL DEVICES WITH MANUAL RESET TO BE LOCATED WITHIN 6 FEET OF THE FLOOR OR OTHERWISE ACCESSIBLE WITHOUT THE USE OF A LADDER.

SHEET KEYNOTES

1. LPS TO HUMIDIFIER DISTRIBUTION GRID.
2. CONDENSATE SENSOR CROSS ASSEMBLY.
3. THROTTLING VALVE OR ORIFICE UNION.
4. MOTORIZED SURFACE BLOWDOWN VALVE.
5. 2-PASS SURFACE BLOWDOWN SAMPLE COOLER. SUPPORT SAMPLE COOLER FROM WALL OR PIPE STAND.



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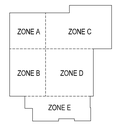

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CLEAN STEAM SYSTEM

m7.03

GENERAL NOTES

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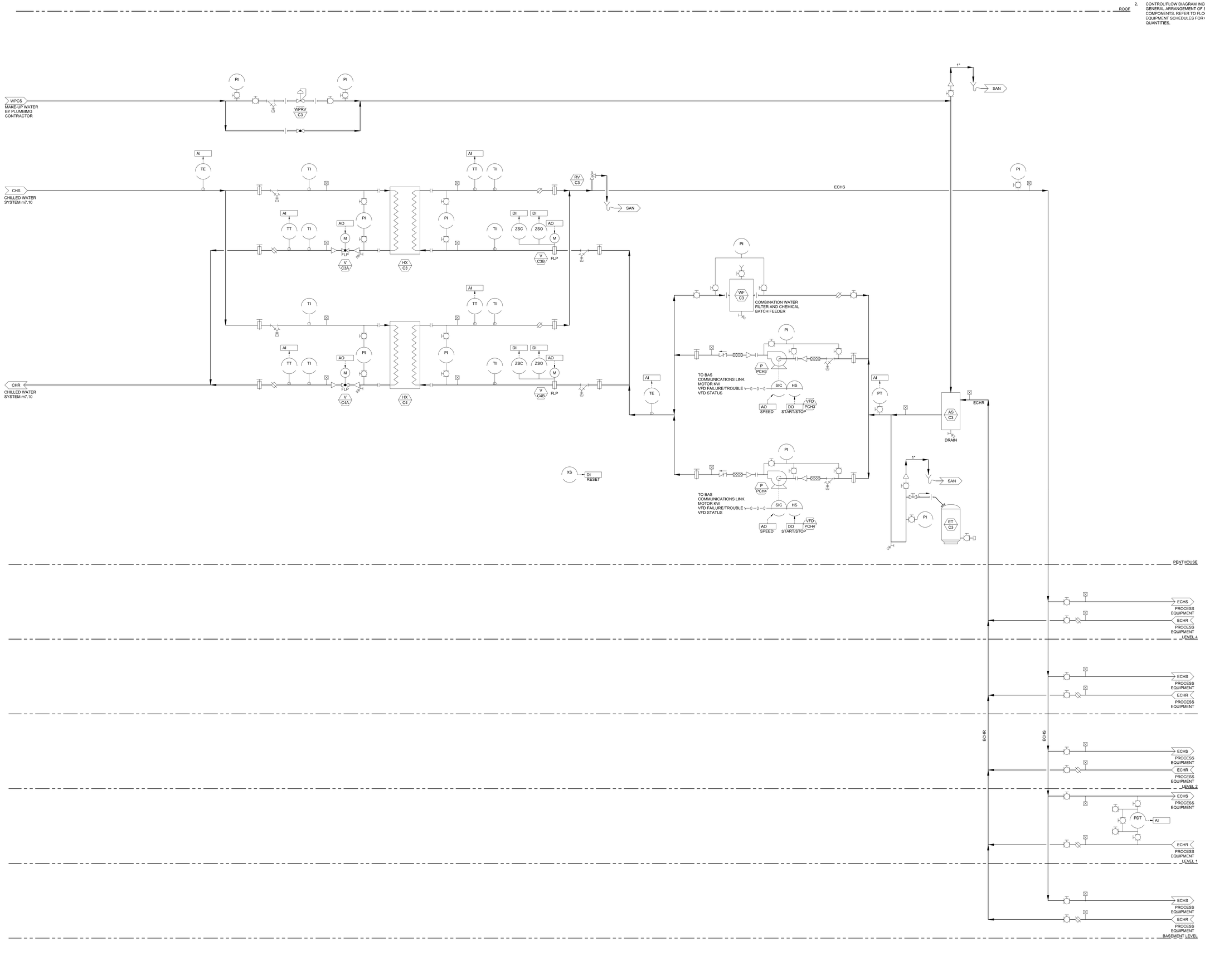

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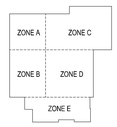

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LABORATORY PROCESS
CHILLED WATER SYSTEM
CONTROL/FLOW DIAGRAM

m7.05

GENERAL NOTES

1. THE CONTROL/FLOW DIAGRAM IS ONLY INTENDED TO PROVIDE CONTROL AND INSTRUMENTATION RELATED INFORMATION. REFER TO MECHANICAL DETAILS FOR VALVING, DAMPERING AND ASSOCIATED SPECIALTIES' INSTALLATION REQUIREMENTS.
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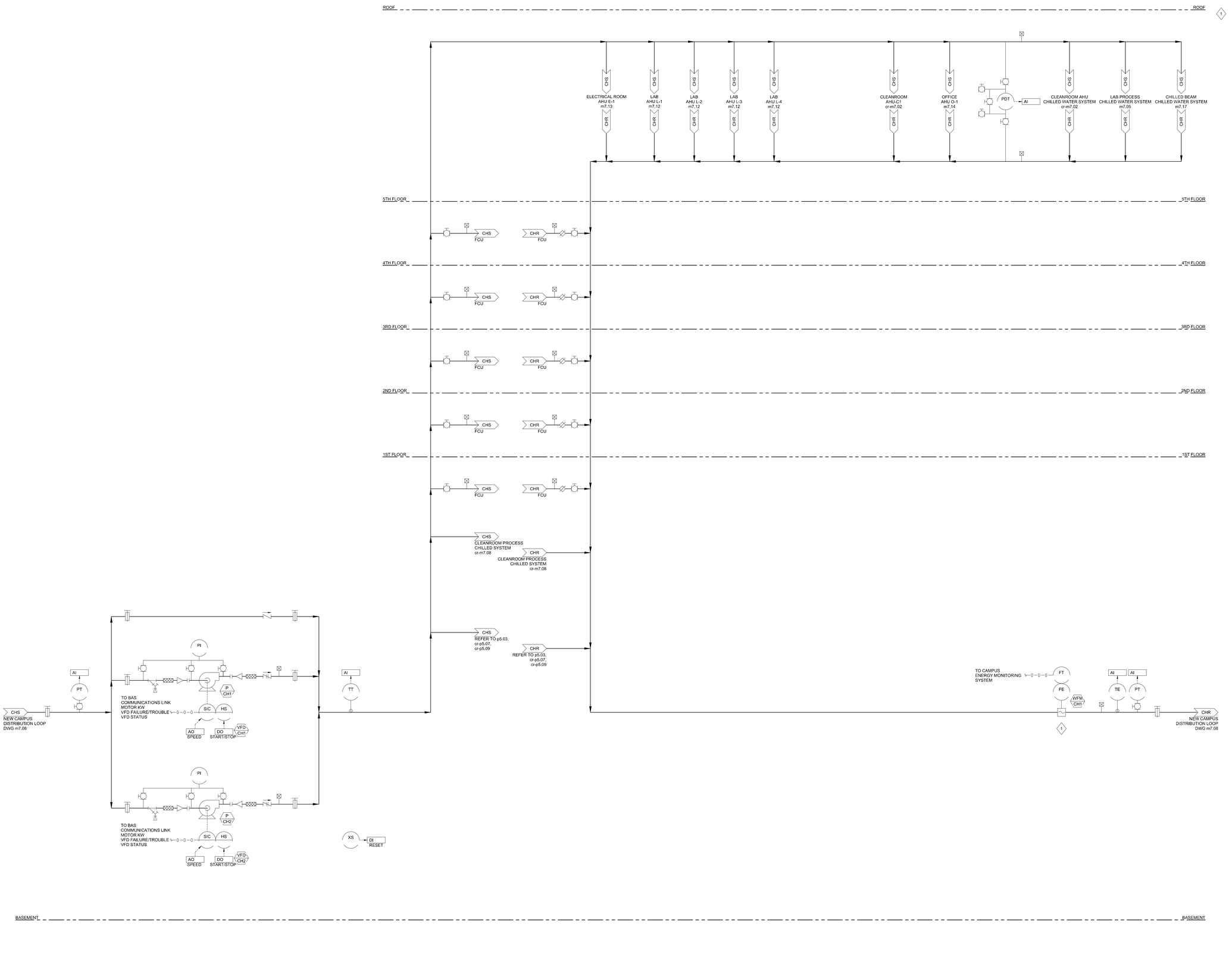

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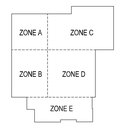

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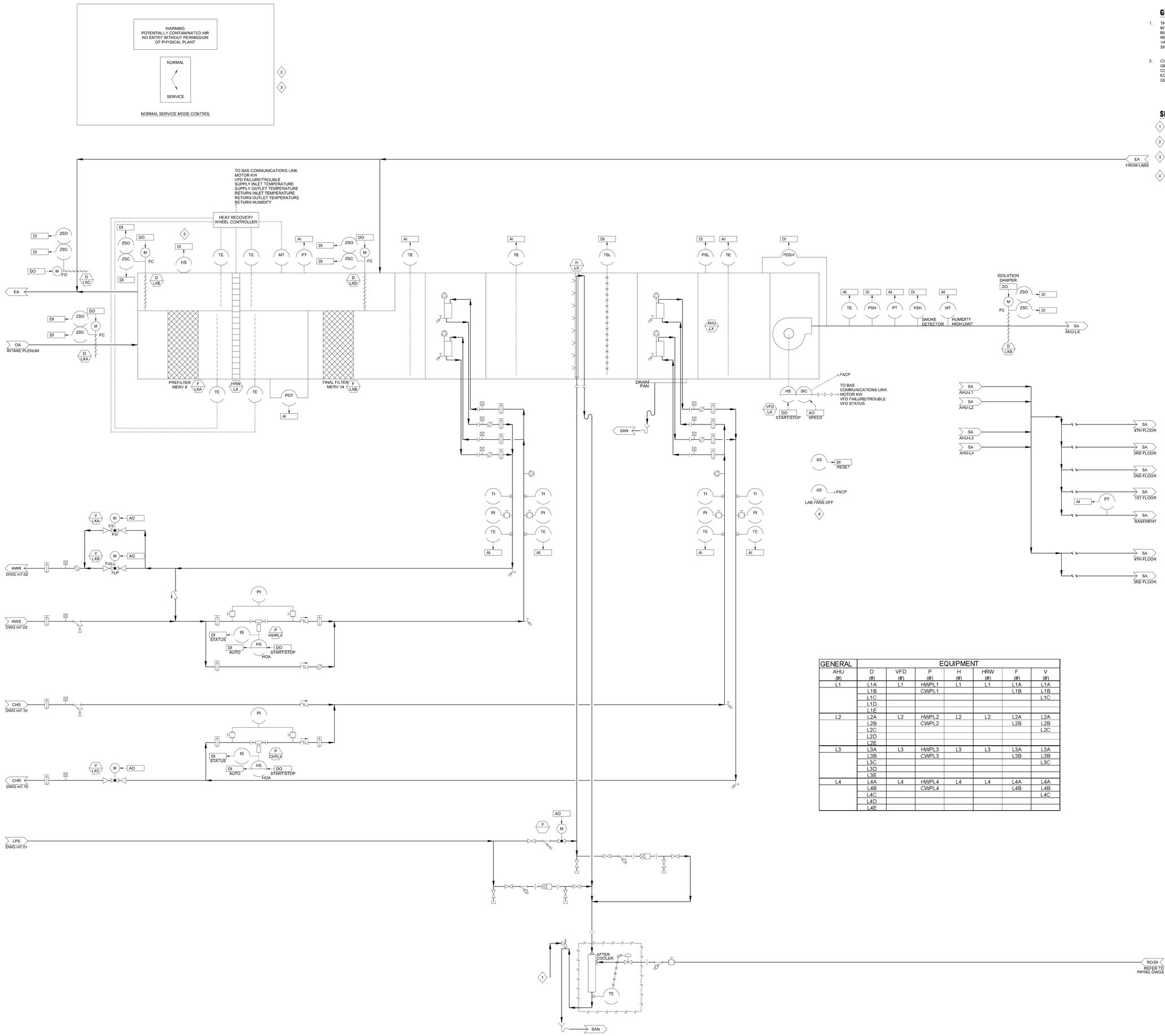
CHILLED WATER SYSTEM CONTROL/FLOW DIAGRAM

m7.10



GENERAL NOTES

1. THE CONTROL/FLOW DIAGRAM IS ONLY INTENDED TO PROVIDE CONTROL AND INSTRUMENTATION RELATED INFORMATION. REFER TO MECHANICAL DETAILS FOR VALVING, DAMPERING AND ASSOCIATED SPECIALTIES' INSTALLATION REQUIREMENTS.
2. CONTROL/FLOW DIAGRAM INCLUDES GENERAL ARRANGEMENT OF SYSTEM COMPONENTS. REFER TO FLOOR PLANS AND EQUIPMENT SCHEDULES FOR COMPONENT QUANTITIES.

SHEET KEYNOTES

1. 1/2" PIPE TERMINATED 10" ABOVE FLOOR LEVEL.
2. LOCATE ADJACENT TO PLENUM ACCESS DOOR.
3. PROVIDE SIGNAGE AS INDICATED IN DETAIL ON THIS SHEET AND REFER TO CONTROL SEQUENCES.
4. PROVIDE DRY CONTACTS FROM BAS TO FACP TO CLOSE ALL SYSTEM FIRE/SMOKE DAMPERS WHEN ALL LAB AHU'S ARE PROVEN STOPPED.

GENERAL	EQUIPMENT						
AHU (#)	D (#)	VFD (#)	P (#)	H (#)	HRW (#)	F (#)	V (#)
L1	L1A	L1	HWPL1	L1	L1	L1A	L1A
	L1B		CWPL1			L1B	L1B
	L1C						L1C
	L1D						
	L1E						
L2	L2A	L2	HWPL2	L2	L2	L2A	L2A
	L2B		CWPL2			L2B	L2B
	L2C						L2C
	L2D						
	L2E						
L3	L3A	L3	HWPL3	L3	L3	L3A	L3A
	L3B		CWPL3			L3B	L3B
	L3C						L3C
	L3D						
	L3E						
L4	L4A	L4	HWPL4	L4	L4	L4A	L4A
	L4B		CWPL4			L4B	L4B
	L4C						L4C
	L4D						
	L4E						

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For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25364

Issued for	Date
Bid Package No. 2	02-24-2012

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Drawn KRG

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Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

ZONE A | ZONE C
ZONE B | ZONE D
ZONE E

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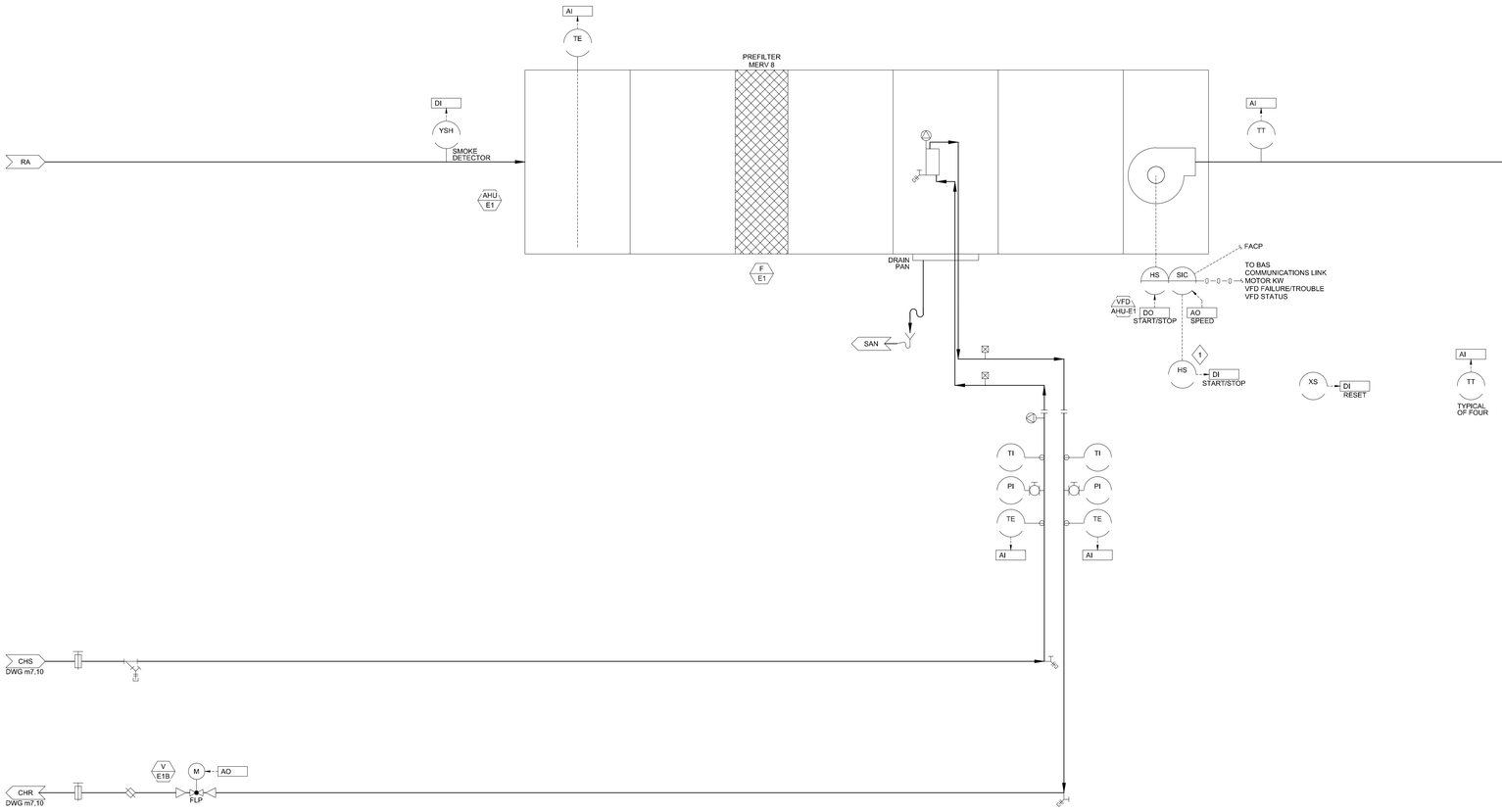
LABORATORY AIR HANDLING UNITS SYSTEM CONTROL/FLOW DIAGRAM

m7.12



GENERAL NOTES

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2. CONTROL/FLOW DIAGRAM INCLUDES GENERAL ARRANGEMENT OF SYSTEM COMPONENTS. REFER TO FLOOR PLANS AND EQUIPMENT SCHEDULES FOR COMPONENT QUANTITIES.

SHEET KEYNOTES

1 PROVIDE REMOTE START/STOP SWITCH AT ENTRANCE DOOR TO ROOM S-104, LOCATE SWITCH ON OUTSIDE OF ROOM.

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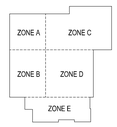

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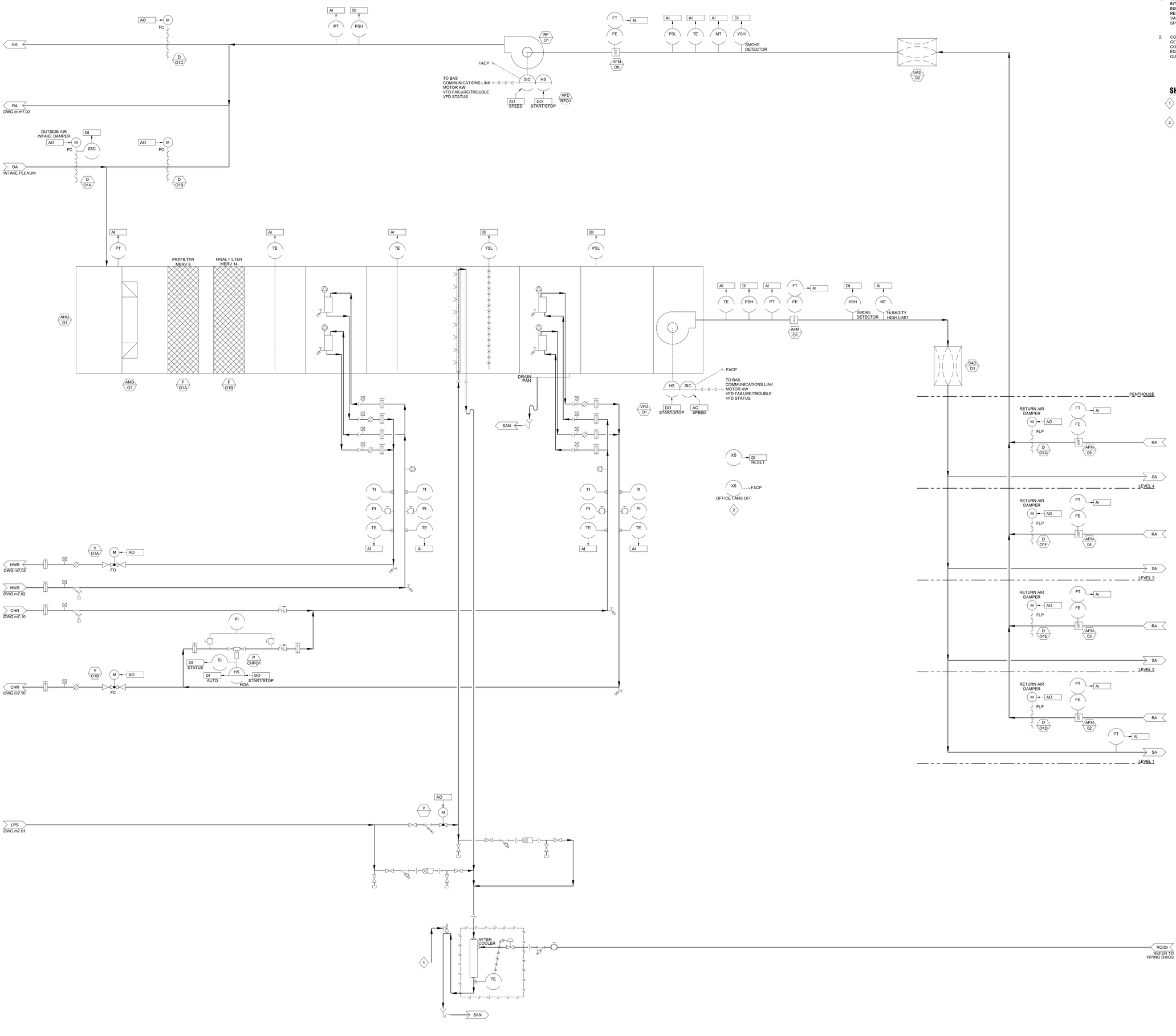
ELECTRICAL ROOM
AIR HANDLING UNIT
CONTROL/AIR FLOW DIAGRAM

m7.13



GENERAL NOTES

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2. CONTROL/FLOW DIAGRAM INCLUDES GENERAL ARRANGEMENT OF SYSTEM COMPONENTS. REFER TO FLOOR PLANS AND EQUIPMENT SCHEDULES FOR COMPONENT QUANTITIES.

SHEET KEYNOTES

1. 1/2" PIPE TERMINATED 10" ABOVE FLOOR LEVEL.
2. PROVIDE DRY CONTACTS FROM BAS TO FACP TO CLOSE ALL SYSTEM FIRE/SMOKE DAMPERS WHEN ALL OFFICE AHU'S ARE PROVEN STOPPED.

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Drawn KRG

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Date 12/16/11

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ZONE A | ZONE C
ZONE B | ZONE D
ZONE E

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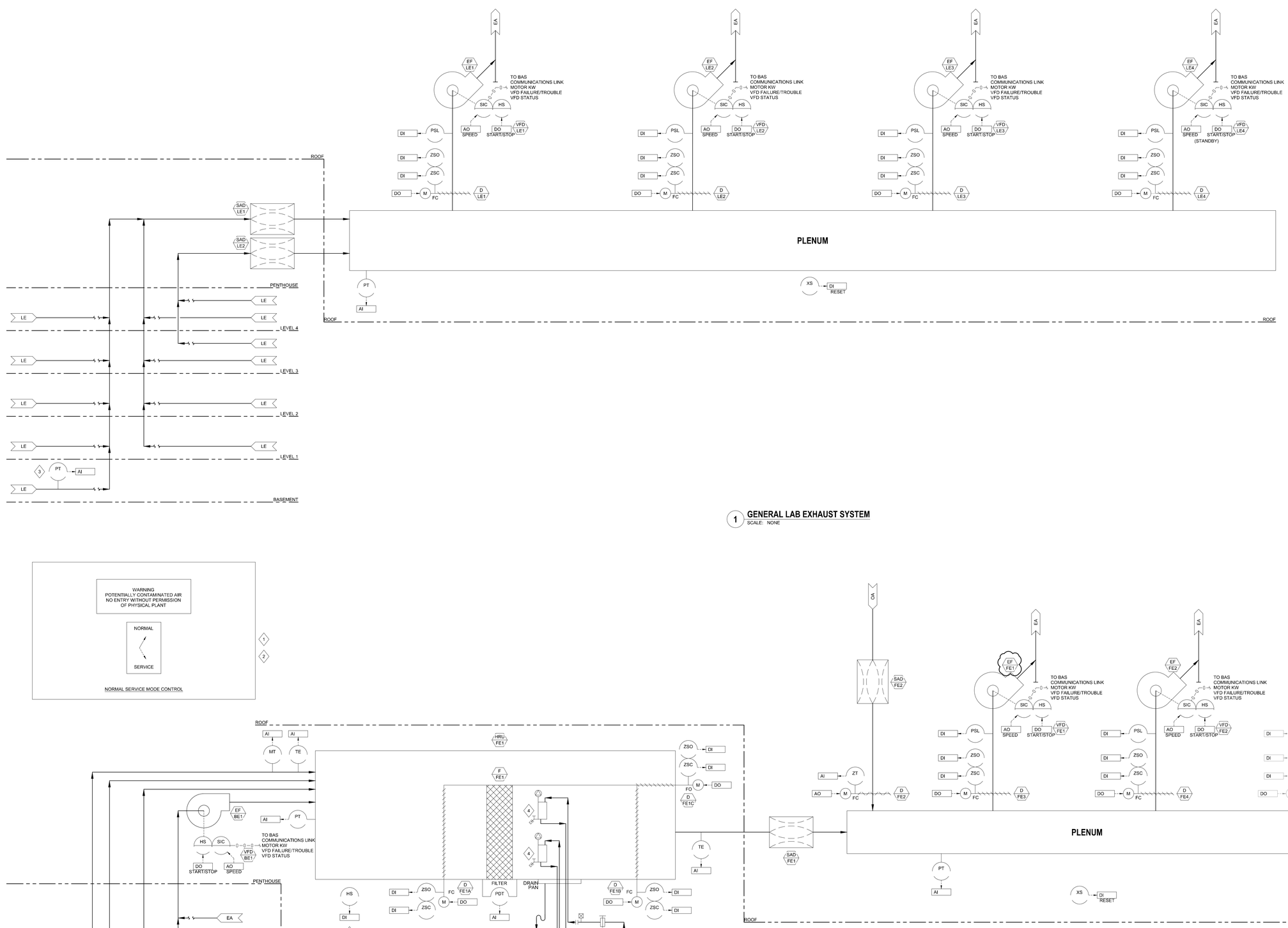
OFFICE AIR HANDLING UNIT CONTROL/FLOW DIAGRAM

m7.14



1 GENERAL LAB EXHAUST SYSTEM
SCALE: NONE

2 FUME HOOD EXHAUST SYSTEM
SCALE: NONE

GENERAL NOTES

1. THE CONTROL/FLOW DIAGRAM IS ONLY INTENDED TO PROVIDE CONTROL AND INSTRUMENTATION RELATED INFORMATION. REFER TO MECHANICAL DETAILS FOR VALVING, DAMPERING AND ASSOCIATED SPECIALTIES' INSTALLATION REQUIREMENTS.
2. CONTROL/FLOW DIAGRAM INCLUDES GENERAL ARRANGEMENT OF SYSTEM COMPONENTS. REFER TO FLOOR PLANS AND EQUIPMENT SCHEDULES FOR COMPONENT QUANTITIES.

SHEET KEYNOTES

1. LOCATE ADJACENT TO PLENUM ACCESS DOOR.
2. PROVIDE SIGNAGE AS INDICATED IN DETAIL ON THIS SHEET AND REFER TO CONTROL SEQUENCES.
3. REFER TO MECHANICAL DRAWINGS FOR LOCATIONS OF PRESSURE TRANSMITTERS.
4. VENT AND DRAIN LINE TO BE PIPED TO EXTERIOR OF HRU.

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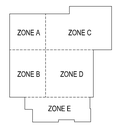

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LABORATORY FUME HOOD AND LABORATORY EXHAUST SYSTEMS CONTROL/AIR FLOW DIAGRAM

m7.16

GENERAL NOTES

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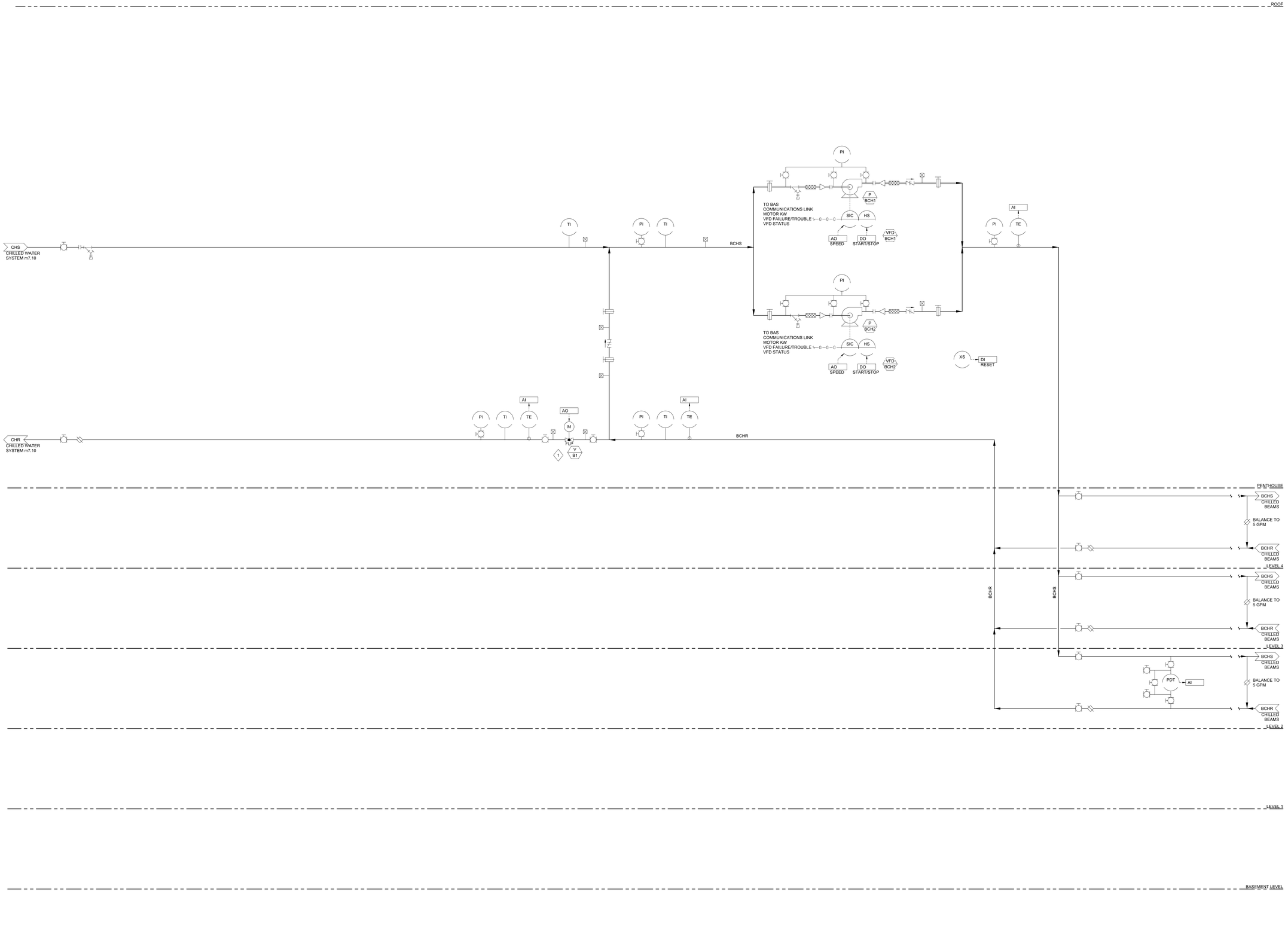
SHEET KEYNOTES

1 VALVE TO BE PRESSURE INDEPENDENT TYPE.



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Project

Physics and Nanotechnology Building

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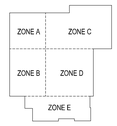

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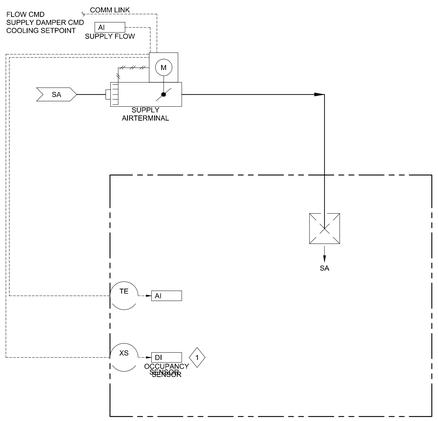
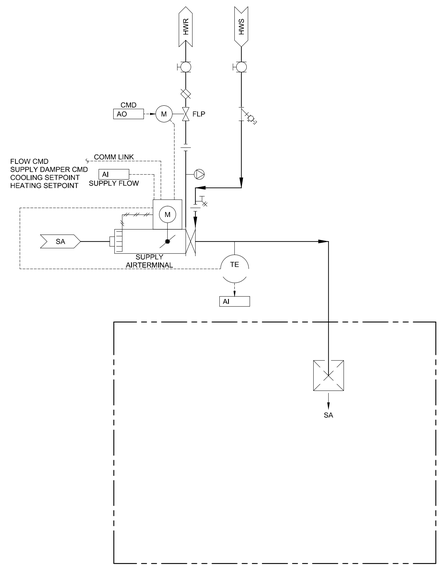
CHILLED BEAM
CHILLED WATER SYSTEM
CONTROL/FLOW DIAGRAM

m7.17



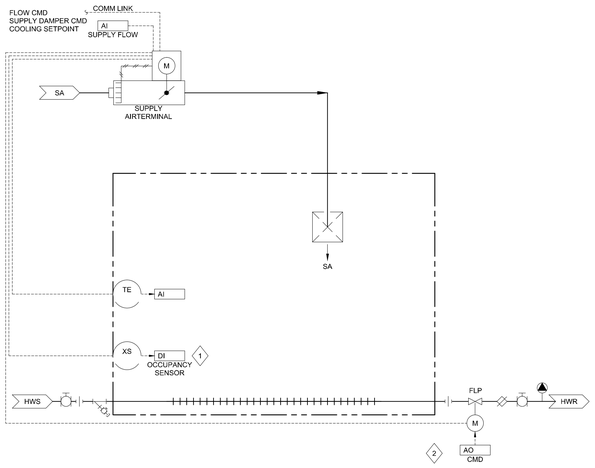
3 SEQUENCE O3 - VARIABLE AIR VOLUME (COOLING ONLY)

SCALE: NONE



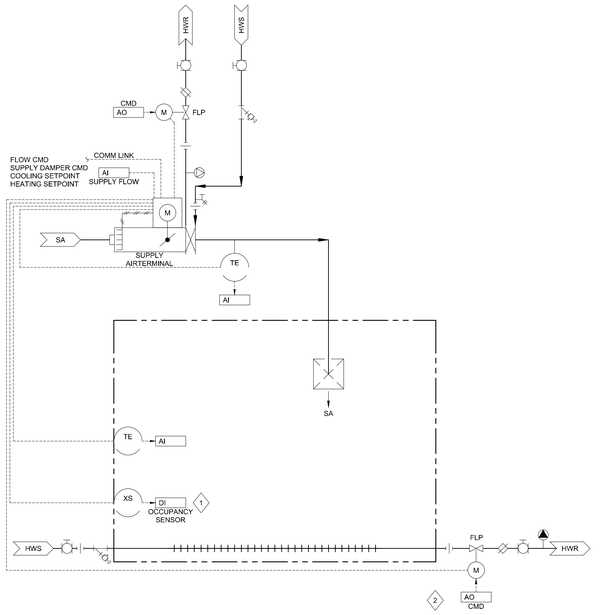
1 SEQUENCE O1 - CONSTANT AIR VOLUME WITH REHEAT

SCALE: NONE



4 SEQUENCE O4 - VARIABLE AIR VOLUME SUPPLY WITH FIN TUBE RADIATION

SCALE: NONE



2 SEQUENCE O2 - CONSTANT AIR VOLUME WITH REHEAT AND FIN TUBE RADIATION

SCALE: NONE

GENERAL NOTES

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SHEET KEYNOTES

1. OCCUPANCY SENSOR PROVIDED BY DIVISION 26 CONTRACTOR.

2. FIN TUBE RADIATION CONTROLLED BY SEPARATE THERMOSTAT IN SOME ROOMS. REFER TO MECHANICAL DRAWINGS FOR ROOMS.

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By

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Project

Physics and Nanotechnology Building

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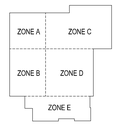

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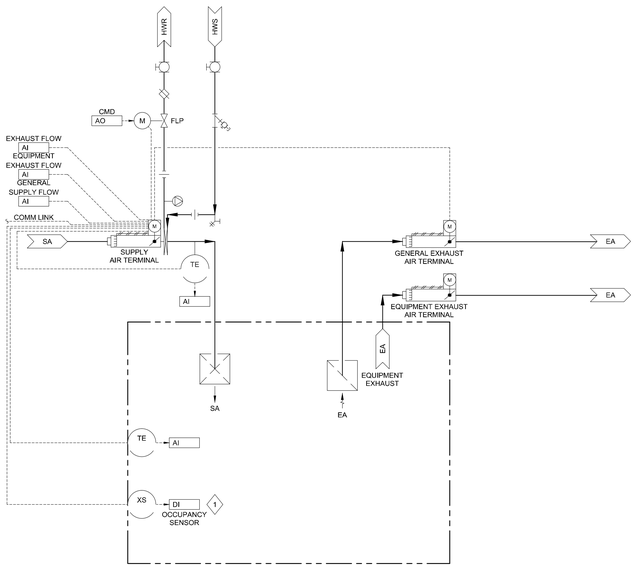
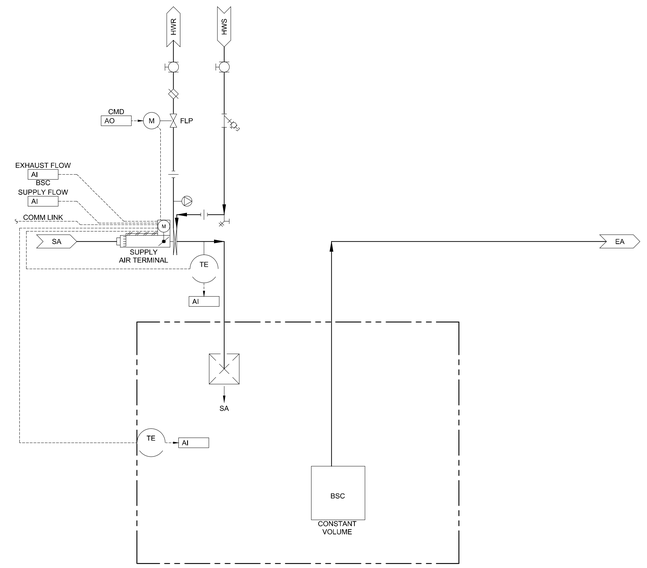
ROOM TYPICAL -
CONTROL DIAGRAMS

m7.20



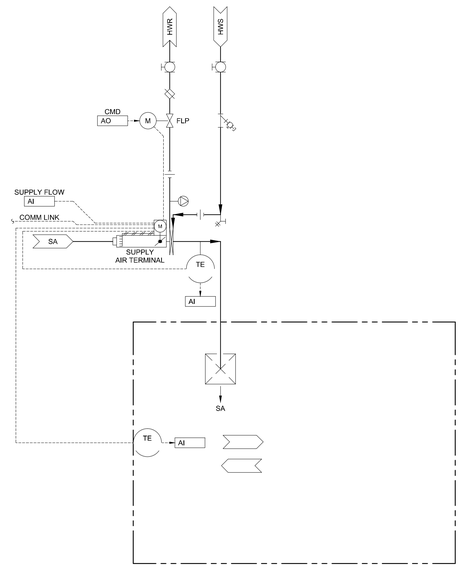
SEQUENCE L5 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - CONSTANT AIR VOLUME GENERAL EXHAUST - CONSTANT VOLUME EQUIPMENT EXHAUST - EXHAUST / SUPPLY AIR TRACKING - OCCUPIED / UNOCCUPIED

5 SCALE: NONE



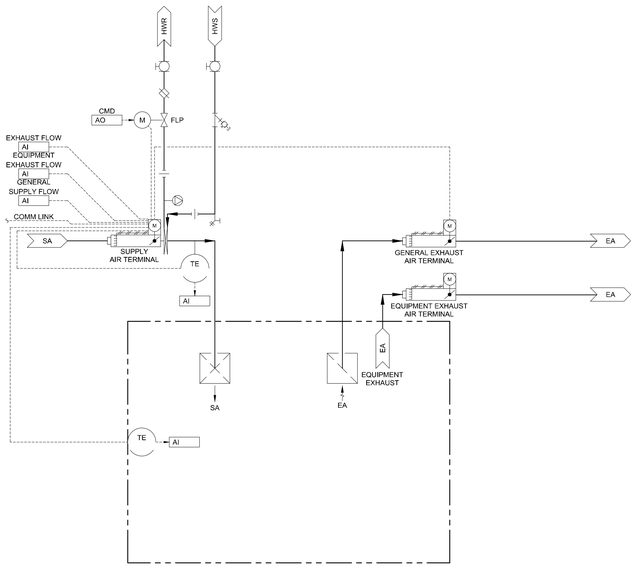
SEQUENCE L3 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - CONSTANT AIR VOLUME BSC EXHAUST - EXHAUST/SUPPLY AIR TRACKING

3 SCALE: NONE



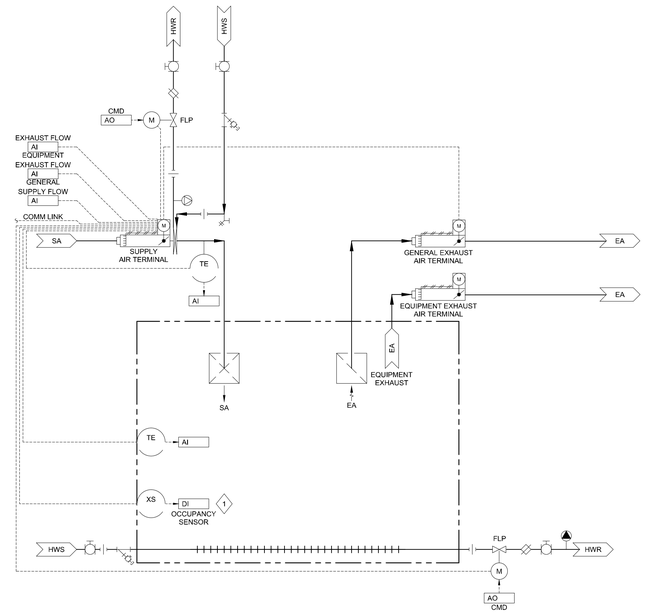
SEQUENCE L1 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT

1 SCALE: NONE



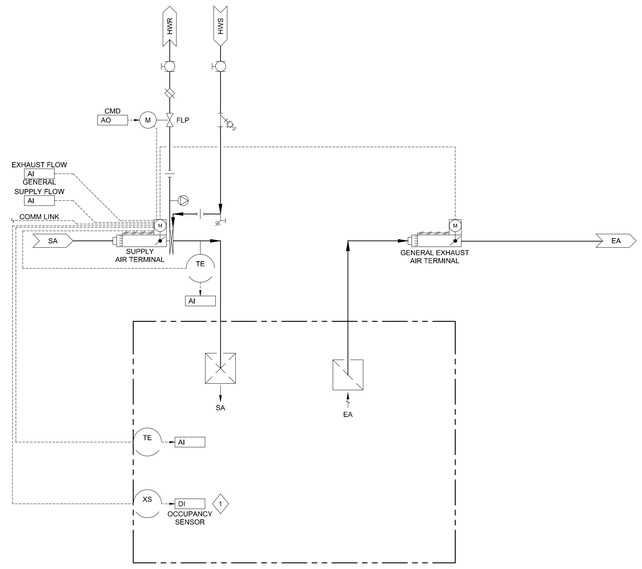
SEQUENCE L6 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - CONSTANT AIR VOLUME GENERAL EXHAUST - CONSTANT VOLUME EQUIPMENT EXHAUST - EXHAUST / SUPPLY AIR TRACKING

6 SCALE: NONE



SEQUENCE L4 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - FIN TUBE RADIATION - CONSTANT AIR VOLUME GENERAL EXHAUST - CONSTANT VOLUME EQUIPMENT EXHAUST - EXHAUST / SUPPLY AIR TRACKING - OCCUPIED / UNOCCUPIED

4 SCALE: NONE



SEQUENCE L2 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - CONSTANT AIR VOLUME GENERAL EXHAUST - EXHAUST / SUPPLY TRACKING - OCCUPIED / UNOCCUPIED

2 SCALE: NONE

GENERAL NOTES

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2. CONTROL/FLOW DIAGRAM INCLUDES GENERAL ARRANGEMENT OF SYSTEM COMPONENTS. REFER TO FLOOR PLANS AND EQUIPMENT SCHEDULES FOR COMPONENT QUANTITIES.

SHEET KEYNOTES

1 OCCUPANCY SENSOR PROVIDED BY DIVISION 26 CONTRACTOR.

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For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25384

Issued for	Date
Bid Package No. 2	02-24-2012

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Drawn WAF

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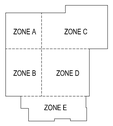
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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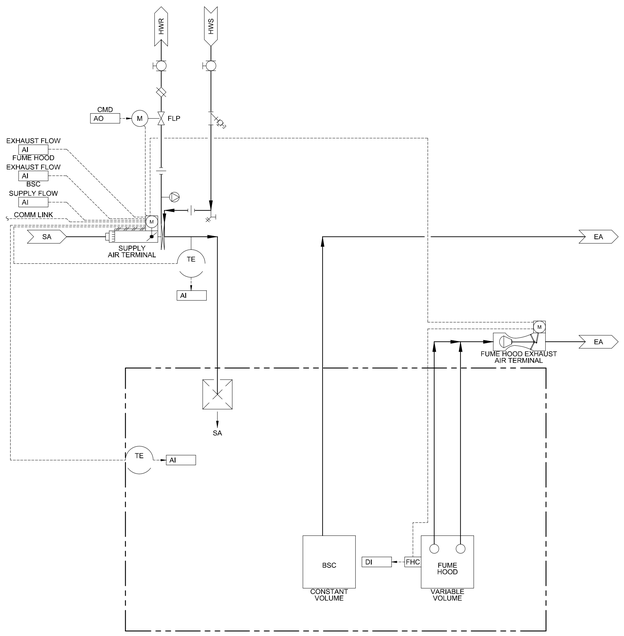
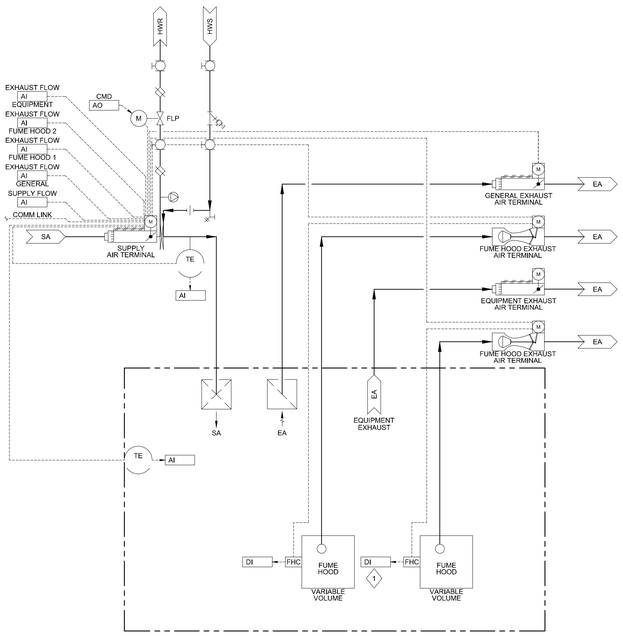
ROOM TYPICAL - CONTROL DIAGRAMS

m7.21



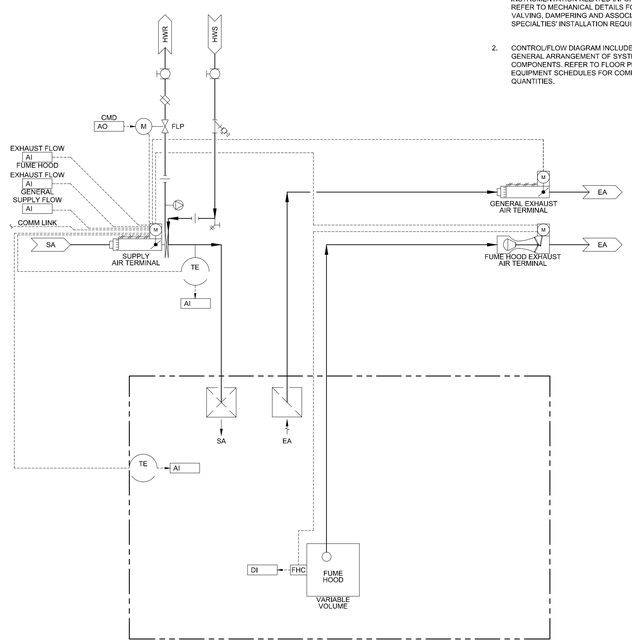
SEQUENCE L11 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - ONE VARIABLE AIR VOLUME FUME HOOD EXHAUST - ONE CONSTANT VOLUME BSC HOOD - EXHAUST / SUPPLY AIR TRACKING

5 SCALE: NONE



SEQUENCE L9 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - MULTIPLE VARIABLE AIR VOLUME FUME HOOD EXHAUST, VARIABLE VOLUME GENERAL EXHAUST - CONSTANT VOLUME EQUIPMENT EXHAUST - EXHAUST / SUPPLY AIR TRACKING

3 SCALE: NONE

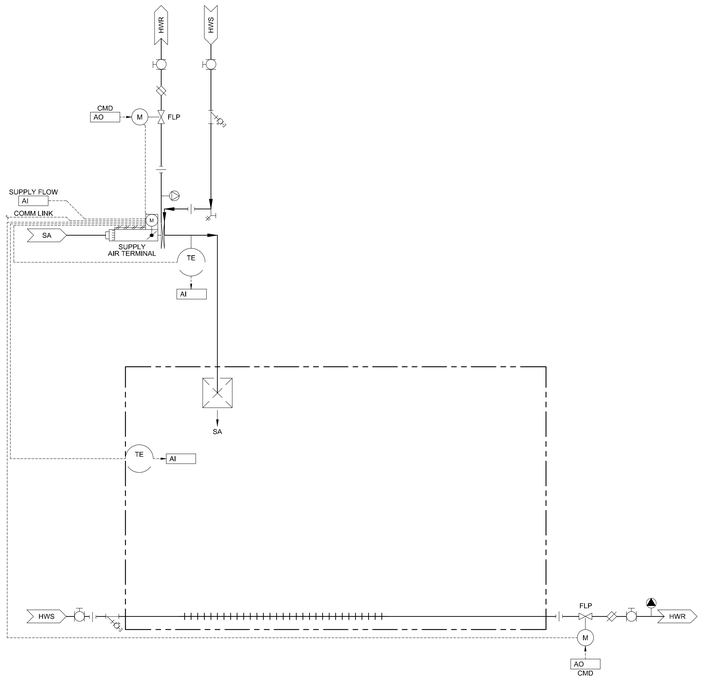


SEQUENCE L7 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - ONE VARIABLE AIR VOLUME FUME HOOD EXHAUST - VARIABLE AIR VOLUME GENERAL EXHAUST - EXHAUST / SUPPLY AIR TRACKING

1 SCALE: NONE

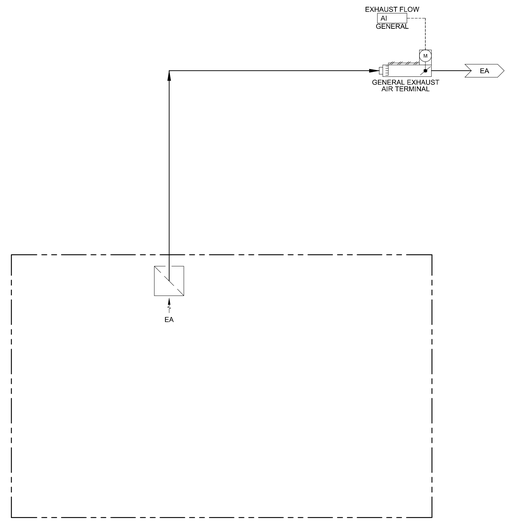
SHEET KEYNOTES

1 TWO FUME HOODS SHOWN, ADDITIONAL ARE SIMILAR.



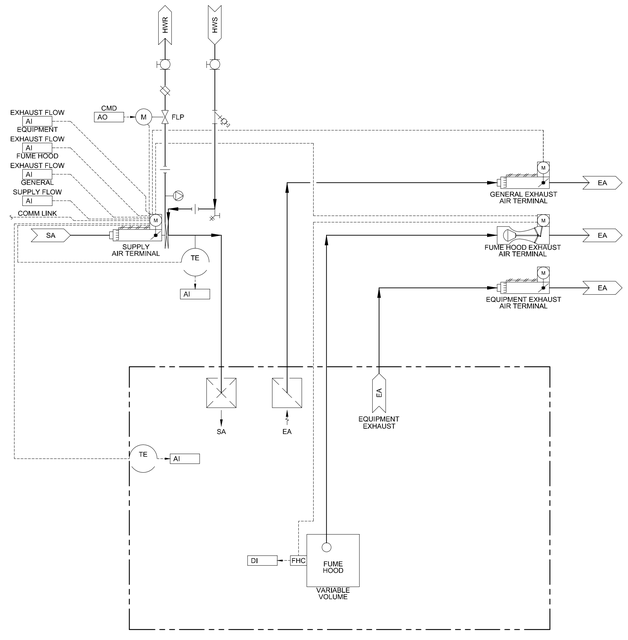
SEQUENCE L12 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - FIN TUBE RADIATION

6 SCALE: NONE



SEQUENCE L10 - CONSTANT AIR VOLUME GENERAL EXHAUST

4 SCALE: NONE



SEQUENCE L8 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - ONE VARIABLE AIR VOLUME FUME HOOD EXHAUST - VARIABLE AIR VOLUME GENERAL EXHAUST - CONSTANT VOLUME EQUIPMENT EXHAUST - EXHAUST / SUPPLY AIR TRACKING

2 SCALE: NONE

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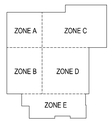
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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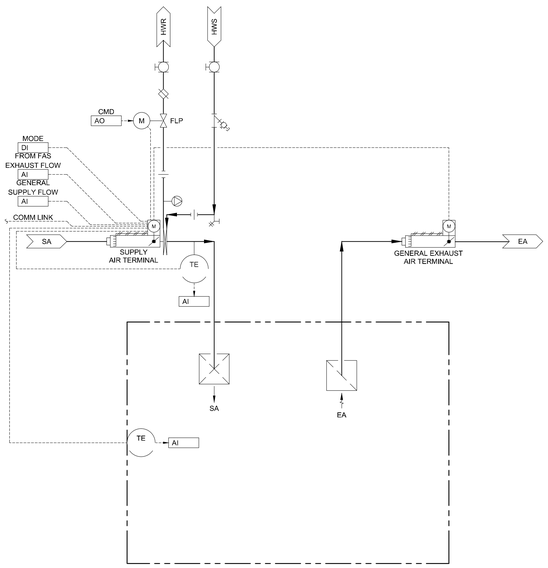
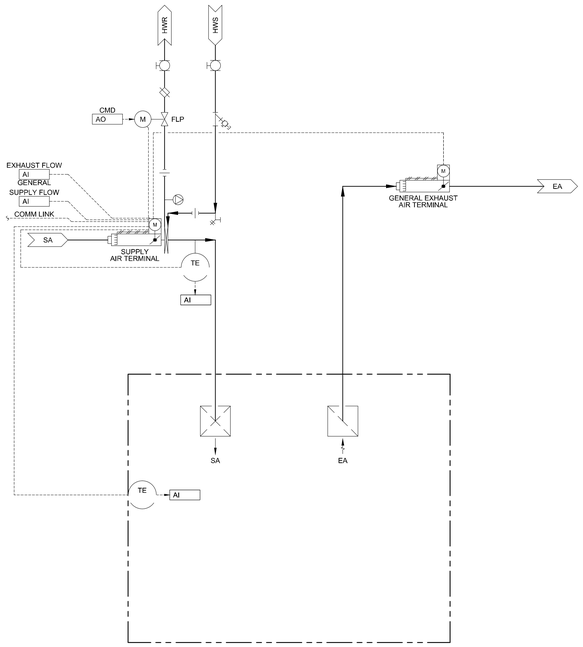
ROOM TYPICAL - CONTROL DIAGRAMS

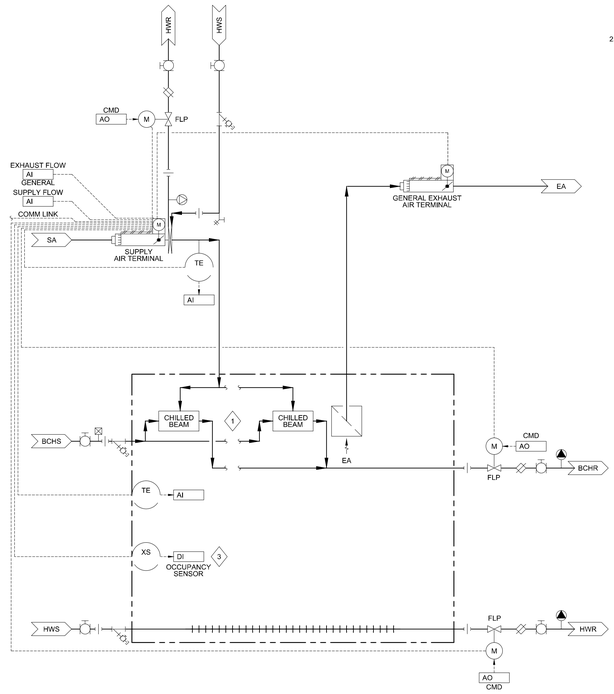
m7.22



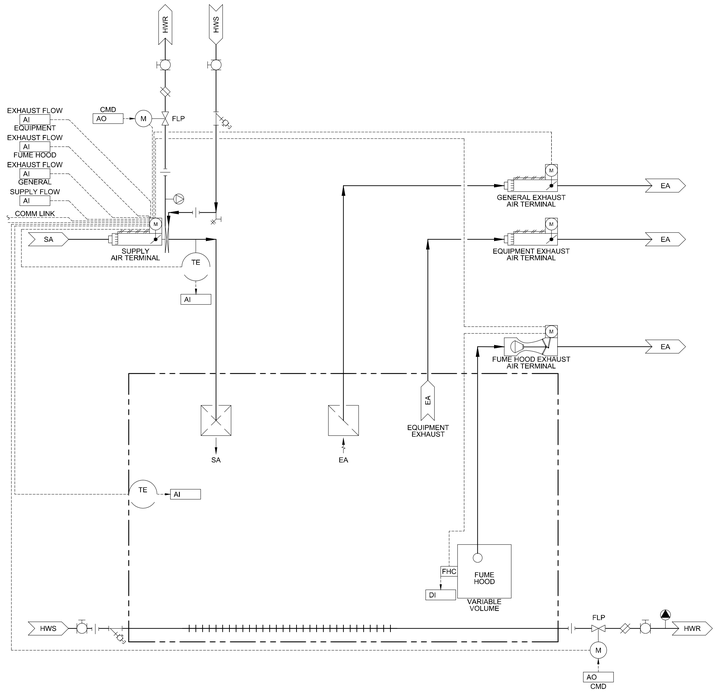
5 **SEQUENCE L22 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - CONSTANT AIR VOLUME GENERAL EXHAUST - EXHAUST / SUPPLY TRACKING - NORMAL/EMERGENCY EXHAUST MODE**
SCALE: NONE



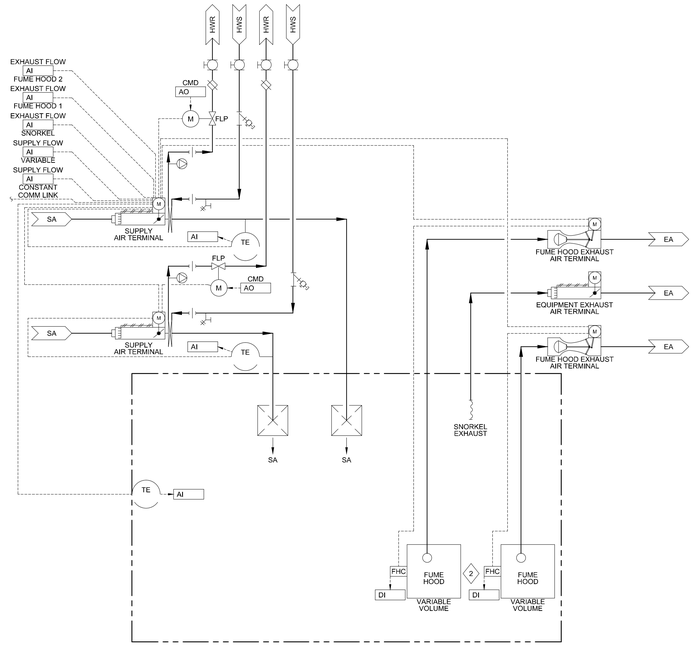
3 **SEQUENCE L15 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - CONSTANT AIR VOLUME EXHAUST - EXHAUST / SUPPLY AIR TRACKING**
SCALE: NONE



1 **SEQUENCE L13 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - FIN TUBE RADIATION - CHILLED BEAMS - CONSTANT AIR VOLUME GENERAL EXHAUST - EXHAUST / SUPPLY AIR TRACKING - OCCUPIED / UNOCCUPIED**
SCALE: NONE



4 **SEQUENCE L16 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - FIN TUBE RADIATION - ONE VARIABLE AIR VOLUME FUME HOOD EXHAUST - VARIABLE AIR VOLUME GENERAL EXHAUST - CONSTANT VOLUME EQUIPMENT EXHAUST - EXHAUST / SUPPLY AIR TRACKING**
SCALE: NONE



2 **SEQUENCE L14 - MULTIPLE VARIABLE AIR VOLUME SUPPLY WITH REHEAT - MULTIPLE VARIABLE AIR VOLUME FUME HOOD EXHAUST - CONSTANT VOLUME SNORKEL EXHAUST - EXHAUST / SUPPLY AIR TRACKING**
SCALE: NONE

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SHEET KEYNOTES

1. TWO CHILLED BEAMS SHOWN, ADDITIONAL CHILLED BEAMS ARE SIMILAR.
2. TWO FUME HOODS SHOWN, ADDITIONAL ARE SIMILAR.
3. OCCUPANCY SENSOR PROVIDED BY DIVISION 26 CONTRACTOR.

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By

Name MICHAEL J. BROGE

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Issued for	Date
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Project Directive No. 3	05-11-2012

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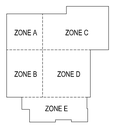
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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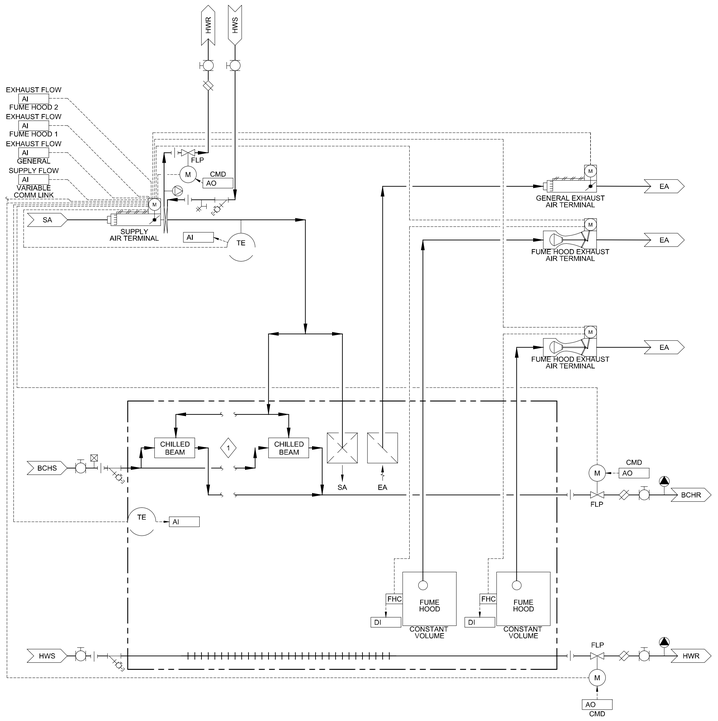
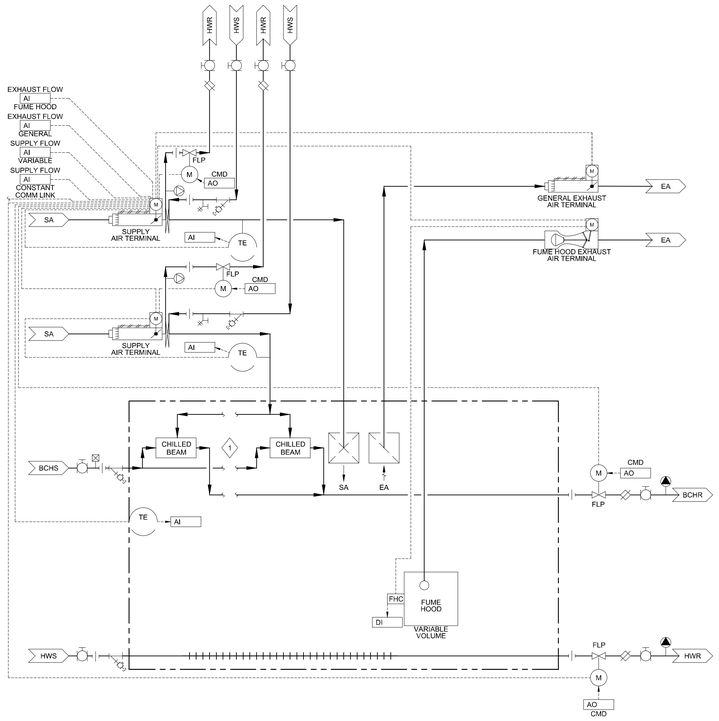
ROOM TYPICAL - CONTROL DIAGRAMS

m7.23



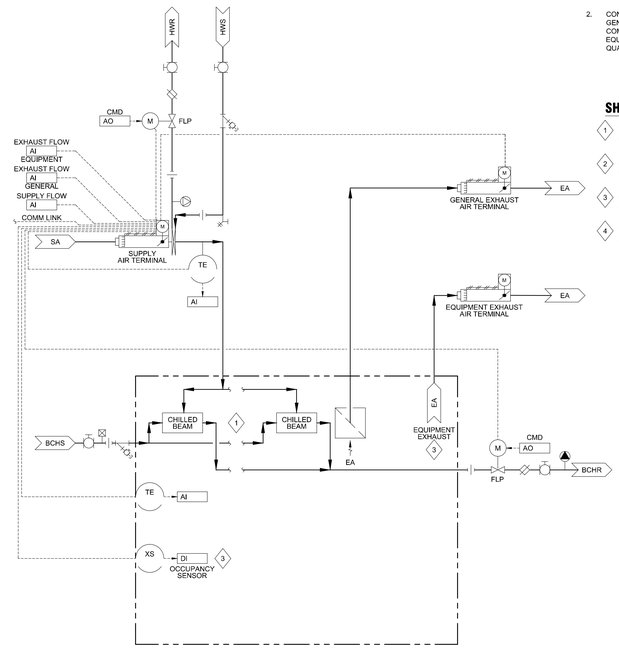
SEQUENCE L21 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - CHILLED BEAM - FIN TUBE RADIATION - MULTIPLE CONSTANT AIR VOLUME FUME HOOD EXHAUST - CONSTANT AIR VOLUME GENERAL EXHAUST - EXHAUST / SUPPLY AIR TRACKING

5 SCALE: NONE



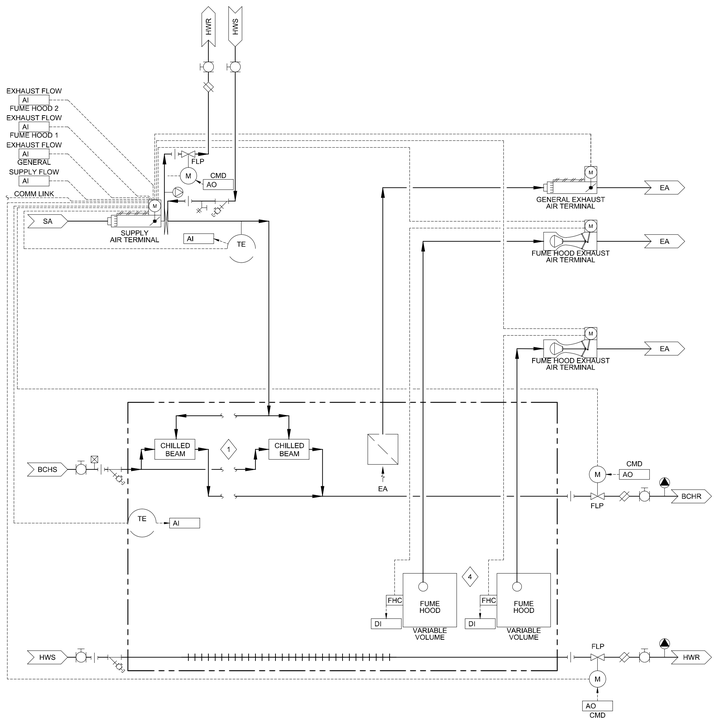
SEQUENCE L19 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - CONSTANT VOLUME SUPPLY WITH REHEAT - CHILLED BEAM - FIN TUBE RADIATION - VARIABLE AIR VOLUME FUME HOOD EXHAUST - VARIABLE VOLUME GENERAL EXHAUST - EXHAUST / SUPPLY AIR TRACKING

3 SCALE: NONE



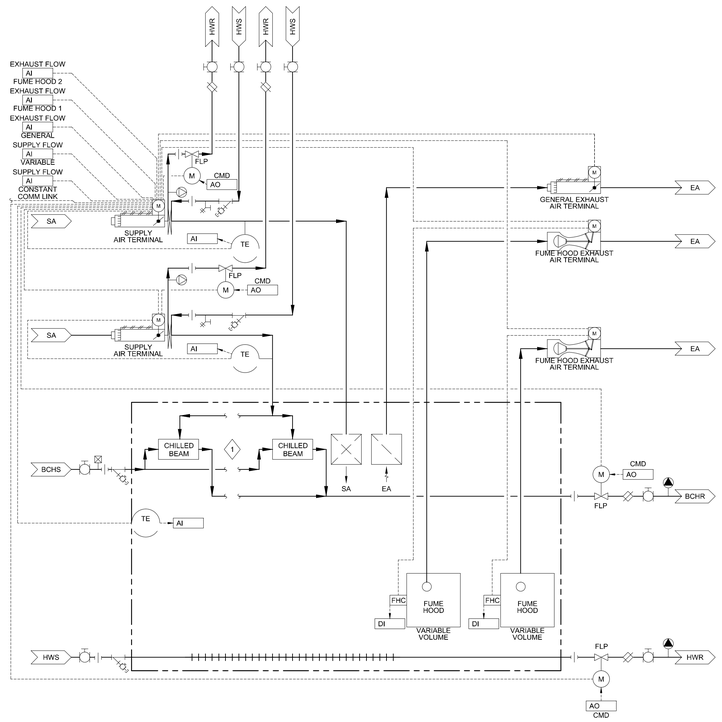
SEQUENCE L17 - CONSTANT AIR VOLUME SUPPLY WITH REHEAT -CHILLED BEAMS - CONSTANT AIR VOLUME GENERAL EXHAUST - CONSTANT AIR VOLUME EQUIPMENT EXHAUST - EXHAUST / SUPPLY AIR TRACKING - OCCUPIED / UNOCCUPIED

1 SCALE: NONE



SEQUENCE L20 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - MULTIPLE VARIABLE AIR VOLUME FUME HOOD EXHAUST - VARIABLE AIR VOLUME GENERAL EXHAUST - CHILLED BEAM - FIN TUBE RADIATION - EXHAUST / SUPPLY AIR TRACKING

4 SCALE: NONE



SEQUENCE L18 - VARIABLE AIR VOLUME SUPPLY WITH REHEAT - CONSTANT AIR VOLUME SUPPLY WITH REHEAT - MULTIPLE VARIABLE AIR VOLUME FUME HOOD EXHAUST - VARIABLE VOLUME GENERAL EXHAUST - CHILLED BEAMS - FIN TUBE RADIATION - EXHAUST / SUPPLY AIR TRACKING

2 SCALE: NONE

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SHEET KEYNOTES

1. TWO CHILLED BEAMS SHOWN, ADDITIONAL CHILLED BEAMS ARE SIMILAR.
2. OCCUPANCY SENSOR PROVIDED BY DIVISION 26 CONTRACTOR.
3. ONE EQUIPMENT EXHAUST SHOWN, ADDITIONAL ARE SIMILAR.
4. TWO FUME HOODS SHOWN, ADDITIONAL ARE SIMILAR.

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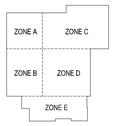

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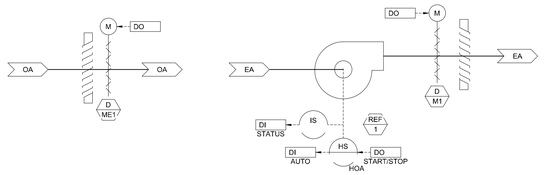
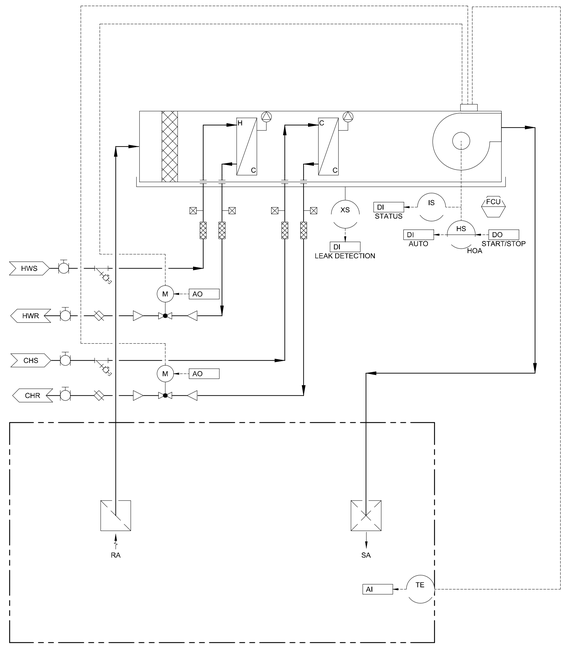
ROOM TYPICAL - CONTROL DIAGRAMS

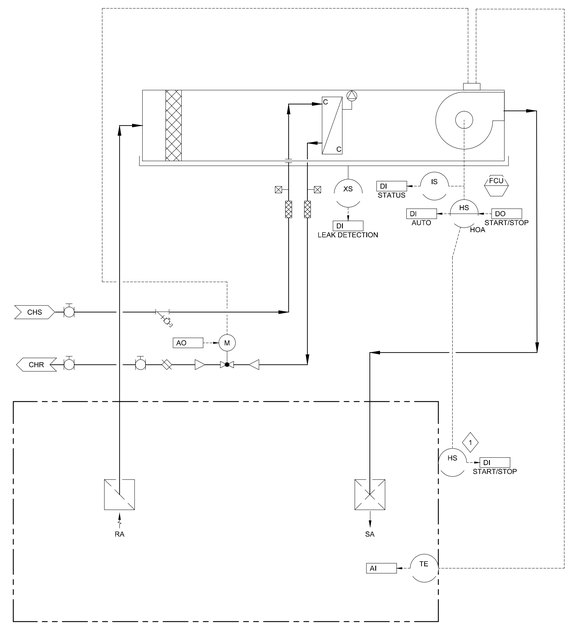
m7.24



5 MECHANICAL ROOM EXHAUST
SCALE: NONE



3 FAN COIL UNIT (HEATING AND COOLING) CONTROL SEQUENCE NUMBER 3.
SCALE: NONE



1 FAN COIL UNIT (COOLING ONLY) CONTROL SEQUENCE NUMBER 1.
SCALE: NONE

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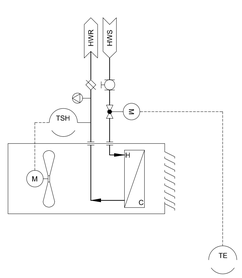
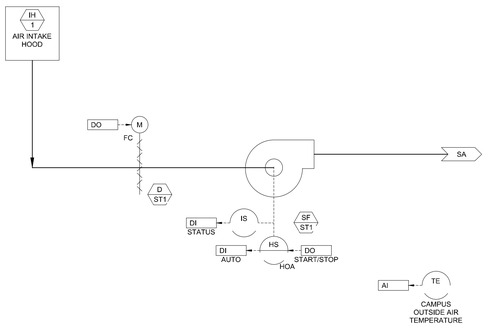
SHEET KEYNOTES

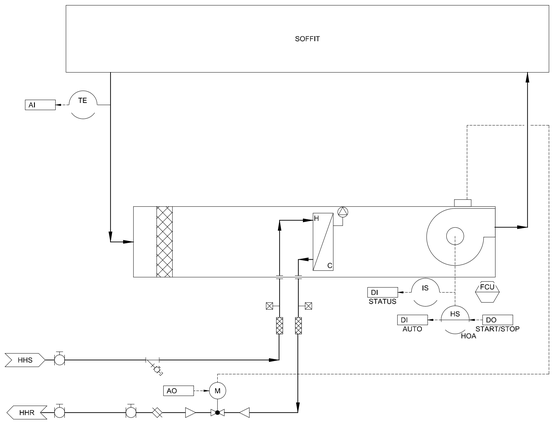
1 PROVIDE REMOTE START/STOP SWITCH AT ENTRANCE DOOR TO FCU-5. LOCATE SWITCH ON OUTSIDE OF ROOM.



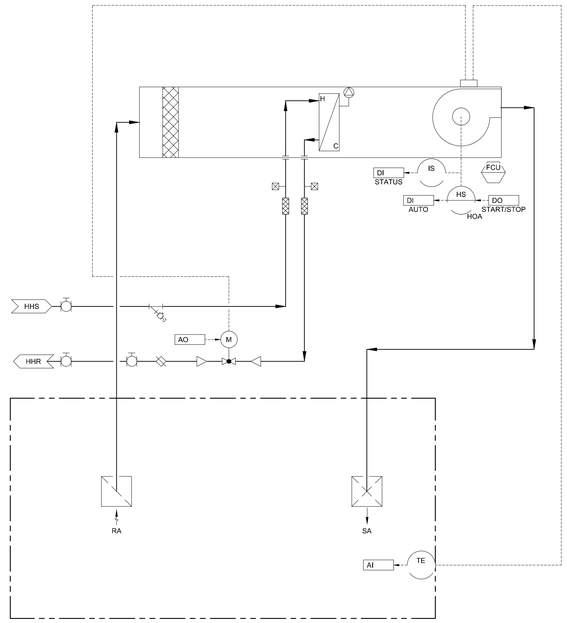
6 UNIT HEATERS AND CABINET HEATERS.
SCALE: NONE



7 SUPPLY FAN SF-ST-1 (STEAM TUNNEL).
SCALE: NONE



4 FAN COIL UNIT (HEATING ONLY) CONTROL SEQUENCE NUMBER 4. (SOFFIT HEATING)
SCALE: NONE



2 FAN COIL UNIT (HEATING ONLY) CONTROL SEQUENCE NUMBER 2.
SCALE: NONE

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For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25384

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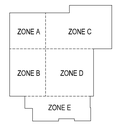
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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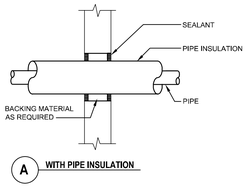
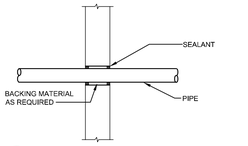
ROOM TYPICAL -
CONTROL DIAGRAMS

m7.25



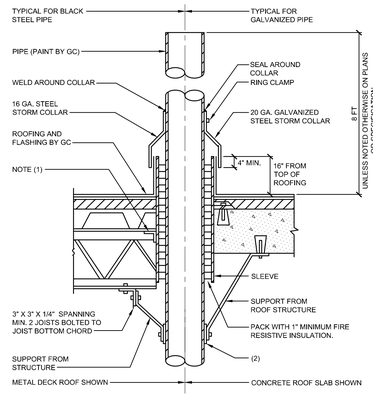
A **WITH PIPE INSULATION**



B **WITHOUT PIPE INSULATION**

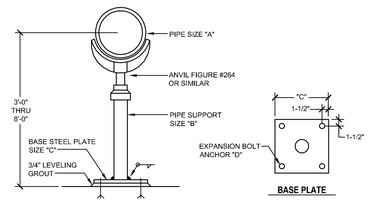
NOTES:
(1) WHERE WALL IS FIRE RATED, APPLY FIRE STOPPING SYSTEM (COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION) MEETING THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.

11 PIPE THRU INTERIOR WALL
SCALE: NONE



NOTES:
(1) BUTT WELD 2-1/2 X 2-1/2 X 1/4 TO TOP CHORD OF JOIST, SPAN BETWEEN JOISTS, FRAME AROUND 4 SIDES OF SLEEVE & WELD TO SLEEVE.
(2) WELD STRAP TO PIPE WHERE PIPE WEIGHT IS SUPPORTED FROM ROOF STRUCTURE. PROVIDE GUIDE WHERE PIPE WEIGHT IS SUPPORTED AT BASE OF RISER.

8 PIPE PENETRATION AT ROOF
SCALE: NONE (NON-INSULATED PIPE)

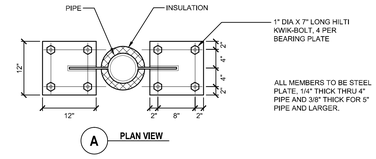


BASE PLATE

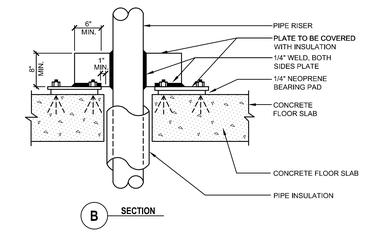
"A"	"B"	"C"	"D"	MAX. WEIGHT (LB.)
3	2-1/2	1/2 X 9 X 9	3/8	170
4	3	1/2 X 9 X 9	1/2	330
6	4	3/4 X 10 X 10	1/2	780
8	4	3/4 X 10 X 10	1/2	1240
10	6	7/8 X 12 X 12	3/4	2200
12	6	7/8 X 12 X 12	3/4	2280
14	6	7/8 X 12 X 12	3/4	2640
16	6	7/8 X 12 X 12	3/4	3260
18	10	1 X 16 X 16	1	4940
20	10	1 X 16 X 16	1	5890
24	10	1 X 16 X 16	1	8010
30	12	1 X 16 X 16	1	13000

NOTES:
(1) ALL DIMENSIONS IN INCHES.
(2) CONCRETE FLOOR SLAB TO HAVE MIN. 3500 PSI.
(3) SUPPORT PIPE TO BE ASME A53, GRADE B, TYPE E OR S, STANDARD WEIGHT, CARBON STEEL.
(4) EXPANSION BOLTS TO HAVE ICBO OR EQUIVALENT LISTING.

5 PIPE SUPPORT
SCALE: NONE (PIPE HEIGHT BETWEEN 3'-0" AND 8'-0")

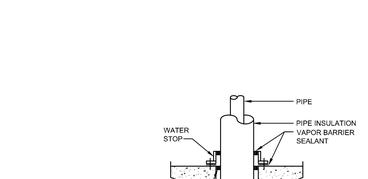


A **PLAN VIEW**



B **SECTION**

1 PIPE ANCHOR AT SLAB
SCALE: NONE

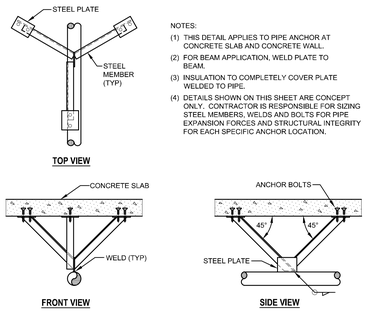


NOTES:
(1) "LINK-SEAL" MODULAR WALL AND CASING SEAL BY THUNDERLINE CORPORATION. USE 316 SS NUTS AND BOLTS.
(2) REFER TO SPECIFICATION SECTION 20 0000 FOR ADDITIONAL REQUIREMENTS.
(3) FASTEN TO WALL WITH EXPANSION ANCHORS & SS SCREWS. ESCUTCHEON NOT REQUIRED FOR BELOW GRADE APPLICATION.
(4) FOR CORE DRILLED HOLE, INSTALL "LINK-SEAL" SEAL BETWEEN PIPE AND OPENING WITHOUT SLEEVE. SIZE OPENING AS RECOMMENDED BY SEAL MANUFACTURER.
(5) FOR INSULATED PIPE, EXTEND INSULATION TO SEAL AT BOTH SIDES. ATTACH ESCUTCHEON TO INSULATION JACKET.

12 PIPE THRU EXTERIOR WALL INTO BUILDING SPACE
SCALE: NONE (CHILLED WATER AND CONDENSER WATER PIPING)

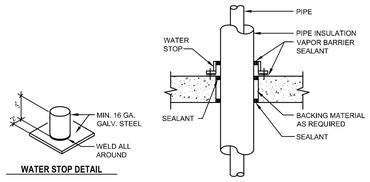
NOTES:
(1) ALL PIPE PENETRATIONS THRU FLOORS SHALL UTILIZE THIS DETAIL.
(2) WHERE FLOOR IS FIRE RATED, APPLY FIRE STOPPING SYSTEM (COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION MEETING THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.

13 PIPE THRU FLOOR SLEEVE
SCALE: NONE (CAST IN PLACE WITH PIPE INSULATION)



NOTES:
(1) THIS DETAIL APPLIES TO PIPE ANCHOR AT CONCRETE SLAB AND CONCRETE WALL.
(2) FOR BEAM APPLICATION, WELD PLATE TO BEAM.
(3) INSULATION TO COMPLETELY COVER PLATE WELDED TO PIPE.
(4) DETAILS SHOWN ON THIS SHEET ARE CONCEPT ONLY. CONTRACTOR IS RESPONSIBLE FOR SIZING STEEL MEMBERS, WELDS AND BOLTS FOR PIPE EXPANSION FORCES AND STRUCTURAL INTEGRITY FOR EACH SPECIFIC ANCHOR LOCATION.

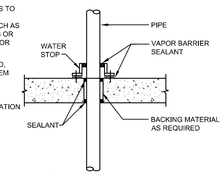
14 ANCHOR TO CONCRETE SLAB
SCALE: NONE



WATER STOP DETAIL

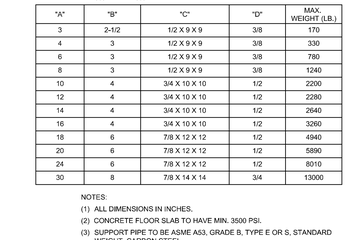
A **WITH PIPE INSULATION**

NOTES:
(1) WATER STOP DETAIL APPLIES TO MECHANICAL ROOM FLOOR WHERE WET EQUIPMENT SUCH AS PIPING, CONVERTORS, COILS OR PUMPS ARE LOCATED (WITH OR WITHOUT INSULATION).
(2) WHERE FLOOR IS FIRE RATED, APPLY FIRE STOPPING SYSTEM (COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION) MEETING THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.



B **WITHOUT PIPE INSULATION**

9 PIPE THRU MECHANICAL ROOM FLOOR
SCALE: NONE

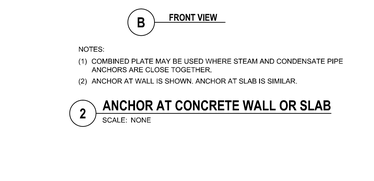


BASE PLATE

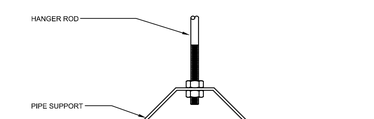
"A"	"B"	"C"	"D"	MAX. WEIGHT (LB.)
3	2-1/2	1/2 X 9 X 9	3/8	170
4	3	1/2 X 9 X 9	3/8	330
6	3	1/2 X 9 X 9	3/8	780
8	3	1/2 X 9 X 9	3/8	1240
10	4	3/4 X 10 X 10	1/2	2200
12	4	3/4 X 10 X 10	1/2	2280
14	4	3/4 X 10 X 10	1/2	2640
16	4	3/4 X 10 X 10	1/2	3260
18	6	7/8 X 12 X 12	1/2	4940
20	6	7/8 X 12 X 12	1/2	5890
24	6	7/8 X 12 X 12	1/2	8010
30	8	7/8 X 14 X 14	3/4	13000

NOTES:
(1) ALL DIMENSIONS IN INCHES.
(2) CONCRETE FLOOR SLAB TO HAVE MIN. 3500 PSI.
(3) SUPPORT PIPE TO BE ASME A53, GRADE B, TYPE E OR S, STANDARD WEIGHT, CARBON STEEL.
(4) EXPANSION BOLTS TO HAVE ICBO OR EQUIVALENT LISTING.

6 PIPE SUPPORT
SCALE: NONE (MAXIMUM PIPE HEIGHT = 3'-0")



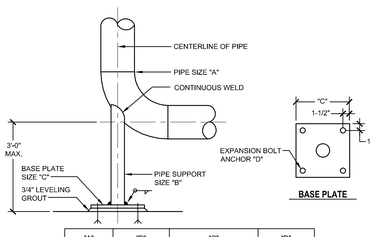
A **SECTION**



B **FRONT VIEW**

NOTES:
(1) COMBINED PLATE MAY BE USED WHERE STEAM AND CONDENSATE PIPE ANCHORS ARE CLOSE TOGETHER.
(2) ANCHOR AT WALL IS SHOWN. ANCHOR AT SLAB IS SIMILAR.

2 ANCHOR AT CONCRETE WALL OR SLAB
SCALE: NONE

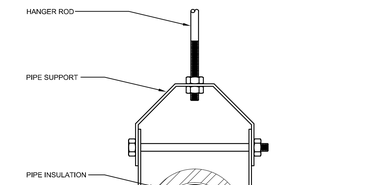


BASE PLATE

"A"	"B"	"C"	"D"
6	3	1/2 X 9 X 9	3/8
8	3	1/2 X 9 X 9	3/8
10	4	3/4 X 10 X 10	1/2
12	4	3/4 X 10 X 10	1/2
14	4	3/4 X 10 X 10	1/2
16	4	3/4 X 10 X 10	1/2
18	6	7/8 X 12 X 12	1/2
20	6	7/8 X 12 X 12	1/2
24	6	7/8 X 12 X 12	1/2
30	8	7/8 X 14 X 14	3/4

NOTES:
(1) ALL DIMENSIONS IN INCHES.
(2) CONCRETE FLOOR SLAB TO HAVE MIN. 3500 PSI.
(3) SUPPORT PIPE TO BE ASME A53, GRADE B, TYPE E OR S, STANDARD WEIGHT, CARBON STEEL.
(4) EXPANSION BOLTS TO HAVE ICBO OR EQUIVALENT LISTING.

7 PIPE SUPPORT
SCALE: NONE

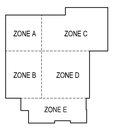


NOTES:
(1) REFER TO SPECIFICATION SECTION 20 0529 FOR INSULATED PIPE SUPPORTS, INSULATION PROTECTION SHIELDS AND SADDLES.

3 PIPE HANGER
SCALE: NONE (MSS TYPE-43 ROLLER HANGER)

NOTES:
(1) REFER TO SPECIFICATION SECTION 20 0529 FOR INSULATED PIPE SUPPORTS, INSULATION PROTECTION SHIELDS AND SADDLES.

4 PIPE HANGER
SCALE: NONE (MSS TYPE-1 CLEVIS HANGER)



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For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25364

Issued for	Date
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Bid Package No. 2	02-24-2012

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Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718

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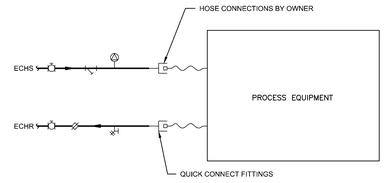
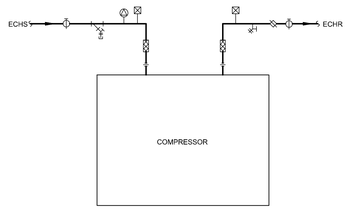
DETAILS

m8.01



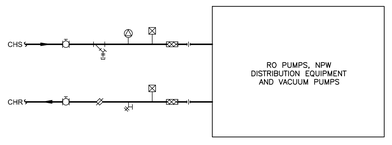
9 TYPICAL PROCESS COOLING EQUIPMENT PIPE CONNECTION

SCALE: NONE



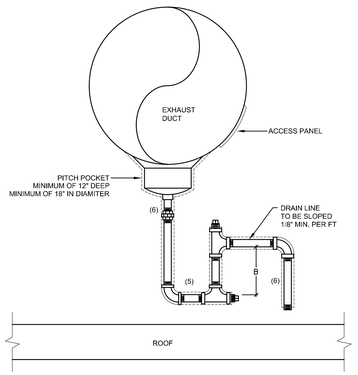
10 HELIUM RECOVERY AND SCREW COMPRESSOR PIPING DETAIL

SCALE: NONE



11 RO PUMPS, NPW DISTRIBUTION EQUIPMENT AND VACUUM PUMPS PIPING

SCALE: NONE



NOTES:

(1) FILL TRAP MANUALLY ON INITIAL START-UP.

(2) TRAP EACH COMPONENT DRAIN CONNECTION.

(3) PIPE SIZE SHALL BE 3/4" OR DRAIN PAN CONNECTION SIZE, WHICHEVER IS LARGER.

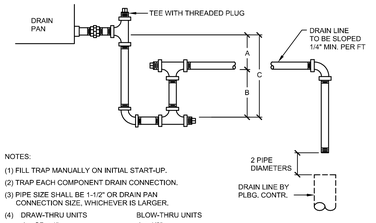
(4) B = 10"

(5) FILL TRAP AT START UP WITH MINERAL OIL.

(6) INSULATE AND HEAT TRACE PITCH POCKET AND DRAIN LINE

12 EXHAUST DUCTWORK CONDENSATE DRAIN TRAP PIPING

SCALE: NONE



NOTES:

(1) FILL TRAP MANUALLY ON INITIAL START-UP.

(2) TRAP EACH COMPONENT DRAIN CONNECTION.

(3) PIPE SIZE SHALL BE 1-1/2" OR DRAIN PAN CONNECTION SIZE, WHICHEVER IS LARGER.

(4) DRAW-THRU UNITS
A = SP + 1"
B = 1/2 SP + 1/2"
C = 1-1/2 SP + 1-1/2"

BLOW-THRU UNITS
A = 1/2"
B = SP + 1/2"
C = SP + 1"

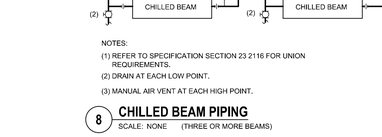
SP TO BE MAXIMUM STATIC PRESSURE (SP) ON DRAIN PAN INCLUDING MAXIMUM FILTER PRESSURE DROP AND PRESSURE DROP OF FUTURE COMPONENTS OF UNIT IF APPLICABLE.

(5) RAISE COIL SECTION OR ENTIRE AIR HANDLING UNIT WITH STRUCTURAL MEMBERS OR STANDS TO PROVIDE PROPER TRAP HEIGHT.

UNIT	A	B
AHU-L1, L2, L3 & L4	6	3
AHU-O1	6	3
AHU-C1	8	4
ALL FCUs	4	2

5 COOLING COIL CONDENSATE DRAIN TRAP PIPING

SCALE: NONE



NOTES:

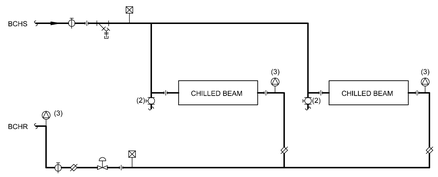
(1) INSTALL FLOW ELEMENT IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS WITH RECOMMENDED UPSTREAM AND DOWNSTREAM STRAIGHT PIPE.

(2) INSTALL FLOW STRAIGHTENING DEVICE IF FURNISHED WITH FLOW ELEMENT.

(3) SHUT-OFF VALVES ARE NOT REQUIRED IF FLOW ELEMENT HAS HOT TAP FEATURE.

6 FLOW ELEMENT (MEASURING STATION)

SCALE: NONE



NOTES:

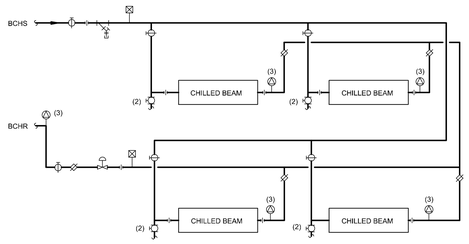
(1) REFER TO SPECIFICATION SECTION 23 2116 FOR UNION REQUIREMENTS.

(2) DRAIN AT EACH LOW POINT.

(3) MANUAL AIR VENT AT EACH HIGH POINT.

7 CHILLED BEAM PIPING

SCALE: NONE (ONE OR TWO BEAMS)



NOTES:

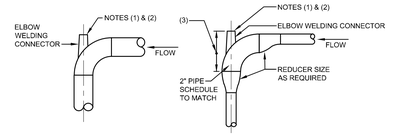
(1) REFER TO SPECIFICATION SECTION 23 2116 FOR UNION REQUIREMENTS.

(2) DRAIN AT EACH LOW POINT.

(3) MANUAL AIR VENT AT EACH HIGH POINT.

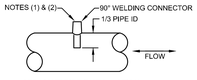
8 CHILLED BEAM PIPING

SCALE: NONE (THREE OR MORE BEAMS)



ELBOW INSTALLATION PIPE 2" AND LARGER

ELBOW INSTALLATION PIPE 1-1/2" AND SMALLER



STRAIGHT PIPE INSTALLATION

NOTES:

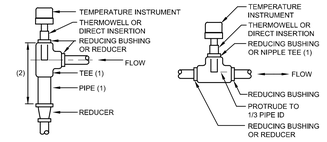
(1) USE THREADED CONNECTOR FOR THREADED WELLS. USE SOCKET OR BUTT WELD CONNECTOR AND FLANGE FOR FLANGED WELLS.

(2) FOR DIRECT INSERTION TEMPERATURE INSTRUMENTS, PROVIDE 1/2" WELD-O-LET.

(3) UN-REDUCED RUN MUST EXCEED THERMOWELL LENGTH PLUS 2 INCHES

1 TEMPERATURE INSTRUMENTS

SCALE: NONE (WELDED PIPE)



ELBOW INSTALLATION PIPE 2" AND SMALLER

TEE INSTALLATION PIPE 2" AND SMALLER

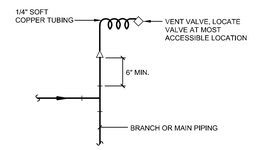
NOTES:

(1) USE TEE APPROPRIATELY SIZED TO MAINTAIN NET AREA NOT LESS THAN CROSS SECTIONAL AREA OF CONNECTED PIPE.

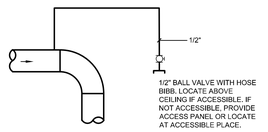
(2) UN-REDUCED RUN SHALL EXCEED THERMOWELL OR DIRECT INSERTION LENGTH PLUS 2 INCHES.

2 TEMPERATURE INSTRUMENTS

SCALE: NONE (THREADED PIPE)



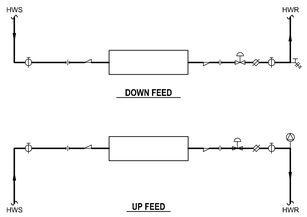
A COILS AND SUBCIRCUITS



B MAIN PIPES

3 AIR VENT PIPING

SCALE: NONE



NOTES:

(1) REFER TO SPECIFICATION SECTION 23 2116 FOR UNION REQUIREMENTS.

(2) REFER TO SPECIFICATION SECTION 23 2118 FOR BALANCING VALVE SIZING AND STRAIGHT INLET AND OUTLET PIPING REQUIREMENTS.

4 HOT WATER FIN TUBE RADIATION PIPING

SCALE: NONE

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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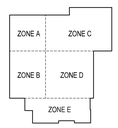
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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DETAILS

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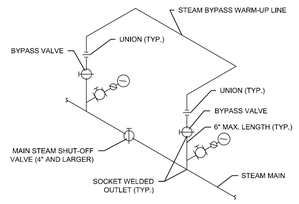
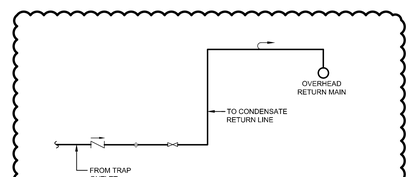


NOTES:

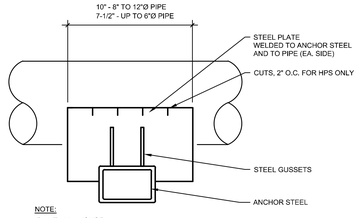
1. PIPE: ASTM A105 SCHED. 80
2. FITTINGS: CLASS 300 FORGED STEEL SOCKET WELD
3. BYPASS VALVES: CLASS 800 FORGED STEEL SOCKET WELD
4. MAIN VALVE SIZES BETWEEN 4"-8" REQUIRE A BYPASS VALVE SIZE OF 3/4".
5. MAIN VALVE SIZES BETWEEN 10"-12" REQUIRE A BYPASS VALVE SIZE OF 1"

9 STEAM BYPASS PIPING DETAIL
SCALE: NONE



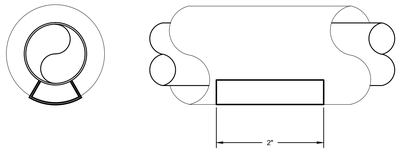
NOTES:
(1) UNLESS SPECIFICALLY SHOWN ON DRAWINGS, OBTAIN APPROVAL FROM ENGINEER BEFORE APPLYING THIS DETAIL. DO NOT USE ON HEATING COILS HANDLING OUTSIDE AIR.
(2) DO NOT EXCEED ONE FOOT OF LIFT BETWEEN TRAP DISCHARGE AND OVERHEAD RETURN MAIN FOR EACH POUND OF PRESSURE DIFFERENTIAL.

10 STEAM CONDENSATE LIFT TO OVERHEAD RETURN
SCALE: NONE



NOTE:
- PAINT ALL ANCHOR STEEL AND WELDS PER SPEC.
- 14" AND SMALLER PIPE DIAMETER

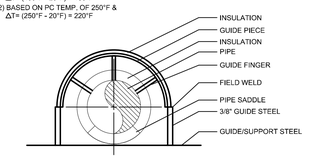
5 TYPICAL PIPE ANCHOR
SCALE: NONE



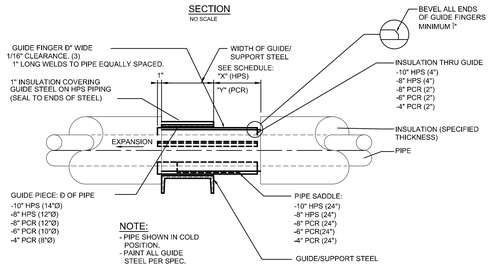
6 HIGH PRESSURE STEAM SUPPORT
SCALE: NONE

DISTANCE FROM ANCHOR (FT.)	INCHES	
	(1) HPS "X"	(2) PCR "Y"
0-30	2"	2"
31-60	3"	2"
61-100	4"	3"
101-130	5"	4"
131-160	7"	4"
161-200	8"	5"
201-230	9"	5"
231-270	10"	5"
271-310	11"	6"

(1) BASED ON STEAM TEMP. OF 450°F & ΔT= (450°F - 20°F) = 430°F
(2) BASED ON PC TEMP. OF 250°F & ΔT= (250°F - 20°F) = 220°F

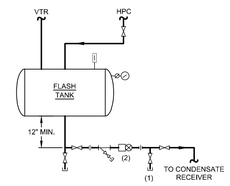


SECTION
NO SCALE



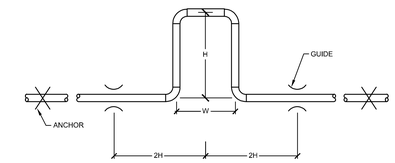
NOTE:
- PIPE SHOWN IN COLD POSITION.
- PAINT ALL GUIDE STEEL PER SPEC.

7 TYPICAL PIPE GUIDE DETAIL
SCALE: NONE



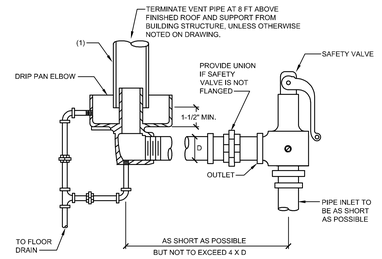
NOTE:
(1) TEST VALVE WITH 6" NIPPLE AND CAP. TEST VALVE TO BE LINE SIZE, BUT NOT LARGER THAN 1". LOCATE TEST VALVE AT SIDE OF PIPE.
(2) TRAP TO BE F&T TYPE.

8 FLASH TANK PIPING
SCALE: NONE



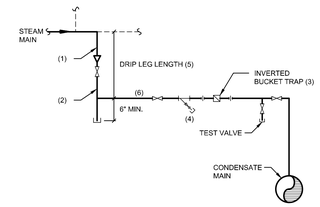
MARK	H (FT)	W (FT)	ANCHOR FORCE (LB)
EL-1	4	4	1200
EL-2	4	4	600

1 EXPANSION LOOP
SCALE: NONE



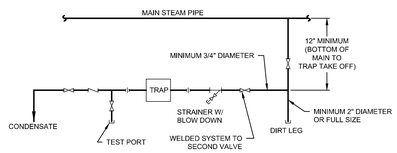
NOTES:
(1) MINIMUM STRAIGHT PIPE SHALL BE 5 PIPE DIAMETERS OR 4 FT WHICHEVER IS LONGER.

2 SAFETY VALVE DRIP PAN ELBOW
SCALE: NONE



NOTES:
(1) DRIP LEG TO BE SAME AS MAIN THRU 4". ABOVE 4", DRIP LEG TO BE AT LEAST 1/2 MAIN SIZE BUT NOT LESS THAN 4".
(2) FULL SIZE OF DRIP LEG UP TO 2". DRIP LEG GREATER THAN 2" SHALL BE 2" MINIMUM.
(3) DRIP TRAPS - 3/4" FOR MAIN PIPE SIZE THROUGH 8" AND 1" FOR MAIN PIPE 10" AND LARGER, UNLESS OTHERWISE NOTED.
(4) STRAINER WITH BLOW DOWN.
(5) DRIP LEG LENGTH TO BE AT LEAST 1-1/2 TIMES DIAMETER OF MAIN, BUT NEVER LESS THAN 12".
(6) MINIMUM PIPE DIAMETER TO BE 1". WELDED SYSTEM TO SECOND VALVE.

3 STEAM MAIN DRIP, END OF MAIN DRIP OR RISER DRIP
SCALE: NONE



NOTES:
(1) HIGH PRESSURE - ALL WELDED CONSTRUCTION EXCEPT VALVES, STRAINERS, AND TRAPS

4 TYPICAL STEAM TUNNEL STEAM TRAP DETAIL
SCALE: NONE

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For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25364

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Project Directive No. 3	05-15-2012

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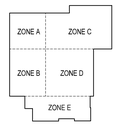
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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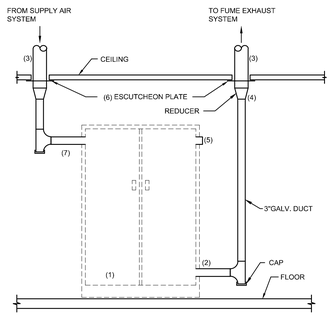


NOTES:

(1) CABINET BY OTHERS.

(2) 2" GALVANIZED, THREADED SCHEDULE 40 NIPPLE SCREWED INTO CABINET, WELDED TO DUCT.

(3) 40 EQUIPMENT DROP PER DETAIL 2/M404.

(4) EXHAUST CONNECTIONS ARE SHOWN FOR VAPORS HEAVIER THAN AIR AND LIGHTER THAN AIR VAPORS

(5) OPEN END PIPE CONNECTION FOR MAKE UP AIR.

(6) ESCUTCHEON PLATE NOT REQUIRED IF THERE IS NO CEILING.

(7) PROVIDE SUPPLY AIR WHERE SHOWN ON DRAWINGS.

13 STAND ALONE ONLY FLAMMABLE STORAGE CABINET

SCALE: NONE (NOT UNDER HOODS)

DUCT DIMENSION	TRANSVERSE JOINT,RE/INFORCEMENT SPACING 42 3/4" (4'-0")	MIN. DUCT GAUGE	DUCT MATERIAL
20" DN	T-24 (M) W/J	24 GA.	PVC COATED (4 MIL INTERIOR SIDE, 4 MIL OUTSIDE)
21"-36"	T-24 (M) W/J	22 GA.	OR (OPTIONAL)
37"-42"	T-24 (M) W/J	20 GA.	G-90 GALVANEAL COATED WITH PLASITE
43"-54"	T-24 (M) W/J	18 GA.	(7-10 MIL) SYSTEM AT INTERIOR ONLY.

M = MODIFIED: AS SHOWN BELOW (RIGHT).

NOTES:

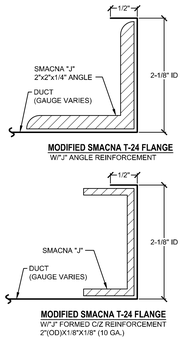
(1) USE TRANSVERSE REINFORCEMENTS (SHOWN RIGHT) TO ENCAPSULATE THE MODIFIED T-24 FLANGE THAT IS FORMED FROM 48" WIDE SHEET METAL ROLL OR FLAT SHEET STOCK. USE "J" REINFORCEMENTS BACK TO BACK ON ADJACENT SIDES WITH FULLY LAPPED 3/8" BOLTED CORNERS, SEAL CORNER OF DUCT WITH CHEMICAL RESISTANT SEALANT. BOLT (1/4"@8" INTERVALS) OR SCREW (#12@6" INTERVALS) "J" REINFORCEMENTS AROUND ENTIRE PERIPHERY OF EACH TRANSVERSE JOINT.

(2) NO INTERMEDIATE REINFORCEMENT IS REQUIRED.

(3) NO SCREWS THROUGH EITHER PVC COATED OR PLASITE COATED DUCT, UNLESS OTHERWISE SPECIFIED.

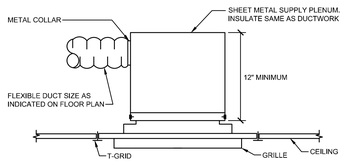
(4) USE TRAPEZE SUPPORT HANGERS FOR RECTANGULAR FUME HOOD DUCTWORK.

(5) USE BUTYL GASKET AROUND OUTSIDE HALF OF FLANGE FACE. AFTER FLANGES OF SECTIONS ARE MATED TOGETHER, FILL INSIDE GAP BETWEEN FLANGES WITH PVC DUCT SEALANT FOR PVC COATED DUCTS OR PLASITE 7122JAS SEALANT FOR PLASITE COATED DUCTS.



14 FUME HOOD EXHAUST DUCT (RECTANGULAR)

SCALE: NONE



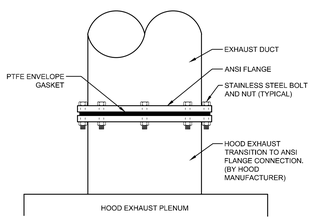
NOTES:

(1) LAY-IN CEILING IS SHOWN. GYP. BOARD CEILING INSTALLATION IS SIMILAR WITH PROPER BORDER.

(2) SUPPORT PLENUM FROM STRUCTURE ABOVE.

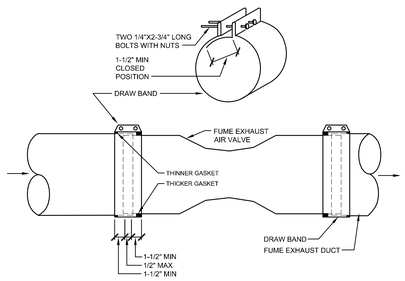
15 DIFFUSER PLENUM DETAIL

SCALE: NONE (TIGHT AREAS ONLY)



16 CLEAN ROOM WET PROCESS BENCH CONNECTION

SCALE: NONE



NOTES:

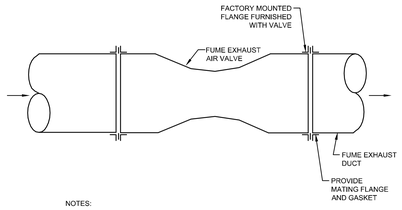
(1) DRAW BANDS SHALL BE:
-FABRICATED FROM THE SAME MATERIAL, AS DUCT SYSTEM.
-INSTALLED TO PROVIDE TIGHT CHEMICAL SEAL AROUND ENTIRE PERIMETER OF DUCT AND AT DEVICE, WITH DRAW BAND FLANGES IN PARALLEL POSITION AFTER BEING FULLY DRAWN TOGETHER.

(2) DRAW BAND GAUGE TO BE MIN. 24 GAUGE.

(3) SEALANT AND GASKET TO BE CHEMICAL RESISTANT MATERIAL. REFER TO SPECIFICATION SECTION 23 3114.

9 FUME EXHAUST AIR VALVE CONNECTION

SCALE: NONE (10 INCH AND SMALLER)



NOTES:

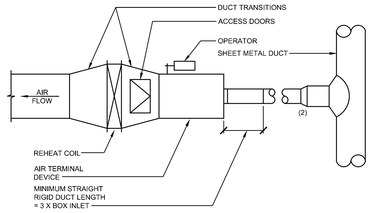
(1) INSTALL ACCORDING TO MANUFACTURER'S INSTALLATION INSTRUCTIONS.

(2) SEALANT AND GASKET TO BE CHEMICAL RESISTANT MATERIAL. REFER TO SPECIFICATION SECTION 23 3114.

(3) FOR RECTANGULAR DUCTS, USE DUCTMATE CONNECTOR SYSTEM OR OTHER APPROVED SYSTEM WITH NEOPRENE GASKET AND BOLT AT EACH CORNER.

10 FUME EXHAUST AIR VALVE CONNECTION

SCALE: NONE (FLANGE CONNECTION)



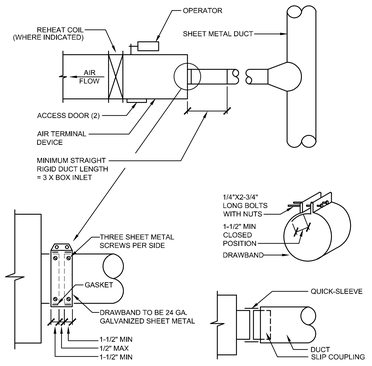
NOTES:

(1) REFER TO SECTION 23 3314 FOR ACCESS DOOR.

(2) UNLESS OTHERWISE SHOWN, INCREASE INLET DUCT SIZE BY 2 INCHES IN DIAMETER IF RUNOUT IS LONGER THAN 8 FT.

11 AIR TERMINAL DEVICE

SCALE: NONE



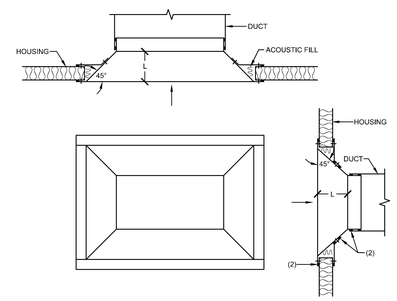
NOTES:

(1) DUCTMATE QUICK-SLEEVE MAY BE USED. USE CENTER BEAD SLIP COUPLING FOR DUCTWORK CONNECTION WITH MINIMUM 3 SHEET METAL SCREWS.

(2) WHERE REHEAT COIL IS MOUNTED IN INLET DUCT (REFER TO SECTION 23 3314).

12 AIR TERMINAL DEVICE DUCT CONNECTION

SCALE: NONE



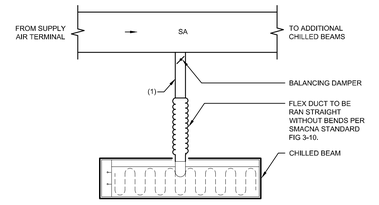
NOTES:

(1) L = 1/4 x (GREATEST DUCT DIMENSION), BUT NOT LESS THAN 6" AND NOT MORE THAN 12".

(2) SEAL ALL JOINTS.

5 BELLMOUTH FITTING FOR RECTANGULAR DUCTS

SCALE: NONE

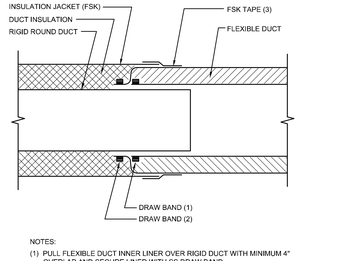


NOTES:

(1) UNLESS OTHERWISE SHOWN ON PLANS, RUNOUT SHALL BE SAME SIZE AS CHILLED BEAM INLET SIZE.

6 CHILLED BEAM DUCT CONNECTION

SCALE: NONE



NOTES:

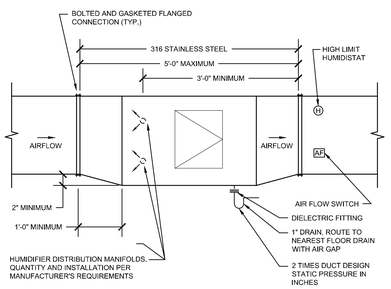
(1) PULL FLEXIBLE DUCT INNER LINER OVER RIGID DUCT WITH MINIMUM 4" OVERLAP AND SECURE LINER WITH SS DRAW BAND.

(2) SECURE FLEXIBLE DUCT INSULATION AND OUTER JACKET WITH METAL OR PLASTIC DRAW BAND.

(3) PULL RIGID DUCT INSULATION AND BUTT JOINT TO TERMINATION OF FLEXIBLE DUCT. APPLY 3" WIDE TAPE SIMILAR TO FSK TAPE TO CREATE VAPOR BARRIER SEAM. TAPE SHALL BE COMPATIBLE WITH FLEXIBLE DUCT INSULATION JACKET AND RIGID DUCT INSULATION JACKET.

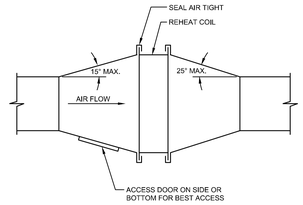
7 FLEXIBLE DUCT CONNECTION TO INSULATED RIGID ROUND DUCT

SCALE: NONE



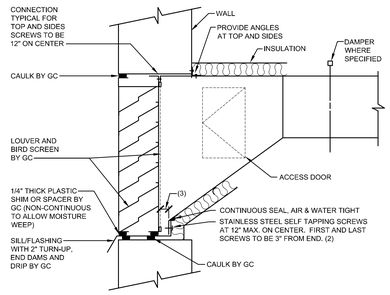
8 DUCT MOUNTED STEAM HUMIDIFIER

SCALE: NONE



1 REHEAT COIL DUCT CONNECTION

SCALE: NONE



NOTES:

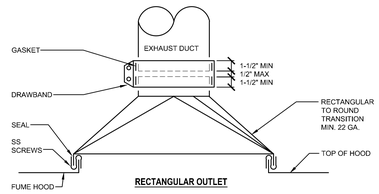
(1) PLENUM CONNECTION TO LOUVER IS SIMILAR.

(2) BOTTOM OF DUCT TO BE COMPLETELY OVERLAPPED WITH TURN-UP. DRILL TURN-UP PRIOR TO INSTALLING SELF TAPPING SCREW TO ENSURE DUCT IS DRAWN TIGHT TO TURN-UP.

(3) MINIMUM 1" SCREW CONNECTION CLEARANCE.

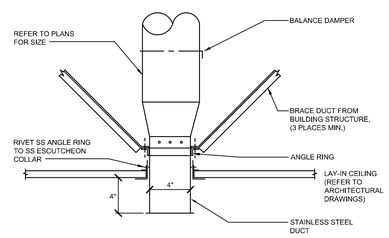
2 DUCT CONNECTION TO LOUVER

SCALE: NONE



3 FUME HOOD CONNECTION

SCALE: NONE



4 SNORKEL DETAIL

SCALE: NONE

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROE

Date 02-24-2012 Reg. No. 25364

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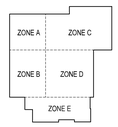
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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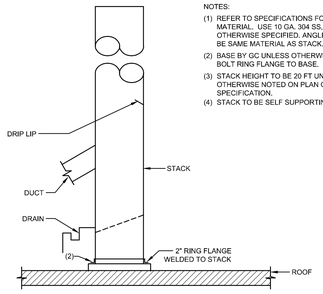
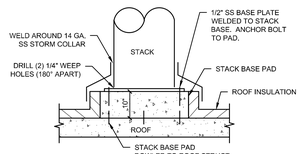
DETAILS

m8.04



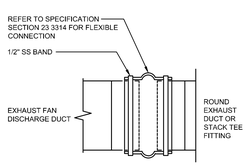
NOTES:
(1) REFER TO SPECIFICATIONS FOR STACK MATERIAL. USE 10 GA. 304 SS, UNLESS OTHERWISE SPECIFIED. ANGLE RINGS TO BE SAME MATERIAL AS STACK.
(2) BASE BY GC UNLESS OTHERWISE NOTED. BOLT RING FLANGE TO BASE.
(3) STACK HEIGHT TO BE 20 FT UNLESS OTHERWISE NOTED ON PLAN OR SPECIFICATION.
(4) STACK TO BE SELF SUPPORTING.

12 FUME EXHAUST FAN AND STACK
SCALE: NONE

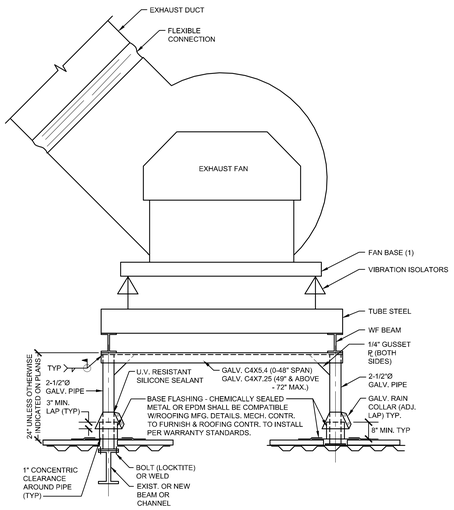


NOTES:
(1) REFER TO SPECIFICATIONS FOR STACK MATERIAL. USE 10 GA. 304 SS, UNLESS OTHERWISE SPECIFIED. ANGLE RINGS TO BE SAME MATERIAL AS STACK.
(2) BASE BY GC UNLESS OTHERWISE NOTED. BOLT RING FLANGE TO BASE.
(3) STACK HEIGHT TO BE 15 FT UNLESS OTHERWISE NOTED ON PLAN OR SPECIFICATION.

13 FUME EXHAUST FAN STACK BASE
SCALE: NONE



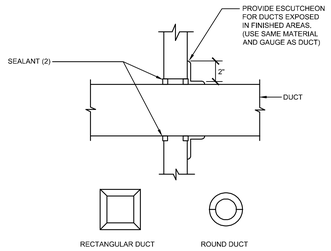
14 LAB EXHAUST FAN OUTLET FLEXIBLE CONNECTION
SCALE: NONE



NOTES:
(1) REFER TO SPECIFICATION SECTION 23 0550 FOR FAN BASE INFORMATION.

BUILT-UP ROOFING

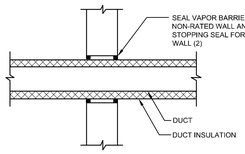
15 FAN SUPPORT ON ROOF
SCALE: NONE



TYPICAL ESCUTCHEON

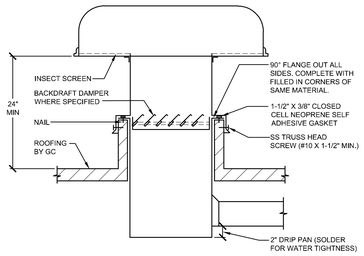
NOTES:
(1) THIS DETAIL APPLIES FOR INSULATED DUCTS THRU WALL WHERE FIRE DAMPER IS NOT REQUIRED.
(2) WHERE WALL IS FIRE RATED, COMBINATION OF SEALANT AND BACKING MATERIAL SHALL MEET THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM MANUFACTURERS.

8 DUCT PENETRATION THROUGH INTERIOR WALL
SCALE: NONE (NON-INSULATED DUCTS)



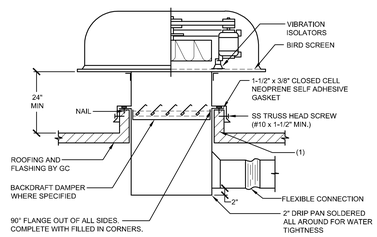
NOTES:
(1) THIS DETAIL APPLIES FOR INSULATED DUCTS THRU WALL WHERE FIRE DAMPER IS NOT REQUIRED.
(2) WHERE WALL IS FIRE RATED, COMBINATION OF SEALANT, BACKING MATERIAL AND INSULATION SHALL MEET THIS RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM MANUFACTURERS.

9 DUCT PENETRATION THROUGH INTERIOR WALL
SCALE: NONE (INSULATED DUCTS)



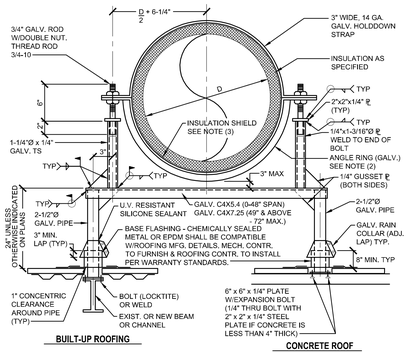
NOTES:
(1) CURB AND FLASHING BY GC UNLESS OTHERWISE SPECIFIED.

10 TYPICAL RELIEF OR EXHAUST HOOD
SCALE: NONE



NOTES:
(1) CURB WILL BE PROVIDED BY GC UNLESS SPECIFIED TO BE FURNISHED WITH FAN. CURB FURNISHED WITH FAN WILL BE INSTALLED BY GC.

11 ROOF EXHAUST FAN
SCALE: NONE

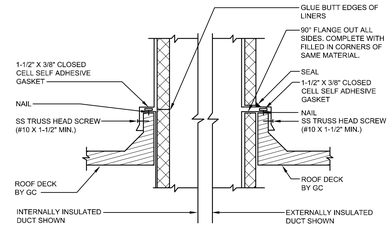


BUILT-UP ROOFING

CONCRETE ROOF

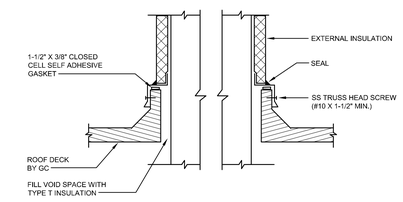
NOTES:
(1) PAINT ALL FIELD WELDED GALVANIZED COMPONENTS WITH ZINC PAINT AFTER WELDING.
(2) 1-1/2" x 1-1/2" x 1/4" FOR DUCTS SMALLER THAN 48" DIA., 2" x 2" x 1/4" FOR DUCTS 48"-60" DIA. AND 2-1/2" x 2-1/2" x 1/4" FOR DUCTS OVER 60" DIA.
(3) INSULATION SHIELD FOR INSULATED DUCT TO BE GALV. STEEL WITH FOLLOWING WIDTH & THICKNESS: 12" WIDE 16 GA. FOR DUCTS SMALLER THAN 36" DIA., 18" WIDE 16 GA. FOR DUCTS 36"-50" DIA. AND 24" WIDE 16 GA. FOR DUCTS OVER 50" DIA. TOP HALF TO OVERLAP MINIMUM 3" OF BOTTOM HALF. SEAL OVERLAP WITH VAPOR BARRIER MASTIC. REFER TO SPECIFICATION SECTION 20 0700 FOR WEIGHT-SUPPORTING INSULATION AT SUPPORT POINTS.

4 DUCT SUPPORT - ROUND DUCT ON ROOF
SCALE: NONE D=25" & ABOVE



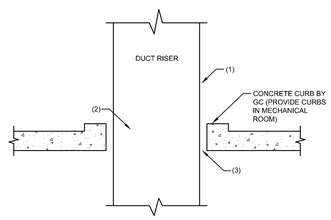
NOTES:
(1) CURB AND FLASHING BY GC UNLESS OTHERWISE SPECIFIED.

5 DUCT PENETRATION THROUGH ROOF
SCALE: NONE



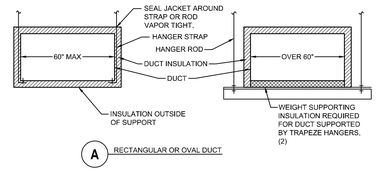
NOTES:
(1) CURB AND FLASHING BY GC UNLESS OTHERWISE SPECIFIED.

6 FUME HOOD EXHAUST DUCT PENETRATION THROUGH ROOF
SCALE: NONE

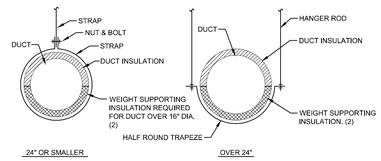


NOTES:
(1) SUPPORT DUCT IN ACCORDANCE WITH RISER SUPPORTS, SMACNA HVAC DUCT CONSTRUCTION STANDARDS. REFER TO SPECIFICATION SECTION 23 3114 FOR OTHER REQUIREMENTS.
(2) REFER TO PLANS FOR FIRE, SMOKE OR COMBINATION FIRE/SMOKE DAMPER REQUIREMENTS.
(3) WHERE FIRE, SMOKE OR COMBINATION FIRE/SMOKE DAMPER IS NOT REQUIRED, PROVIDE FIRE STOPPING SYSTEM MEETING THE REQUIRED RATING. REFER TO SPECIFICATION SECTION 20 0573 FOR FIRE STOPPING SYSTEM.

7 DUCT RISER THRU FLOOR
SCALE: NONE



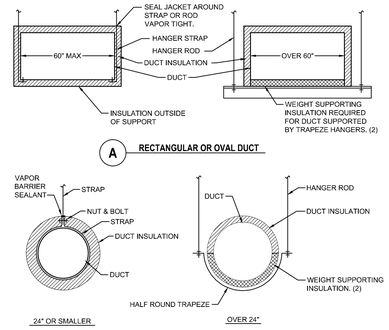
A RECTANGULAR OR OVAL DUCT



B ROUND DUCT

NOTES:
(1) INSULATION AND JACKET MUST RUN CONTINUOUSLY BETWEEN DUCT AND DUCT SUPPORTS.
(2) WEIGHT SUPPORTING INSULATION SHALL BE HAMFAB INSERTS OR FOAMGLAS INSULATION (TYPE-G). HAMFAB INSERT FOR ROUND DUCTS SHALL BE MULTIPLE INSERTS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION. REFER TO SPECIFICATION SECTION 20 0700 FOR WEIGHT SUPPORTING INSULATION REQUIREMENTS.

1 INSULATED DUCT SUPPORTS
SCALE: NONE (RIGID GLASS FIBER INSULATION-TYPE R)

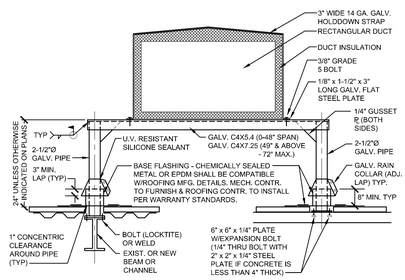


A RECTANGULAR OR OVAL DUCT

B ROUND DUCT

NOTES:
(1) INSULATION AND JACKET MUST RUN CONTINUOUSLY BETWEEN DUCT AND DUCT SUPPORTS, EXCEPT ROUND DUCTS 24" OR SMALLER.
(2) WEIGHT SUPPORTING INSULATION TO BE HAMFAB INSERTS OR FOAMGLAS INSULATION (TYPE-G). HAMFAB INSERT FOR ROUND DUCTS SHALL BE MULTIPLE INSERTS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATION. REFER TO SPECIFICATION SECTION 20 0700 FOR WEIGHT SUPPORTING INSULATION REQUIREMENTS.

2 INSULATED DUCT SUPPORTS
SCALE: NONE (FLEXIBLE GLASS FIBER INSULATION-TYPE F)



BUILT-UP ROOFING

CONCRETE ROOF

NOTES:
(1) PROVIDE SUFFICIENT PITCH AT TOP OF DUCT MAKING CENTER THE HIGHEST POINT TO PREVENT PUDDLING.

3 DUCT SUPPORT- RECTANGULAR DUCT ON ROOF
SCALE: NONE

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For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25364

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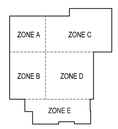
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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DETAILS

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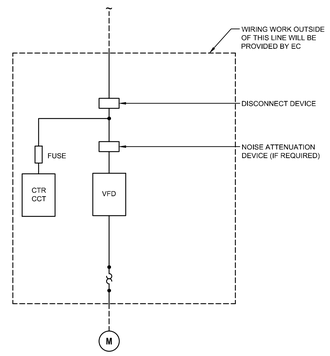
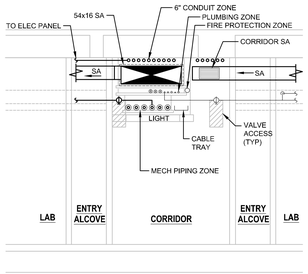
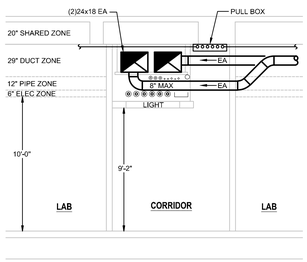
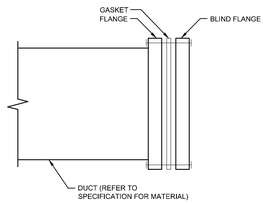


5 VFD SYSTEM WIRING BLOCK DIAGRAM
SCALE: NONE

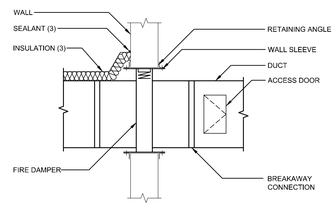




6 TYPICAL CORRIDOR SECTIONS
SCALE: NONE

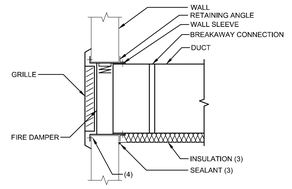


7 FLANGED AND CAPPED DUCT CONNECTION
SCALE: NONE



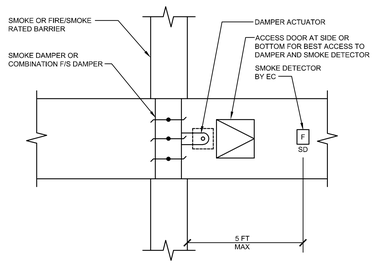
NOTES:
(1) ABOVE DETAIL SHOWS BASIC REQUIREMENT. INSTALL FIRE DAMPERS IN STRICT ACCORDANCE WITH MANUFACTURER'S UL INSTALLATION INSTRUCTION.
(2) VERTICAL CURTAIN TYPE DAMPER SHOWN. HORIZONTAL DAMPER , MULTIPLE BLADE DAMPER, AND COMBINATION FIRE/SMOKE DAMPER INSTALLATION SIMILAR.
(3) FOR DUCTWORK REQUIRING INSULATION, INSTALL INSULATION AND JACKET TO WALL (ALL SIDES) AND APPLY VAPOR BARRIER TAPE TO PREVENT CONDENSATION. TAPE SHALL BE COMPATIBLE WITH INSULATION JACKET AND WALL SURFACE. APPLY INSULATION OVER FIRE DAMPER AFTER INSPECTION HAS BEEN COMPLETED.

1 FIRE DAMPER
SCALE: NONE

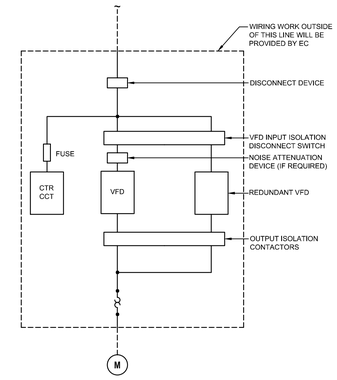


NOTES:
(1) ABOVE DETAIL SHOWS BASIC REQUIREMENT. INSTALL FIRE DAMPERS IN STRICT ACCORDANCE WITH MANUFACTURER'S UL INSTALLATION INSTRUCTION.
(2) VERTICAL DAMPER SHOWN. COMBINATION FIRE/SMOKE DAMPER INSTALLATION SIMILAR.
(3) FOR DUCTWORK REQUIRING INSULATION, INSTALL INSULATION AND JACKET TO WALL (ALL SIDES) AND APPLY VAPOR BARRIER TAPE TO PREVENT CONDENSATION. TAPE SHALL BE COMPATIBLE WITH INSULATION JACKET AND WALL SURFACE. APPLY INSULATION AFTER DAMPER INSTALLATION INSPECTION HAS BEEN COMPLETED.
(4) RETAINING ANGLE SHALL BE INSIDE OF GRILLE FLANGE OR PROVIDE FIRE DAMPER THAT REQUIRES RETAINING ANGLES AT ONLY ONE SIDE.

2 FIRE DAMPER
SCALE: NONE (WITH GRILLE)



3 SMOKE AND COMBINATION F/S DAMPER
SCALE: NONE



4 VFD SYSTEM WIRING BLOCK DIAGRAM
SCALE: NONE

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For AFFILIATED ENGINEERS, INC.
By
Name MICHAEL J. BROGE
Date 02-24-2012 Reg. No. 25384

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012

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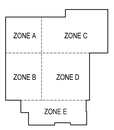
Date 12/16/11
Project

Physics and Nanotechnology Building
U of M Project # 01-155-08-1718



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DETAILS

m8.06

FLASH TANKS

MARK FT	LOCATION	SERVICE	CAPACITY (LBS/HR)	DIAMETER (IN)	LENGTH OR HEIGHT (IN)	CONNECTION SIZE (IN) HPC(250)	LPC	VENT/ LPS	REMARKS
1	-	-	-	-	-	-	-	-	NOT USED (2)
2	PENTHOUSE	CSG	3300	8	40	4	2	4	(1)

(1) FLASH TANK TO BE RATED FOR 300 PSIG.

EXPANSION JOINTS

MARK EJ	SERVICE	LOCATION	SIZE DIA. (IN)	SIZE LEN. (IN)	PRECOMPRESSION (IN)	MIN. TRAVEL (IN)	INTEGRAL ANCHOR (DEGREES)	INSTALL TEMP. (DEGREES)	DESIGN TEMP. (°F)	MAXIMUM PRESSURE (PSIG)	REMARKS
1	HPS	TUNNEL	6	43	1	12	NO	50	500	300	SLIP JOINT(1)
2	HPC	TUNNEL	3	39	1	12	NO	50	500	300	SLIP JOINT(1)
3	HPS	TUNNEL	6	43	1	12	NO	50	500	300	SLIP JOINT(1)
4	HPC	TUNNEL	3	39	1	12	NO	50	500	300	SLIP JOINT(1)
5	HPS	PENTHOUSE	6	43	1	8	NO	50	500	300	SLIP JOINT(1)
6	LPC	PENTHOUSE	3	39	1	8	NO	50	500	300	SLIP JOINT(1)

(1) WELD END

WATER PRESSURE REGULATING VALVES

MARK PRV	SYSTEM	SERVICE	SIZE (IN)	INLET PRESS. (PSIG)	OUTLET PRESS. (PSIG)	BYPASS SIZE (IN)	REMARKS
H1	HOT WATER	HOT WATER	0.75	65	50	1	-
C3	LAB EQUIPMENT	CHILLED WATER	0.75	26	20	1	-

EXPANSION TANKS

MARK ET	SYSTEM	TANK VOLUME (GAL)	MIN. ACCEP. VOLUME (GAL)	DIMENSIONS DIA. (IN)	HEIGHT (IN)	SYSTEM CONN. (IN)	AIR CHARGE PRESSURE (PSIG)	REMARKS
C3	LABORATORY PROCESS CHILLED WATER	53	53	24	37	1	25	-
H1	HOT WATER	264	264	36	73	1.5	25	-

FIN TUBE RADIATION

MARK FR	LOCATION	ENCLOSURE LENGTH (FT)	ENCLOSURE HEIGHT (IN)	ENCLOSURE DEPTH (IN)	RADIATION ROWS	RADIATION CAP (BTUH/FT)	ELEMENT PIPE	ELEMENT FIN	MIN. FIN PER FT.	GPM	LENGTH (FT)	AVG WATER TEMP (°F)	REMARKS
A	(1)	(2)	(2)	(2)	1	860	1" CU	3.25 x 3.25 AL	50	(1)	(1)	170	-
B	(1)	(3)	24	5.5625	1	1000	1" CU	4.5 x 4.5 AL	40	(1)	(1)	170	ENCLOSURE TO HAVE EXTRUDED ALUMINUM GRILLE
C	(1)	-	-	-	-	380	-	-	-	(1)	(1)	170	RUNTAL MODEL R-3
D	(1)	(2)	7	5.5	1	1060	1" CU	4.25 x 4.25	50	(1)	(1)	170	PEDESTAL MOUNT ENCLOSURE WITH EXTRUTED ALUMINUM GRILLE

(1) REFER TO PLANS.
(2) FOR ENCLOSURE REFER TO ARCHITECTURAL DRAWINGS.
(3) WALL TO WALL

PUMPS

MARK P	LOCATION	SERVICE	TYPE	CAP. (GPM)	HEAD (FT)	MAX NPSH REQ'D (FT)	MIN. EFF. (%)	SIZE (IN) SUCT.	SIZE (IN) DISCH.	MOTOR HP	MOTOR RPM	MOTOR VOLT	MOTOR PH	MOTOR VFD	REMARKS
HWP1	PENTHOUSE	HOT WATER	END SUCTION	790	110	11	77	5	4	40	1750	460	3	YES	
HWP2	PENTHOUSE	HOT WATER	END SUCTION	790	110	11	77	5	4	40	1750	460	3	YES	
HWPL1	PENTHOUSE	HW AHU-L1 HC-L1	IN LINE	155	22	5	64	3	3	1.5	1750	460	3	NO	
HWPL2	PENTHOUSE	HW AHU-L1 HC-L2	IN LINE	155	22	5	64	3	3	1.5	1750	460	3	NO	
HWPL3	PENTHOUSE	HW AHU-L1 HC-L3	IN LINE	155	22	5	64	3	3	1.5	1750	460	3	NO	
HWPL4	PENTHOUSE	HW AHU-L1 HC-L4	IN LINE	155	22	5	64	3	3	1.5	1750	460	3	NO	
CHPL1	PENTHOUSE	CH AHU-L1 CC-L1	IN LINE	90	20	4	57	2.5	2.5	1	1150	460	3	NO	
CHPL2	PENTHOUSE	CH AHU-L2 CC-L2	IN LINE	90	20	4	57	2.5	2.5	1	1150	460	3	NO	
CHPL3	PENTHOUSE	CH AHU-L3 CC-L3	IN LINE	90	20	4	57	2.5	2.5	1	1150	460	3	NO	
CHPL4	PENTHOUSE	CH AHU-L4 CC-L4	IN LINE	90	20	4	57	2.5	2.5	1	1150	460	3	NO	
CHPO1	PENTHOUSE	CH AHU-O1 CC-O1	IN LINE	90	20	4	57	2.5	2.5	1	1750	460	3	NO	
CH1	BASEMENT MECHANICAL ROOM	TERTIARY CH	END SUCTION	2100	110	13	81	8	6	100	1750	460	3	YES	
CH2	BASEMENT MECHANICAL ROOM	TERTIARY CH	END SUCTION	2100	110	13	81	8	6	100	1750	460	3	YES	
PCH3	PENTHOUSE	LABORATORY PROCESS CH	END SUCTION	260	155	13	74	3	2.5	20	1750	460	3	YES	
PCH4	PENTHOUSE	LABORATORY PROCESS CH	END SUCTION	260	155	13	74	3	2.5	20	1750	460	3	YES	
BCH1	PENTHOUSE	CHILLED BEAMS CH	END SUCTION	150	80	8	65	3	2	7.5	1750	460	3	YES	
BCH2	PENTHOUSE	CHILLED BEAMS CH	END SUCTION	150	80	8	65	3	2	7.5	1750	460	3	YES	
															(2)

HEAT EXCHANGERS

MARK HX	LOCATION	SYSTEM	TYPE	TOTAL MBH	HEAT TRANS. AREA (FT²)	CHILLED WATER GPM	CHILLED WATER EWT (°F)	CHILLED WATER LWT (°F)	CHILLED WATER PD (FT)	PROCESS CHILLED WATER GPM	PROCESS CHILLED WATER EWT (°F)	PROCESS CHILLED WATER LWT (°F)	PROCESS CHILLED WATER PD (FT)	REMARKS
C3	PENTHOUSE	LABORATORY PROCESS CHILLED WATER	PLATE & FRAME	1440	1558	240	48	60	25	240	77	65	25	
C4	PENTHOUSE	LABORATORY PROCESS CHILLED WATER	PLATE & FRAME	1440	1558	240	48	60	25	240	77	65	25	

WATER FLOW METERS

MARK WFM	LOCATION	SYSTEM	SERVICE	TYPE	FLOW (GPM)	SIZE (IN)	MAX. PD (FT)	REMARKS
H1	B-162	HOT WATER	HOT WATER	TRANSIT TIME ULTRASONIC	770	6	-	
CH1	B-164	CHILLED WATER	CHILLED WATER	TRANSIT TIME ULTRASONIC	2100	8	-	(1)
CPD1	STEAM TUNNEL	CONDENSATE PUMP DISCHAGRE	CONDENSATE PUMP DISCHAGRE	INSERTION TURBINE	75	3	5	CONDENSATE AT 200 °F(1)

(1) OWNER FURNISHED CONTRACTOR INSTALLED.

WATER SYSTEM FILTERS

MARK WF	SERVICE	CAPACITY (GPM)	MAXIMUM PRESSURE DROP (FT)	PIPE SIZE (IN)	NUMBER OF CARTRIDGES(1)	REMARKS
C3	LABORATORY PROCESS CHILLED WATER	20	10	2	1	COMBINATION WATER FILTER AND CHEMICAL BATCH FEEDER
H1	HOT WATER	20	10	2	1	COMBINATION WATER FILTER AND CHEMICAL BATCH FEEDER

(1) 5 MICRON FILTERS

VERTICAL FLOODED TYPE STEAM CONVERTORS

MARK CV	LOCATION	GPM	WATER SIDE EWT (°F)	WATER SIDE LWT (°F)	SCALE FACTOR	PASS	MAX. PD (FT)	STEAM LBS/HR	STEAM PRESS. (PSIG) (1)	RELIEF VALVE SETTING (PSIG)	RECIRC. PUMP HP	ELECTRICAL CHARACTERISTICS (VOLTS)	ELECTRICAL CHARACTERISTICS (PH)	ELECTRICAL CHARACTERISTICS (MCA)	REMARKS BASED ON:
1	B-162	660	137	180	0.00025	2	5	-	115	-	1/2	120	1	30	
2	B-162	660	137	180	0.00025	2	5	-	115	-	1/2	120	1	30	

(1) PRESSURE AVAILABLE AT INLET OF OF VERTICAL FLOODED TYPE STEAM CONVERTORS.
(2) FILL PRESSURE EQUALS 30 PSIG.

CONDENSATE PUMPS

MARK CP	LOCATION	TYPE	CAPACITY (LBS/HR)	DISCH. PRESS. (PSIG)	RECEIVER CAP. (GAL)	MAX. RPM	PUMP CAP. (GPM)	MOTOR HP	MOTOR PH	MOTOR VOLT	REMARKS
1											NOT USED
2	-	-	-	-	-	-	-	-	-	-	NOT USED (2)
3											NOT USED

AIR SEPARATORS

MARK AS	SYSTEM	SIZE (IN)	GPM	STRAINER	REMARKS
H1	HOT WATER	6	660	NO	-

CLEAN STEAM GENERATORS

MARK CSG	LOCATION	PLANT STEAM PRESSURE (PSIG)	PLANT STEAM FLOW REQUIRED (LB/HR)	CLEAN STEAM CAPACITY (LB/HR)	CLEAN STEAM PRESSURE (PSIG)	MAKE-UP WATER TYPE	MAKE-UP WATER TEMP (F)	REMARKS BASED ON:
1	PENTHOUSE	115		1200	10	SOFT	40	

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Date 02-24-2012 Reg. No. 25364

Issued for	Date
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Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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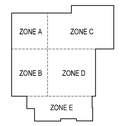
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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SCHEDULES

m9.01

VARIABLE FREQUENCY DRIVES

MARK (VFD)	SYSTEM	MAX. HORSEPOWER	INPUT ELECTRICAL CHARACTERISTICS			REMARKS
			VOLT	FREQUENCY	PHASE	
L1	AHU-L1A SF-L1A	60	460	60	3	
L2	AHU-L1B SF-L1B	60	460	60	3	
L3	AHU-L2A SF-L2A	60	460	60	3	
L4	AHU-L2B SF-L2B	60	460	60	3	
O1	AHU-O1	60	460	60	3	
LE1	EF-L1	60	460	60	3	
LE2	EF-L2	60	460	60	3	
LE3	EF-L3	60	460	60	3	
LE4	EF-L3	60	460	60	3	
FE1	EF-FE-1	50	460	60	3	
FE2	EF-FE-2	50	460	60	3	
BE1	EF-BE-1	1.5	460	60	3	
RF-O1	RF-O1	25	460	60	3	
HWP1	P-HWP1	40	460	60	3	
HWP2	P-HWP2	40	460	60	3	
CH1	P-CH1	100	460	60	3	
CH2	P-CH2	100	460	60	3	
PCH3	P-PCH3	20	460	60	3	
PCH4	P-PCH4	20	460	60	3	
BCH1	P-BCH1	15	460	60	3	
BCH2	P-CHB2	15	460	60	3	
SCHWP1	SCHWP1	100	460	60	3	
SCHWP2	SCHWP2	100	460	60	3	
SCHWP3	SCHWP3	100	460	60	3	
PCHWP2	PCHWP2	25	460	60	3	BASE BID
PCHWP2	PCHWP2	100	460	60	3	ALTERNATE BID M-1
PCHWP3	PCHWP3	100	460	60	3	ALTERNATE BID M-1
CWP2	CWP2		460	60	3	BASE BID
CWP2	CWP2	200	460	60	3	ALTERNATE BID M-1
CWP3	CWP3	200	460	60	3	ALTERNATE BID M-1
CT2A	CT2	50	460	60	3	ALTERNATE BID M-2
CT2B	CT2	50	460	60	3	ALTERNATE BID M-2
CT3A	CT3	50	460	60	3	
CT3B	CT3	50	460	60	3	
E1	AHU-E1	7.5	460	60	3	

INTAKE AND RELIEF HOODS

MARK (HRH)	LOCATION	SERVICE	CAPACITY (CFM)	APPROX. HEIGHT (IN)	THROAT SIZE (IN) (W x L)	MAXIMUM INLET VELOCITY (FPM)	DAMPER	REMARKS
RH-1	ROOF	RF-O1	32440	30	66x90	780	-	-
IH-1	ROOF	TUNNEL OA	2200	20	24x24	550	-	-

UNIT HEATERS

MARK (UH)	LOCATION	TYPE	AIR		WATER				MOTOR			REMARKS
			CFM	LAT (°F)	MBH	GPM	PD (FT)	EWT (°F)	HP	PH	VOLT	
1	1-166	HORIZONTAL	1900	103	67	8.8	2	180	1/3	1	115	-
2	1-166	HORIZONTAL	1900	103	67	8.8	2	180	1/3	1	115	-
3	1-162	HORIZONTAL	1900	103	67	8.8	2	180	1/3	1	115	-
4	1-162	HORIZONTAL	1900	103	67	8.8	2	180	1/3	1	115	
5	3-154	HORIZONTAL	815	92	20	2.9	2	180	1/20	1	115	-
6	3-154	HORIZONTAL	815	92	20	2.9	2	180	1/20	1	115	-
7	3-162	HORIZONTAL	815	92	20	2.9	2	180	1/20	1	115	-
8	4-172	HORIZONTAL	1200	95	36	4.7	2	180	1/20	1	115	-

(1) EAT= *70°F*

STEAM FLOW METERS

MARK (SFM)	LOCATION	SYSTEM	SERVICE	TYPE	CAPACITY (LBS/HR)	MIN. CAPACITY (LBS/HR)	LINE SIZE (IN)	MAX. PD (PSI)	REMARKS
1	STEAM TUNNEL	HPS(120)	HPS(120)	VORTEX SHEDDING	13,700	850	3	5	METER TO BE OWNER FURNISHED CONTRACTOR INSTALLED.

ROTARY AIR-TO-AIR EXCHANGERS

MARK (HRW)	SYSTEM	SUPPLY AIR		EXHAUST AIR		SUMMER CONDITIONS						WINTER CONDITIONS						MOTOR				LEAKAGE PURGE CFM	SP DIFFERENTIAL ACROSS HRW	REMARKS
		CFM	MAX. PD ("WG)	CFM	MAX. PD ("WG)	SA ENTERING T-DB (°F)	SA ENTERING T-WB (°F)	SA LEAVING T-DB (°F)	SA LEAVING T-WB (°F)	EA ENTERING T-DB (°F)	EA ENTERING T-WB (°F)	OA ENTERING T-DB (°F)	OA ENTERING T-WB (°F)	OA LEAVING T-DB (°F)	OA LEAVING T-WB (°F)	EA ENTERING T-DB (°F)	EA ENTERING T-WB (°F)	HP	VOLT	PH	VFD			
L1	AHU-L1	25,000	0.95	15,775	0.6	92	75	82.5	68.6	75	63	-20	-20	31.1	29	72	54	0.5	460	3	YES	2160	5.5	
L2	AHU-L2	25,000	0.95	15,775	0.6	92	75	82.5	68.6	75	63	-20	-20	31.1	29	72	54	0.5	460	3	YES	2160	5.5	
L3	AHU-L3	25,000	0.95	15,775	0.6	92	75	82.5	68.6	75	63	-20	-20	31.1	29	72	54	0.5	460	3	YES	2160	5.5	
L4	AHU-L4	25,000	0.95	15,775	0.6	92	75	82.5	68.6	75	63	-20	-20	31.1	29	72	54	0.5	460	3	YES	2160	5.5	

WATER PRESSURE REGULATING VALVES

MARK (PRV)	SYSTEM	SERVICE	SIZE (IN)	INLET PRESS. (PSIG)	OUTLET PRESS. (PSIG)	BYPASS SIZE (IN)	REMARKS
H1	HOT WATER	HOT WATER	0.75	65	50	1	-
C3	LAB EQUIPMENT	CHILLED WATER	0.75	26	20	1	-

HEAT RECOVERY UNITS

MARK (HRU)	SYSTEM	GLYCOL HEAT RECOVERY COIL(1)									WATER SIDE					HR COIL NOMINAL SIZE		BY-PASS DAMPER				FACE DAMPERS		FILTERS	REMARKS
		CAPACITY		AIR SIDE												TOTAL FACE AREA (SQFT)	QUANTITY	DIM (IN) PER COIL		DIM (IN)		DIM (IN)		REFER TO FILTER SCHEDULE	
		SENSIBLE MBH	CFM	MAX. ROWS	MAX. FINS PER INCH	MAX. FACE VEL.	MAX. PD ("WG)	EAT (DEGF) DB	EAT (DEGF) WB	LAT (DEGF) DB	FLUID	GPM	EWT (DEGF) DB	LWT (DEGF) DB	MAX. PD (FT)			H INCHES	L INCHES	H INCHES	L INCHES	H INCHES	L INCHES		
FE1	FUME HOOD EXHAUST	1,527.0	47,440	8	8	508	0.6	75	45.3	44.3	30% EG	165	33.4	53.7	20	93.3	2	42	160	24	150	78	150	F-FE-1	(1)

(1) HERESITE COATED

ACTIVE CHILLED BEAMS

TAG (CB)	UNIT MODEL	ROOM CONDITIONS		LENGTH PER BEAM FEET	WIDTH PER BEAM INCHES	THROW PATTERN	TOTAL CAPACITY /BEAM BTU/HR	PRIMARY AIR PER BEAM					WATER COIL PER BEAM				REMARKS
		SPACE TEMP (DEG F)	SPACE DEW PT (DEG F)					INLET SIZE INCHES	AIR FLOW PER BEAM CFM	AIR FLOW PER FOOT CFM/LF	AIR PRESS DROP (IN)	MAX NC LEVEL	SUPPLY AIR DEG F	PRIMARY COOLING BTU/HR	EWT DEG F	COIL COOLING BTU/HR	WATER FLOW GPM	WATER PRESS DROP (FT)	
A	DADANCO, ACB40	75	55	4	24	2 - WAY	3,922	4	60	15.0	0.3	35	55	1,303	58	2,619	1.6	7	
B	DADANCO, ACB40	75	55	4	24	2 - WAY	4,448	4	75	18.8	0.3	35	55	1,629	58	2,819	1.6	7	
C	DADANCO, ACB40	75	55	4	24	2 - WAY	5,574	6	100	25.0	0.3	35	55	2,172	58	3,402	1.6	7	
D	DADANCO, ACB50	75	55	4	24	1 - WAY	3,384	4	50	12.5	0.3	35	55	1,086	58	2,298	1.6	7	

FAN COIL UNITS

MARK (FCU)	LOCATION	TYPE	FAN CHARACTERISTICS					COOLING COIL							HEATING COIL					REMARKS
			NOM. CFM	ESP "WC	MOTOR HP	VOLT	PH	EAT DB (°F)	EAT WB (°F)	TOTAL (MBH)	SENSIBLE (MBH)	EWT (°F)	GPM	MAX PD (FT)	EAT DB (°F)	CAP. (MBH)	EWT (°F)	GPM	MAX PD (FT)	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NOT USED
2	B-164 - MECHANICAL ROOM	(1)	1000	0.5	0.5	208	3	90	70	28.8	25.7	42	5	10	-	-	-	-	-	BLOWER COIL
3	B-163 - MDF	(1)	2700	0.5	1.5	208	3	75	63	59.4	55.2	42	10.5	10	-	-	-	-	-	BLOWER COIL
4	B-159 - BASEMENT ELECTRICAL RM	(1)	1000	0.5	0.5	208	3	90	70	46.5	36.5	42	8.8	10	-	-	-	-	-	BLOWER COIL
5	B-158 - ELEC SERVICE ENTRANCE ROOM	(1)	500	0.5	0.33	115	1	90	70	14.9	14.5	42	2.9	10	-	-	-	-	-	BLOWER COIL
6	1-158 - IDF	(1)	900	0.5	0.5	208	3	75	63	27.2	21.1	42	4.8	10	-	-	-	-	-	BLOWER COIL
7	1-159 - ELECTRICAL ROOM	(1)	1000	0.5	0.5	208	3	90	70	46.5	36.5	42	8.8	10	-	-	-	-	-	BLOWER COIL
8	2-157 - IDF	(1)	900	0.5	0.5	208	3	75	63	27.2	21.1	42	4.8	10	-	-	-	-	-	BLOWER COIL
9	2-159 - ELECTRICAL ROOM	(1)	1000	0.5	0.5	208	3	90	70	46.5	36.5	42	8.8	10	-	-	-	-	-	BLOWER COIL
10	3-158 - IDF	(1)	900	0.5	0.5	208	3	75	63	27.2	21.1	42	4.8	10	-	-	-	-	-	BLOWER COIL
11	3-159 - ELECTRICAL ROOM	(1)	1000	0.5	0.5	208	3	90	70	46.5	36.5	42	8.8	10	-	-	-	-	-	BLOWER COIL
12	4-158 - IDF	(1)	900	0.5	0.5	208	3	75	63	27.2	21.1	42	4.8	10	-	-	-	-	-	BLOWER COIL
13	4-159 - ELECTRICAL ROOM	(1)	1000	0.5	0.5	208	3	90	70	46.5	36.5	42	8.8	10	-	-	-	-	-	BLOWER COIL
14	1-140 RECEPTION LOBBY	(1)	550	0.5	0.33	115	1	-	-	-	-	-	-	-	70	40	180	3	10	BLOWER COIL
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NOT USED
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
17	5-111 PENTHOUSE ELEVATOR CNTRL RM	(1)	950	0.5	0.5	460	3	80	67	33.1	24.2	42	5.7	10	-	-	-	-	-	BLOWER COIL
18	5-107 PENTHOUSE ELEVATOR MECH RM	(1)	1600	0.5	0.75	460	3	80	67	47	36.5	42	8.2	10	-	-	-	-	-	BLOWER COIL
19	1-105 - CATERING	(1)	2000	0.75	0.75	208	3	-	-	-	-	-	-	-	70	65	180	4.3	5	BLOWER COIL
20	B-169 - SECURITY CLOSET	(1)	500	0.5	0.33	115	1	90	70	14.9	14.5	42	2.9	10	-	-	-	-	-	BLOWER COIL
21	B-167 - CLNRM ELECTRICAL	(1)	3000	0.5	2	460	3	80	67	110	78	42	12.2	10	-	-	-	-	-	BLOWER COIL
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NOT USED
23	5-109 PENTHOUSE MECHANICAL ROOM	(1)	3000	0.5	1.5	460	3	80	67	145	93.5	42	25	15	65	66	180	2.3	5	BLOWER COIL
24	1-170 CORRIDOR	(1)	2000	0.75	0.75	208	3	-	-	-	-	-	-	-	70	90	180	5	5	BLOWER COIL

HUMIDIFIERS

MARK (H)	LOCATION	SYSTEM	TYPE	CFM	CAPACITY (LBS/HR)	STEAM PRESSURE AT INLET OF CONTROL VALVE (PSIG)	MANIFOLD LENGTH (IN)	MAX. ABSORPTION DISTANCE (INCHES)	REMARKS(1)
L1	PENTHOUSE	AHU-L1	STEAM DISPERATION	25,000	220	9	REFER TO DRAWINGS	24	
L2	PENTHOUSE	AHU-L2	STEAM DISPERATION	25,000	220	9	REFER TO DRAWINGS	24	
L3	PENTHOUSE	AHU-L3	STEAM DISPERATION	25,000	220	9	REFER TO DRAWINGS	24	
L4	PENTHOUSE	AHU-L4	STEAM DISPERATION	25,000	220	9	REFER TO DRAWINGS	24	
O1	PENTHOUSE	AHU-O1	STEAM DISPERATION	30,000	190	9	REFER TO DRAWINGS	24	

(1) PROVIDE INSULATED TUBES.

CABINET UNIT HEATERS

MARK (CUH)	LOCATION	TYPE	AIR SIDE			WATER SIDE				DEPTH OF RECESS (IN)	FOUR SIDE OVER LAP	MOTOR			REMARKS
			CFM	ESP	LAT (°F)	MBH	GPM	PD (FT)	EWT (°F)			HP	PH	VOLT	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NOT USED
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NOT USED
3	1-161B	HORIZONTAL CABINET	275	0.5	110	12	0.5	5	180	-	-	0.08	1	115	INLET & OUTLET DUCT COLLARS
4	1-170A	VERTICAL CABINET	180	-	121	12	0.5	5	180	9.75	Y	0.03	1	115	-
5	STAIR 1 - LEVEL1	VERTICAL CABINET	140	-	113	8	0.5	5	180	-	-	0.03	1	115	-
6	STAIR 2- ROOF	VERTICAL CABINET	140	-	113	8	0.5	5	180	-	-	0.03	1	115	-

AIR MIXING DEVICES

MARK (AMD)	LOCATION	SERVICE	MAXIMUM			MINIMUM			OVERALL DIMENSION (IN)			REMARKS
			FLOW RATE (CFM)	VEL. (FPM)	MAX PD ("WG)	FLOW RATE (CFM)	VEL. (FPM)	PD ("WG)	MIN AREA FT2	W	L	
O1	PENTHOUSE	AHU-O1	30,000	1087	0.25	12,000	435	-	27.6	-	12	-

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

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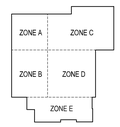
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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SCHEDULES

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PACKAGED AIR HANDLING UNITS

MARK (AHU)	LOCATION	SERVICE	FAN CHARACTERISTICS: MAX. CFM	MIN. CFM	MIN. O.A. CFM	FAN TYPE	WHEEL TYPE	WHEEL DIA. (IN)	FAN CLASS	DRIVE	TSP ("WG)	ESP ("WG) (1)	MOTOR: HP	PH	VOLT	VFD	HEATING COIL: EAT (°F)	LAT (°F)	EWT (°F)	MAX. AIR PD ("WG)	CAPACITY (MBH)	GPM	MIN. WATER VELOCITY FPS	MAX. WATER PD (FT)	COOLING COIL (2): EAT (°F) DB	EAT (°F) WB	LAT (°F) DB	LAT (°F) WB	MAX. FACE VEL. (FPM)	MAX. AIR PD ("WG)	MAX. WATER PD (FT)	MIN. WATER VELOCITY FPS	CAPACITY (MBH)	GPM	EWT (°F)	FACE AND BYPASS DAMPERS	REMARKS
L1	PENTHOUSE	LABS	25,000	-	100	PLENUM	AF	33	III	DIRECT	8.5	3.4	60	3	460	YES	-20	50	130	0.2	1899	155	4	10	82.5	66.8	50.1	49.9	495	0.9	21	4.5	1409	188	42	NO	(3)
L2	PENTHOUSE	LABS	25,000	-	100	PLENUM	AF	33	III	DIRECT	8.5	3.4	60	3	460	YES	-20	50	130	0.2	1899	155	4	10	82.5	66.8	50.1	49.9	495	0.9	21	4.5	1409	188	42	NO	(3)
L3	PENTHOUSE	LABS	25,000	-	100	PLENUM	AF	33	III	DIRECT	8.5	3.4	60	3	460	YES	-20	50	130	0.2	1899	155	4	10	82.5	66.8	50.1	49.9	495	0.9	21	4.5	1409	188	42	NO	(3)
L4	PENTHOUSE	LABS	25,000	-	100	PLENUM	AF	33	III	DIRECT	8.5	3.4	60	3	460	YES	-20	50	130	0.2	1899	155	4	10	82.5	66.8	50.1	49.9	495	0.9	21	4.5	1409	188	42	NO	(3)
O1	PENTHOUSE	OFFICE	30,000	0	0	PLENUM	AF	49	II	DIRECT	7	-	60	3	460	YES	65	85	180	0.1	651	34	2	5	77.6	66.4	50.8	50.4	475	0.8	20	3.7	1224	150	42	NO	(4)
E1	PENTHOUSE	PH ELECTRICAL	11,140	0	0	PLENUM	AF	30	I	DIRECT	2.6	-	7.5	3	460	YES	-	-	-	-	-	-		-	85	71	53.5	53.5	500	0.8	15	3.2	655	55	42	NO	(5)

(1) ESP TO EXCLUDE PD OF UNIT COMPONENTS FURNISHED BY UNIT MANUFACTURER SUCH AS COILS, FACE AND BYPASS DAMPERS, HOT AND COLD DECK DAMPERS, INLET VANES AND PERFORATED DIFFUSER PLATES WHERE REQUIRED.
(2) MAX. 8 ROWS 10 FINS INCH.
(3) REFER TO FILTER, HEAT RECOVERY WHEEL AND HUMIDIFIER SCHEDULES.
(4) REFER TO FILTER, AIR MIXING DEVICE AND HUMIDIFIER SCHEDULES.
(5) REFER TO FILTER SCHEDULE.

RETURN AND EXHAUST FANS

MARK (SF,EF,RF)	LOCATION	SERVICE	CFM(7)	SP ("WG)	FAN: TYPE	DRIVE	WHEEL TYPE: TYPE	DIA.	MAXIMUM RPM	FAN CLASS	FAN ARRANGEMENT	FAN MOTOR LOCATION(3)	FAN DISCHARGE AND ROTATION(3)	MAX. DISCHARGE/INLET SOUND POWER LEVELS(1): 63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	8000 HZ	MOTOR: HP	PH	VOLT	VFD	REMARKS
EF-LE1	ROOF	LABORATORIES GENERAL EXHAUST	27,400	8	SWSI	BELT	BI	40	1,200	III	9	-	-	98	106	99	92	91	89	86	83	60	3	460	YES	(1) & (2)
EF-LE2	ROOF	LABORATORIES GENERAL EXHAUST	27,400	8	SWSI	BELT	BI	40	1,200	III	9	-	-	96	104	101	92	90	88	85	83	60	3	460	YES	(1) & (2)
EF-LE3	ROOF	LABORATORIES GENERAL EXHAUST	27,400	8	SWSI	BELT	BI	40	1,200	III	9	-	-	96	104	101	92	90	88	85	83	60	3	460	YES	(1) & (2)
EF-LE4	ROOF	LABORATORIES GENERAL EXHAUST	27,400	8	SWSI	BELT	BI	40	1,200	III	9	-	-	96	104	101	92	90	88	85	83	60	3	460	YES	(1) & (2)
EF-FE1	ROOF	FUME EXHAUST HOODS	28240(6)	7	SWSI	BELT	BI	40	1,200	III	9	-	-	98	106	100	93	91	89	86	83	60	3	460	YES	(1) & (2)
EF-FE2	ROOF	FUME EXHAUST HOODS	28240(6)	7	SWSI	BELT	BI	40	1,200	III	9	-	-	98	106	100	93	91	89	86	83	60	3	460	YES	(1) & (2)
EF-FE3	ROOF	FUME EXHAUST HOODS	FUTURE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EF-BE1	PENTHOUSE	BSC EXHAUST	2,000	2	SWSI	BELT	BI	16	1,500	I	10	-	-	84	81	78	77	76	71	69	61	1.5	3	460	YES	(1)
RF-O1	PENTHOUSE	OFFICE	32,440	2.7	MIXED FLOW	BELT	MIXED FLOW	49	650	II	9	-	-	87	88	85	84	81	76	69	62	25	3	460	YES	
REF-1	ROOF	PENTHOUSE	24,000	1	ROOF EXHAUST FAN	BELT	BI	54	400	I	-	-	-	-	-	-	-	-	-	-	-	7.5	3	460	NO	
SF-ST-1	STEAM VAULT	STEAM VAULT	2,200	1.25	IN-LINE	BELT	BI	18	1,250	I	-	-	-	-	-	-	-	-	-	-	-	1.5	3	460	NO	

(1) FANS TO BE HERESITE COATED
(2) PROVIDE TEFC MOTOR AND WEATHER PROOF ENCLOSURE
(3) REFER TO DRAWINGS.
(4) NOT USED.
(5) PRESENT AIR QUANTITY LISTED. FUTURE AIR QUANTITY IS 23,720 CFM WITH TWO FANS OPERATING.
(6) WHEN MULTIPLE FANS ARE SCHEDULED CFMM LISTED IS FOR EACH FAN.

DIFFUSERS, REGISTERS, AND GRILLES

MARK	SERVICE	CFM RANGE	NECK SIZE (IN)	FACE SIZE (IN)	FACE TYPE	PATTERN	FINISH (3)	MATERIAL	MOUNTING SURFACE (2)	REMARKS BASED ON:
CD-1	SUPPLY	50-120	6 DIA.	24x24	PERF	SEE PLANS	BWE	STEEL	SEE PLANS	PRICE PDN
	SUPPLY	121-210	8 DIA.	24x24	PERF	SEE PLANS	BWE	STEEL	SEE PLANS	PRICE PDN
	SUPPLY	211-320	10 DIA.	24x24	PERF	SEE PLANS	BWE	STEEL	SEE PLANS	PRICE PDN
	SUPPLY	321-450	12 DIA.	24x24	PERF	SEE PLANS	BWE	STEEL	SEE PLANS	PRICE PDN
	SUPPLY	451-550	14 DIA.	24x24	PERF	SEE PLANS	BWE	STEEL	SEE PLANS	PRICE PDN
	SUPPLY	551-800	16 DIA.	24x24	PERF	SEE PLANS	BWE	STEEL	SEE PLANS	PRICE PDN
CD-2	SUPPLY	0-50	6 DIA.	24x24	PERF	SEE PLANS	BWE	STEEL	SEE PLANS	PRICE DF1LWITH 50% BLANKOFF AND OFFSET INLET COLLAR.
CD-3	SUPPLY	0-300	8 DIA.	24x24	PERF	SEE PLAN	BWE	STEEL	SEE PLANS	PRICE FRFD
		301-450	10 DIA.	24x24	PERF	SEE PLAN	BWE	STEEL	SEE PLANS	PRICE FRFD
CD-4	SUPPLY	0-500	10 DIA.	24x48	PERF	SEE PLAN	BWE	STEEL	SEE PLANS	PRICE FRFD
		501-720	12 DIA.	24x48	PERF	SEE PLAN	BWE	STEEL	SEE PLANS	PRICE FRFD
CD-5	SUPPLY	0-2250	24x24	29x29	LOUVER	3-WAY	BWE	STEEL	SEE PLANS	PRICE SMDA
LD-1	SUPPLY	65 / LF	8 DIA.	SEE PLANS	(1) 1.5" SLOT	-	BWE	ALUMINUM	SEE PLANS	PRICE AS WITH ENGINEERED PLENUM UNLESS OTHERWISE NOTED
LD-2	SUPPLY	75 / LF	8 DIA.	SEE PLANS	(1) 2" SLOT	-	BWE	ALUMINUM	SEE PLANS	PRICE AS WITH ENGINEERED PLENUM UNLESS OTHERWISE NOTED
LD-3	SUPPLY	100 / LF	12 DIA.	SEE PLANS	(1) 2" SLOT	-	BWE	ALUMINUM	SEE PLANS	PRICE AS WITH ENGINEERED PLENUM UNLESS OTHERWISE NOTED
LD-4	SUPPLY	200 / LF	SEE PLAN	44x6	6"BAR	0° DEF	BWE	ALUMINUM	SEE PLAN	PRICE LBP-15A
LD-5	SUPPLY	140 / LF	SEE PLAN	SEE PLANS	(1) 2.5" SLOT	0° DEF	BWE	ALUMINUM	SEE PLAN	PRICE AS WITH CUSTOM PLENUM
LR-1	RA/EA	200 / LF	-	SEE PLANS	6"BAR	0° DEF	BWE	ALUMINUM	SEE PLAN	PRICE LBP-15A
SG-1	SUPPLY	SEE PLAN	SEE PLAN	(1)	LOUVERED	-	BWE	STEEL	DUCT/WALL	PRICE 520
G-1	RA/EA	0-150	6 DIA.	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
	RA/EA	151-230	8 DIA.	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
	RA/EA	231-340	10 DIA.	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
	RA/EA	341-475	12 DIA.	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
	RA/EA	476-560	14 DIA.	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
	RA/EA	501-820	14x14	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
	RA/EA	821-1000	15x15	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
	RA/EA	1001-2000	22x22	24x24	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
G-2	RA/EA	0-150	6 DIA.	12x12	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
		151-200	6x6	12x12	PERF	-	BWE	STEEL	SEE PLANS	PRICE PDDR
G-3	RA/EA	SEE PLAN	SEE PLAN	(1)	LOUVERED	-	BWE	STEEL	DUCT/WALL	PRICE 530

(1) FACE SIZE EQUALS NECK SIZE PLUS 1 3/4".
(2) REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR CEILING TYPE.
(3) REFER TO ARCHITECT FOR COLOR.
(4) DIFFUSERS TO HAVE 18x18 BACK PAN FOR UNIFORM APPEARANCE
(5) PROVIDE BLANK-OFF PANELS FOR UNUSED PORTIONS OF DIFFUSER.
(6) FACE SIZE EQUALS NECK SIZE PLUS 1 5/8".

ROOF EXHAUST FANS

MARK (REF)	SERVICE	LOCATION ABOVE ROOM	CFM	MAX RPM	TSP ("WG)	DAMPER	MOTOR: HP	PH	VOLT	REMARKS
1	PENTHOUSE	PENTHOUSE	24000	400	1	AUTOMATIC	10	3	460	-

SOUND ATTENUATING DEVICES

MARK (SAD)	LOCATION	SERVICE	TOTAL CAPACITY (CFM)	MAX. VEL. (FPM)	MAX. PD ("WG)	OVERALL DIMENSION (IN): H / DIA.	W	L	DYNAMIC INSERTION LOSS / MAXIMUM SELF GENERATED POWER LEVELS: 63	125	250	500	1000	2000	4000	8000	REMARKS
O1	PENTHOUSE	AHU-O1 SA	30,000	2,186	0.25	38	52	84	4/64	4/65	7/61	15/60	23/59	28/60	16/56	6/48	FILM LINED
O2	PENTHOUSE	AHU-O1 RA	32,440	1,854	0.25	42	60	60	3/64	5/59	7/57	13/55	11/56	10/57	6/47	2/42	FILM LINED
FE1	ROOF	EF-FE-1&2 OA BYPASS	27,000	2,250	0.5	48	36	36	5/63	3/57	4/54	8/63	11/62	5/67	3/68	1/50	PACKLESS GALVANIZED STEEL
LE1	PENTHOUSE	LE-1,2,3&4 EA	61,350	2,045	0.25	72	60	36	3/66	4/62	6/62	11/62	11/63	20/67	14/61	5/55	FILM LINED
LE2	PENTHOUSE	LE-1,2,3&4 EA	11,800	1,967	0.25	24	36	36	3/58	4/51	6/50	12/48	13/53	17/52	9/40	2/37	FILM LINED
BE1	PENTHOUSE	BE-1	2,000	889	0.25	18	18	84	6/45	5/41	10/40	14/46	14/53	10/53	8/44	7/30	PACKLESS 316 STAINLESS STEEL
SAD-C	(1)	AT-C	600	600	0.25	12	12	36	2/51	4/45	10/41	14/40	13/39	13/39	12/31	7/23	FILM LINED
SAD-D	(1)	AT-D	1200	882	0.25	14	14	36	7/53	8/43	11/41	13/42	18/39	24/37	17/29	10/26	FILM LINED
SAD-E	(1)	AT-E	1600	1,029	0.25	16	14	36	3/57	5/44	1038	18/21	21/38	23/36	23/28	12/28	FILM LINED
SAD-F	(1)	AT-F	1800	926	0.25	20	14	36	3/48	4/38	10/37	19/37	20/34	18/28	14/21	7/22	FILM LINED

(1) REFER TO DRAWINGS.

AIR FLOW METERS

MARK (AFM)	LOCATION	SYSTEM	MAX. CFM	TYPE	DUCT SIZE (IN)	MINIMUM PRESSURE DROP("WG)	REMARKS
O1	PENTHOUSE	AHU-O1 SA	30000	THERMAL DISPERSION	52x38	0.05	-
O2	LEVEL 1	RF-O1 RA	8815	THERMAL DISPERSION	36 x 22	0.05	-
O3	LEVEL 2	RF-O1 RA	9915	THERMAL DISPERSION	36 x 24	0.05	-
O4	LEVEL 3	RF-O1 RA	9770 (1)	THERMAL DISPERSION	36 x 22	0.05	INTIAL CFM = 7265
O5	LEVEL 4	RF-O1 RA	8055	THERMAL DISPERSION	36 x 22	0.05	-

(1) FUTURE CFM

FILTERS AND FILTER HOUSINGS

MARK (F)	SYSTEM	LOCATION	TYPE	CFM	MIN. FACE AREA (SQFT)	PRESS. DROP ("WG): INITIAL	FINAL	PD FOR FAN TSP AND AIR BALANCE	MERV RATING	MEDIA LENGTH (IN)	REMARKS
L1A	AHU-L1	PENTHOUSE	PLEATED	25,000	52	0.3	0.8	0.8	8	2	
L1B	AHU-L1	PENTHOUSE	CARTRIDGE	25,000	52	0.6	1.5	1.5	14	12	
L2A	AHU-L2	PENTHOUSE	PLEATED	25,000	52	0.3	0.8	0.8	8	2	
L2B	AHU-L2	PENTHOUSE	CARTRIDGE	25,000	52	0.6	1.5	1.5	14	12	
L3A	AHU-L3	PENTHOUSE	PLEATED	25,000	52	0.3	0.8	0.8	8	2	
L3B	AHU-L3	PENTHOUSE	CARTRIDGE	25,000	52	0.6	1.5	1.5	14	12	
L4A	AHU-L4	PENTHOUSE	PLEATED	25,000	52	0.3	0.8	0.8	8	2	
L4B	AHU-L4	PENTHOUSE	CARTRIDGE	25,000	52	0.6	1.5	1.5	14	12	
O1A	AHU-O1	PENTHOUSE	PLEATED	30,000	60	0.3	0.8	0.8	8	2	
O1B	AHU-O1	PENTHOUSE	CARTRIDGE	30,000	60	0.6	1.5	1.5	14	12	
FE1	HRU-FE1	ROOF	PLEATED	47,440	96	0.3	1	1	8	2	
E1	PENTHOUSE	PENTHOUSE	PLEATED	11,140	24	0.3	0.7	0.7	8	2	
ME1	PENTHOUSE	PENTHOUSE	PLEATED	24,000	48	0.3	0.7	0.7	8	2	

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.
By
Name MICHAEL J. BROGE
Date 02-24-2012 Reg. No. 25364

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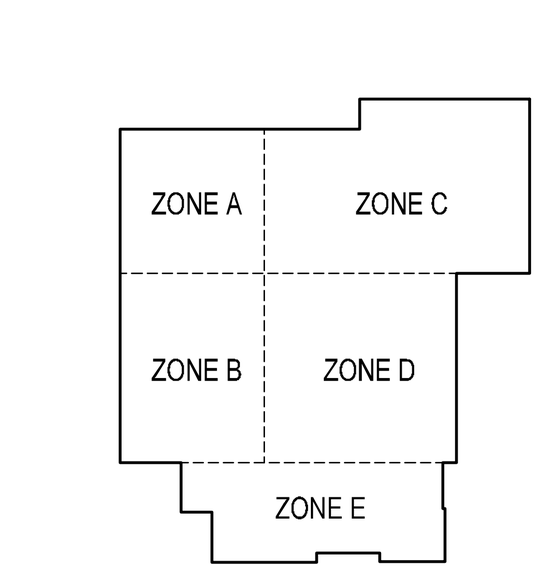
Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



UNIVERSITY OF MINNESOTA
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SCHEDULES

m9.03

AIR TERMINAL DEVICES

GENERAL ROOM(S) SERVED NAME	CONTROL SEQUENCE NO.	CFM OFFSET(6)	MARK(3) AT	SUPPLY AIR TERMINAL UNIT (1) MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE	REHEAT COILS MARK(3) RC	REHEAT CFM	CAPACITY Btuh	SIZE WxH (INCHES)	MAXIMUM APD (in wg)	EWT (°F)	EAT (°F)	LAT (°F)	GPM (2)	WPD (ft wg)	EXHAUST AIR TERMINAL UNIT (1) MARK(3) EV	MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE
B-100 - CORRIDOR	L1	-	B-100	1,340	1,340	0.60	10	D	BUTTERFLY	B-100	1,340	29078	16x15	0.20	150	55	75	2.9	5	B-100	-	-	-	-	-	-
B-102 - LABORATORY	L8	-	B-102	1,860	1,530	0.60	16	D	BUTTERFLY	B-102	1,860	40362	24x18	0.20	150	55	75	4.0	5	B-102-A	830	660	0.60	10	D	BUTTERFLY
B-102 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-102-B	800	300	0.60	10	D	VENTURI
B-102 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-102-C	400	400	0.60	6	D	BUTTERFLY
B-102B - PUMP ROOM	L2	-	B-102B	200	200	0.60	5	D	BUTTERFLY	B-102B	200	4340	12x8	0.20	150	55	75	0.5	5	B-102B-A	300	300	0.60	5	D	BUTTERFLY
B-102C - LABORATORY	L2	-	B-102C	750	530	0.60	10	D	BUTTERFLY	B-102C	530	11501	14x13	0.20	150	55	75	1.2	5	B-102C-A	650	430	0.60	10	D	BUTTERFLY
B-102C - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-102C-B	200	200	0.60	5	D	BUTTERFLY
B-103 - WOMEN, B-105 - MEN	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-103	530	530	0.60	8	D	BUTTERFLY
B-104 - LABORATORY	L8	-	B-104	1,390	1,010	0.60	12	D	BUTTERFLY	B-104	1,390	30163	16x15	0.20	150	55	75	3.0	5	B-104-A	800	300	0.60	10	D	VENTURI
B-104 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-104-B	200	200	0.60	5	D	BUTTERFLY
B-104 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-104-C	110	70	0.60	5	D	BUTTERFLY
B-104A - PUMP ROOM	L5	-	B-104A	210	170	0.60	5	D	BUTTERFLY	B-104A	170	3689	12x8	0.20	150	55	75	0.5	5	B-104A-A	110	70	0.60	5	D	BUTTERFLY
B-104A - PUMP ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-104A-B	200	200	0.60	5	D	BUTTERFLY
B-104B - PIT ROOM	L5	-	B-104B	330	330	0.60	6	D	BUTTERFLY	B-104B	330	7161	12x8	0.20	150	55	75	0.7	5	B-104B-A	430	430	0.60	8	D	BUTTERFLY
B-104B - PIT ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-104B-B	100	100	0.60	4	D	BUTTERFLY
B-104C - PUMP ROOM	L5	-	B-104C	190	170	0.60	5	D	BUTTERFLY	B-104C	170	3689	12x8	0.20	150	55	75	0.5	5	B-104C-A	90	70	0.60	4	D	BUTTERFLY
B-104C - PUMP ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-104C-B	200	200	0.60	5	D	BUTTERFLY
B-104D - PIT ROOM	L5	-	B-104D	330	330	0.60	6	D	BUTTERFLY	B-104D	330	7161	12x8	0.20	150	55	75	0.7	5	B-104D-A	430	430	0.60	8	D	BUTTERFLY
B-104D - PIT ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-104D-B	100	100	0.60	4	D	BUTTERFLY
B-106 - LABORATORY	L9	-	B-106	1,770	970	0.60	14	D	BUTTERFLY	B-106	1,770	38409	20x18	0.20	150	55	75	3.8	5	B-106-A	270	70	0.60	5	D	BUTTERFLY
B-106 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-106-B	100	100	0.60	4	D	BUTTERFLY
B-106 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-106-C	800	300	0.60	10	D	VENTURI
B-106 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-106-D	800	300	0.60	10	D	VENTURI
B-106A - MBE_STM ROOM	L5	-	B-106A	530	320	0.60	8	D	BUTTERFLY	B-106A	320	6944	12x10	0.20	150	55	75	0.7	5	B-106A-A	530	320	0.60	8	D	BUTTERFLY
B-106A - MBE_STM ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-106A-B	200	200	0.60	5	D	BUTTERFLY
B-107 - CUSTODIAN EQUIP STORAGE	L2	-	B-107	100	100	0.60	5	D	BUTTERFLY	B-107	100	2170	12x8	0.20	150	55	75	0.5	5	B-107	200	200	0.60	5	D	BUTTERFLY
B-150 - CORRIDOR	L1	-	B-150	1,190	1,190	0.60	10	D	BUTTERFLY	B-150	1,190	25823	13x14	0.20	150	55	75	2.6	5	-	-	-	-	-	-	-
B-153 - LABORATORY	L2	-	B-153	1,130	1,020	0.60	10	D	BUTTERFLY	B-153	1,020	22134	13x14	0.20	150	55	75	2.2	5	B-153	1,230	1,120	0.60	12	D	BUTTERFLY
B-153A - PUMP ROOM	L2	-	B-153A	210	180	0.60	5	D	BUTTERFLY	B-153A	180	3906	12x8	0.20	150	55	75	0.5	5	B-153A	310	280	0.60	6	D	BUTTERFLY
B-154 - LABORATORY	L5	-	B-154	1,050	1,050	0.60	10	D	BUTTERFLY	B-154	1,050	22785	13x14	0.20	150	55	75	2.3	5	B-154-A	750	750	0.60	10	D	BUTTERFLY
B-154 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-154-B	200	200	0.60	5	D	BUTTERFLY
B-154A - PREP A	L2	-	B-154A	200	200	0.60	5	D	BUTTERFLY	B-154A	200	4340	12x8	0.20	150	55	75	0.5	5	B-154A	300	300	0.60	5	D	BUTTERFLY
B-154B - PREP B	L7	-	B-154B	760	320	0.60	10	D	BUTTERFLY	B-154B	760	16492	14x13	0.20	150	55	75	1.6	5	B-154B-A	800	300	0.60	10	D	VENTURI
B-154B - PREP B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-154B-B	120	60	0.60	10	D	BUTTERFLY
B-154D - PUMP ROOM	L5	-	B-154D	160	160	0.60	5	D	BUTTERFLY	B-154D	160	3472	12x8	0.20	150	55	75	0.5	5	B-154D-A	60	60	0.60	4	D	BUTTERFLY
B-154D - PUMP ROOM	L5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-154D-B	200	200	0.60	5	D	BUTTERFLY
B-155 - PHYSICS STORAGE	L2	-	B-155	180	180	0.60	5	D	BUTTERFLY	B-155	180	3906	12x8	0.20	150	55	75	0.5	5	B-155	180	180	0.60	5	D	BUTTERFLY
B-156 - LABORATORY	L7	-	B-156	1,070	1,070	0.60	12	D	BUTTERFLY	B-156	1,070	23219	13x14	0.20	150	55	75	2.3	5	B-156-A	970	470	0.60	12	D	BUTTERFLY
B-156 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-156-B	800	300	0.60	10	D	VENTURI
B-157 - LABORATORY	L7	-	B-157	990	990	0.60	10	D	BUTTERFLY	B-157	990	21483	13x14	0.20	150	55	75	2.1	5	B-157-A	800	390	0.60	10	D	BUTTERFLY
B-157 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-157-B	800	300	0.60	10	D	VENTURI
B-165 - WASTE RECYCLE	L2	-	B-165	100	100	0.60	5	D	BUTTERFLY	B-165	100	2170	12x8	0.20	150	55	75	0.5	5	B-165	200	200	0.60	5	D	BUTTERFLY
B-166 - HE LIQUEFIER	L5	-	B-166	770	560	0.60	10	D	BUTTERFLY	B-166	560	12152	14x13	0.20	150	55	75	1.2	5	B-166-A	570	360	0.60	8	D	BUTTERFLY
B-166 - HE LIQUEFIER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-166-B	100	100	0.60	4	D	BUTTERFLY
B-166A - HP RECOVERY LIQUEFIER	L5	-	B-166A	1,050	770	0.60	10	D	BUTTERFLY	B-166A	770	16709	13x14	0.20	150	55	75	1.7	5	B-166A-A	1,150	870	0.60	10	D	BUTTERFLY
B-166A - HP RECOVERY LIQUEFIER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-166A-B	100	100	0.60	4	D	BUTTERFLY
B-168 - STUDENT MACHINE SHOP	L5	-	B-168	1,540	1,540	0.60	12	D	BUTTERFLY	B-168	1,540	33418	16x15	0.20	150	55	75	3.3	5	B-168-A	1,740	1,740	0.60	14	D	BUTTERFLY
B-168 - STUDENT MACHINE SHOP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B-168-B	100	100	0.60	4	D	BUTTERFLY

AT SCHEDULE NOTES

1. SEE SPECIFICATION FOR MAXIMUM SOUND POWER LEVEL PER OCTAVE BAND.
2. COIL HOT-WATER FLOW RATE LIMITED TO 0.5 GPM MINIMUM, AS FLOW RATES BELOW 0.5 GPM MAY CAUSE BALANCE PROBLEMS AND POOR COIL PERFORMANCE.
3. MARK REFERS TO ALL SCHEDULED EQUIPMENT INCLUDING AIR TERMINAL, SOUND ATTENUATOR AND REHEAT COIL.
4. AIR TERMINAL MATERIAL - REFER TO SPECIFICATION
   D = GALVANIZED
   E = ALUMINUM
   F = ALUMINUM WITH HERESITE COATING
5. SAD MATERIAL - REFER TO SPECIFICATION
   A= FILM LINED
   B = PACKLESS GALVANIZED
   C= PACKLESS 316 STAINLESS STEEL
6. NEGATIVE NUMBER INDICATES AIR IS TRANSFERRED INTO THE ROOM (EXHAUST CFM IS GREATER THAN SUPPLY CFM) AND POSITIVE NUMBER INDICATES AIR IS TRANSFERRED OUT OF THE ROOM (SUPPLY CFM IS GREATER THAN EXHAUST CFM).

AIR TERMINAL DEVICES

GENERAL ROOM(S) SERVED NAME	CONTROL SEQUENCE NO.	CFM OFFSET(6)	MARK(3) AT	SUPPLY AIR TERMINAL UNIT (1) MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE	REHEAT COILS MARK(3) RC	REHEAT CFM	CAPACITY Btuh	SIZE WxH (INCHES)	MAXIMUM APD (in wg)	EWT (°F)	EAT (°F)	LAT (°F)	GPM (2)	WPD (ft wg)	EXHAUST AIR TERMINAL UNIT (1) MARK(3) EV	MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE
1-100 - OFFICE VENTILATION AIR	O1	-	1-100	1,810	1,810	0.60	14	D	VENTURI	1-100	1,810	39277	20x18	0.20	150	55	75	3.9	5	-	-	-	-	-	-	-
1-103 - WOMEN, 1-105 - MEN	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1-103	460	460	0.60	8	D	BUTTERFLY
1-162 - HIGH BAY LAB	L5	-	1-162-A	4,200	4,200	0.60	24x16	D	BUTTERFLY	1-162-A	4,200	101527	24x18	0.20	150	55	77	10.2	5	1-162-A	3,300	3,300	0.60	24x16	D	BUTTERFLY
1-162 - HIGH BAY LAB	L5	-	1-162-B	4,200	4,200	0.60	24x16	D	BUTTERFLY	1-162-B	4,200	101527	24x18	0.20	150	55	77	10.2	5	1-162-B	3,300	3,300	0.60	24x16	D	BUTTERFLY
1-162 - HIGH BAY LAB	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1-162-C	2,000	2,000	0.60	16	D	BUTTERFLY
1-163 - JANITOR	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1-163	80	80	0.60	4	D	BUTTERFLY
1-164 - FILL STATION	L5	-	1-164	70	70	0.60	4	D	BUTTERFLY	1-164	70	1519	12x8	0.20	150	55	75	0.5	5	1-164	170	170	0.60	6	D	BUTTERFLY
1-166 - LOADING DOCK	L22	600	1-166	1,500	900	0.60	12	D	BUTTERFLY	1-166	900	35690	16x15	0.20	150	55	92	3.6	5	1-166	300	900	0.60	10	D	BUTTERFLY
1-166A - GAS STORAGE	L15	-	FOA 1-166A	NOT USED	FOA -	-	-	FOA -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FOA
1-166B - LIQUID (H-3) STORAGE	L5	-	1-166B	170	170	0.60	5	D	BUTTERFLY	1-166B	170	3689	12x8	0.20	150	55	75	0.5	5	1-166B	230	230	0.60	5	D	BUTTERFLY
1-166C - LN2/GAS STORAGE	L2	-	1-166C	80	80	0.60	4	D	BUTTERFLY	1-166C	80	1736	12x8	0.20	150	55	75	0.5	5	1-166C	180	180	0.60	5	D	BUTTERFLY
1-168 - UNISEX TOILET	L10	-	1-168	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1-168	80	80	0.60	4	D	BUTTERFLY
1-170 - CORRIDOR	L1	-	1-170	1,260	1,260	0.60	12	D	BUTTERFLY	1-170	1,260	27342	16x15	0.20	150	55	75	2.7	5	-	-	-	-	-	-	-
1-171 - LABORATORY	L11	-	1-171	1,500	1,200	0.60	12	D	BUTTERFLY	1-171	1,500	32550	16x15	0.20	150	55	75	3.3	5	1-171-A	500	250	0.60	8	D	VENTURI
1-171 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1-171-B	NOT USED	-	-	-	-	-
1-173 - LABORATORY	L7	-	1-173	690	460	0.60	8	D	BUTTERFLY	1-173	690	14973	12x10	0.20	150	55	75	1.5	5	1-173-A	360	90	0.60	6	D	BUTTERFLY
1-173 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1-173-B	800	300	0.60	10	D	VENTURI
1-175 - LABORATORY	L7	-	1-175	690	460	0.60	8	D	BUTTERFLY	1-175	690	14973	12x10	0.20	150	55	75	1.5	5	1-175-A	360	90	0.60	6	D	BUTTERFLY
1-175 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1-175-B	800	300	0.60	10	D	VENTURI
1-177 - LABORATORY	L7	-	1-177	670	460	0.60	8	D	BUTTERFLY	1-177	670	14539	12x10	0.20	150	55	75	1.5	5	1-177-A	360	70	0.60	6	D	BUTTERFLY
1-177 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1-177-B	800	300	0.60	10	D	VENTURI

(1) SEE SPECIFICATION FOR MAXIMUM SOUND POWER LEVEL PER OCTAVE BAND.
(2) COIL HOT-WATER FLOW RATE LIMITED TO 0.5 GPM MINIMUM, AS FLOW RATES BELOW 0.5 GPM MAY CAUSE BALANCE PROBLEMS AND POOR COIL PERFORMANCE.
(3) MARK REFERS TO ALL SCHEDULED EQUIPMENT INCLUDING AIR TERMINAL, SOUND ATTENUATOR AND REHEAT COIL.
(4) AIR TERMINAL MATERIAL - REFER TO SPECIFICATION
D = GALVANIZED
E = ALUMINUM
F = ALUMINUM WITH HERESITE COATING
(5) SAD MATERIAL - REFER TO SPECIFICATION
A= FILM LINED
B = PACKLESS GALVANIZED
C= PACKLESS 316 STAINLESS STEEL

VARIABLE VOLUME AIR TERMINAL DEVICES

MARK AT	LOCATION	SYSTEM	CFM RANGE	MINIMUM CFM	MAXIMUM UNIT PD ("WG)	MINIMUM INLET SIZE (IN)	SOUND ATTEN. (3)	REMARKS
A	(1)	AHU-O1	60-300	0	0.5	5	-	REFER TO DRAWINGS FOR QUANTITY
B	(1)	AHU-O1	301-400	0	0.5	6	-	REFER TO DRAWINGS FOR QUANTITY
C	(1)	AHU-O1	401-600	0	0.5	8	SAD-C	REFER TO DRAWINGS FOR QUANTITY
D	(1)	AHU-O1	601-1200	0	0.5	10	SAD-D	REFER TO DRAWINGS FOR QUANTITY
E	(1)	AHU-O1	1201-1600	0	0.5	12	SAD-E	REFER TO DRAWINGS FOR QUANTITY
F	(1)	AHU-O1	1601-1800	0	0.5	14	SAD-F	REFER TO DRAWINGS FOR QUANTITY
G	(1)	AHU-O1	2801-4000	0	0.5	24x16	-	REFER TO DRAWINGS FOR QUANTITY

(1) REFER TO DRAWINGS.
(2) SEE SPECIFICATION FOR MAXIMUM SOUND POWER LEVEL PER OCTAVE BAND.
(3) REFER TO SOUND ATTENUATOR SCHEDULE FOR MORE INFORMATION.

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

Issued for	Date
100% CD set	12-16-2011
Bid Package No. 2	02-24-2012
Project Directive No. 3	05-15-2012

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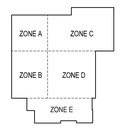
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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SCHEDULES

m9.04

AIR TERMINAL DEVICES

GENERAL ROOM(S) SERVED NAME	CONTROL SEQUENCE NO.	CFM OFFSET(6)	MARK(3) AT	SUPPLY AIR TERMINAL UNIT (1) MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE	REHEAT COILS MARK(3) RC	REHEAT CFM	CAPACITY Btuh	SIZE WxH (INCHES)	MAXIMUM APD (in wg)	EWT (°F)	EAT (°F)	LAT (°F)	GPM (2)	WPD (ft wg)	EXHAUST AIR TERMINAL UNIT (1) MARK(3) EV	MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE
2-100A - OFFICE VENTILATION AIR	O1	-	2-100A	1,420	1,420	0.60	12	D	BUTTERFLY	2-100A	1,420	30814	16x15	0.20	150	55	75	3.1	5	-	-	-	-	-	-	-
2-103 - WOMEN, 2-105 - MEN	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-103	460	460	0.60	8	D	BUTTERFLY
2-158 - JANITOR	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-158	135	135	0.60	5	D	BUTTERFLY
2-162 - LABORATORY	L14	-	2-162-A	2,880	1,280	0.60	16	D	BUTTERFLY	2-162-A	2,000	54891	24x18	0.20	150	55	80	5.5	5	2-162-A	250	250	0.60	8	D	VENTURI
2-162 - LABORATORY	-	-	2-162-B	2,870	1,270	0.60	16	D	BUTTERFLY	2-162-B	2,000	52019	24x18	0.20	150	55	79	5.2	5	2-162-B	650	250	0.60	8	D	VENTURI
2-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-162-C	500	200	0.60	8	D	VENTURI
2-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-162-D	650	250	0.60	8	D	VENTURI
2-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-162-E	1,100	400	0.60	12	D	VENTURI
2-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-162-F	1,100	400	0.60	12	D	VENTURI
2-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-162-G	1,100	400	0.60	12	D	VENTURI
2-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-162-H	600	600	0.60	8	D	BUTTERFLY
2-164 - LABORATORY	L20	-	2-164-A	1,520	770	0.60	12	D	BUTTERFLY	2-164-A	1,520	37422	16x15	0.20	150	55	78	3.7	5	2-164-A	420	70	0.60	8	D	BUTTERFLY
2-164 - LABORATORY	-	-	2-164-B	200	200	0.60	5	D	BUTTERFLY	2-164B	200	4340	12x8	0.20	150	55	75	0.5	5	2-164-B	100	100	0.60	4	D	BUTTERFLY
2-164 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-164-C	1,100	400	0.60	12	D	VENTURI
2-164 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-164-D	650	250	0.60	8	D	VENTURI
2-166 - LABORATORY	L13	-	2-166	1,000	1,000	0.60	10	D	BUTTERFLY	2-166	1,000	21935	13x14	0.20	150	55	75	2.2	5	2-166	1,200	1,200	0.60	10	D	BUTTERFLY
2-170 - CORRIDOR	L1	-	2-170	1,200	1,200	0.60	10	D	BUTTERFLY	2-170	1,200	32450	13x14	0.20	150	55	80	3.2	5	-	-	-	-	-	-	-
2-171 - LABORATORY	L5	-	2-171	1,820	1,610	0.60	12	D	BUTTERFLY	2-171	1,610	34937	20x18	0.20	150	55	75	3.5	5	2-171-A	1,130	1,130	0.60	10	D	BUTTERFLY
2-171 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-171-B	480	480	0.60	8	D	BUTTERFLY
2-171A - PREP ROOM	L8	-	2-171A	670	260	0.60	8	D	BUTTERFLY	2-171A	260	5642	12x10	0.20	150	55	75	0.6	5	2-171A-A	800	300	0.60	10	D	VENTURI
2-171A - PREP ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-171A-B	160	70	0.60	5	D	BUTTERFLY
2-171A - PREP ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-171A-C	100	100	0.60	4	D	BUTTERFLY
2-171B - PUMP	L5	-	2-171B	200	200	0.60	5	D	BUTTERFLY	2-171B	200	4340	12x8	0.20	150	55	75	0.5	5	2-171B-A	300	300	0.60	5	D	BUTTERFLY
2-175 - LABORATORY	L5	-	2-175	760	460	0.60	10	D	BUTTERFLY	2-175	460	9982	14x13	0.20	150	55	75	1.0	5	2-175-A	780	480	0.60	10	D	BUTTERFLY
2-175 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2-175-B	180	180	0.60	5	D	BUTTERFLY

AIR TERMINAL DEVICES

GENERAL ROOM(S) SERVED NAME	CONTROL SEQUENCE NO.	CFM OFFSET(6)	MARK(3) AT	SUPPLY AIR TERMINAL UNIT (1) MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE	REHEAT COILS MARK(3) RC	REHEAT CFM	CAPACITY Btuh	SIZE WxH (INCHES)	MAXIMUM APD (in wg)	EWT (°F)	EAT (°F)	LAT (°F)	GPM (2)	WPD (ft wg)	EXHAUST AIR TERMINAL UNIT (1) MARK(3) EV	MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE
3-100A OFFICE VENTILATION AIR	O1	-	3-100A	1,420	1,420	0.60	12	D	BUTTERFLY	3-100A	1,420	30814	16x15	0.20	150	55	75	3.1	5	-	-	-	-	-	-	-
3-103 - WOMEN, 3-105 - MEN	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-103	460	460	0.60	8	D	BUTTERFLY
3-156 - JANITOR	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-156	80	80	0.60	4	D	BUTTERFLY
3-160 - CORRIDOR	L12	-	3-160	1,040	1,040	0.60	10	D	BUTTERFLY	3-160	1,040	22568	13x14	0.20	150	55	75	2.3	5	-	-	-	-	-	-	-
3-164 - LABORATORY	L16	-	3-164	1,540	1,470	0.60	14	D	BUTTERFLY	3-164	1,540	38043	16x15	0.20	150	55	78	3.8	5	3-164-A	1,070	640	0.60	10	D	BUTTERFLY
3-164 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-164-B	300	300	0.60	5	D	BUTTERFLY
3-164 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-164-C	800	300	0.60	10	D	VENTURI
3-166 - LABORATORY	L19	-	3-166	1,260	1,260	0.60	12	D	BUTTERFLY	3-166	1,260	27798	16x15	0.20	150	55	75	2.8	5	3-166-A	1,060	560	0.60	10	D	BUTTERFLY
3-166 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-166-B	800	300	0.60	10	D	VENTURI
3-166A - DARK PROCEDURE	L2	-	3-166A	420	250	0.60	8	D	BUTTERFLY	3-166A	250	5425	12x10	0.20	150	55	75	0.5	5	3-166A	520	350	0.60	8	D	BUTTERFLY
3-170 - CORRIDOR	L12	-	3-170	1,040	1,040	0.60	10	D	BUTTERFLY	3-170	1,040	22568	13x14	0.20	150	55	75	2.3	5	-	-	-	-	-	-	-
3-171 - LABORATORY	L8	-	3-171	1,010	950	0.60	10	D	BUTTERFLY	3-171	1,010	21917	13x14	0.20	150	55	75	2.2	5	3-171-A	350	110	0.60	6	D	BUTTERFLY
3-171 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-171-B	400	400	0.60	6	D	BUTTERFLY
3-171 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-171-C	500	200	0.60	8	D	VENTURI
3-171A - DARK PROCEDURE	L5	-	3-171A	320	260	0.60	6	D	BUTTERFLY	3-171A	260	5642	12x8	0.20	150	55	75	0.6	5	3-171A-A	320	260	0.60	6	D	BUTTERFLY
3-171A - DARK PROCEDURE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-171A-B	100	100	0.60	4	D	BUTTERFLY
3-171B - FARADAY ROOM	L5	-	3-171B	260	260	0.60	5	D	BUTTERFLY	3-171B	260	5642	12x8	0.20	150	55	75	0.6	5	3-171B-A	260	260	0.60	5	D	BUTTERFLY
3-171B - FARADAY ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-171B-B	100	100	0.60	4	D	BUTTERFLY
3-174 - LABORATORY	L19	-	3-174	1,120	1,120	0.60	10	D	BUTTERFLY	3-174	1,120	24367	13x14	0.20	150	55	75	2.4	5	3-174-A	720	220	0.60	10	D	BUTTERFLY
3-174 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-174-B	800	300	0.60	10	D	VENTURI
3-174A - PUMP ROOM	L5	-	3-174A	160	160	0.60	5	D	BUTTERFLY	3-174A	160	3472	12x8	0.20	150	55	75	0.5	5	3-174A-A	160	160	0.60	5	D	BUTTERFLY
3-174A - PUMP ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-174A-B	100	100	0.60	4	D	BUTTERFLY
3-174B - PREP ROOM	L2	-	3-174B	160	160	0.60	5	D	BUTTERFLY	3-174B	160	3472	12x8	0.20	150	55	75	0.5	5	3-174B	260	260	0.60	5	D	BUTTERFLY
3-174C - ELECTRONICS ROOM	L13	-	3-174C	470	470	0.60	8	D	BUTTERFLY	3-174C	470	10205	12x10	0.20	150	55	75	1.0	5	3-174C	570	570	0.60	8	D	BUTTERFLY
3-176 - LABORATORY	L2	-	3-176	1,230	1,230	0.60	12	D	BUTTERFLY	3-176	1,230	26691	16x15	0.20	150	55	75	2.7	5	3-176	1,330	1,330	0.60	12	D	BUTTERFLY
3-176A - PUMP ROOM	L5	-	3-176A	430	240	0.60	8	D	BUTTERFLY	3-176A	240	5208	12x10	0.20	150	55	75	0.5	5	3-176A-A	430	240	0.60	8	D	BUTTERFLY
3-176A - PUMP ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-176A-B	100	100	0.60	4	D	BUTTERFLY
3-178 - LABORATORY	L2	-	3-178	1,720	1,460	0.60	14	D	BUTTERFLY	3-178	1,460	31745	20x18	0.20	150	55	75	3.2	5	3-178	1,720	1,460	0.60	14	D	BUTTERFLY
3-178A - ASSEMBLY ROOM	L7	-	3-178A	540	450	0.60	8	D	BUTTERFLY	3-178A	540	16242	12x10	0.20	150	55	83	1.6	5	3-178A-A	550	140	0.60	8	D	BUTTERFLY
3-178A - ASSEMBLY ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3-178A-B	800	300	0.60	10	D	VENTURI

AT SCHEDULE NOTES

1. SEE SPECIFICATION FOR MAXIMUM SOUND POWER LEVEL PER OCTAVE BAND.
2. COIL HOT-WATER FLOW RATE LIMITED TO 0.5 GPM MINIMUM, AS FLOW RATES BELOW 0.5 GPM MAY CAUSE BALANCE PROBLEMS AND POOR COIL PERFORMANCE.
3. MARK REFERS TO ALL SCHEDULED EQUIPMENT INCLUDING AIR TERMINAL, SOUND ATTENUATOR AND REHEAT COIL.
4. AIR TERMINAL MATERIAL - REFER TO SPECIFICATION
   D = GALVANIZED
   E = ALUMINUM
   F = ALUMINUM WITH HERESITE COATING
5. SAD MATERIAL - REFER TO SPECIFICATION
   A= FILM LINED
   B = PACKLESS GALVANIZED
   C= PACKLESS 316 STAINLESS STEEL
6. NEGATIVE NUMBER INDICATES AIR IS TRANSFERRED INTO THE ROOM (EXHAUST CFM IS GREATER THAN SUPPLY CFM) AND POSITIVE NUMBER INDICATES AIR IS TRANSFERRED OUT OF THE ROOM (SUPPLY CFM CFM IS GREATER THAN EXHAUST CFM).

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

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Date 02-24-2012 Reg. No. 25364

Issued for	Date
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Bid Package No. 2	02-24-2012

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Comm. No. 2030037

Drawn TMM

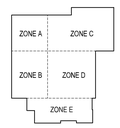
Checked RLH

Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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SCHEDULES

m9.05

AIR TERMINAL DEVICES

GENERAL ROOM(S) SERVED NAME	CONTROL SEQUENCE NO.	CFM OFFSET(6)	MARK(3) AT	SUPPLY AIR TERMINAL UNIT (1) MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE	REHEAT COILS MARK(3) RC	REHEAT CFM	CAPACITY Btuh	SIZE WxH (INCHES)	MAXIMUM APD (in wg)	EWT (°F)	EAT (°F)	LAT (°F)	GPM (2)	WPD (ft wg)	EXHAUST AIR TERMINAL UNIT (1) MARK(3) EV	MAXIMUM CFM	MINIMUM CFM	MAXIMUM APD (in wg)	INLET SIZE (in)	MATERIAL (4)	AIR TERMINAL TYPE
4-100 - OFFICE VENTILATION AIR	O1	-	4-100	820	820	0.60	10	D	VENTURI	4-100	820	17794	14x13	0.20	150	55	75	1.8	5	-	-	-	-	-	-
4-103 - WOMEN. 4-105 - MEN	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-103	460	460	0.60	8	D	BUTTERFLY
4-150 - CORRIDOR	L12	-	4-150	1,340	1,340	0.60	12	D	BUTTERFLY	4-150	1,340	29078	16x15	0.20	150	55	75	2.9	5	-	-	-	-	-	-	-
4-151 - LABORATORY	L8	-	4-151	1,670	1,540	0.60	14	D	BUTTERFLY	4-151	1,670	36239	20x18	0.20	150	55	75	3.6	5	4-151-A	1,040	670	0.60	10	D	BUTTERFLY
4-151 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-151-B	800	300	0.60	10	D	VENTURI
4-151 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-151-C	200	200	0.60	5	D	BUTTERFLY
4-151A - DARK PROCEDURE	L2	-	4-151A	330	240	0.60	6	D	BUTTERFLY	4-151A	240	5208	12x8	0.20	150	55	75	0.5	5	4-151A	430	340	0.60	8	D	BUTTERFLY
4-151B - DARK PROCEDURE	L2	-	4-151B	340	240	0.60	6	D	BUTTERFLY	4-151B	240	5208	12x8	0.20	150	55	75	0.5	5	4-151B	440	340	0.60	8	D	BUTTERFLY
4-154 - LABORATORY	L21	-	4-154-A	1,280	1,280	0.60	12	D	BUTTERFLY	4-154-A	1,280	29544	16x15	0.20	150	55	76	3.0	5	4-154-A	2,160	1,160	0.60	16	D	BUTTERFLY
4-154 - LABORATORY	-	-	4-154-B	1,320	1,320	0.60	12	D	BUTTERFLY	4-154-B	1,320	30412	16x15	0.20	150	55	76	3.0	5	4-154-B	800	300	0.60	10	D	VENTURI
4-154 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-154-C	800	300	0.60	10	D	VENTURI
4-154A - SOURCE ROOM	L2	-	4-154A	170	120	0.60	5	D	BUTTERFLY	4-154A	120	2604	12x8	0.20	150	55	75	0.5	5	4-154A	270	220	0.60	6	D	BUTTERFLY
4-154B - DARK PROCEDURE	L2	-	4-154B	550	360	0.60	8	D	BUTTERFLY	4-154B	360	7812	12x10	0.20	150	55	75	0.8	5	4-154B	650	460	0.60	8	D	BUTTERFLY
4-154C - ELECTRONICS ROOM	L13	-	4-154C	360	360	0.60	6	D	BUTTERFLY	4-154C	360	17731	12x8	0.20	150	55	100	1.8	5	4-154C	460	460	0.60	8	D	BUTTERFLY
4-156 - JANITOR	L10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-156	80	80	0.60	4	D	BUTTERFLY
4-162 - LABORATORY	L8	-	4-162	1,000	790	0.60	10	D	BUTTERFLY	4-162	790	22045	13x14	0.20	150	55	81	2.2	5	4-162-A	390	100	0.60	6	D	BUTTERFLY
4-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-162-B	100	100	0.60	4	D	BUTTERFLY
4-162 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-162-C	800	300	0.60	10	D	VENTURI
4-162A - DARK PROCEDURE	L2	-	4-162A	270	140	0.60	5	D	BUTTERFLY	4-162A	140	7437	12x8	0.20	150	55	104	0.7	5	4-162A	370	240	0.60	6	D	BUTTERFLY
4-162B - ELECTRONICS ROOM	L5	-	4-162B	400	220	0.60	6	D	BUTTERFLY	4-162B	220	15667	12x8	0.20	150	55	121	1.6	5	4-162B	500	320	0.60	8	D	BUTTERFLY
4-164 - LABORATORY	L4	-	4-164	1,740	1,460	0.60	16	D	BUTTERFLY	4-164	1,460	31745	20x18	0.20	150	55	75	3.2	5	4-164-A	1,640	1,360	0.60	14	D	BUTTERFLY
4-164 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-164-B	200	200	0.60	5	D	BUTTERFLY
4-164A - RF SHIELD ROOM	L2	-	4-164A	260	150	0.60	5	D	BUTTERFLY	4-164A	150	7654	12x8	0.20	150	55	102	0.8	5	4-164A	360	250	0.60	6	D	BUTTERFLY
4-164B - CONTROL ROOM	L2	-	4-164B	200	160	0.60	5	D	BUTTERFLY	4-164B	160	3472	12x8	0.20	150	55	75	0.5	5	4-164B	100	60	0.60	4	D	BUTTERFLY
4-164C - DARK PROCEDURE	L2	-	4-164C	250	170	0.60	5	D	BUTTERFLY	4-164C	170	3689	12x8	0.20	150	55	75	0.5	5	4-164C	350	270	0.60	6	D	BUTTERFLY
4-166 - LABORATORY	L18	-	4-166	1,000	1,000	0.60	10	D	BUTTERFLY	4-166	1,000	22004	13x14	0.20	150	55	75	2.2	5	4-166-A	1,100	1,100	0.60	10	D	BUTTERFLY
4-166 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-166-B	100	100	0.60	4	D	BUTTERFLY
4-170 - CORRIDOR	L12	-	4-170	1,340	1,340	0.60	12	D	BUTTERFLY	4-170	1,340	29078	16x15	0.20	150	55	75	2.9	5	-	-	-	-	-	-	-
4-173 - LABORATORY	L5	-	4-173	940	940	0.60	10	D	BUTTERFLY	4-173	940	20398	13x14	0.20	150	55	75	2.0	5	4-173-A	1,040	1,040	0.60	10	D	BUTTERFLY
4-173 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-173-B	100	100	0.60	4	D	BUTTERFLY
4-174 - LABORATORY	L13	-	4-174	1,380	1,380	0.60	16	D	BUTTERFLY	4-174	1,380	30161	16x15	0.20	150	55	75	3.0	5	4-174	1,380	1,380	0.60	12	D	BUTTERFLY
4-174A - LABORATORY	L2	-	4-174A	400	310	0.60	6	D	BUTTERFLY	4-174A	310	6727	12x8	0.20	150	55	75	0.7	5	4-174A	500	410	0.60	8	D	BUTTERFLY
4-174B - LABORATORY	L5	-	4-174B	320	260	0.60	6	D	BUTTERFLY	4-174B	260	5642	12x8	0.20	150	55	75	0.6	5	4-174B-A	320	260	0.60	6	D	BUTTERFLY
4-174B - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-174B-B	100	100	0.60	4	D	BUTTERFLY
4-175 - LABORATORY	L13	-	4-175	810	810	0.60	10	D	BUTTERFLY	4-175	810	17577	14x13	0.20	150	55	75	1.8	5	4-175	1,110	1,110	0.60	10	D	BUTTERFLY
4-175A - TISSUE CULTURE	L3	-	4-175A	900	900	0.60	10	D	BUTTERFLY	4-175A	900	19530	14x13	0.20	150	55	75	2.0	5	4-175A	NOT USED	-	-	-	-	-
4-176 - LABORATORY	L20	-	4-176-A	1,890	570	0.60	16	D	BUTTERFLY	4-176-A	1,890	41013	24x18	0.20	150	55	75	4.1	5	4-176-A	800	300	0.60	10	D	VENTURI
4-176 - LABORATORY	-	-	4-176-B	600	600	0.60	8	D	BUTTERFLY	4-176-B	600	13020	12x10	0.20	150	55	75	1.3	5	4-176-B	800	300	0.60	10	D	VENTURI
4-176 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-176-C	800	300	0.60	10	D	VENTURI
4-176 - LABORATORY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-176-D	250	70	0.60	5	D	BUTTERFLY
4-176A - TOOLS ROOM	L5	-	4-176A	210	160	0.60	5	D	BUTTERFLY	4-176A	160	3472	12x8	0.20	150	55	75	0.5	5	4-176A-A	210	160	0.60	5	D	BUTTERFLY
4-176A - TOOLS ROOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4-176A-B	100	100	0.60	4	D	BUTTERFLY
4-176C - EQUIPMENT ROOM	L17	-	4-176C	590	590	0.60	8	D	VENTURI	4-176C	590	12803	12x10	0.20	150	55	75	1.3	5	4-176C	690	690	0.60	8	D	BUTTERFLY

AT SCHEDULE NOTES

1. SEE SPECIFICATION FOR MAXIMUM SOUND POWER LEVEL PER OCTAVE BAND.
2. COIL HOT-WATER FLOW RATE LIMITED TO 0.5 GPM MINIMUM, AS FLOW RATES BELOW 0.5 GPM MAY CAUSE BALANCE PROBLEMS AND POOR COIL PERFORMANCE.
3. MARK REFERS TO ALL SCHEDULED EQUIPMENT INCLUDING AIR TERMINAL, SOUND ATTENUATOR AND REHEAT COIL.
4. AIR TERMINAL MATERIAL - REFER TO SPECIFICATION
   D = GALVANIZED
   E = ALUMINUM
   F = ALUMINUM WITH HERESITE COATING
5. SAD MATERIAL - REFER TO SPECIFICATION
   A= FILM LINED
   B = PACKLESS GALVANIZED
   C= PACKLESS 316 STAINLESS STEEL
6. NEGATIVE NUMBER INDICATES AIR IS TRANSFERRED INTO THE ROOM (EXHAUST CFM IS GREATER THAN SUPPLY CFM) AND POSITIVE NUMBER INDICATES AIR IS TRANSFERRED OUT OF THE ROOM (SUPPLY CFM IS GREATER THAN EXHAUST CFM).

CONTROL DAMPERS

TAG D	SERVICE	BLADE TYPE OPPOSED	BLADE TYPE PARALLEL	FAIL POSITION FC	FAIL POSITION FO	FAIL POSITION FLP	SIZE (IN) W	SIZE (IN) H	LOW LEAK SEALS	INSULATED	REMARKS
LXA	OA		X	X			96	36	YES	YES	AHU-LX
LXB	SA		X	X			72	24	YES	NO	AHU-LX
LXC	EA		X		X		44	24	YES	NO	AHU-LX BYPASS
LXD	EA		X	X			54	24	YES	NO	AHU-LX
LXE	EA		X	X			62	24	YES	NO	AHU-LX
LE1	EA		X	X			38	-	YES	NO	EF-LE1 (BUTTERFLY TYPE)
LE2	EA		X	X			38	-	YES	NO	EF-LE2 (BUTTERFLY TYPE)
LE3	EA		X	X			38	-	YES	NO	EF-LE3 (BUTTERFLY TYPE)
LE4	EA		X	X			38	-	YES	NO	EF-LE4 (BUTTERFLY TYPE)
FE1A	EA		X	X			148	76	YES	NO	HRU-FE1 (BUTTERFLY TYPE) (1)
FE1B	EA		X	X			148	76	YES	NO	HRU-FE1 (BUTTERFLY TYPE) (1)
FE1C	EA		X	X			148	76	YES	NO	HRU-FE1 (BUTTERFLY TYPE) (1)
FE2	OA	X		X			48	36	YES	NO	BYPASS
FE3	EA		X	X			38	-	YES	NO	EF-FE1 (BUTTERFLY TYPE)
FE4	EA		X	X			38	-	YES	NO	EF-FE2 (BUTTERFLY TYPE)
FE5	EA		X	X			38	-	YES	NO	EF-FE3 (FUTURE BUTTERFLY TYPE)
O1A	OA	X		X			42	36	YES	YES	AHU-O1
O1B	RA	X		X			70	30	YES	YES	AHU-O1 RA
O1C	EA	X		X			42	42	YES	NO	RH-1
O1D	RA	X				X	36	22	YES	NO	LEVEL 1 RA
O1E	RA	X				X	36	24	YES	NO	LEVEL 2 RA
O1F	RA	X				X	36	22	YES	NO	LEVEL 3 RA
O1G	RA	X				X	36	22	YES	NO	LEVEL 4 RA
ME1	OA	X		X			72	96	YES	YES	MECHANICAL ROOM OA INTAKE
M1	EA	X		X			54	54	YES	NO	REF-M1
ST1	SA	X		X			24	12	YES	NO	SF-ST-1

(1) DAMPER PROVIDED BY HEAT RECOVERY UNIT MANUFACTURER

CONTROL VALVES

MARK V	SERVICE	TYPE	LINE SIZE (IN)	GPM (LBS/HR)	CV@90% STROKE MAX. (3 PSID)	CV@90% STROKE MIN. (5 PSID)	SHUTOFF PRESSURE DIFFERENTIAL (PSI)	ACTUATOR TYPE	ACTUATOR FAIL POSITION	REMARKS
LXA	HWR	2-WAY BALL	1 1/4	10	6	5	150	ELEC / MOD	FO	AHU-LX (1/3)
LXB	HWR	2-WAY GLOBE	2 1/2	50	29	22	150	ELEC / MOD	FLP	AHU-LX (FULL)
LXC	CHR	TWO WAY(3)	4	188	109	84	150	ELEC / MOD	FLP	AHU-LX, PRESSURE INDEPENDENT
E1B	CHR	TWO WAY(3)	2 1/2	55	32	25	150	ELEC / MOD	FLP	AHU-E1B, PRESSURE INDEPENDENT
O1A	HWR	2-WAY GLOBE	2	34	20	16	150	ELEC / MOD	FLP	AHU-O1
O1B	CHR	TWO WAY(3)	4	150	87	67	150	ELEC / MOD	FLP	AHU-O1
B1	BCHS	2-WAY	2	30	17	13	150	ELEC / MOD	FLP	PRESSURE INDEPENDENT
CV1C	HWR	2-WAY BTR	6	600	346	268	150	ELEC / MOD	FO	CV-1
CV2C	HWR	2-WAY BTR	6	600	346	268	150	ELEC / MOD	FO	CV-2
C3A	CHS	TWO WAY(3)	4	200	115	89	150	ELEC / MOD	FLP	HX-C3, PRESSURE INDEPENDENT
C4A	CHS	TWO WAY(3)	4	200	115	89	150	ELEC / MOD	FLP	HX-C4, PRESSURE INDEPENDENT
C3B	ECHR	2-WAY BTR	4	200	115	89	150	ELEC / MOD	FLP	HX-C3
C4B	ECHR	2-WAY BTR	4	200	115	89	150	ELEC / MOD	FLP	HX-C4

(1) STEAM CONTROL VALVES SIZED WITH 10 PSIG INLET AND 2 PSIG OUTLET .
(2) ALTERNATE BID M2 .
(3) SELF BALANCING PRESSURE INDEPENDENT CONTROL VALVE.

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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100% CD set	12-16-2011
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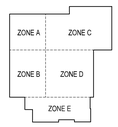
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



UNIVERSITY OF MINNESOTA
Driven to Discover℠

SCHEDULES

m9.06

OFFICE AIRFLOW SUMMARY

											IBC 2009														
			TRANE TRACE OUTPUT								OA per Person	Zone Population	OA CFM	OA per Unit Area	Zone Floor Area	OA CFM						MAX. VENT LOAD / MAX. COOL LOAD			
ROOM NUMBER	ROOM NAME	ROOM TYPE	AREA	CEILING HEIGHT	ROOM VOL	COOLING SETPOINT	HEATING SETPOINT	SENS GAIN	LATENT GAIN	HEAT LOSS 10% SAFETY	SENS SA	Rp	Pz	Rp x Pz	Ra	Az	Ra x Az	DESIGN OA CFM	PRESSURIZATION	TRANSF. AIR IN	TRANSF. AIR OUT	Unadj SA	SUPPLY	OA Supplied from LAB AHU	RETURN	EXHAUST	TRANSF.
			SQ FT	FT.	CU FT			BTUH	BTUH	BTUH	CFM	CFM/Prsn	# PEOPLE	CFM	CFM/SF	SF	CFM	CFM		CFM	CFM						
1-100	Lobby	LOBBY	2,275	10.0	22,750	75	72	26090	6308	-14741	1323	5.0	30	150	0.06	2,275	137	372	Neutral		500	1,323	1,325	380	1,205	0	-500
1-102	Large Conference	CONF/AUD	1050	11.3	11,865	75	72	33850	5600	-49196	1716	5.0	53	265	0.06	1,050	63	426	Neutral			1,716	1,720	430	2,150	0	0
1-104	Vending	KITCHEN	115	10.0	1,150	75	72	1256	0	0	64	5.0	0	0	0.06	115	7	9	Neutral	200		64	0	10	210	0	200
1-104B	Catering Prep	KITCHEN	120	10.0	1,200	75	72	4665	280	-5400	236	5.0	0	0	0.06	120	7	9	Neutral			236	240	10	250	0	0
1-106	CNA Conference	CONF/AUD	635	11.3	7,176	75	72	22100	4000	-24739	1120	5.0	22	115	0.06	635	38	199	Neutral			1,120	1,125	200	1,325	0	0
1-108	Medium Conference	CONF/AUD	710	11.3	8,023	75	72	22100	6262	-37151	1120	5.0	22	110	0.06	710	43	198	Neutral			1,120	1,125	200	1,325	0	0
1-140	Reception/Lobby	LOBBY	280	10.0	2,800	75	72	2452	280	0	124	5.0	1	10	0.06	280	17	35	Neutral		165	125	125	40	0	0	-165
1-140A	Copy/Kitchen	KITCHEN	85	10.0	850	75	72	1035	85	0	52	5.0	0	5	0.06	85	5	13	Neutral	385		52	0	20	405	0	385
1-142	Info Sys Support	OFFICE	125	10.0	1,250	75	72	1095	125	0	55	5.0	1	5	0.06	125	8	16	Neutral			55	60	20	80	0	0
1-143	Account	OFFICE	125	10.0	1,250	75	72	1095	125	0	55	5.0	1	5	0.06	125	8	16	Neutral			55	60	20	80	0	0
1-144	Director	OFFICE	190	10.0	1,900	75	72	7633	683	-10706	387	5.0	1	5	0.06	190	11	21	Neutral			387	390	30	420	0	0
1-145	Outreach Coord	OFFICE	125	10.0	1,250	75	72	1095	125	0	55	5.0	1	5	0.06	125	8	16	Neutral			55	60	20	80	0	0
1-146	Lab Manager	OFFICE	155	10.0	1,550	75	72	5226	862	-10823	265	5.0	1	5	0.06	155	9	19	Neutral			265	265	20	285	0	0
1-147	Staff	OFFICE	125	10.0	1,250	75	72	1095	125	0	55	5.0	1	5	0.06	125	8	16	Neutral			55	60	20	80	0	0
1-148	Admin	OFFICE	95	10.0	950	75	72	832	95	0	42	5.0	0	5	0.06	95	6	14	Neutral			42	60	20	80	0	0
1-150	Corridor	OFFICE	380	10.0	3,800	75	72	3328	380	0	169	5.0	2	10	0.06	380	23	43	Neutral		220	170	170	50	0	0	-220
1-151	Staff	OFFICE	125	10.0	1,250	75	72	1095	125	0	55	5.0	1	5	0.06	125	8	16	Neutral			55	60	20	80	0	0
1-152	Staff	OFFICE	425	10.0	4,250	75	72	9663	892	-10905	490	5.0	2	15	0.06	425	26	53	Neutral			490	490	60	550	0	0
1-153	PhD	OFFICE	125	10.0	1,250	75	72	1095	125	0	55	5.0	1	5	0.06	125	8	16	Neutral			55	60	20	80	0	0
1-154	Corridor	CORRIDOR	155	10.0	1,550	75	72	423	0	0	21	0.0	0	0	0.06	155	9	12	Neutral			21	0	20	20	0	0
1-156	Grad Offices	OFFICE	310	10.0	3,100	75	72	5882	719	-8168	298	5.0	2	10	0.06	310	19	37	Neutral			298	300	40	340	0	0
	TRANSFER TO LAB TOILETS																			300							420
			7730					153105	27197	-171828	7761							1,558		885	885		7695	1650	9045	0	120
2-100	Corridor	CORRIDOR	1105	10.0	11,050	75	72	23580	517	-21419	1195	0.0	0	0	0.06	1,105	66	86	Neutral	230	300	1,195	1,200	100	1,230	0	-70
2-107	Medium Conference	CONF/AUD	350	10.0	3,500	75	72	35500	4079	-35698	1800	5.0	18	90	0.06	350	21	144	Neutral			1,800	1,800	150	1,950	0	0
2-108	Grad	OFFICE	355	10.0	3,550	75	72	10676	2245	-28423	541	5.0	2	10	0.06	355	21	41	Neutral			541	545	50	595	0	0
2-110	Kitchenette	KITCHEN	80	10.0	800	75	72	974	80	0	49	5.0	0	5	0.06	80	5	13	Neutral	200		49	0	20	220	0	200
2-112	Post Doc	OFFICE	240	10.0	2,400	75	72	7795	1714	-17835	395	5.0	1	10	0.06	240	14	32	Neutral			395	400	40	440	0	0
2-113	Grad	OFFICE	425	10.0	4,250	75	72	3771	425	0	191	5.0	2	15	0.06	425	26	53	Neutral			191	225	60	285	0	0
2-114	Faculty	OFFICE	120	10.0	1,200	75	72	3832	257	-6712	194	5.0	1	5	0.06	120	7	16	Neutral			194	195	20	215	0	0
2-116	Meeting/Flex	CONF/AUD	120	10.0	1,200	75	72	5275	1067	-7106	267	5.0	6	30	0.06	120	7	48	Neutral			267	270	50	320	0	0
2-117	Admin	OFFICE	375	10.0	3,750	75	72	3284	375	-896	166	5.0	2	10	0.06	375	23	42	Neutral			166	200	50	250	0	0
2-118	Faculty	OFFICE	120	10.0	1,200	75	72	3832	257	-6712	194	5.0	1	5	0.06	120	7	16	Neutral			194	195	20	215	0	0
2-120	Hallway	CORRIDOR	965	10.0	9,650	75	72	6860	754	-10431	348	0.0	0	0	0.06	965	58	75	Neutral		430	430	350	80	0	0	-430
2-121	Post Doc	OFFICE	180	10.0	1,800	75	72	1577	180	0	80	5.0	1	5	0.06	180	11	21	Neutral			80	80	30	110	0	0
2-122	Faculty	OFFICE	120	10.0	1,200	75	72	3832	257	-6712	194	5.0	1	5	0.06	120	7	16	Neutral			194	195	20	215	0	0
2-124	Meeting/Flex	CONF/AUD	120	10.0	1,200	75	72	5306	1067	-6899	269	5.0	6	30	0.06	120	7	48	Neutral			269	270	50	320	0	0
2-125	Grad Students	OFFICE	370	10.0	3,700	75	72	3241	370	0	164	5.0	2	10	0.06	370	22	42	Neutral			164	200	50	250	0	0
2-126	Faculty	OFFICE	120	10.0	1,200	75	72	3883	257	-6505	196	5.0	1	5	0.06	120	7	16	Neutral			196	200	20	220	0	0
2-128	Faculty	OFFICE	120	10.0	1,200	75	72	3863	257	-6505	196	5.0	1	5	0.06	120	7	16	Neutral			196	200	20	220	0	0
2-131	Post Doc	OFFICE	180	10.0	1,800	75	72	1577	180	0	80	5.0	1	5	0.06	180	11	21	Neutral			80	80	30	110	0	0
2-132	Meeting/Flex	CONF/AUD	120	10.0	1,200	75	72	5306	1067	-6899	269	5.0	6	30	0.06	120	7	48	Neutral			269	270	50	320	0	0
2-134	Faculty	OFFICE	120	10.0	1,200	75	72	3740	927	-9315	190	5.0	1	5	0.06	120	7	16	Neutral			190	190	20	210	0	0
2-136	Faculty	OFFICE	115	10.0	1,150	75	72	3792	967	-11525	192	5.0	1	5	0.06	115	7	15	Neutral			192	195	20	215	0	0
2-140	Corridor	CORRIDOR	605	10.0	6,050	75	72	1652	0	0	84	0.0	0	0	0.06	605	36	47	Neutral		135	135	85	50	0	0	-135
2-140	Grad Students	OFFICE	275	10.0	2,750	75	72	5692	563	-6541	289	5.0	1	10	0.06	275	17	34	Neutral			289	290	40	330	0	0
2-141	Storage	STORAGE	200	10.0	2,000	75	72	546	0	0	28	0.0	0	0	0.12	200	24	31	Neutral			28	100	0	100	0	0
2-142	Grad Students	OFFICE	275	10.0	2,750	75	72	5692	563	-6541	289	5.0	1	10	0.06	275	17	34	Neutral			289	290	40	330	0	0
2-144	Grad Students	OFFICE	275	10.0	2,750	75	72	5692	563	-6541	289	5.0	1	10	0.06	275	17	34	Neutral			289	290	40	330	0	0
2-146	CNA CAD	OFFICE	275	10.0	2,750	75	72	5692	563	-6541	289	5.0	1	10	0.06	275	17	34	Neutral			289	290	40	330	0	0
2-146A	CNA Visiting Faculty	OFFICE	135	10.0	1,350	75	72	1182	135	0	60	5.0	1	5	0.06	135	8	17	Neutral			60	60	20	80	0	0
2-146B	CNA Visiting Faculty	OFFICE	135	10.0	1,350	75	72	4466	423	-6206	226	5.0	1	5	0.06	135	8	17	Neutral			226	230	20	250	0	0
2-151	Storage	STORAGE	50	10.0	500	75	72	137	0	0	7	0.0	0	0	0.12	50	6	8	Neutral			7	0	0	0	0	0
2-152	Grad Students	OFFICE	450	10.0	4,500	75	72	7697	1431	-14594	390	5.0	2	15	0.06	450	27	55	Neutral			390	395	60	455	0	0
	TRANSFER TO JANITOR 2-158																			135							
	TRANSFER TO LAB TOILETS																			300							420
			8495					179924	21537	-118466	9121							1,137		865	865		9290	1260	10115	0	-15
3-100A	Corridor	CORRIDOR	935	10.0	9,350	75	72	30721	1350	-49358	1557	0.0	0	0	0.06	935	56	73	Neutral		150	1,557	1,560	80	1,490	0	-150
3-100B	Corridor	CORRIDOR	675	10.0	6,750	75	72	21130	530	-49358	1071	0.0	0	0	0.06	675	41	53	Neutral		150	1,071	1,075	60	985	0	-150
3-108	Conference	CONF/AUD	285	10.0	2,850	75	72	9563	3299	-16404	485	5.0	14	75	0.06	285	17	120	Neutral			485	485	120	605	0	0
3-110	Kitchenette	KITCHEN	80	10.0	800	75	72	1217	100	0	62	5.0	1	5	0.06	80	5	13	Neutral	430		62	0	20	450	0	430
3-112	Grad	OFFICE	370	10.0	3,700	75	72	9639	2084	-19331	489	5.0	2	10	0.06	370	22	42	Neutral			489	490	50	540	0	0
3-114	Post Doc	OFFICE	180	10.0	1,800	75	72	4665	314	-6282	236	5.0	1	5	0.06	180	11	21	Neutral			236	240	30	270	0	0
3-116	Faculty	OFFICE	180	10.0	1,800	75	72	4665	314	-6282	236	5.0	1	5	0.06	180	11	21	Neutral			236	240	30	270	0	0
3-117	Post Doc	OFFICE	175	10.0	1,750	75	72	1533	175	0	78	5.0	1	5	0.06	175	11	20	Neutral			78	80	30	110	0	0
3-118	Grad	OFFICE	370	10.0	3,700	75	72	9429	646	-12828	478	5.0	2	10	0.06	370	22	42	Neutral			478	480	50	530	0	0
3-120	Hallway	CORRIDOR	860	10.0	8,600	75	72	7072	698	-12012	358	0.0	0	0	0.06	860	52	67	Neutral		430	430	360	70	0	0	-430
3-121	Faculty	CONF/AUD	185	10.0	1,850	75	72	1620	185	0	82	5.0	1	5	0.06	185	11	21	Neutral			82	85	30	115	0	0
3-123	Faculty	OFFICE	120	10.0	1,200	75	72	1051	120	0	53	5.0	1	5	0.06	120	7	16	Neutral			53	55	20	75	0	0
3-124	Grad	OFFICE	370	10.0	3,700	75	72	9429	646	-12828	478	5.0	2	10	0.06	370	22	42	Neutral			478	480	50	530	0	0
3-127	Meeting/Flex	CONF/AUD	120	10.0	1,200	75	72	2494	930	0	126	5.0	6	30	0.06	120	7	48	Neutral			126	130	50	180	0	0
3-128	Faculty	OFFICE	180	10.0	1,800	75	72	4665	314	-6282	236	5.0	1	5	0.06	180	11	21	Neutral			236	240	30	270	0	0
3-131	Faculty	OFFICE	120	10.0	1,200	75	72	1051	120	0	53	5.0	1	5	0.06	120	7	16	Neutral			53	55	20	75	0	0
3-132	Faculty	OFFICE	180	10.0	1,800	75	72	4665	314	-6282	236	5.0	1	5	0.06	180	11	21	Neutral			236	240	30	270	0	0
3-133	Faculty	OFFICE	120	10.0	1,200	75	72	1051	120	0	53	5.0	1	5	0.06	120	7	16	Neutral			53	55	20	75	0	0
3-135	Post Doc	OFFICE	175	10.0	1,750	75	72	1533	175	0	78	5.0	1	5	0.06	175	11	20	Neutral			78	80	30	110	0	0
3-136	Grad	OFFICE	370	10.0	3,700	75	72	9163	2084	-19201	465	5.0	2	10	0.06	370	22	42	Neutral			465	465	50	515	0	0
3-152	Storage	STORAGE	80	10.0	800	75	72	218	0	0	11	0.0	0	0	0.12	80	10	12	Neutral			11	0	0	0	0	0
3-154	Future Physics Offices	OFFICE	2400	10.0	24,000	75	72	41686	4764	-50216	2113	5.0	12	60	0.06	2,400	144	265	Neutral			2,113	2,115	390	2,505	0	0
	TRANSFER TO LAB TOILETS																			300							420
			8530					178261	19284	-266665	9036							1,010		730	730		9010	1260	9970	0	120
4-100	Corridor	CORRIDOR	860	10.0	8,600	75	72	3900	0	-5639	198	0.0	0	0	0.06	860	52	67	Neutral	320	300	300	200	100	320	0	20
4-100A	Skylight Load	STORAGE	1375	10.0	13,750	75	72	101752	416	-70891	5158	0.0	-	-	-	-	-	-	Neutral			5,158	5,160	0	5,160	0	0
4-100B	West 2nd Story	CORRIDOR	390	10.0	3,900	75	72	29550	1366	-35765	1498	0.0	0	0	0.06	390	23	30	Neutral			1,498	1,500	0	1,500	0	0
4-100C	East 2nd Story	CORRIDOR	200	10.0	2,000	75	72	19650	598	-20657	996	0.0	0	0	0.06	200	12	16	Neutral			996	1,000	0	1,000	0	0
4-108	Conf	CONF/AUD	285	10.0	2,850	75	72	10842	3934	-21071	550	5.0	14	75	0.06	285	17	120	Neutral			550	550	120	670	0	0
4-110	Kitchenette	KITCHEN	80	10.0	800	75	72	1288	80	-380	65	5.0	0	5	0.06	80	5	13	Neutral	300		65	0	20	320	0	300
4-112	Grad	OFFICE	370	10.0	3,700	75	72	11035	2084	-21469	559	5.0	2	10	0.06	370	22	42	Neutral			559	560	50	610	0	0
4-114	Post Doc	OFFICE	180	10.0	1,800	75	72	5044	314	-7239	256	5.0	1	5	0.06	180	11	21	Neutral			256	260	30	290	0	0
4-116	Faculty	OFFICE	180	10.0	1,800	75	72	5044	314	-7239	256	5.0	1	5	0.06	180	11	21	Neutral			256	260	30	290	0	0
4-117	Post Doc	OFFICE	175	10.0	1,750	75	72	2221	175	-829	113	5.0	1	5	0.06	175	11	20	Neutral			113	115	30	145	0	0
4-118	Grad	OFFICE	370	10.0	3,700	75	72	10205	645	-11963	517	5.0	2	10	0.06	370	22	42	Neutral			517	520	50	570	0	0
4-120	Corridor	CORRIDOR	850	10.0	8,500	75	72	9380	521	-13256	475	0.0	0	0	0.06	850	51	66	Neutral		620	620	550	70	0	0	-620
4-121	Post Doc	OFFICE	185	10.0	1,850	75	72	2348	185	-880	119	5.0	1	5	0.06	185	11	21	Neutral			119	120	30	150	0	0
4-123	Faculty	OFFICE	120	10.0	1,200	75	72	1523	120	-984	77	5.0	1	5	0.06	120	7	16	Neutral			77	80	20	100	0	0
4-124	Grad	OFFICE	370	10.0	3,700	75	72	10205	645	-11963	517	5.0	2	10	0.06	370	22	42	Neutral			517	520	50	570	0	0
4-127	Meeting Flex	CONF/AUD	120	10.0	1,200	75	72	2966	930	-1378	150	5.0	6	30	0.06	120	7	48	Neutral			150	155	50	205	0	0
4-128	Grad	OFFICE	180	10.0	1,800	75	72	5044	314	-7239	256	5.0	1	5	0.06	180	11	21	Neutral			256	260	30	290	0	0
4-131	Faculty	OFFICE	120	10.0	1,200	75	72	1523	120	-660	77	5.0	1	5	0.06	120	7	16	Neutral			77	80	20	100	0	0
4-132	Faculty	OFFICE	180	10.0	1,800	75	72	5044	314	-7239	256	5.0	1	5	0.06	180	11	21	Neutral			256	260	30	290	0	0
4-133	Faculty	OFFICE	120	10.0	1,200	75	72	1523	120	-660	77	5.0	1	5	0.06	120	7	16	Neutral			77	80	20	100	0	0
4-135	Post Doc	OFFICE	180	10.0	1,800	75	72	2284	180	-770	116	5.0	1	5	0.06	180	11	21	Neutral			116	120	30	150	0	0
4-136	Grad	OFFICE	370	10.0	3,700	75	72	10552	2066	-21172	535	5.0	2	10	0.06	370	22	42	Neutral			535	535	50	585	0	0
	TRANSFER TO LAB TOILETS																			300							
			7260					252921	15442	-269341	12821							719		920	920		12885	830	13415	0	-300
			32,015					764,211	83,460	-826,299	38,739							4,424		3,400	3,400	38,739	38,880	5,000	42,545	0	-150

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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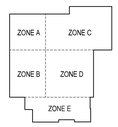
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



UNIVERSITY OF MINNESOTA
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SCHEDULES

m9.07

LAB AIRFLOW SUMMARY

			TRANE TRACE OUTPUT								MIN AIRFLOW					MAX. VENT LOAD MAX. COOL LOAD												MIN CFM (HOODS AT MIN POSITION)				
ROOM NUMBER	ROOM NAME	ROOM TYPE	AREA	CEILING HEIGHT	ROOM VOL	COOLING SETPOINT	HEATING SETPOINT	SENS GAIN	LATENT GAIN	HEAT LOSS 10% SAFETY	SENS SA	MIN OCC. AIR CHANGE	MIN OCC. AIRFLOW	UNADJ SA	CHILLED BEAM	CHILLED BEAM QUANTITY	TOTAL SUPPLY	C.B. SUPPLY	DIFUSER SUPPLY	SUPPLY INCLD FUTURE	LAB EXHAUST	LAB EXH MIN SENS DRIVEN	LAB EXH INCLD FUTURE	FUME EXHAUST	POINT EXHAUST	FUTURE FUME EXH	FUTURE FUME HOODS	BSC	TRANSF.	SUPPLY	EXHAUST	LAB EXH INCLD FUTURE	FUME EXH MIN	FUTURE FUME EXH MIN
			SQ FT	FT.	CU FT			BTUH	BTUH	BTUH	CFM	ACH	CFM				CFM	CFM	CFM	CFM	CFM	CFM	CFM	CFM	CFM	CFM		CFM	CFM	CFM	CFM	CFM	CFM
B-102	CM Lab	LAB	1020	15.0	15,300	75	72	36552	2550	0	1860	6	1,530	1,860			1,860	0	1,860	2,060	820		220	800	240	800	(1) 6" Future	0	1,530	990	690	300	300
B-102B	Pump Room	LAB	110	15.0	1,650	75	72	3191	0	0	170	6	170	170			170	0	170		270							100					
B-102C	Lab Support	LAB	350	15.0	5,250	75	72	14612	875	0	750	6	530	750			750	0	750		850							100					
B-103	Women	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
B-104	CM Lab	LAB	670	15.0	10,050	75	72	17911	1675	0	910	6	1,010	1,010			1,390	0	1,390		70	90		800	120			-400	1,010	190		300	
B-104A	Pump Room	LAB	110	15.0	1,650	75	72	4029	0	0	210	6	170	210			210	0	210		190				120			100					
B-104B	K400 Pit Room	LAB	220	15.0	3,300	75	72	6106	0	0	310	6	330	330			330	0	330		470				60			200					
B-104C	Pump Room	LAB	110	15.0	1,650	75	72	3654	0	0	190	6	170	190			190	0	190		170				120			100					
B-104D	Pit Room	LAB	220	15.0	3,300	75	72	5956	0	0	310	6	330	330			330	0	330		470				60			200					
B-105	Men	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
B-106	CM Lab	LAB	645	15.0	9,675	75	72	17327	1600	0	880	6	970	970			1,720	0	1,720		60	220		1,600	60			0	970	310		600	
B-106A	MBE_STM Room	LAB	210	15.0	3,150	75	72	10416	525	0	530	6	320	530			530	0	530		610				120			200					
B-107	Custodian Equip Storage	JANITOR/EVS	220	10.0	2,200	75	72	601	0	0	40	0	0	40			100	0	100		200							100					
B-150	Corridor	CORRIDOR	2110	10.0	21,100	75	72	5761	0	0	300	0	0	2,370			2,370	0	2,370		0							-2,370					
B-151	Janitor	JANITOR/EVS	95	10.0	950	75	72	0	0	0	0	0	0	0			0	0	0		70							70					
B-153	A/C Lab	LAB	675	15.0	10,125	75	72	22183	1688	0	1130	6	1,020	1,130			1,130	0	1,130		1,230							100					
B-153A	Pump Room	LAB	120	15.0	1,800	75	72	3985	0	0	210	6	180	210			210	0	210		310							100					
B-154	CM Lab	LAB	698	15.0	10,470	75	72	17518	1452	0	890	6	1,050	1,050			1,050	0	1,050		830				120			-100					
B-154A	Prep A	LAB	133	15.0	1,995	75	72	3839	332	0	200	6	200	200			200	0	200		300							100					
B-154B	Prep B	LAB	211	15.0	3,165	75	72	7477	528	0	380	6	320	380			760	0	760		60	180		800				100	320	120		300	
B-154D	Pump Room	LAB	78	15.0	1,170	75	72	1979	195	0	110	6	120	120			120	0	120		100				120			100					
B-155	Physics Storage	STORAGE	260	10.0	2,600	75	72	710	0	0	40	4	180	180			180	0	180		180							0					
B-156	CNA Labs	LAB	710	15.0	10,650	75	72	20434	1775	0	1040	6	1,070	1,070			1,070	0	1,070	1,490	470		90	800		800	(1) 6' Future	200	1,070	970	670	300	300
B-157	A/C Lab	LAB	595	15.0	8,925	75	72	19427	1488	0	990	6	900	990			990	0	990		390			800				200	900	800		300	
B-165	Waste Recycle	JANITOR/EVS	145	10.0	1,450	75	72	1689	0	0	90	4	100	100			100	0	100		200							100					
B-166	HE Liquefier	LAB	370	15.0	5,550	75	72	15022	500	0	770	6	560	770			770	0	770		610				60			-100					
B-166A	HE Recovery	LAB	510	15.0	7,650	75	72	20517	500	0	1050	6	770	1,050			1,050	0	1,050		1,190				60			200					
B-168	Student Machine Shop	LAB	1025	15.0	15,375	75	72	13594	1000	0	690	6	1,540	1,540			1,540	0	1,540		1,720				120			300					
Floor Totals			12040							0	14050			17550	0	0	19280				12300		310	5600	1380	1600			5800	3380	1360	2100	600
																		0	0														
																		0	0														
1-103	Men	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
1-105	Women	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
1-162	High Bay Lab	LAB	3610	38.0	137,180	75	72	75549	7184	-126797	3830	0	8,400	8,400	0		8,400	0	8,400		8,600							200					
1-163	Janitor	JANITOR/EVS	85	10.0	850	75	72	0	0	0	0	0	0	0			0	0	0		80							80					
1-164	Fill Station	MECH	100	10.0	1,000	75	72	273	0	0	20	4	70	70			70	0	70		170							100					
1-166	Loading Dock	MECH	1660	10.0	16,600	75	72	10997	6940	-61377	560	0	0	760			760	0	760		0							-760					
1-166A	Gas Sorage	STORAGE	200	10.0	2,000	75	72	1530	784	-7848	80	4	140	140			140	0	140		0			500				360					
1-166B	Liquid(H-3) Storage	STORAGE	255	10.0	2,550	75	72	696	0	0	40	4	170	170			170	0	170		230			40				100					
1-166C	LN2/Gas Storage	STORAGE	115	10.0	1,150	75	72	314	0	0	20	4	80	80			80	0	80		180							100					
1-168	Unisex Toilet	TOILET	60	10.0	600	75	72	0	0	0	0	0	0	0			0	0	0		70							70					
1-170	Corridor	CORRIDOR	2020	10.0	20,200	75	72	5515	0	0	280	0	0	1,250			1,250	0	1,250		0							-1,250					
1-171	Wet BIO Lab	LAB	275	14.0	3,850	75	72	6976	688	0	360	6	390	390			1,400	0	1,400		0			500			1,100	200	1,100	0	200		
1-173	CNA LAB	LAB	325	14.0	4,550	75	72	8022	813	0	410	6	460	460			690	0	690		90	310		800				200	460	360		300	
1-175	CNA LAB	LAB	325	14.0	4,550	75	72	8133	813	0	420	6	460	460			690	0	690		90	320		800				200	460	360		300	
1-177	CNA LAB	LAB	325	14.0	4,550	75	72	7970	775	0	410	6	460	460			670	0	670		70	310		800				200	460	360		300	
	LOADING DOCK POSITIVE																											200					
	TOILET TRANSFER																																
Floor Totals			9775							-196021	26730			12640	0	0	14480				10040		0	3440	0	0			2480	1080	0	1100	0
2-103	Men	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
2-105	Women	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
2-158	Janitor	JANITOR/EVS	110	10.0	1,100	75	72	0	0	0	0	0	0	0			0	0	0		135							135					
2-162	CM Lab	LAB	815	14.0	11,410	75	72	21173	3856	-18197	1080	6	1,150	1,150			5,450	0	5,450		0			5,350	300			200	2,250	0		2,150	
2-164	CM Lab A	LAB	690	14.0	9,660	75	72	27735	2663	-9016	1410	6	970	1,410	6,686	2	1,670	200	1,470		60			1,750	60			200	970	460		650	
2-166	CM Lab	LAB	680	14.0	9,520	75	72	53433	2660	-10213	2710	6	960	2,710	32,601	10	1,000	1,000	0		1,200							200					
2-170	Corridor	CORRIDOR	1570	10.0	15,700	75	72	11363	234	-5800	580	0	0	1,200			1,200	0	1,200		0							-1,200					
2-171	CM Lab	LAB	1145	14.0	16,030	75	72	30609	2863	0	1560	6	1,610	1,610			1,610	0	1,610	1,610	1,130		330		480	800	(1) 6' Future	0	1,610	1,130	830		300
2-171A	Prep Room	LAB	180	14.0	2,520	75	72	5180	450	0	270	6	260	270			620	0	620	210	60			800	60			300	260	200		300	
2-171B	Pump	LAB	110	14.0	1,540	75	72	3354	0	0	170	6	160	170			170	0	170		90				180			100					
2-175	PPMS Lab	LAB	325	14.0	4,550	75	72	14900	813	0	760	6	460	760			760	0	760		780				180			200					
	TRANSFER FROM 2-140																																
	TOILET TRANSFER																																
Floor Totals			6045							-308471	37870			9280	39287	12	12640				3915		330	7900	1260	800			5090	1790	830	3100	300
3-103	Women	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
3-105	Men	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
3-150	Corridor	CORRIDOR	725	10.0	7,250	75	72	1980	0	0	110	0	0	280			280	0	280		0							-280					
3-151	Future Physics Lab	LAB	1475	14.0	20,650	75	72	61581	3688	0	3130	6	2,070	3,130	16,662	6	2,070	540	1,530	FUTURE	1,470					800	(1) 6' Future	200	2,070	2,270	1,970		300
3-156	Janitor	JANITOR/EVS	90	10.0	900	75	72	0	0	0	0	0	0	0			0	0	0		80							80					
3-162	Future Physics Lab	LAB	845	14.0	11,830	75	72	38051	3969	-18576	1930	6	1,190	1,930	12,228	4	1,190	400	790	FUTURE	590					800	(1) 6' Future	200	1,190	1,390	1,090		300
3-164	CM Lab	LAB	1050	14.0	14,700	75	72	30272	4071	-14185	1540	6	1,470	1,540			1,540	420	1,120	1,640	760		60	800	180	800	(1) 6' Future	200	1,470	1,190	890	300	300
3-166	A/C Lab	LAB	895	14.0	12,530	75	72	32601	3707	-15413	1660	6	1,260	1,660	5,259	2	1,260	200	1,060		560			800				100	1,260	1,060		300	
3-166A	Dark Procedure	LAB	175	14.0	2,450	75	72	8252	450	0	420	6	250	420			420	0	420		520							100					
3-170	Corridor	CORRIDOR	2225	10.0	22,250	75	72	9767	495	-7930	500	0	0	1,800			1,800	0	1,800		0							-1,800					
3-171	CM Lab	LAB	675	14.0	9,450	75	72	19887	1688	0	1010	6	950	1,010			1,010	0	1,010		270			500	240			0	950	510		200	
3-171a	Dark Procedure	LAB	185	14.0	2,590	75	72	6145	463	0	320	6	260	320			320	0	320		360				60			100					
3-171b	Faraday Rm	LAB	185	14.0	2,590	75	72	3340	463	0	170	6	260	260			260	0	260		300				60			100					
3-173	Future Physics Lab	LAB	1800	14.0	25,200	75	72	75149	4500	0	3810	6	2,520	3,810	20,465	8	3,860	600	3,260	FUTURE	60					4,000	(5) 6' Future	200	2,520	2,720	1,220		1,500
3-174	A/C Lab	LAB	800	14.0	11,200	75	72	35054	2976	-15057	1780	6	1,120	1,780	10,750	4	1,120	400	720		220			800				-100	1,120	720		300	
3-174a	Pump Rm	LAB	110	14.0	1,540	75	72	2828	275	0	150	6	160	160			160	160	0		200				60			100					
3-174b	Prep Rm	LAB	110	14.0	1,540	75	72	3128	275	0	160	6	160	160			160	0	160		260							100					
3-174c	Electronics Rm	LAB	330	14.0	4,620	75	72	16887	2335	-20005	860	6	470	860	6,688	2	470	200	270		570							100					
3-176	A/C Lab B	LAB	875	14.0	12,250	75	72	33221	2929	-14892	1690	6	1,230	1,690	6,630	2	1,230	200	1,030		1,330							100					
3-176a	Pump Rm	LAB	165	14.0	2,310	75	72	8304	720	0	430	6	240	430			430	0	430		470				60			100					
3-178	A/C Lab A	LAB	1040	14.0	14,560	75	72	33842	3737	-15057	1720	6	1,460	1,720			1,720	600	1,120		1,720							0					
3-178a	Hanany Assembly Rm	LAB	315	14.0	4,410	75	72	11459	2682	-4094	590	6	450	590			450	0	450		50			800				400	450	550		300	
	TOILET TRANSFER																																
Floor Totals			14490							-433681	60780			23550	78683	20	19910				10250		60	3700	660	6400			11030	10410	5170	1400	2400
4-103	Women	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
4-105	Men	TOILET	210	10.0	2,100	75	72	0	0	0	0	0	0	0			80	0	80		230							150					
4-150	Corridor	CORRIDOR	770	10.0	7,700	75	72	2102	0	0	110	0	0	880			880	0	880		0							-880					
4-151	HEP/A/C Lab	LAB	1100	14.0	15,400	75	72	32784	2750	0	1670	6	1,540	1,670			1,670	0	1,670		750			800	120			0	1,540	1,120		300	
4-151A	Dark Procedure	LAB	165	14.0	2,310	75	72	6494	413	0	330	6	240	330			330	330	0		430							100					
4-151b	Dark Procedure	LAB	165	14.0	2,310	75	72	6663	413	0	340	6	240	340			340	340	0		440							100					
4-154	HELP Lab	LAB	1825	14.0	25,550	75	72	75510	6073	-28200	3830	6	2,560	3,830	19,958	6	2,560	600	1,960		1,160			1,600				200	2,560	2,160		600	
4-154A	Source Rm	LAB	80	14.0	1,120	75	72	3231	200	0	170	6	120	170			170	170	0		370							200					
4-154B	Dark Procedure	LAB	255	14.0	3,570	75	72	10733	638	0	550	6	360	550			550	550	0		650							100					
4-154C	Electronics Rm	LAB	255	14.0	3,570	75	72	16108	1795	-13976	820	6	360	820	8,296	3	360	300	60		460							100					
4-156	Janitor	JANITOR/EVS	110	10.0	1,100	75	72	0	0	0	0	0	0	0			80	0	0		80							80					
4-162	HEP Heavy Plavors Lab	LAB	560	14.0	7,840	75	72	15930	1843	-4436	810	6	790	810			920		920		60	374		800	60			0	790	430		300	
4-162A	Dark Procedure	LAB	100	14.0	1,400	75	72	5254	648	-3981	270	6	140	270			270	60	210		370							100					
4-162B	Electronics Rm	LAB	155	14.0	2,170	75	72	7781	1373	-9857	400	6	220	400			400	90	310		500							100					
4-164	HELP Laboratory	LAB	1040	14.0	14,560	75	72	34249	4041	-15057	1740	6	1,460	1,740			1,740	60	1,680	1,720	1,720		100		120	1,600	(2) 6' Future	100	1,460	1,440	840		600
4-164A	RF Shield Rm	LAB	105	14.0	1,470	75	72	5098	660	-3981	260	6	150	260			260	260	0		360							100					
4-164B	Control Rm	LAB	110	14.0	1,540	75	72	2828	275	0	150	6	160	200			200	0	200		100							-100					
4-164C	Dark Procedure	LAB	120	14.0	1,680	75	72	4928	300	0	250	6	170	250			250	0	250		350							100					
4-166	HELP Laboratory	LAB	710	14.0	9,940	75	72	26014	2763	-10275	1320	6	1,000	1,320	4,314	2	1,000	120	880	1,000	1,140		340		60	800	(1) 6' Future	200	1,000	1,140	840		300
4-170	Corridor	CORRIDOR	2030	10.0	20,300	75	72	12819	300	-9840	650	0	0	1,800			1,800	0	1,800		0							-1,800					
4-171	Future Lab	LAB	1420	14.0	19,880	75	72	59284	3550	0	3010	6	1,990	3,010	16,101	6	3,860	540	3,320	FUTURE	60					4,000	(5) 6' Future	200	1,990	2,190	690		1,500
4-172	Future Lab	LAB	1400	14.0	19,600	75	72	75370	5729	-35252	3830	6	1,960	3,830	32,838	10	1,960	1,000	960	FUTURE	560					1,600	(2) 6' Future	200	1,960	2,160	1,560		600
4-173	BIO Laser Lab	LAB	665	14.0	9,310	75	72	15734	1663	0	800	6	940	940			940	0	940	940	1,080		280		60	800	(1) 6' Future	200	940	1,080	780		300
4-174	BIO Lab	LAB	985	14.0	13,790	75	72	39200	3740	-20195	1990	6	1,380	1,990	9,254	4	1,380	300	1,080	1,700	1,380		100			1,600	(2) 6' Future	0	1,380	1,380	780		600
4-174A	Optics Lab	LAB	215	14.0	3,010	75	72	7802	538	0	400	6	310	400			400	0	400		500							100					
4-174B	Optics Lab	LAB	185	14.0	2,590	75	72	6145	463	0	320	6	260	320			320	0	320		360				60			100					
4-175	BIO Optics Lab	LAB	575	14.0	8,050	75	72	14782	1438	0	750	6	810	810			810	0	810		1,110							300					
4-175A	Tissue Culture	LAB	105	14.0	1,470	75	72	4885	263	0	250	6	150	250			855	0	855		0						755	-100					
4-176	Shared Bio Labs	LAB	790	14.0	11,060	75	72	71623	2750	-9991	3640	6	1,110	3,640	17,807	6	2,480	600	1,880		60			2,400	20			0	1,110	190		900	
4-176A	Tools Room	LAB	110	14.0	1,540	75	72	4142	275	0	210	6	160	210			210	210	0		250				60			100					
4-176C	Equipment Rm	LAB	125	14.0	1,750	75	72	19917	250	0	1010	6	180	1,010	7,114	4	590	200	390		690							100					
	TOILET TRANSFER																																
Floor Totals			16650							-165040	27770			32050	115684	41	27665				15450		820	5600	560	10400		1,855	14730	13290	5490	2100	3900
			59,000							-1,103,212	167,200			95,070		73	93,975				51,955		1,520	26,240	3,860	19,200			39,130	29,950	12,850	9,800	7,200

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.

For AFFILIATED ENGINEERS, INC.

By

Name MICHAEL J. BROGE

Date 02-24-2012 Reg. No. 25364

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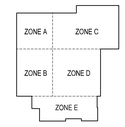
Date 12/16/11

Project

Physics and Nanotechnology Building

U of M Project # 01-155-08-1718



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