

DATE: 02/23/2024

PROJECT MANUAL FOR: DANGEROUS MATERIALS STORAGE FACILITY

PROJECT NUMBER: RC000212

ADVERTISEMENT DATE: February 5, 2024

PREPARED FOR: The Curators of the University of Missouri
Missouri University of Science and Technology

CONSULTANT: CDG ENGINEERS
1 Campbell Plaza #3a, St. Louis MO 63139
DAN SCHNEFKE

Drawings and Specifications for the above noted project and the work covered thereby are herein modified as follows, and except as set forth herein, otherwise remain unchanged and in full force and effect:

Drawings:

1. Sheet M-600 Mechanical Schedules:
 - a. In seismic code block, change Category "C" to Category "D".
2. Sheet M-601 Mechanical Details:
 - a. Remove the word "SOX" from Detail 5.
3. Sheet M-602 HVAC Air Flow Diagram
 - a. Revised Sequence of Control and sheet layout to accommodate revised sequence.
4. Sheet M-604 JCI Controls
 - a. Relocate visual pressure device location adjacent to door/entrance of the space being monitored.

Project Manual:

Substitutions:

END OF ADDENDUM #2

GENERAL NOTES

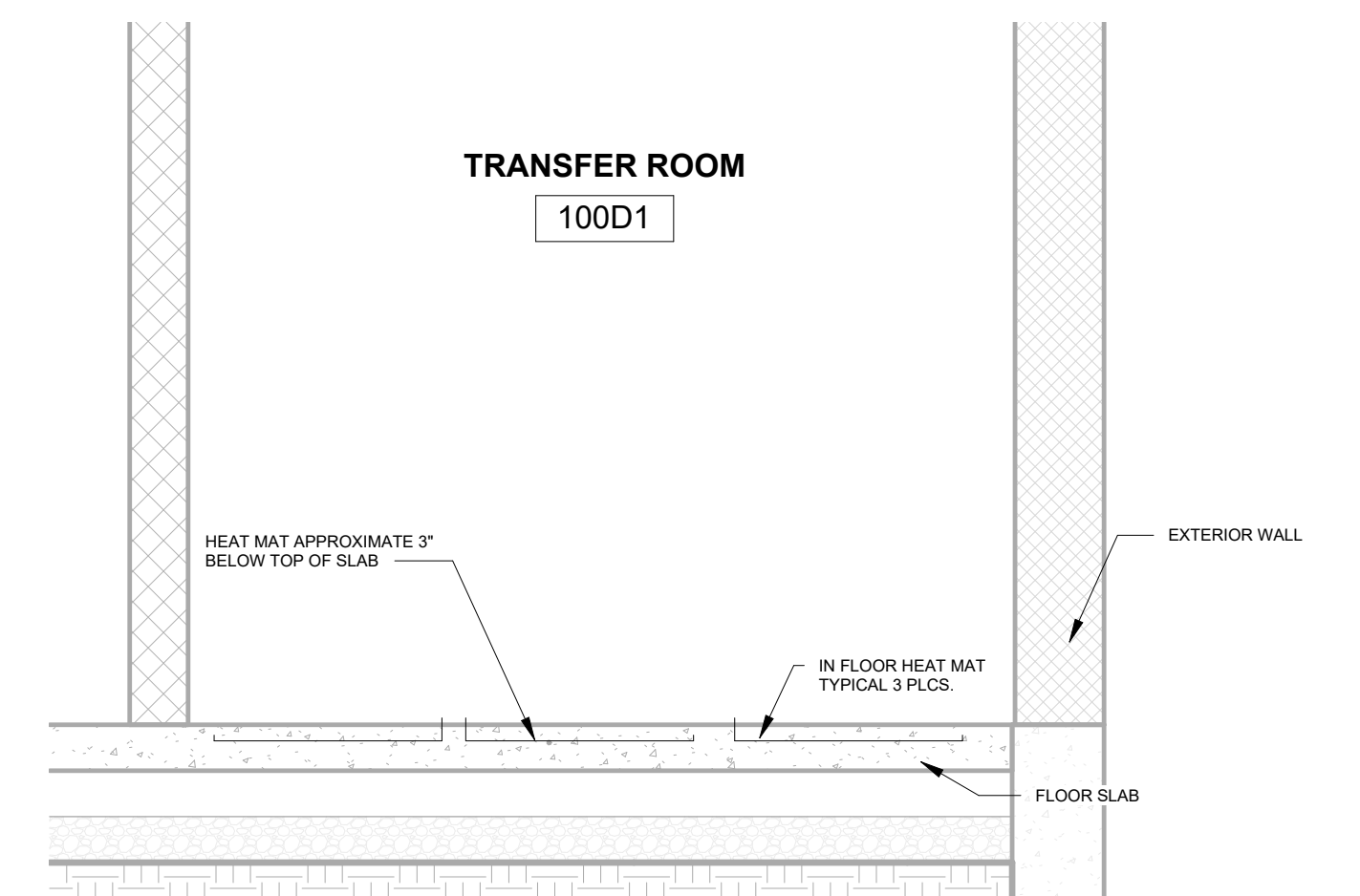
- REMARKS.
1. UNDER FLOOR RADIANT HEAT TO BE COORDINATED WITH CONCRETE SLAB POUR.
 2. THERMOSLAB BRAND OR EQUAL HEAT MAT.
 3. COORDINATE WITH ELECTRICAL CONTRACTOR FOR POWER REQUIREMENTS.

KEYED NOTES

1. PROVIDE IN FLOOR ELECTRIC RADIANT HEATING MAT (3) 36" X15' WITH IN FLOOR SENSOR TO REMOTE THERMOSTAT. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. PROVIDE WALL MOUNTED RADIANT FLOOR HEAT THERMOSTAT. TO BE INSTALLED OUTSIDE OF C1D1 ROOM. COORDINATE FINAL LOCATION WITH GC.
3. REMOTE SENSOR TO BE ADHERED TO FLOOR SLAB.

FLOOR HEAT SEQUENCE OF CONTROL

1. WHEN FLOOR HEAT THERMOSTAT IS TURNED TO ON, THE SYSTEM SHALL ACTIVATE ALL THREE HEAT MATS SIMULTANEOUSLY.
2. THERMOSTAT SHALL ENERGIZE A 4 CIRCUIT LIGHTING CONTACTOR COIL SO THAT THE SPACE IS PROVIDED EVEN HEATING.
3. THE THERMOSTAT SHALL CYCLE POWER TO HEAT THE SLAB TO MAINTAIN SET POINT ON THERMOSTAT. SLAB TEMPERATURE SHALL NOT BE GREATER THAN 85° F



2 INFLOOR HEAT MAT SECTION
1/2" = 1'-0"

1 ELECTRIC RADIANT FLOOR HEATING
1/4" = 1'-0"



NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE	As indicated
0	12/07/23	ISSUED FOR BID	POB/BM	POB		SHEET FULL SIZE	34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB			
						CDG PROJECT	21380
						PROJ MGR	GEB

ELECTRIC RADIANT FLOOR HEAT PLAN MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY ROLLA, MISSOURI DANGEROUS MATERIALS STORAGE FACILITY	
SITE: ROLLA, MISSOURI	DRAWING NO. M100
 <small>One Campbell Plaza St. Louis, Missouri, 63139</small> <small>314.781.7770 314.781.9075</small>	REVISION NO. 2

Copyright © 2023 Dynamic Engineered Systems
MISSOURI CERTIFICATE OF AUTHORITY # E-2011001315
PROFESSIONAL ENGINEER # MO-20069

GENERAL NOTES

- FLOOR PLAN SHOWN IS FOR REFERENCE ONLY. VERIFY ALL FINAL DIMENSIONS WITH GC AND ARCHITECTURAL DRAWINGS.
- NEW BUILDING WITH NEW EQUIPMENT, DUCT, AIR DEVICES, AND EXHAUST FANS.
- SEE SEQUENCE OF CONTROL FOR SYSTEM OPERATION.
- THESE DRAWINGS ARE DIAGRAMMATIC IN NATURE DO NOT SCALE FOR REFERENCE ONLY.

KEYED NOTES

- EXTERIOR PAD MOUNTED DOAS. UNIT TO SET ON BOX CURB WITH SIDE DISCHARGE DUCTING. DUCT TO EXTEND FROM UNIT UP EXTERIOR WALL AND THRU PENETRATION. DUCT ON EXTERIOR OF BUILDING TO BE ANCHORED TO WALL AND WRAPPED WITH R=8.0 INSULATION WITH UV JACKET. SEE SECTION CUT THIS SHEET.
- ROUTE NEW SUPPLY DUCT THRU POISON OXIDIZER TO NEW 18" DIA. SPIRAL DUCT. SEAL PER SMACNA STANDARD, ALL DUCT WRAPPED WITH R=8.0 AND JACKETED.
- NEW EXHAUST DUCT. ROUTE DUCT THRU SPACE TO NEW ROOF MOUNTED EXHAUST FAN. SEE FAN ANCHOR DETAIL. SEAL ALL EXHAUST PER SHEET M000.
- NEW TRANSFER GRILLES AND TRANSFER DUCT FOR AIRFLOW THRU SPACE. DUCT TO TERMINATE 12" A.F.F. SEE M400 FOR ISOMETRIC.
- ALL EXTERIOR DUCT TO BE SEALED & PRESSURE TESTED TO 2" W.C. AND LEAK TESTED.
- TEST AND BALANCE OF SYSTEMS CONTRACTOR BY MO S&T. MECHANICAL CONTRACTOR TO MANAGE, COORDINATE, AND ASSIST.
- ELECTRIC STEAM GENERATOR, TRANSFER TUBE, & DISTRIBUTION HEADER. PROVIDE DRIP PAN. SEE DETAIL M601.
- GAS PIPE TO UNIT AND CONDENSATE FROM UNIT SHOWN ON PLUMBING SET.

NOTE:
ALL EXTERIOR DUCT SHALL BE LEAK TESTED PRIOR TO INSULATION WRAP.

PROVIDE WATER RESISTANT CAP ON DUCT. SEAL TIGHT TO STRUCTURE COORDINATE WITH GC & ARCHITECT

ALL EXTERIOR DUCT SHALL BE WRAPPED WITH 2" CLOSED CELL INSULATION R=8.0 WITH UV JACKET.

DOAS-1 DOAS & CURB SIDE ADAPTER TO BE SUPPLIED BY MANUFACTURER

3'-0" BOX CURB ANCHORED TO SLAB

NEW SUPPLY PLENUM FIELD COORDINATE

NEW SLAB BY OTHERS

SEE DETAIL 1 SHEET M601 FOR ANCHORING

PROVIDE GASKET & SEAL START COLLAR WATER AND AIR TIGHT

DOAS UNIT ELEVATION
1/2" = 1'-0"

DUCT ROUTING PLAN
MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
ROLLA, MISSOURI
DANGEROUS MATERIALS STORAGE FACILITY

SITE: ROLLA, MISSOURI



One Campbell Plaza
St. Louis, Missouri, 63139 314.781.7770
314.781.9075

DRAWING NO.

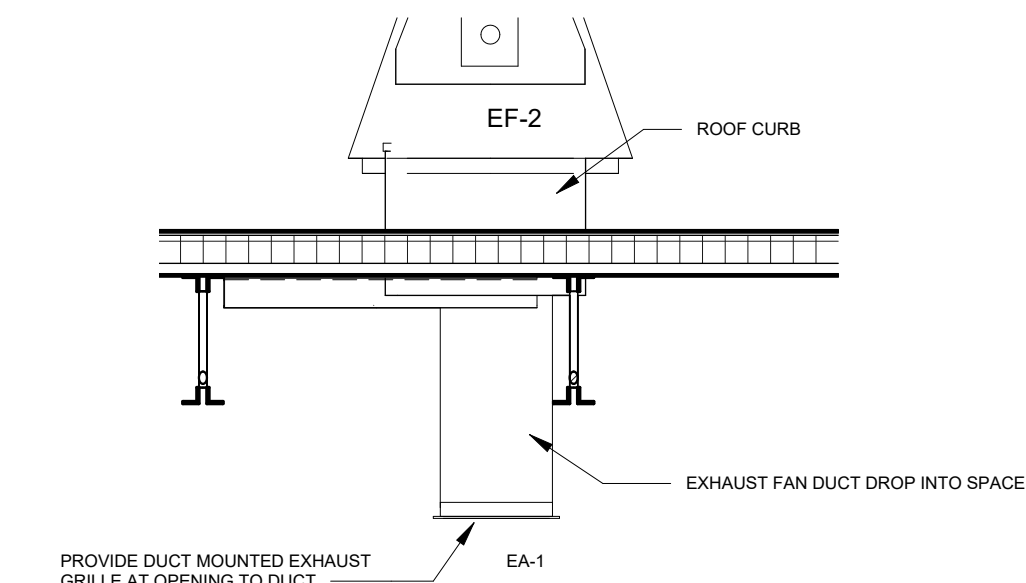
M101

REVISION NO. 2

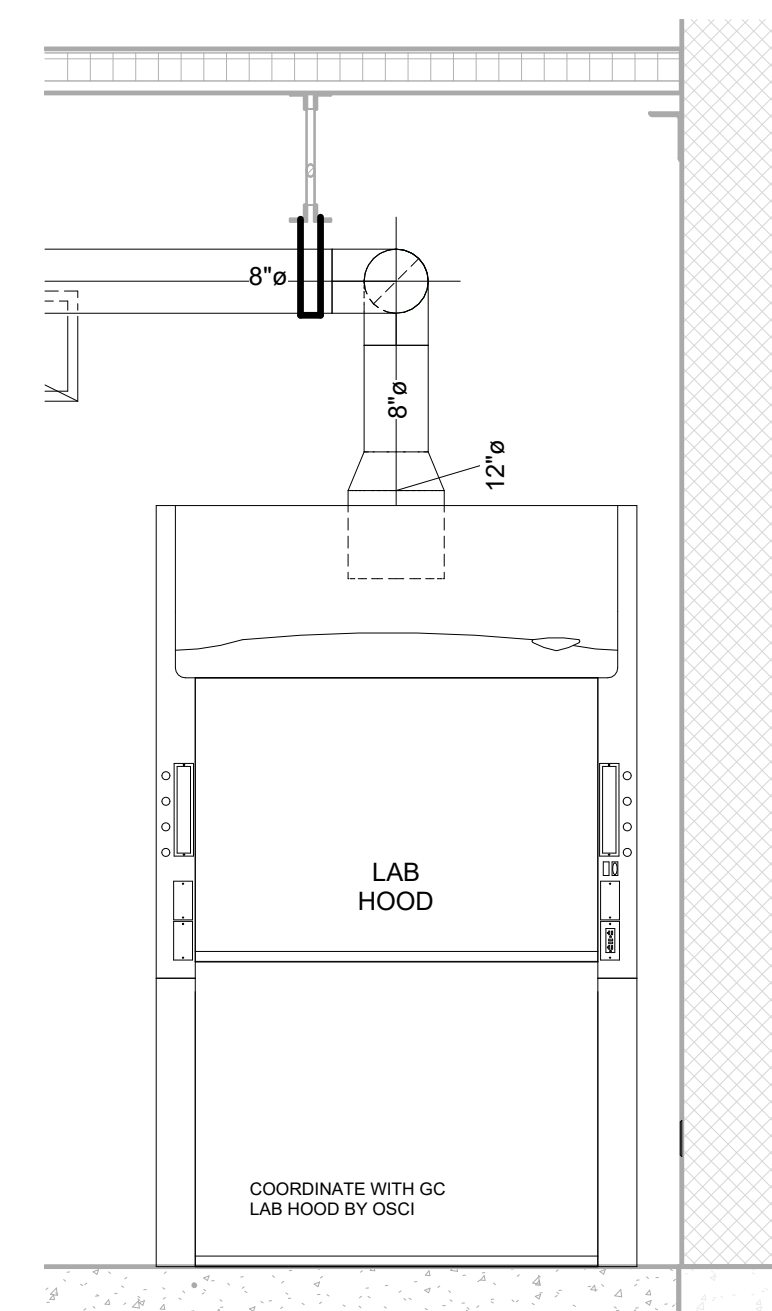


NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		As indicated 34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB		
						CDG PROJECT 21380
						PROJ MGR GEB

Copyright © 2023 Dynamic Engineered Systems
MISSOURI CERTIFICATE OF AUTHORITY # E-3011001315
PROFESSIONAL ENGINEER # MO-25069

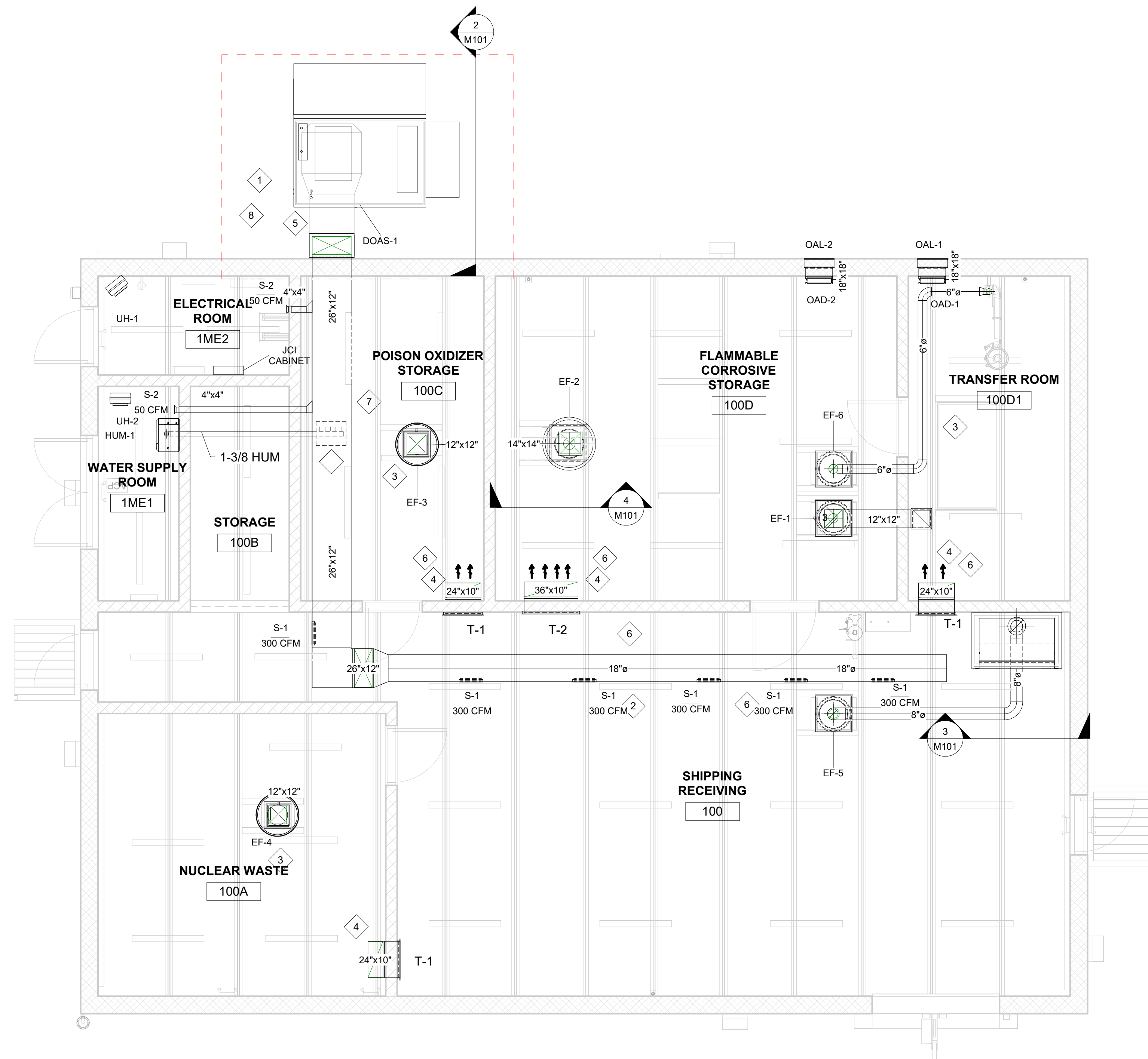


EXHAUST FAN DUCT DROP
1/2" = 1'-0"



LAB HOOD DUCT ELEVATION
1/2" = 1'-0"

DUCT ROUTING PLAN
1/4" = 1'-0"

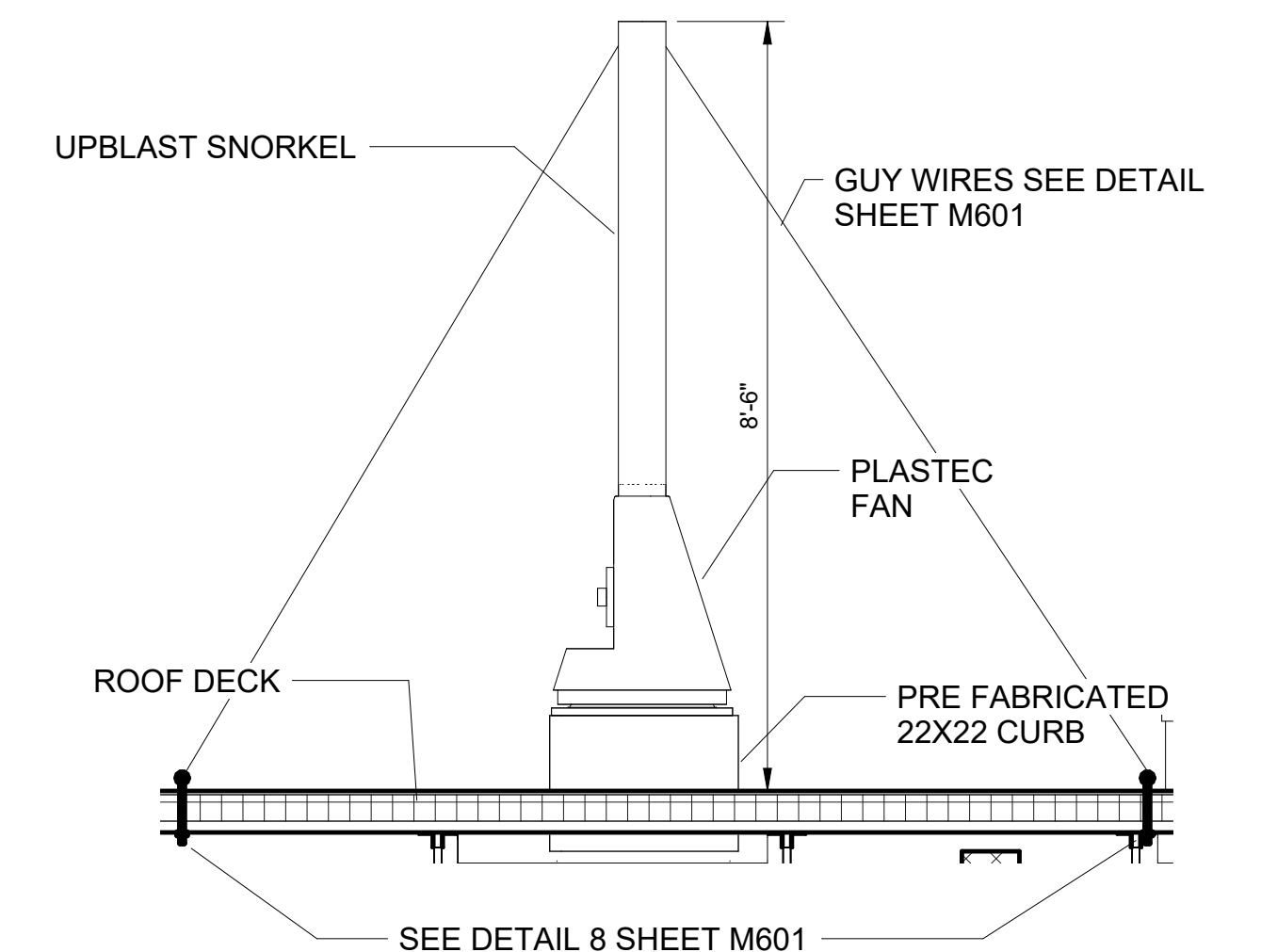
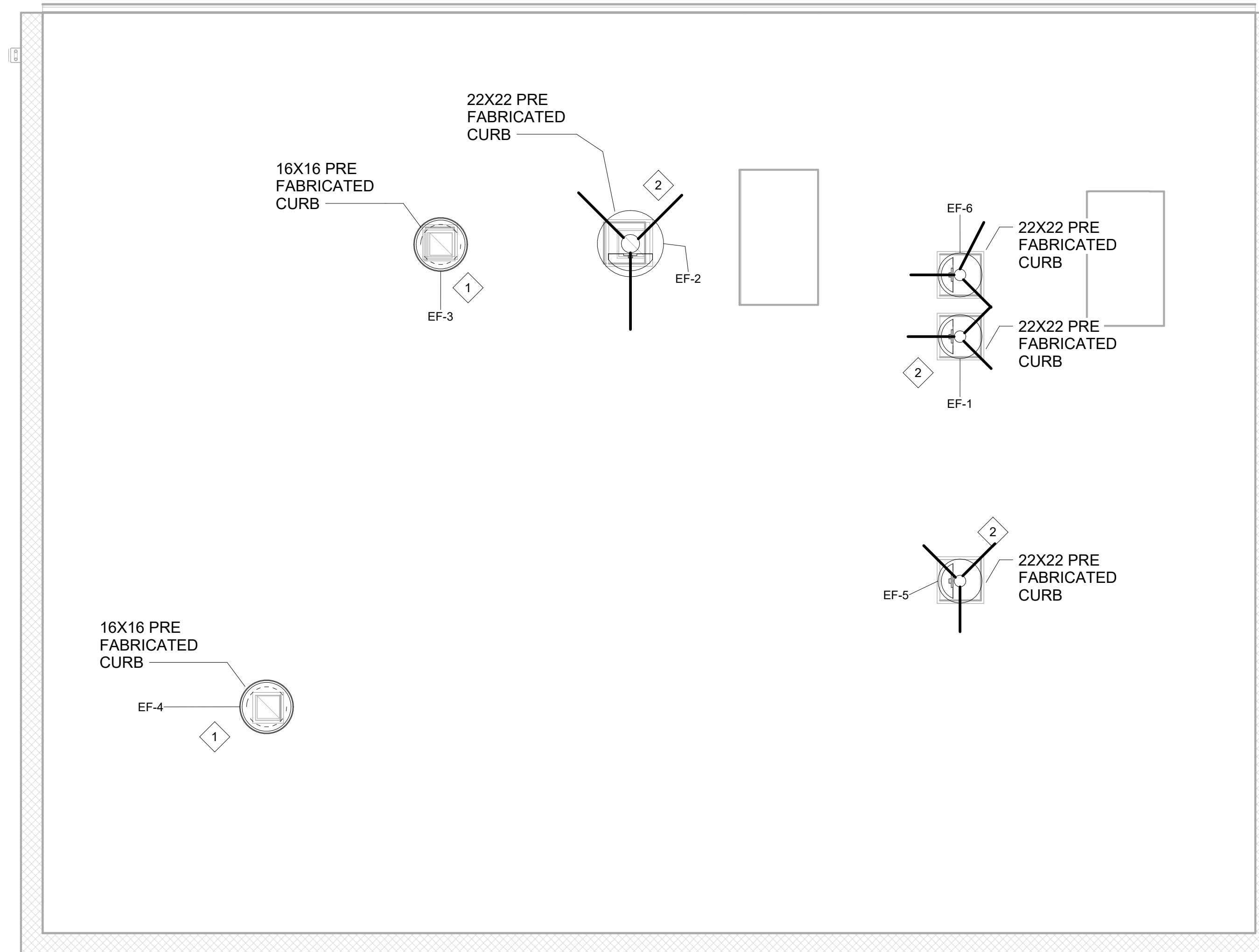


GENERAL NOTES

- FLOOR PLAN SHOWN IS FOR REFERENCE ONLY. VERIFY ALL FINAL DIMENSIONS WITH GC AND ARCHITECTURAL DRAWINGS.
- NEW BUILDING WITH NEW EQUIPMENT, DUCT, AIR DEVICES, AND EXHAUST FANS.
- SEE SEQUENCE OF CONTROL FOR SYSTEM OPERATION.
- VISUAL INSPECTION IS REQUIRED PRIOR TO INSULATION AS THIS DUCT IS TO BE SEAL CLASS 4. SEAL PER SMACNA SEALING REQUIREMENT M000

KEYED NOTES

- NEW ROOF MOUNTED UPBLAST EXHAUST FAN. PROVIDE MANUFACTURE PRE FABRICATED CURB. SEAL PENETRATION WEATHER TIGHT. SEE DETAIL 7 SHEET M601 FOR ANCHORING.
- NEW PLASTEC EXHAUST FAN. PROVIDE MANUFACTURER PRE FABRICATED CURB. SEAL PENETRATION WEATHER TIGHT. SEE DETAIL 2 THIS SHEET FOR ANCHORING.



② PLASTEC FAN SECTION
1/2" = 1'-0"

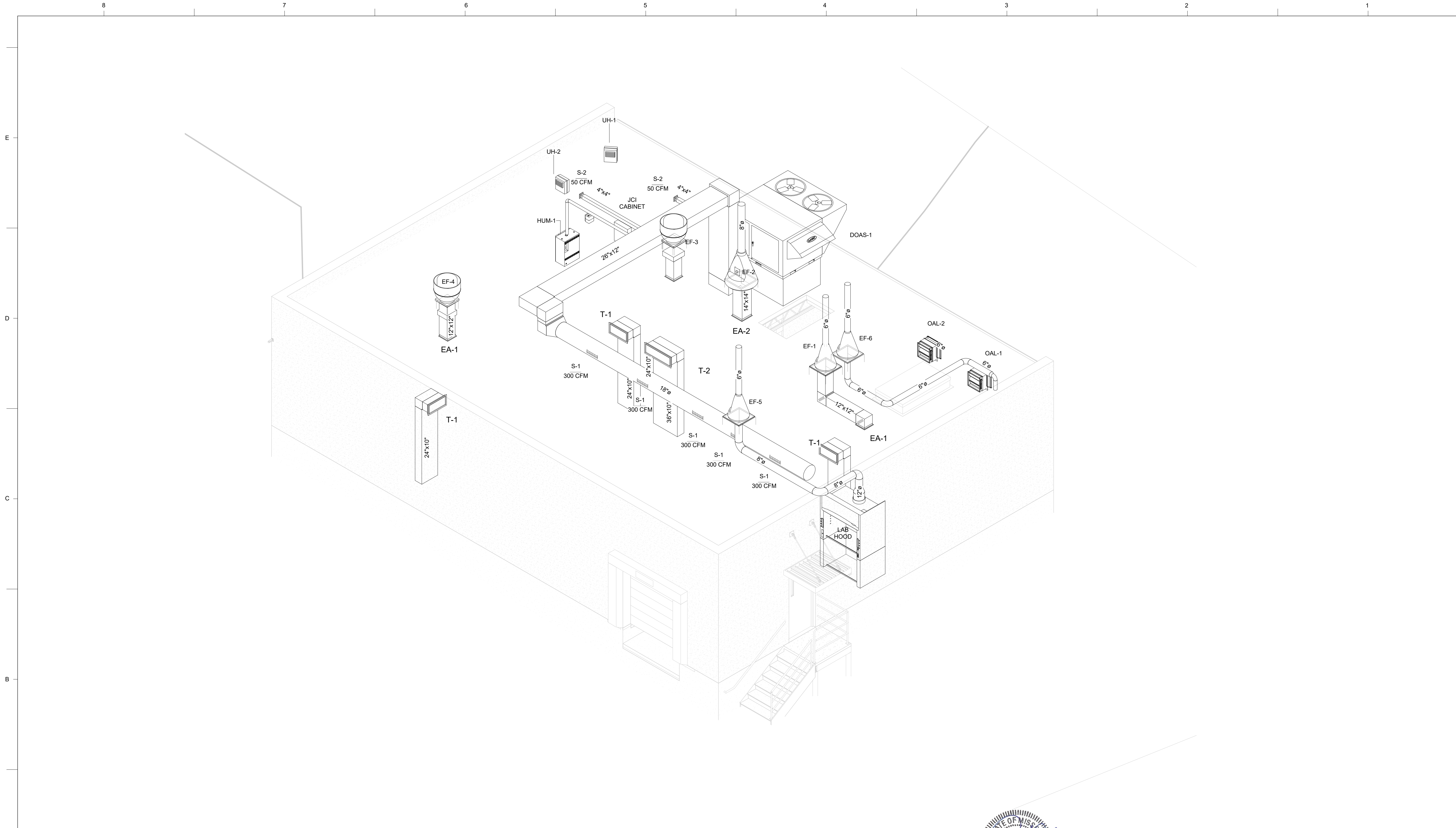
① Roof Plan Mechanical
1/4" = 1'-0"



Copyright © 2023 Dynamic Engineered Systems
MISSOURI CERTIFICATE OF AUTHORITY # E-3011001315
PROFESSIONAL ENGINEER # MO-25069

NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE	As indicated
0	12/07/23	ISSUED FOR BID	POB/BM	POB		SHEET FULL SIZE	34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB			
						CDG PROJECT	21380
						PROJ MGR	GEB

MECHANICAL ROOF PLAN MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY ROLLA, MISSOURI DANGEROUS MATERIALS STORAGE FACILITY	
SITE: ROLLA, MISSOURI	DRAWING NO. M102
CDG ENGINEERS One Campbell Plaza St. Louis, Missouri, 63139 314.781.7770 314.781.9075	REVISION NO. 2



1 Isometric Mechanical (FOR REFERENCE)



Copyright © 2023 Dynamic Engineered Systems
 MISSOURI CERTIFICATE OF AUTHORITY # E-2011001315
 PROFESSIONAL ENGINEER # MO-25068

NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		SHEET FULL SIZE 34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB		
						CDG PROJECT 21380
						PROJ MGR GEB

MECHANICAL ISOMETRIC
 MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
 ROLLA, MISSOURI
 DANGEROUS MATERIALS STORAGE FACILITY

SITE: ROLLA, MISSOURI

CDG ENGINEERS
 One Campbell Plaza
 St. Louis, Missouri, 63199
 314.781.7770
 314.781.9075

DRAWING NO.
M400

REVISION NO. 2

SEISMIC CODE BLOCK FOR MECHANICAL SYSTEMS EQUIPMENT AND COMPONENT ANCHORAGE EARTHQUAKE LOAD RESISTANCE

EQUIPMENT & SYSTEM COMPONENTS		SEISMIC ANCHORAGE TO FLOORS, ROOFS, ETC.		SEISMIC SWAY BRACING		LOCATION OF THE PROFESSIONALLY SEALED ANCHORAGE AND SWAY BRACING DETAILS			OTHER PROVISIONS (SEE NOTES)	COMMENTS	
ITEM	IMPORTANCE FACTOR (Ip)	NOT PROVIDED FOR PROJECT	PROVIDED FOR PROJECT	NOT PROVIDED FOR PROJECT	PROVIDED FOR PROJECT	ON CONSTRUCTION DOCUMENTS	SUBSEQUENT SUBMITTAL	SEPARATE PERMITS & PLANS		IBC SECTION THAT EXEMPTS SEISMIC REQUIREMENTS	REFERENCE THAT EXEMPTS SEISMIC REQUIREMENTS
PAD MOUNTED EQUIPMENT > 400 LBS DOAS-1	1.5		X	X		M-601				1	
ROOF-MOUNTED EQUIPMENT ≤ 400 LBS (EF-1,2,3,4,5,6)	1.5		X	X		M601				2	
FLOOR-WALL-MOUNTED EQUIPMENT ≤ 400 LBS (HUM-1)	1.5		X	X		M601				2	
AIR DEVICES	1.5	X		X						1,3	
DUCTWORK < 6 SQ.FT.	1.5	X		X						4,5	

- COMPONENTS SHALL BE POSITIVELY ATTACHED WITH MECHANICAL FASTENERS.
- TABLE 4.4, ITEM 1, GENERAL EXEMPTIONS, PART "A" - EQUIPMENT MOUNTED 4 FEET OR LESS ABOVE THE FLOOR LEVEL & WEIGHING 400 LBS OR LESS DOES NOT REQUIRE SEISMIC BRACING.
- TABLE 4.4, ITEM 1, GENERAL EXEMPTIONS, PART "B" - EQUIPMENT WEIGHING 20 LBS OR LESS DOES NOT REQUIRE SEISMIC BRACING.
- TABLE 4.4, ITEM 3, DUCT EXEMPTIONS, PART "A" - DUCT SUSPENDED FROM HANGERS 12 INCHES OR LESS IN LENGTH WHICH ARE DETAILED TO AVOID SIGNIFICANT BENDING OF THE HANGERS & THEIR ATTACHMENT DOES NOT REQUIRE SEISMIC BRACING.
- TABLE 4.4, ITEM 3, DUCT EXEMPTIONS, PART "B" - DUCT HAVING A CROSS-SECTIONAL AREA OF LESS THAN 6 SQUARE FEET DOES NOT REQUIRE SEISMIC BRACING. SEE PLAN DRAWINGS FOR DUCT SIZES.
- TABLE 4.4, ITEM 4, PIPING SYSTEM EXEMPTIONS - PIPING IS SUPPORTED BY ROD HANGERS; HANGERS IN THE PIPE RUN ARE 12 INCHES OR LESS IN LENGTH FROM THE TOP OF THE PIPE TO THE SUPPORTING STRUCTURE; HANGERS ARE DETAILED TO AVOID BENDING OF THE HANGERS AND THEIR ATTACHMENTS; AND PROVISIONS ARE MADE FOR PIPING TO ACCOMMODATE EXPECTED DEFLECTIONS. PIPING MEETING ALL CRITERIA IS EXEMPT FROM SEISMIC BRACING REQUIREMENTS.
- TABLE 4.4, ITEM 4, PIPING SYSTEM EXEMPTIONS - HIGH-DEFORMABILITY PIPING (STEEL & COPPER PIPING AND TUBING JOINED BY WELDING, BRAZING/SOLDERING OR BY BOLTED STEEL FLANGES) IS USED; PROVISIONS ARE MADE TO AVOID IMPACT WITH LARGER PIPING OR MECHANICAL COMPONENTS OR TO PROTECT THE PIPING IN THE EVENT OF SUCH IMPACT; AND THE NOMINAL PIPE SIZE IS LIMITED TO 3" OR LESS FOR Ip=1.0 & 1" OR LESS FOR Ip>1.0
- TABLE 4.4, ITEM 5, GAS PIPING SYSTEM EXEMPTIONS, PART "A" - EXTERIOR GAS PIPING INSTALLED ON ROOFS WHICH SUPPLIES NO MORE THAN 2 PSI AND IS PROTECTED BY AN APPROVED SEISMIC SHUT-OFF VALVE WITHIN 5 FEET OF THE BEGINNING OF THE RUN OF GAS PIPE ON THE ROOF OR OTHER APPROVED LOCATION.
- TABLE 4.4, ITEM 5, GAS PIPING SYSTEM EXEMPTIONS, PART "B" - EXTERIOR GAS PIPING INSTALLED ON ROOFS WHICH SUPPLIES NO MORE THAN 2 PSI AND IS PROTECTED BY APPROVED FLEXIBLE PIPING NO LESS THAN 3 FEET IN LENGTH IS INSTALLED WITHIN 5 FEET OF THE BEGINNING OF THE RUN OF GAS PIPE ON THE ROOF AND AT THE CONNECTION TO THE EQUIPMENT SERVED BY THE PIPE AND AT INTERVALS ALONG THE RUN OF NO MORE THAN 42 FEET.
- EXEMPT EXISTING EQUIPMENT/DUCT/PIPE.

PLAN MARK		MANUFACTURER AND MODEL NO.		SUPPLY FAN SECTION			COOLING PERFORMANCE						HOT GAS REHEAT		HEATING PERFORMANCE				ELECTRICAL DATA			REMARKS	
PLAN MARK	MANUFACTURER AND MODEL NO.	SA CFM	OA CFM	MAX ESP IN W.G.	HP	VOLTS/PH	TOTAL COOLING MBH	SENS. COOLING MBH	EAT DB °F	EAT WB °F	LAT DB °F	LAT WB °F	REF. TYPE	LAT DB °F	LAT WB °F	INPUT	EAT °F	LAT °F	TURN DOWN	VOLTS/PH	MCA		MOP
DOAS-1	AON-RN-15-3-0-HB09-3FB:M000-U0B-DBC-AFO-ODMAHBF-00-F000000V	1800	1800	1.5	2	480/3	169.6	92.6	95	78	48	48	410	75	58	400	0	80	10:01	480/3	49	50	1 THRU 9

EXHAUST FAN SCHEDULE									
PLAN MARK	MANUFACTURER & MODEL NUMBER	SA CFM	SP"	RPM	DRIVE	HP	ELEC. VOLTS/PH	WEIGHT	REMARKS
EF-1	PLASTEC J20XT4P033	350/510	0.25	1725	INDIRECT	0.34	120/1	40	1,2,4,5,6,7,8
EF-2	PLASTEC J30XT4P150	600/1500	0.3	1725.0	INDIRECT	1.47	120/1	46	1,2,4,5,6,7,8
EF-3	JENCO FAN STXDE6	200	0.25	1750.0	DIRECT	0.33	120/1	89	1,2,3
EF-4	JENCO FAN STXDE7	275	0.25	1750.0	DIRECT	0.33	120/1	89	1,2,3
EF-5	PLASTEC J20XT4P033	750	2	2100	DIRECT	0.34	115/1	40	1,2,4,5,6,7,8
EF-6	PLASTEC J20XT4P033	250	0.5	1800	DIRECT	0.34	115/1	40	1,2,4,5,6,7,8

HEATER (ELECTRIC) SCHEDULE							
PLAN MARK	MANUFACTURER	MODEL NO.	CFM	KW	STEPS	VOLTS/PH	REMARKS
UH-1	Q-MARK/MARLEY	MUH0321SB	350	2.2-3.0	N/A	208/1	1,2
UH-2	Q-MARK/MARLEY	MUH0321SB	350	2.2-3.0	1	208/1	1,2

(ELECTRIC) UNDER FLOOR HEAT SCHEDULE									
PLAN MARK	MANUFACTURER	MAT SKU	MODEL NO.	MAT WIDTH	MAT LENGTH	WATTS	AMPS	VOLTS/PH	REMARKS
EFH-1	THERMO SLAB	TSLM015W36-120	TS145-120	36"	15	876	7.3	120/1	1,2,3
EFH-2	THERMO SLAB	TSLM015W36-120	TS145-120	36"	15	876	7.3	120/1	1,2,3
EFH-3	THERMO SLAB	TSLM015W36-120	TS145-120	36"	15	876	7.3	120/1	1,2,3

ISOLATION DAMPER SCHEDULE					
PLAN MARK	MANUFACTURER & MODEL NO.	SIZE	ACTUATOR (ELECTRIC / PNEUMATIC)	FAIL POSITION	REMARKS
OAD-1	RUSKIN CD50	24X12	ELECTRIC	OPEN	1-3
OAD-2	RUSKIN CD50	24X12	ELECTRIC	OPEN	1-3

LOUVER SCHEDULE					
PLAN MARK	MANUFACTURER	MODEL	SIZE	NO. OF SECTIONS	REMARKS
OAL-1	RUSKIN	ELF-365D	24X12	1	D,BS
OAL-2	RUSKIN	ELF-365D	24X12	1	D,BS

AIR DEVICE SCHEDULE								
PLAN MARK	MANUFACTURER	MODEL	MODULE SIZE	NECK SIZE	MATERIAL	ACCESSORIES	FINISH	REMARKS
S-1	TITUS	300FS	14X6	N/A	STL	PC,VC	BWE	1
T-1	TITUS	300R	24X8	N/A	STL		BWE	2
T-2	TITUS	300R	36X8	N/A	STL		BWE	2
EA-1	TITUS	50F	24X24	12X12	STL		BWE	1
EA-2	TITUS	50F	24X24	14X14	STL		BWE	1

AIR BALANCE SCHEDULE					
PLAN MARK	OUTSIDE AIR (CFM)	RETURN AIR (CFM)	SUPPLY AIR (CFM)	EXHAUST AIR (CFM)	PRESSURE
DOAS	1800	0	1800		1800

IMC 2021 VENTILATION RATES TABLE 403.3							Zone Air	
	Occupants	CFM Per Pers	Resulting CFM	CFM Per SF	SF	Resulting CFM	Distribution Effectiveness	Total CFM
SHIPPING	2	5	10	0.06	799	48	1	58
FLAMMABLE STORAGE	0	5	0	1.0	714	565	1	565
NUCLEAR WASTE	0	5	0	1.0	308	262	1	262
POISON / OXYDIZER	0	5	0	1.0	126	184	1	184
TRANSFER	2	5	10	1.0	224	162	1	172
								1267

HUMIDIFIER SCHEDULE							
PLAN MARK	MANUFACTURER	MODEL	LBS per HR	KW	VOLTAGE	Amps	REMARKS
HUM-1	NEPTRONIC	SKE4-N14M	40	15	480V-3Ph	20	see below

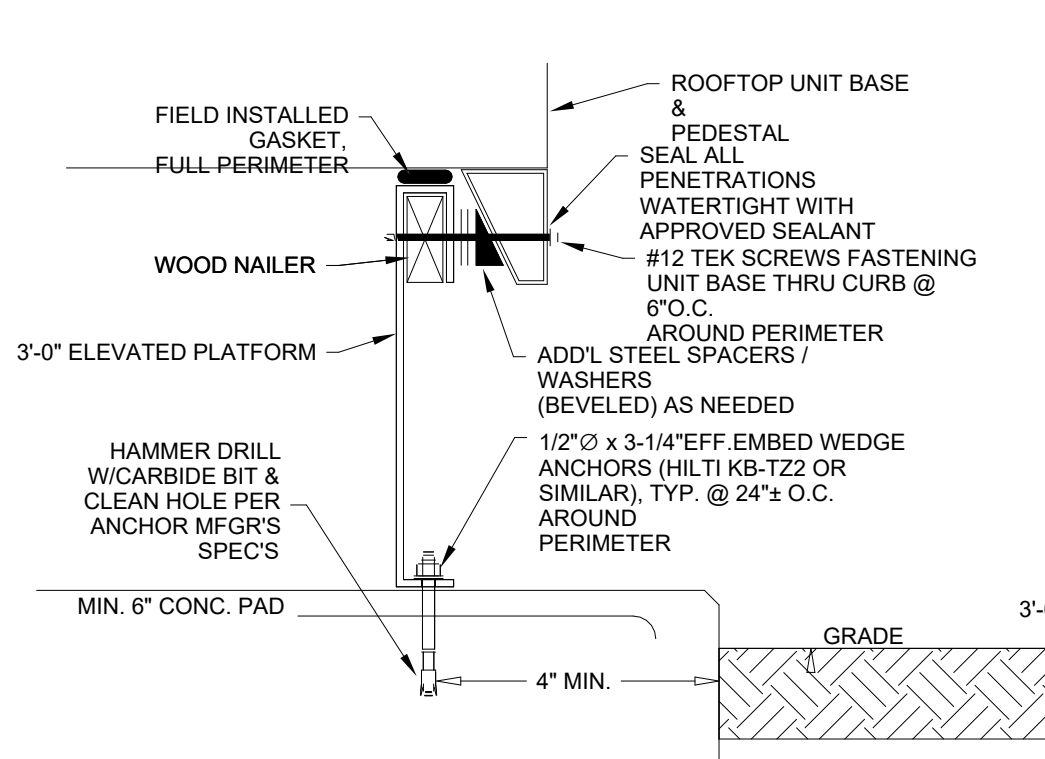


**MECHANICAL SCHEDULES
MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
ROLLA, MISSOURI
DANGEROUS MATERIALS STORAGE FACILITY**

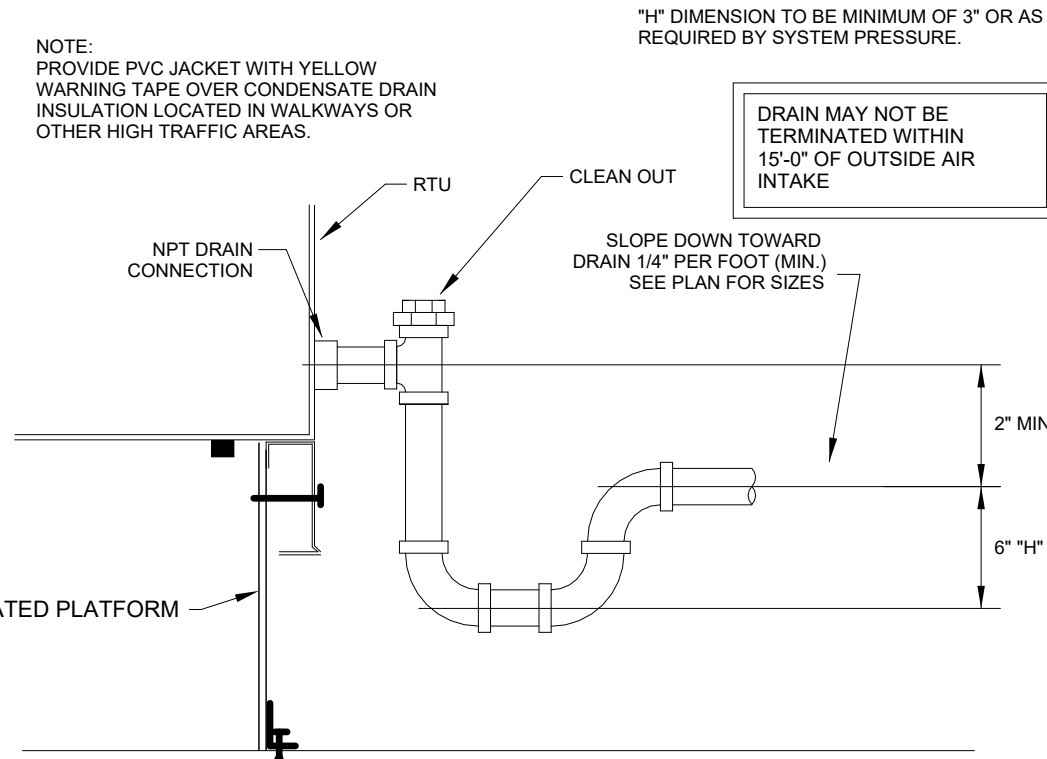
**MECHANICAL SCHEDULES
12" = 1'-0"**

NO.	DATE	DESCRIPTION	DESIGNR	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB	POB	12" = 1'-0" SHEET FULL SIZE 34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB	POB	

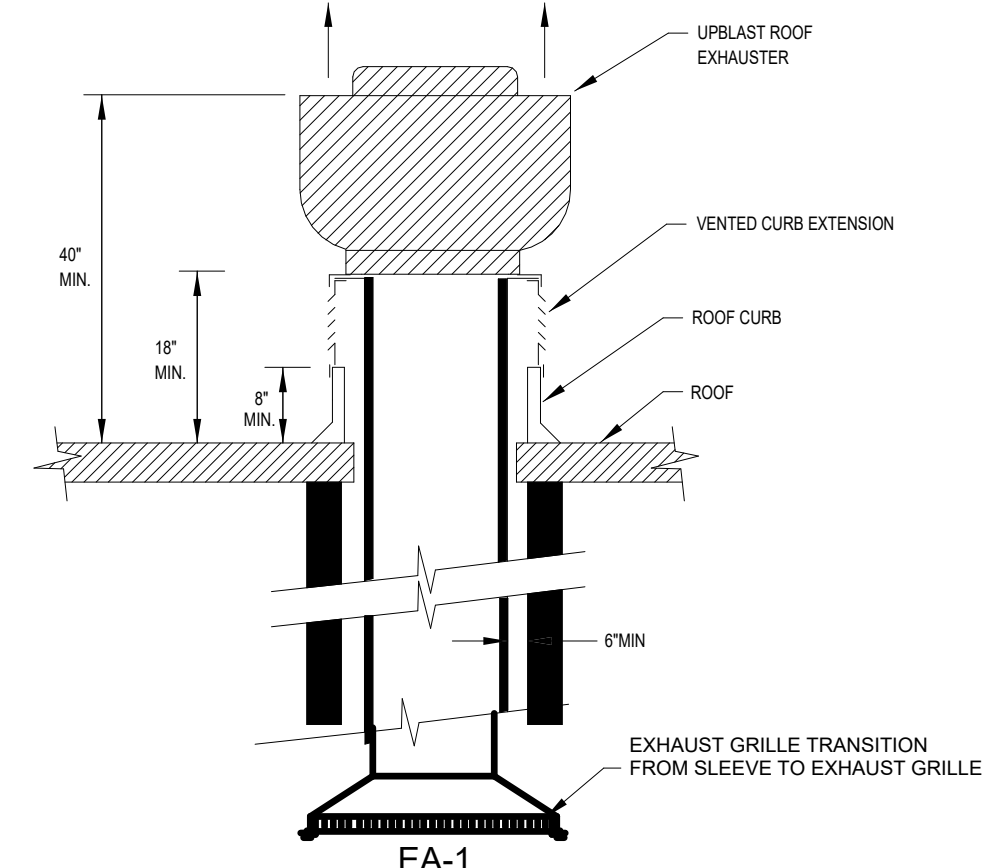
SITE: ROLLA, MISSOURI	DRAWING NO. M600
REVISION NO.	2



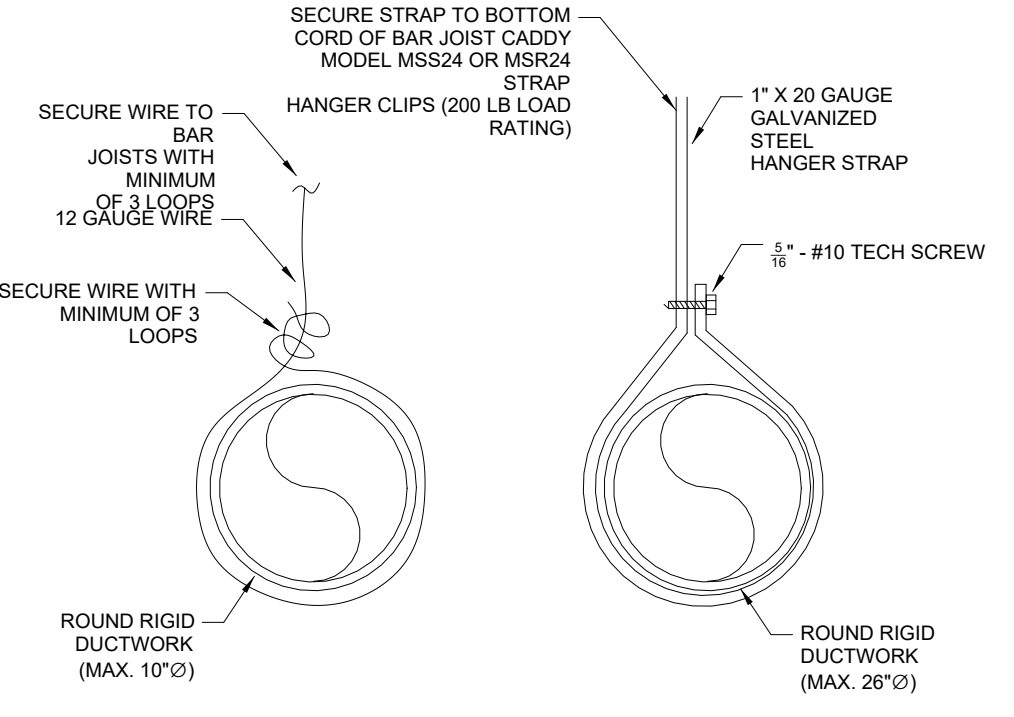
1 RTU - 1/2" WEDGE ANCHORS
M601 SCALE: NO SCALE



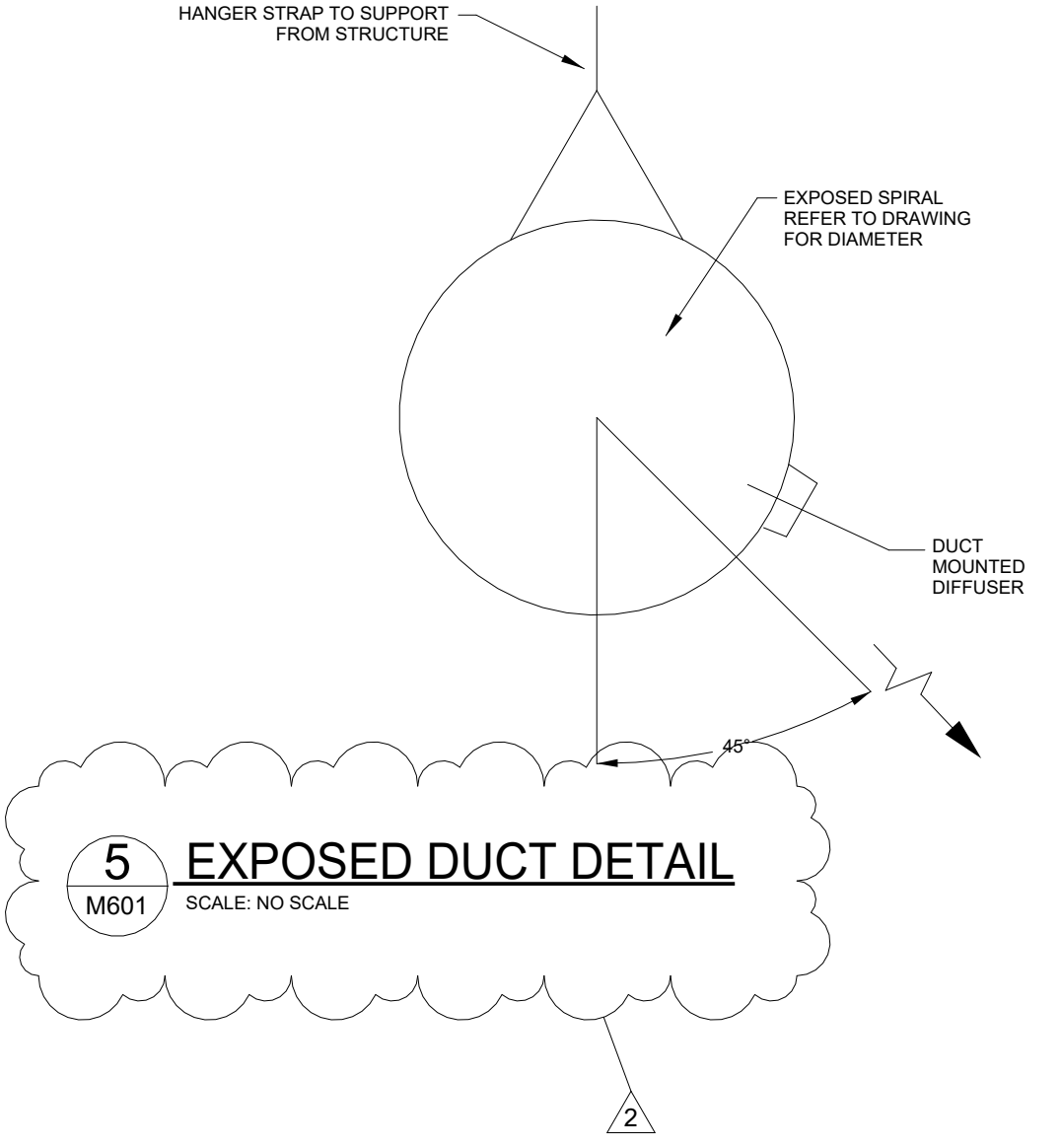
2 CONDENSATE DRAIN DETAIL
M601 SCALE: NO SCALE Detail NO.: P1001



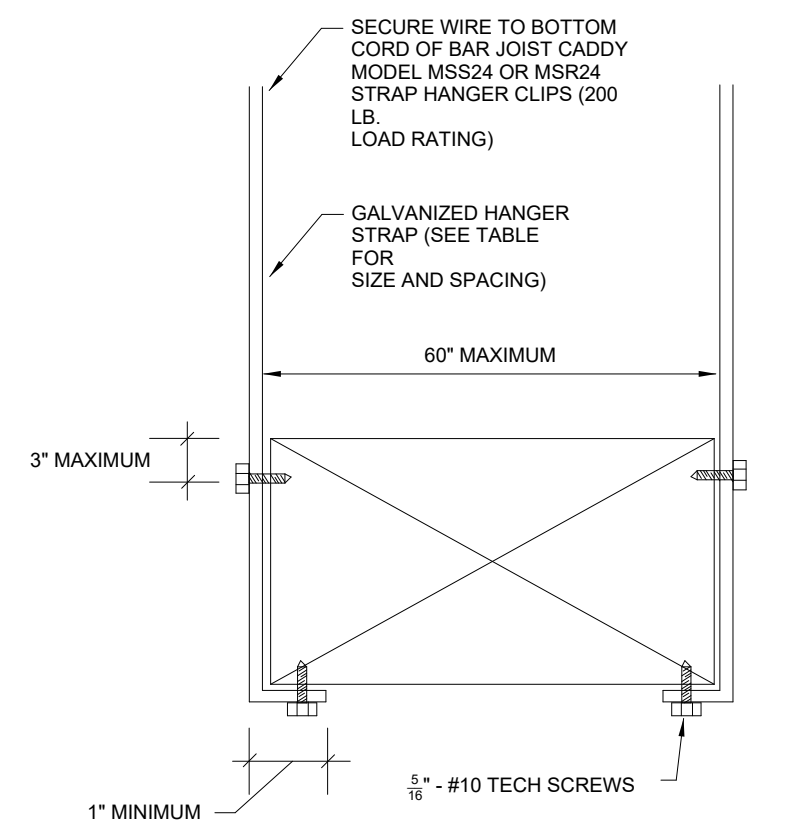
3 UPBLAST EF DETAIL EF-3.4
M601 SCALE: NO SCALE Detail NO.: EQ003C



4 ROUND DUCT HANGER DETAIL
M601 SCALE: NO SCALE Detail NO.: DU015A

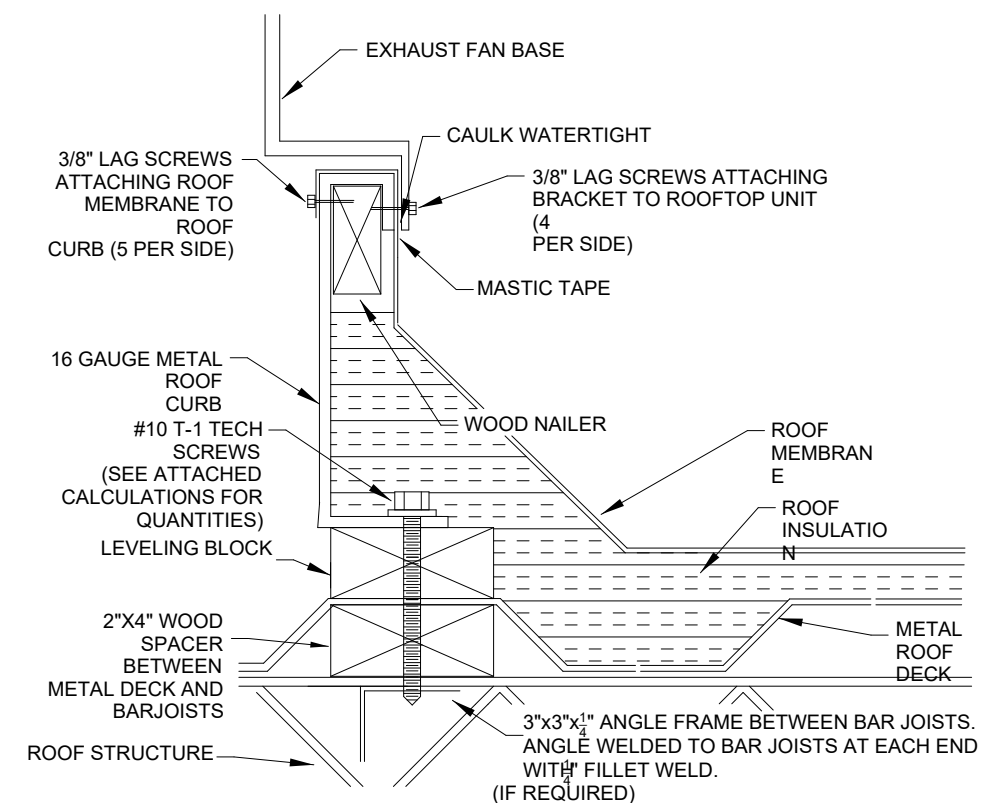


5 EXPOSED DUCT DETAIL
M601 SCALE: NO SCALE

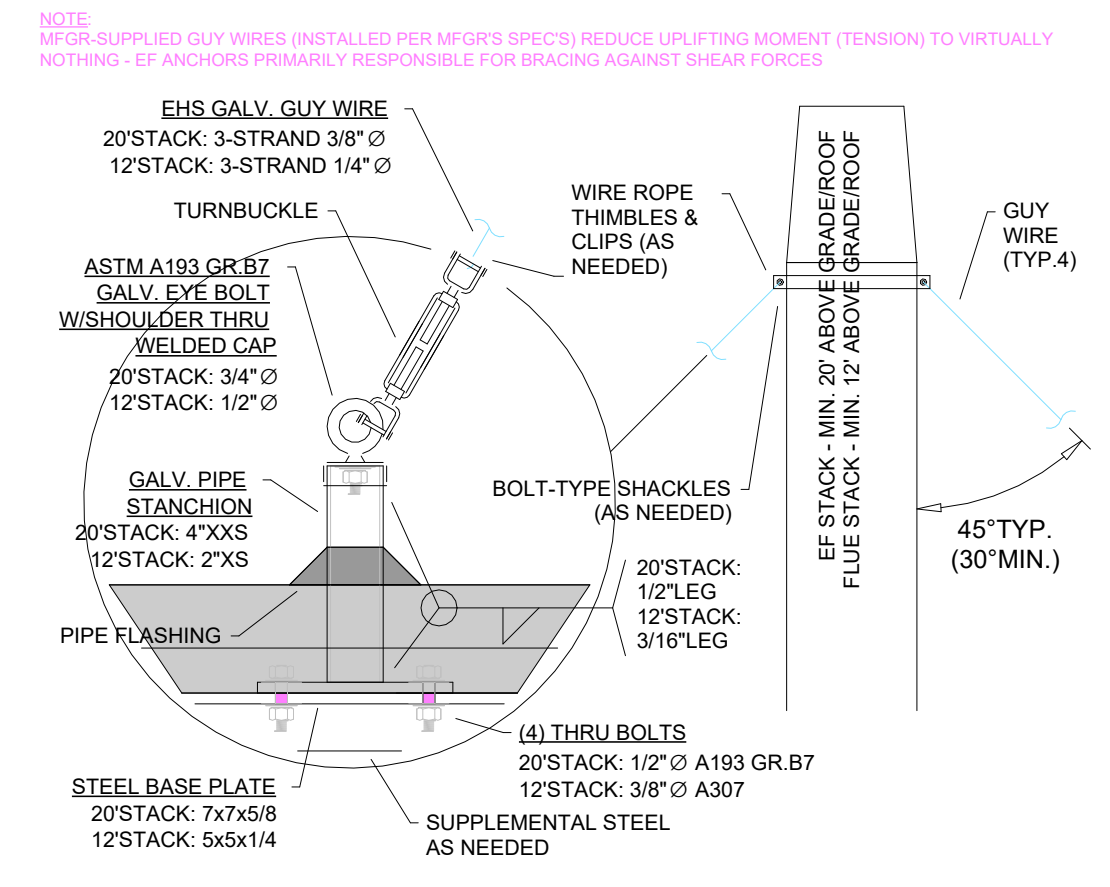


6 RECTANGULAR DUCT HANGER DETAIL
M601 SCALE: NO SCALE

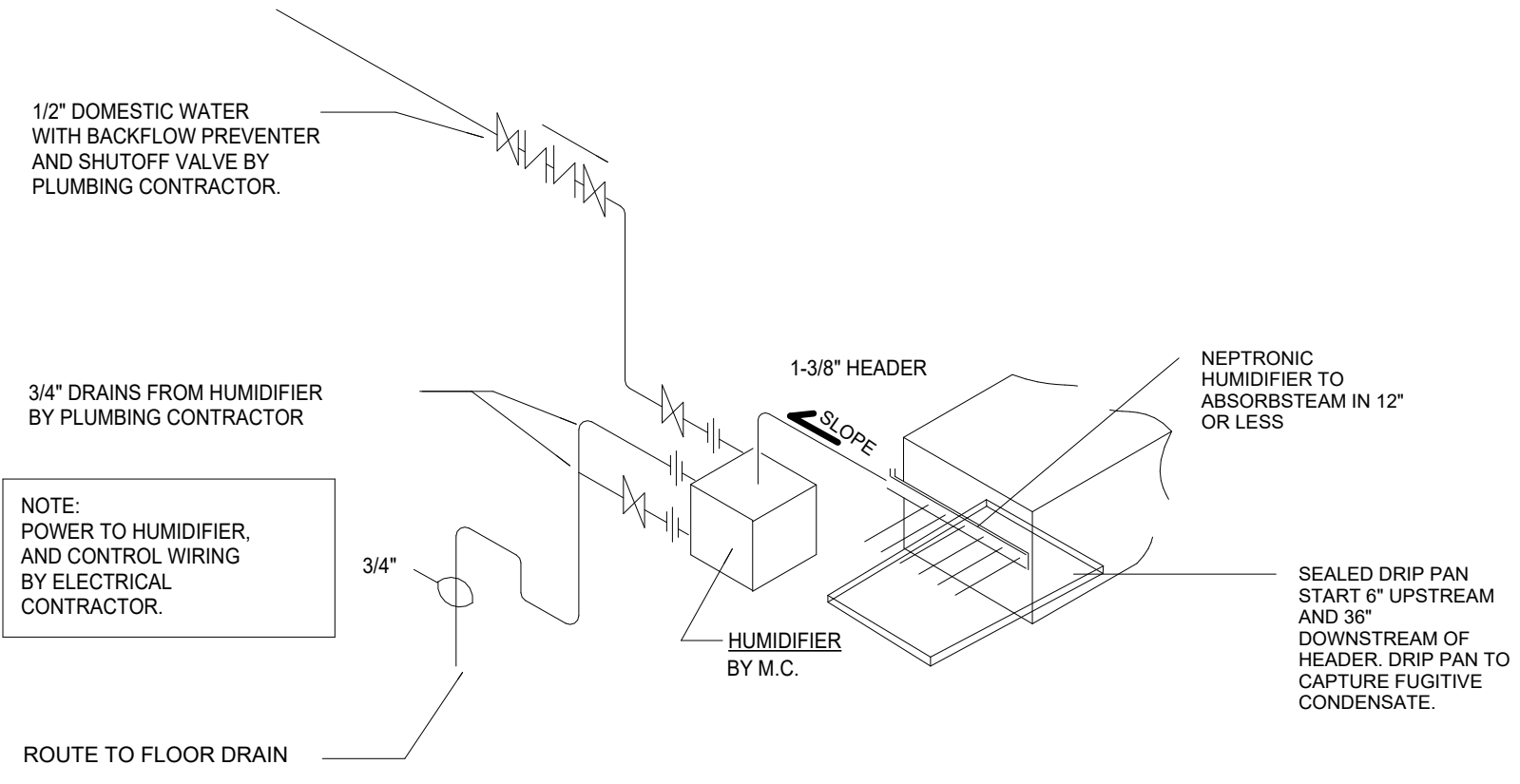
MAXIMUM HALF OF DUCT PERIMETER	PAIR @ 10 FT SPACING	PAIR @ 5 FT SPACING
P/2 = 30"	1" X 22 GA.	1" X 22 GA.
P/2 = 72"	1" X 18 GA.	1" X 22 GA.
P/2 = 96"	1" X 16 GA.	1" X 20 GA.
P/2 = 120"	1" X 16 GA.	1" X 18 GA.
P/2 = 168"	1" X 16 GA.	1" X 16 GA.
P/2 = 192"	NOT GIVEN	1" X 16 GA.



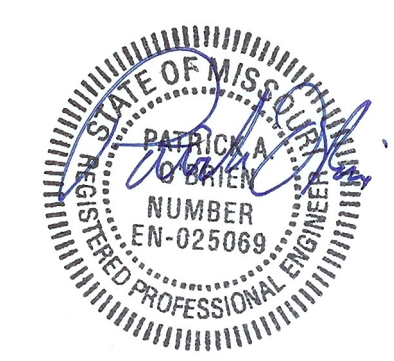
7 #10 TECH SCREW ROOF ANCH.
M601 SCALE: NO SCALE EQUIPMENT UNDER 1000LBS



8 GUY WIRES EF-1.2.5.6
M601 SCALE: NO SCALE



9 HUMIDIFIER DETAIL
M601 SCALE: NO SCALE



NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		12" = 1'-0" SHEET FULL SIZE 34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB		
						CDG PROJECT 21380 PROJ MGR GEB

MECHANICAL DETAILS
MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
ROLLA, MISSOURI
DANGEROUS MATERIALS STORAGE FACILITY

SITE: ROLLA, MISSOURI

CDG ENGINEERS
One Campbell Plaza
St. Louis, Missouri, 63139 314.781.7770
314.781.9075

DRAWING NO. M601

REVISION NO. 2

SEQUENCE OF CONTROL FOR DOAS (DEDICATED OUTDOOR AIR SYSTEM)

OVERVIEW

• THE UNIT IS PROVIDED WITH PACKAGED CONTROLS WHICH ARE INTEGRATED TO THE BUILDING AUTOMATION SYSTEM (BAS) VIA BACNET. THE BAS SENDS THE DOAS ENABLE SIGNAL, A VENTILATION SETPOINT, AND A DISCHARGE SETPOINT. DOAS IS PROVIDED WITH VARIABLE VOLUME SUPPLY FAN, OUTSIDE AIR DAMPER, DX COOLING, HOT GAS REHEAT, AND FILTER (SEE SCHEDULE). ONE DUCT HUMIDIFIER WILL MODULATE TO MAINTAIN HUMIDITY IN THE SPACE. THIS UNIT WILL RUN 24/7.

DISCHARGE AIR TEMPERATURE CONTROL:

COOLING:

• SYSTEM SHALL ENABLE COOLING MODE WHEN OUTSIDE TEMPERATURE IS ABOVE 56 °F. THE SYSTEM SHALL COOL VARYING OUTSIDE AIR TEMPERATURE DOWN TO 55°F AND SHALL MODULATE HOT GAS REHEAT TO MAINTAIN A 70 °F LEAVING AIR TEMPERATURE. PROGRAMMED FOR A 2°F DEADBAND BETWEEN COOLING AND HEATING CHANGE OVER.

HEATING:

• THE SYSTEM SHALL ENABLE HEATING MODE WHEN OUTSIDE TEMPERATURE IS BELOW 54°F. THE SYSTEM SHALL ENERGIZE MODULATING GAS HEAT TO MAINTAIN A 70 °F LEAVING AIR TEMPERATURE. PROGRAMMED FOR A 2°F DEADBAND BETWEEN COOLING AND HEATING CHANGE OVER.

DISCHARGE AIRFLOW CONTROL

OUTSIDE AIRFLOW SET POINT:

• THE MINIMUM OUTSIDE AIRFLOW SETPOINT SHALL MATCH THE DESIGN MINIMUM OUTSIDE AIR REQUIREMENT TO MAINTAIN 1.0 CFM SF VENTILATION RATE. SYSTEM TO BE BALANCED TO CFM INDICATED BY SCHEDULE AND BALANCED BY OWNER CONTRACTOR TO CFM INDICATED. VSD IS BASED ON SPACE PRESSURE AND IS ONLY ADJUSTED TO ACCOUNT FOR RAISED SASH HOOD ON/OFF.

SUPPLY FAN CONTROL

• THE FAN SHALL RUN AND MAINTAIN AIRFLOW SETPOINT 24/7.

ZONE HUMIDIFICATION CONTROL:

• HUMIDIFIER H-1 SHALL GENERATE STEAM FROM DOMESTIC WATER. THE DISTRIBUTION TUBES SHALL BE IN THE DUCT. HUMIDIFICATION IS CONTROLLED BY MODULATING THE HUMIDIFIER OUTPUT VIA JCI BAS BACNET INTEGRATION TO MEET DESIRED ZONE RELATIVE HUMIDITY SETPOINT.

HUMIDIFICATION SETPOINT:

• THE UNIT SHALL MAINTAIN A CONSTANT ZONE SETPOINT OF 30% RELATIVE HUMIDITY.

SUPPLY AIR HUMIDITY CONTROL:

• IF THE SUPPLY AIR HUMIDITY SENSOR DETECTS THAT THE HUMIDITY IS ABOVE 30% RELATIVE HUMIDITY, THE HUMIDIFIER SHALL BE TURNED OFF. HUMIDIFIER TO BE LOCKED OUT IN COOLING MODE.

SPACE HUMIDITY CONTROL:

• IF THE SPACE AIR HUMIDITY SENSOR DETECTS THAT THE HUMIDITY IS BELOW 25% RELATIVE HUMIDITY, THE HUMIDIFIER SHALL BE ENERGIZED. THE HUMIDIFIER SHALL MODULATE ITS OUTPUT TO MAINTAIN THE SPACE HUMIDITY ABOVE 30% RELATIVE HUMIDITY AND PROGRAMMED WITH A DEADBAND TO KEEP FROM SHORT CYCLING.

HUMIDIFIER MODULATION:

• THE HUMIDIFIER OUTPUT SHALL BE MODULATED BASED ON THE DIFFERENCE BETWEEN THE SPACE AIR HUMIDITY READING AND THE SETPOINT OF 30% RELATIVE HUMIDITY. THE MODULATION SHALL BE SUCH THAT AS THE SPACE AIR HUMIDITY APPROACHES 30%, THE OUTPUT OF THE HUMIDIFIER IS GRADUALLY REDUCED TO PREVENT OVERTHOOTING THE SETPOINT AND LOCKED OUT DURING COOLING MODE.

ALARMS:

PACKAGED DOAS CONTROLLER FAULT:

• FILTRATION PRESSURE DROP MONITORED AND WILL ALARM BMS IF PRESSURE DIFFERENTIAL IS ACHIEVED. CRITICAL ALARMS FROM THE PACKAGED CONTROLLER SHALL BE MAPPED TO THE BAS FOR PRE FILTER.

PACKAGED HUMIDITY CONTROLLER FAULT:

• ALL ALARMS FROM THE PACKAGED CONTROLLER SHALL BE MAPPED TO THE BAS.

ZONE HUMIDITY:

• IF ZONE HUMIDITY DROPS BELOW 25% THE BAS SHALL GENERATE A BAS ALARM.

SEQUENCE OF CONTROL FOR CRITICAL EXHAUST FANS (EF-1-EF-2) AND GAS DETECTION SYSTEM SERVING FLAMMABLE CORROSIVE STORAGE AREA 100D AND 100D1

OVERVIEW:

• FLAMMABLE AND CORROSIVE STORAGE SPACES SHALL BE SERVED BY A CONTINUOUS OPERATION EXHAUST SYSTEM. THE EXHAUST FANS RUN CONTINUOUSLY AT MINIMUM SPEED AND INCREASES SPEED IN THE EVENT OF A GAS DETECTION ALARM. THIS SPACE SHALL HAVE A REDUNDANT SYSTEM THAT SHALL BE ON EMERGENCY POWER AND SHALL SENSE THE LEL (LOWER EXPLOSIVE LIMIT) OF THE HYDROCARBONS IN THE SPACE.

EXHAUST FANS

• EXHAUST FANS EF-1 AND EF-2 OPERATE CONTINUOUSLY AND ARE INTERLOCKED WITH THE DEDICATED OUTDOOR AIR SYSTEM (DOAS). WHEN THE DOAS IS ACTIVATED, THE EXHAUST FANS ARE AUTOMATICALLY TURNED ON. THE STATUS OF THE FANS IS MONITORED BY THE JCI BAS SYSTEM USING A CURRENT SENSING RELAY. ALARM WILL BE TRIGGERED IF BELT BREAKS OR MOTOR FAIL. STANDALONE BALL IN THE WALL DEVICES SHALL CONFIRM SPACE PRESSURIZATION OF NEGATIVE 0.01" WC FOR HAZARDOUS SPACES (100D AND 100D1)

GAS DETECTION SYSTEM

CONTINUOUS MONITORING:

• LEL SENSORS, TWO IN EACH ROOM FOR REDUNDANCY, WILL CONTINUOUSLY MONITOR THE CONCENTRATION OF COMBUSTIBLE GASES IN THE AREA.

ALARM LEVELS:

• THE SYSTEM IS PROGRAMMED WITH PREDEFINED ALARM LEVELS BASED ON THE PERCENTAGE OF THE LEL (LOWER EXPLOSIVE LIMIT).
 • LOW ALARM (ACTIVATED AT 25% OF THE LEL); IF 25% LEL IS ACHIEVED THEN PURGE MODE IS ACTIVATED. THE CORRESPONDING EXHAUST FAN EF1 OR EF2 SHALL INCREASE SPEED TO 100% AND CORRESPONDING OUTSIDE AIR LOUVER OAL1 OR OAL2 SHALL FULLY OPEN UNTIL SPACE IS VENTILATED BELOW 25% LEL CONCENTRATION. JCI BAS WILL SEND EMAIL/TEXT NOTIFICATION TO DESIGNATED PARTY/PERSONNEL.

DAMPER CONTROL:

• THE OUTDOOR AIR LOUVERS (OAL1 AND OAL2) ARE INTERLOCKED WITH THE GAS DETECTION SYSTEM. IN THE EVENT OF AN ALARM, THE DAMPERS ARE PROGRAMMED TO AUTOMATICALLY OPEN TO FACILITATE VENTILATION AND DILUTION OF ANY DETECTED GAS. THE JOHNSON CONTROLS BUILDING AUTOMATION SYSTEM (JCI BAS) CONTINUOUSLY MONITORS THE POSITION OF THE DAMPERS VIA END SWITCHES. IF THE DAMPERS FAIL TO REACH THE CORRECT POSITION UPON ACTIVATION, A SECONDARY ALARM WILL BE TRIGGERED IN THE JCI BAS, EITHER ALARM SHALL ALERT THE FACILITY MANAGEMENT TEAM FOR IMMEDIATE ACTION.

SEQUENCE OF CONTROL FOR EXHAUST FANS (EF-3 AND EF-4) SERVING ROOM 100C AND 100A

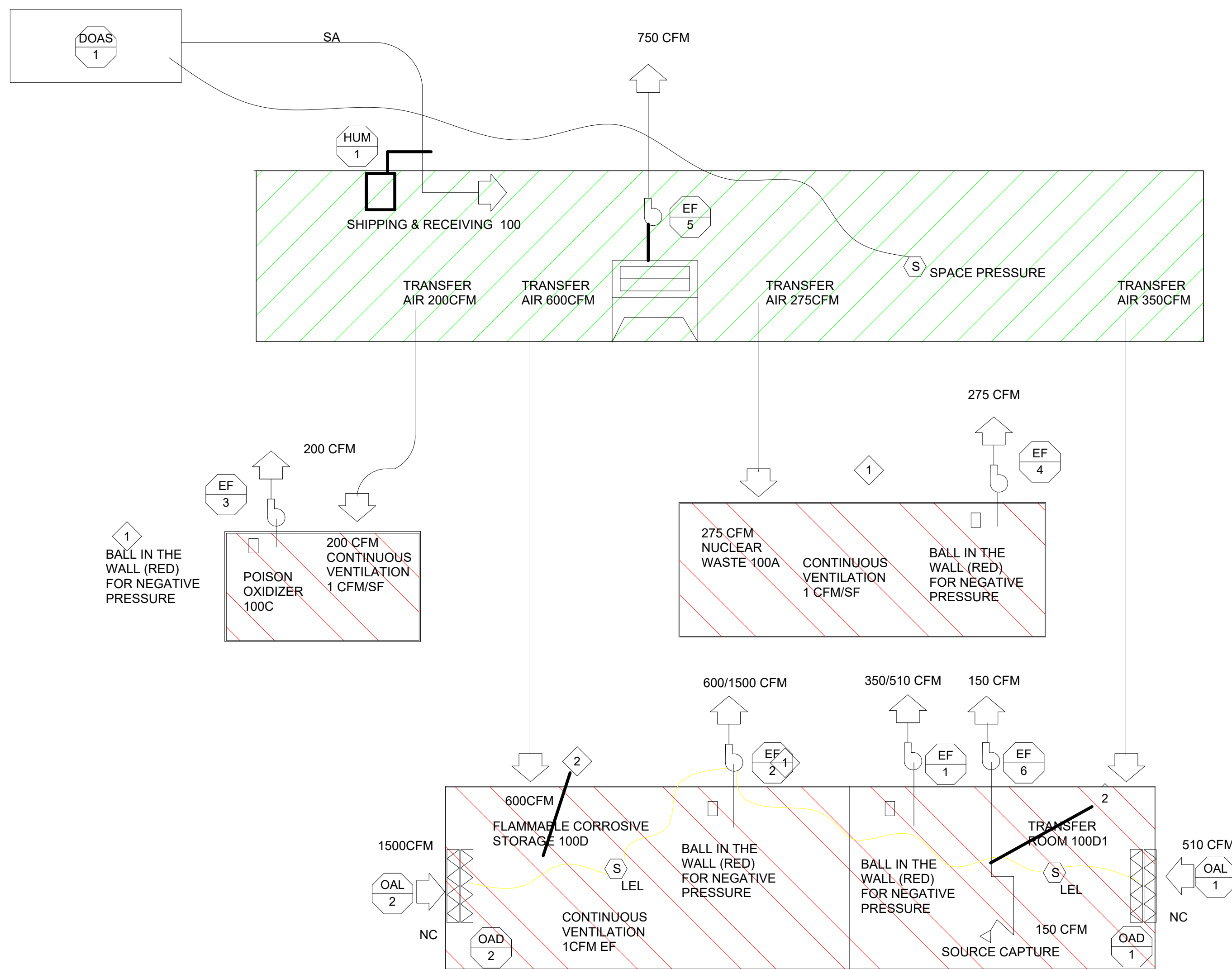
• EXHAUST FANS EF-3 AND EF-4 OPERATE CONTINUOUSLY AND ARE INTERLOCKED WITH THE DEDICATED OUTDOOR AIR SYSTEM (DOAS). WHEN THE DOAS IS ACTIVATED, THE EXHAUST FANS ARE AUTOMATICALLY TURNED ON. THE STATUS OF THE FANS IS MONITORED BY THE JCI BAS USING A CURRENT SENSING RELAY. ALARM WILL BE TRIGGERED IF BELT BREAKS OR MOTOR FAIL.

• STANDALONE BALL IN THE WALL DEVICES SHALL CONFIRM SPACE PRESSURIZATION OF NEGATIVE 0.01" WC FOR HAZARDOUS SPACES (100C AND 100A)

SEQUENCE OF CONTROL FOR GENERAL EXHAUST FANS (EF-5 AND EF-6) FOR NON-CRITICAL APPLICATION.

• EXHAUST FAN 5 & 6 SHALL BE ON A SWITCH AND ONLY MANUALLY OPERATED AS NEEDED. JCI SHALL MONITOR STATUS VIA CURRENT SENSING RELAY.

Autodesk Docs://MO S&T - Dangerous Material Storage/21380-MECH_v22-CPRO.rvt
 2/23/2024 11:26:32 AM



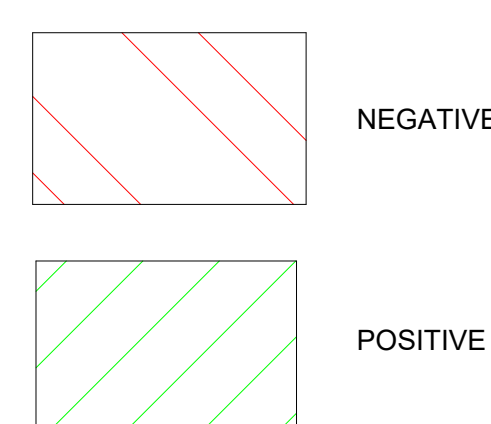
1 HVAC AIR FLOW DIAGRAM
 1" = 1'-0"

GENERAL NOTES

1. HVAC SYSTEMS AIR FLOW DIAGRAM. DO NOT SCALE FOR REFERENCE ONLY.

KEYED NOTES

- 1 BALL IN WALL STATIC PRESSURE INDICATOR
 MFG: AIRFLOW DIRECTION INCORPORATED
 MODEL: NEGATIVE BALL IN WALL
 SET POINT: 0.01" WC NEGATIVE
 WEBSITE: AIRFLOWDIRECTIONS.COM
- 2 EXPLOSIVE GAS DETECTOR
 MFG: CALIBRATED TECHNOLOGIES INCORPORATED
 MODEL: GG-LEL2
 WEBSITE: CTIGAS.COM
 INTERFACE: JCI CONTROLS
 SEE SEQUENCE OF CONTROL FOR OPERATION.



Copyright © 2023 Dynamic Engineered Systems
 MISSOURI CERTIFICATE OF AUTHORITY # E-2011001315
 PROFESSIONAL ENGINEER # MO-20089

NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		1" = 1'-0"
2	02/14/24	ADDENDUM 2	POB/BM	POB		SHEET FULL SIZE 34x22 ANSI D

CDG PROJECT	21380
PROJ MGR	GEB

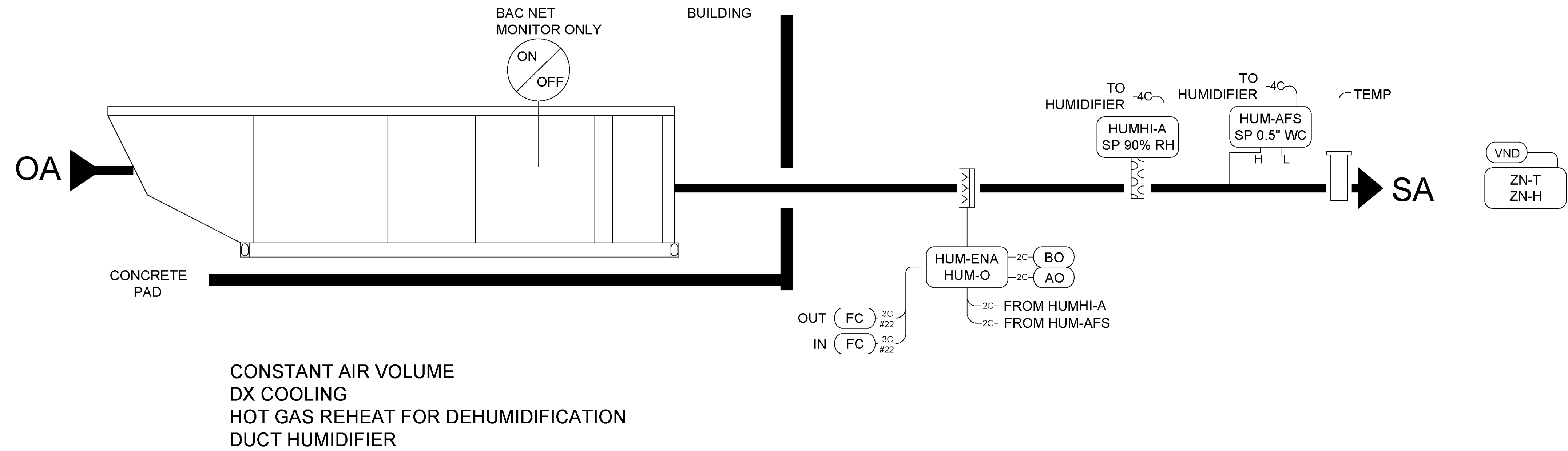
HVAC AIR FLOW DIAGRAM
 MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
 ROLLA, MISSOURI
 DANGEROUS MATERIALS STORAGE FACILITY

SITE: ROLLA, MISSOURI

CDG ENGINEERS
 One Campbell Plaza
 St. Louis, Missouri, 63139 314.781.7770
 314.781.9075

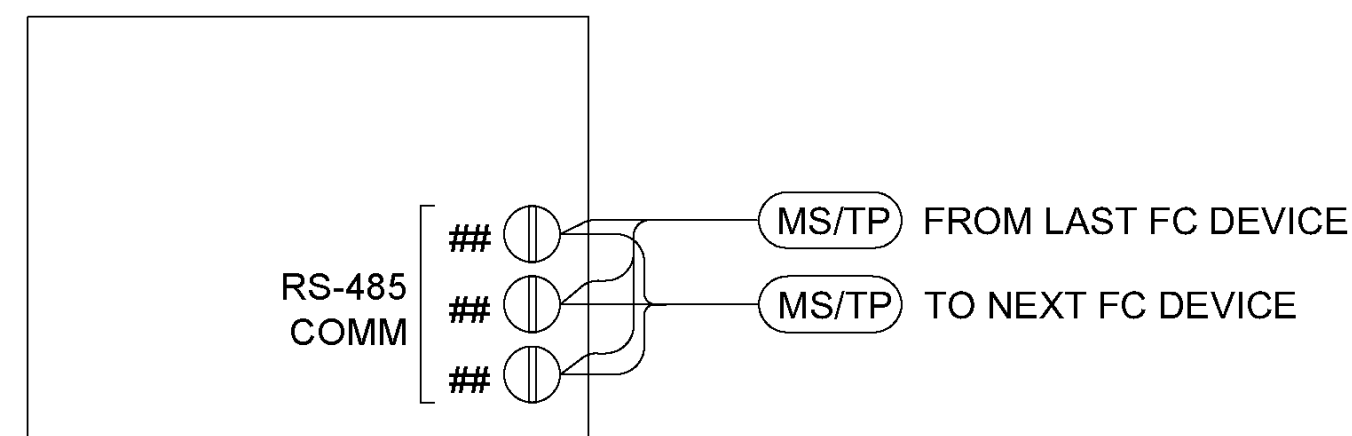
DRAWING NO. M602

REVISION NO. 2



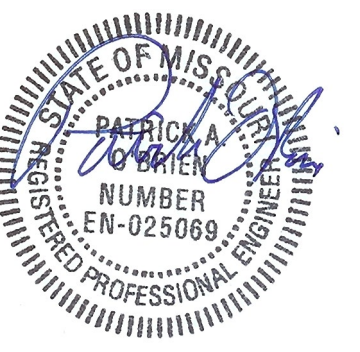
- NOTES:**
1. RTU-1 IS A PACKAGED UNIT. ALL CONTROL DEVICES ARE PROVIDED BY UNIT MANUFACTURER.
 2. JCI WILL INSTALL AND WIRE ZONE TEMPERATURE AND HUMIDITY SENSOR

WIRING DETAIL FOR RTU



ADDRESS	
EQUIPMENT	FC ADDRESS
DOAS-1	#
FC-A	

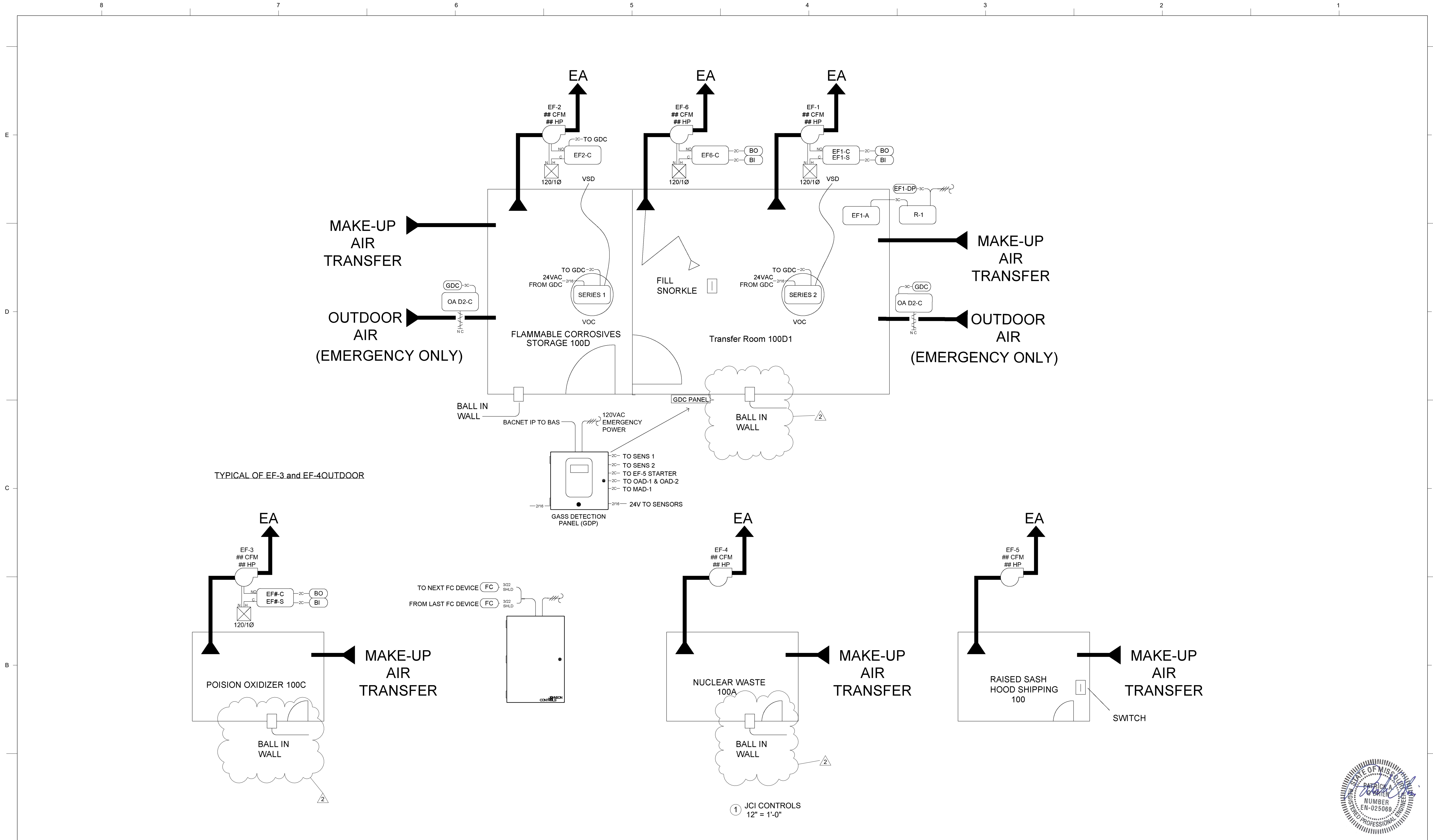
① JCI DOAS CONTROLS
12" = 1'-0"



NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		12" = 1'-0"
2	02/14/24	ADDENDUM 2	POB/BM	POB		SHEET FULL SIZE 34x22 ANSI D
						CDG PROJECT 21380
						PROJ MGR GEB

JCI DOAS CONTROLS DIAGRAM	
DANGEROUS MATERIALS STORAGE FACILITY	
SITE: ROLLA, MISSOURI	DRAWING NO. M603
REVISION NO.	2





JCI CONTROLS DIAGRAM

DANGEROUS MATERIALS STORAGE FACILITY

NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		12" = 1'-0" SHEET FULL SIZE 34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB		
						CDG PROJECT 21380 PROJ MGR GEB

SITE: ROLLA, MISSOURI	DRAWING NO. M604
	REVISION NO. 2
<small>One Campbell Plaza St. Louis, Missouri, 63199 314.781.7770 314.781.9075</small>	

PLUMBING FIXTURE CONNECTION SCHEDULE

Table with columns: MARK, DESCRIPTION, WASTE, IW, VENT, CW, HW. Rows include US-1 (UTILITY SINK), ECS-1 (EMERG. COMBO. SHOWER), EWH-1 (EMERG. TANKLESS HEATER), EWH-2 (POU TANKLESS HEATER), FD-1 (FLOOR DRAIN).

NOTES: 1. EQUIPMENT AND PIPE SIZES SHOWN ARE FOR CONNECTIONS TO EQUIPMENT SCHEDULED WITHIN THESE DOCUMENTS...

PIPING SPECIFICATIONS

Table with columns: PIPING SYSTEM, SIZE, MATERIAL, JOINTS, INSULATION. Rows for Sanitary/Vent Systems, Domestic Cold Water, Domestic Hot Water (140°F), Domestic Hot Water (110°F), Domestic Hot Water Return.

Table for NATURAL GAS (G) with columns: SIZE, MATERIAL, JOINTS, INSULATION. Rows for sizes < 3" and -> 3".

- 1. 6" DIRT LEG SHALL BE INSTALLED AT ALL GAS EQUIPMENT.
2. A GAS REGULATOR SHALL BE INSTALLED AT GAS EQUIPMENT WHERE APPLICABLE.
3. ALL GAS PIPING EXPOSED TO THE ELEMENTS SHALL BE PAINTED WITH "RUSTOLEUM" PAINT.
4. ALL GAS PIPING SHALL BE INSTALLED PER NFPA 54.

Table for MAX SPACING BETWEEN SUPPORTS (FT) with columns: NOMINAL PIPE SIZE (IN), COPPER TUBING, STAINLESS STEEL AND MONEL, CARBON STEEL, GLASS FIBER, CPVC PVC.

SYMBOLS AND ABBREVIATIONS

PLUMBING SYMBOLS: Includes symbols for CW, HW, SAN, V, PO, D, and plumbing symbols like flow direction, isolation valve, check valve, butterfly valve, etc.

PROJECT DESIGN INFORMATION

Table with columns: CODE REQUIREMENTS, LOCATION, PLUMBING CODE. Values: ROLLA, MO; 2021 INTERNATIONAL PLUMBING CODE.

FIXTURE UNIT CALCULATIONS

Table with columns: FIXTURE TYPE, QTY, COLD WATER (CFU/FT, CWFU/TOTAL), HOT WATER (HWFU/FT, HWFU/TOTAL), TOT. SERVICE (TSFU/FT, TSFU/TOTAL), DRAINAGE (DFU/FT, DFU/TOTAL). Rows for US-1 and FD-1, plus a TOTAL row.

GENERAL NOTES

- 1. ALL INSULATED PIPE WHICH PENETRATES FLOORS AND FIRE WALLS SHALL BE STOPPED USING 3M INFUSCENT FIRE STOPPING SYSTEM...
2. ALL OPENINGS THROUGH FLOOR SLABS SHALL BE CORE DRILLED...
3. THIS CONTRACTOR SHALL SEAL WATER TIGHT ALL PENETRATIONS THRU FLOOR SLAB.
4. ALL CUTTING AND PATCHING REQUIRED FOR THE INSTALLATION OF WORK SHOWN ON THESE DRAWINGS SHALL BE PERFORMED BY THIS CONTRACTOR...
5. THIS CONTRACTOR SHALL COORDINATE ALL NEW WORK WITH ALL TRADES AND EXISTING SITE CONDITIONS...
6. THIS CONTRACTOR SHALL INSULATE HOT AND COLD PIPE. SEE SPECIFICATION.
7. EACH PIECE OF EQUIPMENT, FIXTURE, OR GROUP OF FIXTURES, AND ALL OTHER ITEMS REQUIRING WATER SUPPLY SHALL BE SEPARATELY VALVED...
8. ALL VENTS THRU ROOF SHALL BE LOCATED A MINIMUM OF 12" FROM ALL SUPPLY AIR INTAKES.

Table with columns: MARK, EQUIP., DESCRIPTION/ACCESSORIES, MANUFACTURER/MODEL, NOTES. Rows for US-1, EWH-1, EWH-2, ECS-1, FD-1, TS-1.

PLUMBING NOTES:

HANDICAP SPECIFICATIONS: ADA (AMERICANS WITH DISABILITIES ACT) 2010 STANDARDS AND ANSI A117.1 (REFER TO ARCHITECTURAL DRAWINGS FOR EXACT CLEARANCE DIMENSIONS)

GENERAL:

THE WORK COVERED BY THESE SPECIFICATIONS INCLUDES BUT IS NOT LIMITED TO PROVIDING ALL LABOR, MATERIAL, AND EQUIPMENT NECESSARY TO COMPLY WITH REQUIREMENTS OF THIS FACILITY.

PLUMBING FIXTURES:

UTILITY SINK - AS IDENTIFIED ON PLANS. WALL MOUNTED STEEL/PORCELAIN WITH 2" DRAIN. VINYL BUMPER GUARD ON 3 SIDES. SERVICE FAUCET 8" CTR. TO CTR. WITH VACUUM BREAKER HOSE AND HOSE BRACKET. PROVIDE 2" VENTED WASTE WITH "P-TRAP". CALLK WITH A SILICONE SEALANT ALONG WALLS. AT 4'-0" A.F.F. FLOOR DRAIN - AS IDENTIFIED ON PLANS. CAST IRON DRAIN WITH NICKEL-BRONZE ADJUSTABLE STRAINER. INSIDE CAULD. OUTLET AND CLAMPING DEVICE WHERE REQUIRED. PROVIDE WITH TRAP PRIMER TAP AND TRAP PRIMER WHERE INDICATED.

NOTE: OWNER'S GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER INSTALLATION OF ALL TOILET ACCESSORIES INCLUDING SUPPORT BLOCKING INSIDE WALL.

MATERIALS: SANITARY SEWER - CAST IRON. PVC OR COPPER PIPING MAY BE USED EXCEPT THAT ALL PIPING BELOW GRADE SHALL BE CAST IRON, OR PVC. VENTS TWO INCHES (2") IN SIZE AND SMALLER MAY BE EITHER SCHEDULE 40 GALVANIZED STEEL OR COPPER PIPING.

INSULATED WITH ARMAFLEX OR EQUIVALENT INSULATING TO A THICKNESS OF 1" THRU 1". SEE TABLE SHEET MEP 1.0 GAS PIPING (WHEN REQUIRED) SHALL BE BLACK STEEL SCHEDULE 40 WITH SCREWED FITTINGS.

PIPING: PIPING AND FITTINGS SHALL BE OF THE WEIGHTS AND TYPES SHOWN ON DRAWINGS. SIZES SHOWN ON ON DRAWINGS ARE NOMINAL PIPE SIZES. ALL PIPING SHALL BE INSTALLED PARALLEL TO, OR AT RIGHT ANGLES WITH THE BUILDING WALLS AND PARTITIONS AND SHALL BE INSTALLED WITH THE PROPER PITCH. ALL PIPING SHALL BE OPENED AND POUNDED TO REMOVE ANY FOREIGNER PRESENT AND SHALL BE SWABED IF NECESSARY.

PREPARING PIPE:

SCREWED PIPE SHALL BE INSTALLED WITH PIPE COMPOUND APPLIED TO THE MALE THREAD WITH NOT MORE THAN TWO THREADS LEFT EXPOSED. PIPE SHALL BE REAMED AFTER THREADING. BELOW GRADE SANITARY PIPING SHALL BE CAST IRON PIPE AND SHALL BE INSTALLED WITH ONE THIRD OF THE HUB CAULKED WITH FIRST QUALITY OAKUM, AND THE REMAINDER FILLED WITH FIRST QUALITY CAULKING AT ONE POURING AND CAULKED TIGHT. COPPER JOINTS SHALL BE MADE UP WITH 95-5 SOLDER.

HANGERS AND SUPPORTS:

HORIZONTAL PIPING SHALL BE SUPPORTED AT INTERVALS NOT TO EXCEED 10'-0" WITH SWIVEL SPLIT PIPE HANGERS EQUAL TO CRANE #109F OR GRINNELL #104. VERTICAL PIPING SHALL BE SUPPORTED BY MEANS OF WROUGHT IRON CLAMPS SUSPENDED FROM THE UNDER-SIDE OF STRUCTURE WITH HANGER RODS. REFER TO HANGER SCHEDULE FOR ALL OTHER PIPE HANGER SIZES AND SUPPORT LENGTHS.

VALVES:

ALL VALVES SHALL BE BRASS AND MANUFACTURED BY CRANE, NIBCO, STOCKHAM, LUNKENHEIMER, NORDSTROM, GRINNELL OR EQUAL.

ROUGH-INS:

FOR SECOND LEVEL STORES, THE GENERAL CONTRACTOR SHALL ROUTE ALL LINES REQUIRED FOR PLUMBING ROUGH-INS TIGHT AGAINST THE UNDERSIDE OF THE SECOND FLOOR LEVEL WITH ALLOWANCE FOR SLOPE. SECOND FLOOR SLAB SHALL BE CORE DRILLED AS REQUIRED TO INSTALL THESE ITEMS AT THE LOCATIONS SHOWN ON THE PLANS. COORDINATE WITH LOWER LEVEL TENANTS.

TESTING AND ADJUSTING:

CONTRACTOR SHALL DEMONSTRATE OPERATION OF PIPING SYSTEM TO FULL SATISFACTION OF TENANT. ALL PIPING SHALL WITHSTAND AIR PRESSURE TESTING PER GOVERNING CODES.

FIRE SPRINKLER NOTES:

ALL NEW SYSTEMS SHALL BE DESIGNED AND COORDINATED WITH CURRENT NFPA STANDARDS AS ADOPTED BY GOVERNING CODES AND FIRE MARSHAL OF MUNICIPALITY. NEW AND EXISTING SYSTEMS SHALL MEET THE REQUIREMENTS OF NFPA AND LOCAL CODES FOR OCCUPANCY AND HAZARD CLASSIFICATION SYSTEMS MAY REQUIRE HYDRAULIC FLOW TESTING BY GOVERNING AUTHORITY TO ESTABLISH FLOW RATES TO SYSTEMS AT PEAK AND OFF PEAK DEMAND TIMES FOR LOCAL WATER DELIVERY SYSTEMS. EXISTING FLOW TEST EXPIRED 01-04-24. NEW FLOW TEST REQUIRED SYSTEMS SHOWN WITHIN THESE DRAWINGS ARE DIAGRAMMATIC IN NATURE. I.E., PIPE SIZE, HEAD LOCATION, AND FINAL PIPE ROUTING SHALL BE PREPARED AND CALCULATED BY FIRE SPRINKLER INSTALLING CONTRACTOR TO BE REVIEWED AND APPROVED BY INSTALLING ENGINEER OF RECORD AND LOCAL AHJ AUTHORITY HAVING JURISDICTION PRIOR TO INSTALLATION. SYSTEMS SHALL BE TESTED AND APPROVED BY AHJ. FIRE PROTECTION PIPING TO BE ANCHORED AND SUPPORTED PER NFPA.

TESTING AND ADJUSTING:

CONTRACTOR SHALL DEMONSTRATE PIPE SYSTEMS TO AHJ BE MEANS OF HYDROSTATIC TESTING AND TESTING FORMS AS PER NFPA AND LOCAL AHJ.

GUARANTEE:

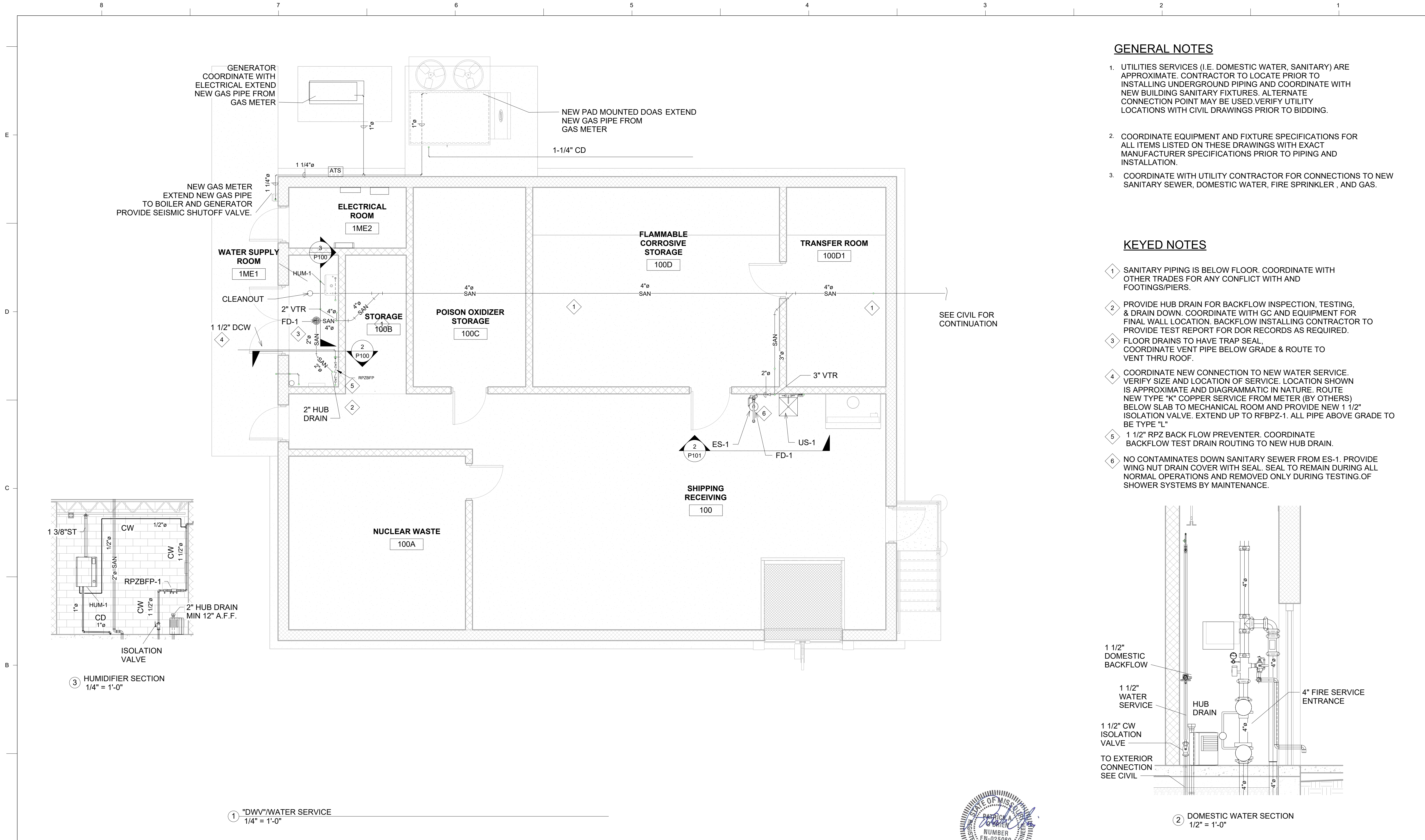
ALL MATERIALS, EQUIPMENT, AND WORKMANSHIP SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER DATE OF ACCEPTANCE. THE COMPLETED PLUMBING SYSTEM SHALL BE FULLY OPERATIONAL AND ACCEPTANCE BY TENANT SHALL BE A CONDITION OF THIS CONTRACT. ALL WORK FOUND TO BE DEFECTIVE SHALL BE REPAIRED OR REPLACED BY THIS SUBCONTRACTOR WITHOUT ADDITIONAL COST TO THE TENANT.

PLUMB SYMBOLS/LEGENDS 12" = 1'-0"

Table with columns: NO., DATE, DESCRIPTION, DESIGR, ENGR, PM. Rows for 0 (12/07/23) ISSUED FOR BID, 2 (02/14/24) ADDENDUM 2.

Table with columns: SCALE, SHEET FULL SIZE, CDG PROJECT, PROJ MGR. Values: 12" = 1'-0", 34x22 ANSI D, 21380, GEB.

PLUMBING SYMBOLS AND LEGENDS MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY ROLLA, MISSOURI DANGEROUS MATERIALS STORAGE FACILITY. Includes CDG logo and site information.

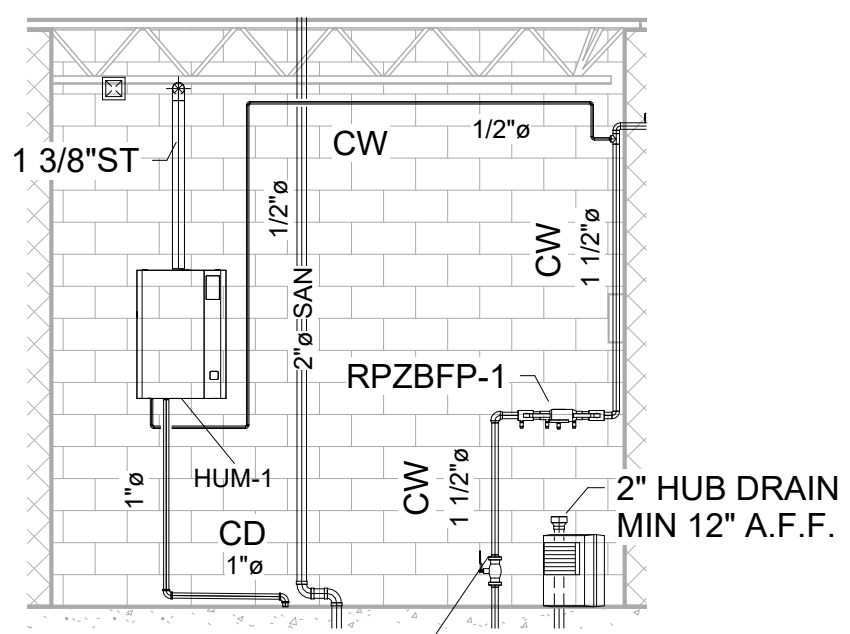


GENERAL NOTES

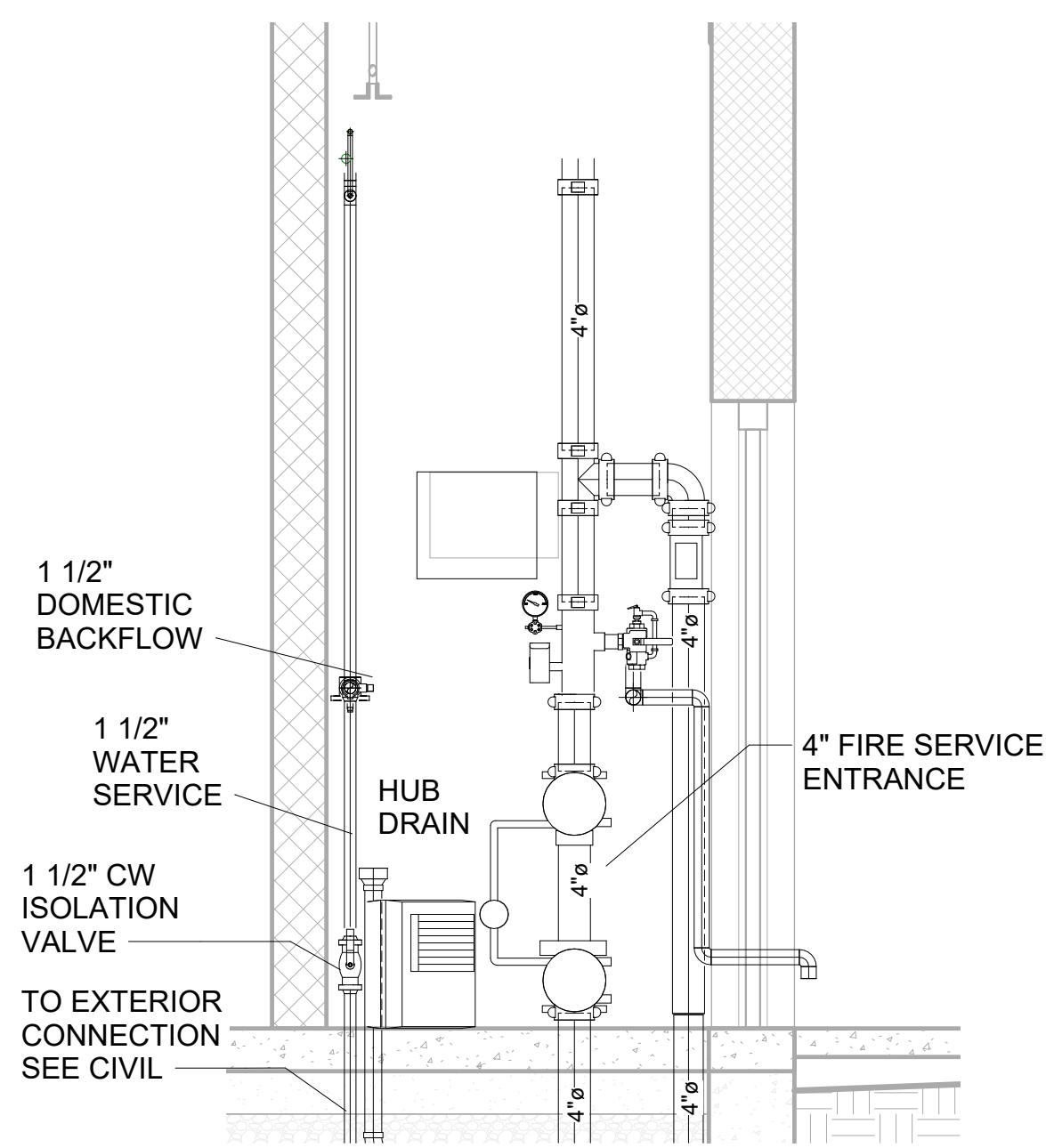
1. UTILITIES SERVICES (I.E. DOMESTIC WATER, SANITARY) ARE APPROXIMATE. CONTRACTOR TO LOCATE PRIOR TO INSTALLING UNDERGROUND PIPING AND COORDINATE WITH NEW BUILDING SANITARY FIXTURES. ALTERNATE CONNECTION POINT MAY BE USED. VERIFY UTILITY LOCATIONS WITH CIVIL DRAWINGS PRIOR TO BIDDING.
2. COORDINATE EQUIPMENT AND FIXTURE SPECIFICATIONS FOR ALL ITEMS LISTED ON THESE DRAWINGS WITH EXACT MANUFACTURER SPECIFICATIONS PRIOR TO PIPING AND INSTALLATION.
3. COORDINATE WITH UTILITY CONTRACTOR FOR CONNECTIONS TO NEW SANITARY SEWER, DOMESTIC WATER, FIRE SPRINKLER, AND GAS.

KEYED NOTES

- 1 SANITARY PIPING IS BELOW FLOOR. COORDINATE WITH OTHER TRADES FOR ANY CONFLICT WITH AND FOOTINGS/PIERS.
- 2 PROVIDE HUB DRAIN FOR BACKFLOW INSPECTION, TESTING, & DRAIN DOWN. COORDINATE WITH GC AND EQUIPMENT FOR FINAL WALL LOCATION. BACKFLOW INSTALLING CONTRACTOR TO PROVIDE TEST REPORT FOR DOR RECORDS AS REQUIRED.
- 3 FLOOR DRAINS TO HAVE TRAP SEAL. COORDINATE VENT PIPE BELOW GRADE & ROUTE TO VENT THRU ROOF.
- 4 COORDINATE NEW CONNECTION TO NEW WATER SERVICE. VERIFY SIZE AND LOCATION OF SERVICE. LOCATION SHOWN IS APPROXIMATE AND DIAGRAMMATIC IN NATURE. ROUTE NEW TYPE "K" COPPER SERVICE FROM METER (BY OTHERS) BELOW SLAB TO MECHANICAL ROOM AND PROVIDE NEW 1 1/2" ISOLATION VALVE. EXTEND UP TO RFBPZ-1. ALL PIPE ABOVE GRADE TO BE TYPE "L".
- 5 1 1/2" RPZ BACK FLOW PREVENTER. COORDINATE BACKFLOW TEST DRAIN ROUTING TO NEW HUB DRAIN.
- 6 NO CONTAMINATES DOWN SANITARY SEWER FROM ES-1. PROVIDE WING NUT DRAIN COVER WITH SEAL. SEAL TO REMAIN DURING ALL NORMAL OPERATIONS AND REMOVED ONLY DURING TESTING OF SHOWER SYSTEMS BY MAINTENANCE.



3 HUMIDIFIER SECTION
1/4" = 1'-0"



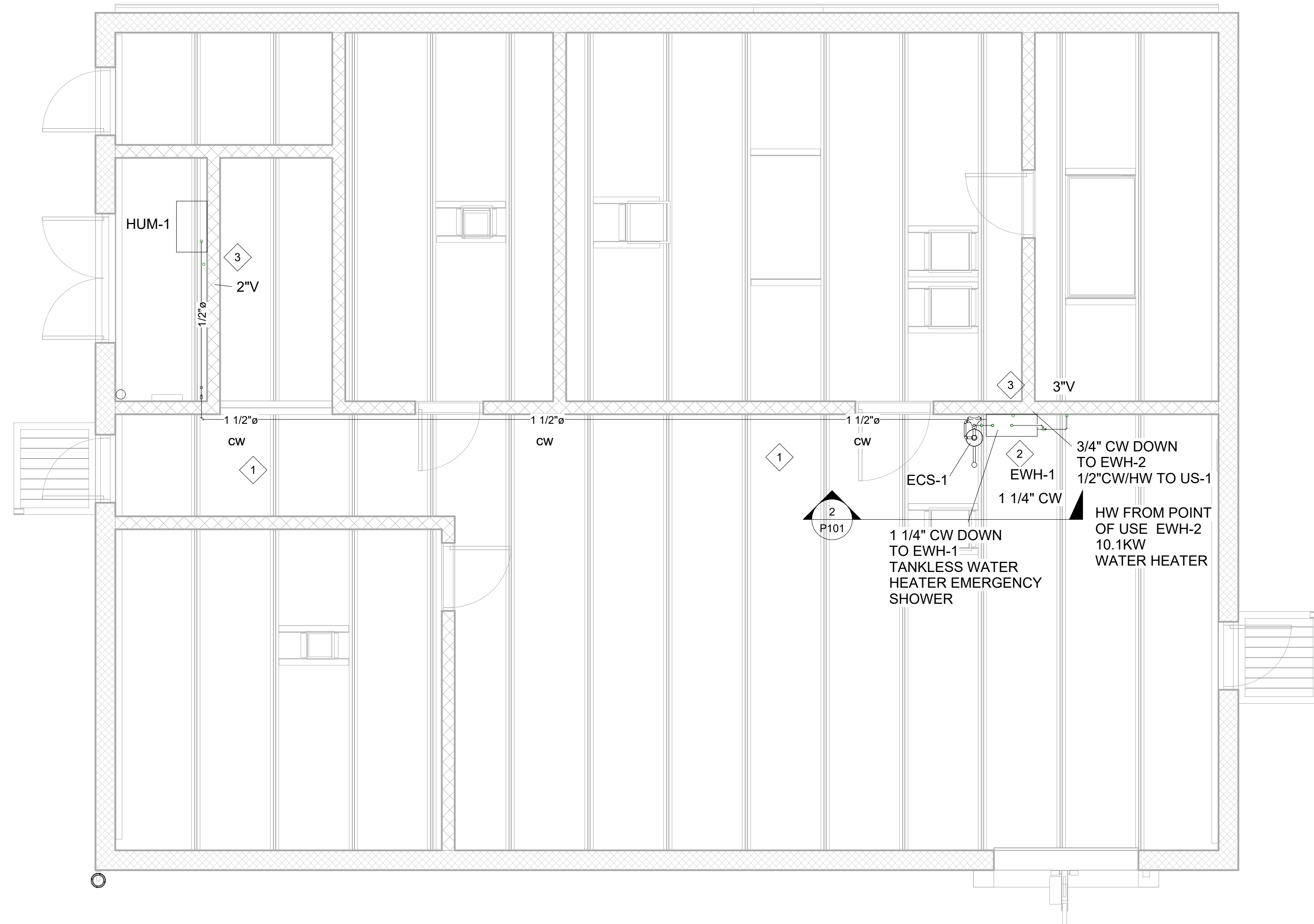
2 DOMESTIC WATER SECTION
1/2" = 1'-0"

1 "DWWS" WATER SERVICE
1/4" = 1'-0"



NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		As indicated SHEET FULL SIZE 34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB		
						CDG PROJECT 21380 PROJ MGR GEB

PLUMBING "DWWS" WATER SERVICE FLOOR PLAN MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY ROLLA, MISSOURI DANGEROUS MATERIALS STORAGE FACILITY	
SITE: ROLLA, MISSOURI	DRAWING NO. P100
	REVISION NO. 2



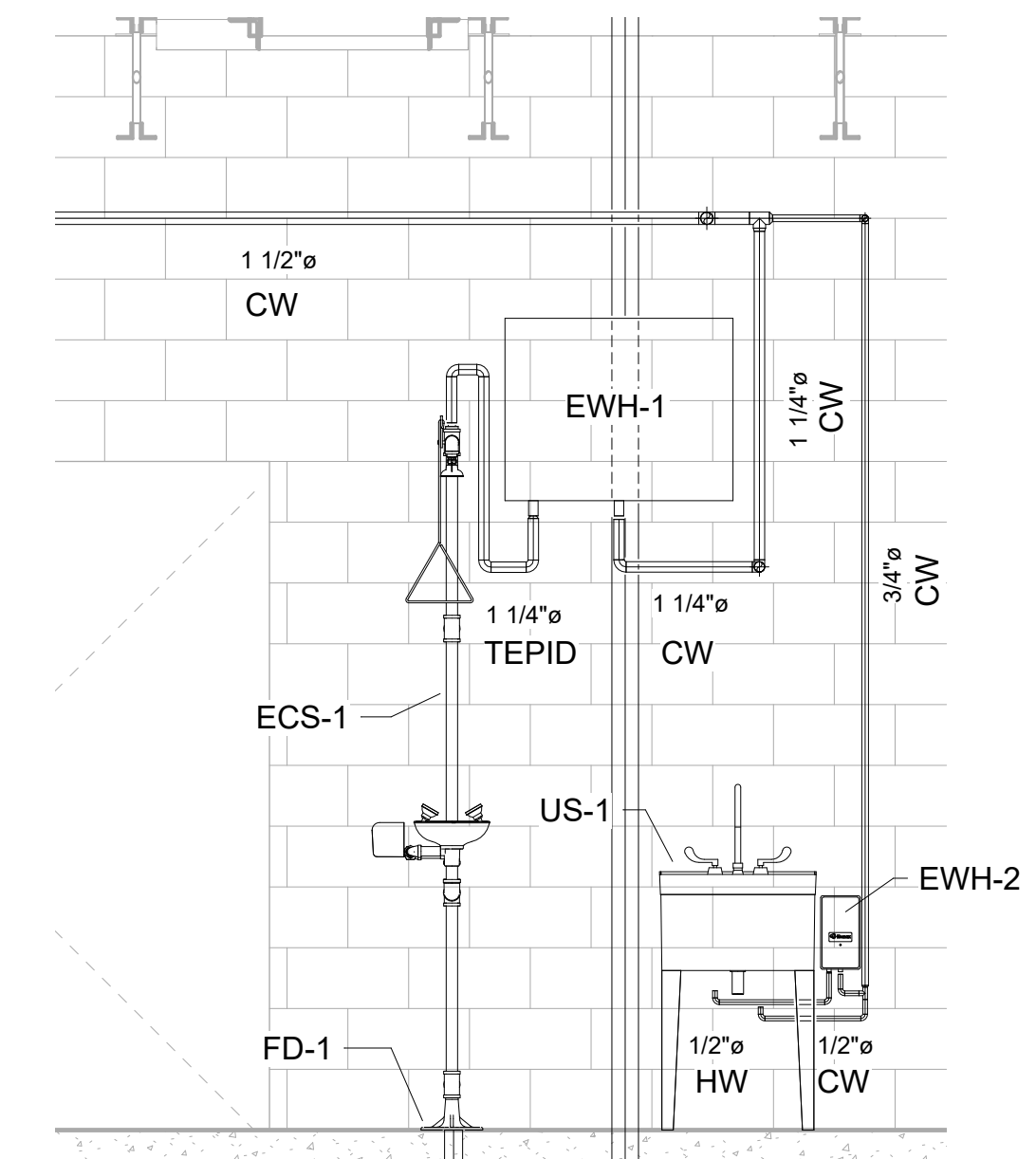
① ABOVE SLAB PLUMBING PIPING
1/4" = 1'-0"

GENERAL NOTES

1. UTILITIES SERVICES (I.E. DOMESTIC WATER, SANITARY) ARE APPROXIMATE. CONTRACTOR TO LOCATE PRIOR TO INSTALLING UNDERGROUND PIPING AND COORDINATE WITH NEW BUILDING SANITARY FIXTURES. ALTERNATE CONNECTION POINT MAY BE USED. VERIFY UTILITY LOCATIONS WITH CIVIL DRAWINGS PRIOR TO BIDDING.
2. COORDINATE EQUIPMENT AND FIXTURE SPECIFICATIONS FOR ALL ITEMS LISTED ON THESE DRAWINGS WITH EXACT MANUFACTURER SPECIFICATIONS PRIOR TO PIPING AND INSTALLATION.

KEYED NOTES

- ① DOMESTIC OVERHEAD WATER, SANITARY, VENT, ALL OVERHEAD WATER PIPE TO BE INSULATED, JACKETED, LABELED & HAVE FLOW ARROWS.
- ② NEW ELECTRIC TANKLESS WATER HEATER TO PROVIDE TEPID WATER AT ECS-1. PROVIDE THERMOSTATIC VALVE FROM MANUFACTURER.
- ③ COORDINATE VENT RISER AND WALL LOCATIONS FOR FINAL ROUTE TO ROOF. ANCHOR TO WALL.



② SAFETY SHOWER/UTILITY SINK
1/2" = 1'-0"



Copyright © 2023 Dynamic Engineered Systems
MISSOURI CERTIFICATE OF AUTHORITY # E-2011001315
PROFESSIONAL ENGINEER # MO-25069

NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		As indicated
2	02/14/24	ADDENDUM 2	POB/BM	POB		34x22 ANSI D
						CDG PROJECT 21380
						PROJ MGR GEB

ABOVE FLOOR DOMESTIC WATER
MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
ROLLA, MISSOURI
DANGEROUS MATERIALS STORAGE FACILITY

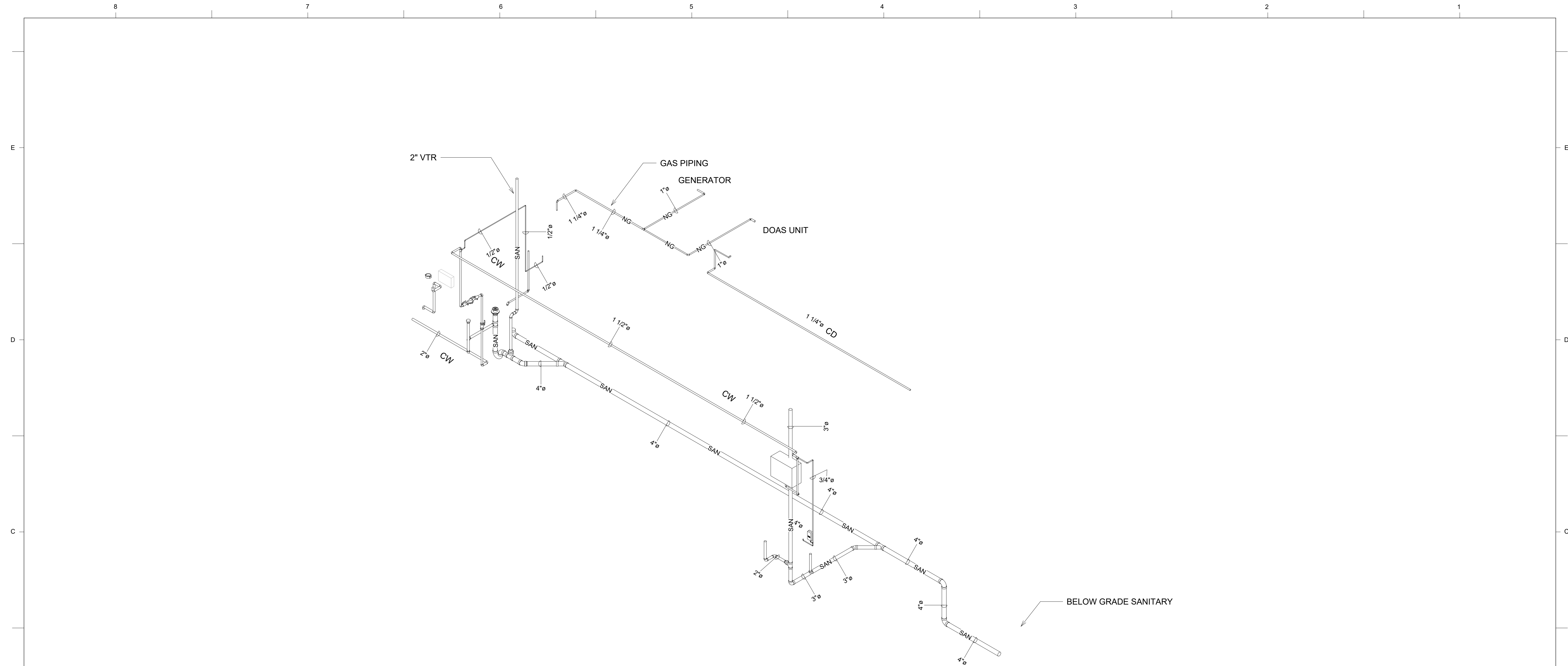
SITE: ROLLA, MISSOURI



One Campbell Plaza
St. Louis, Missouri, 63139 314.781.7770
314.781.9075

DRAWING NO.
P101

REVISION NO. 2



1 Isometric Plumbing (FOR REFERENCE ONLY)



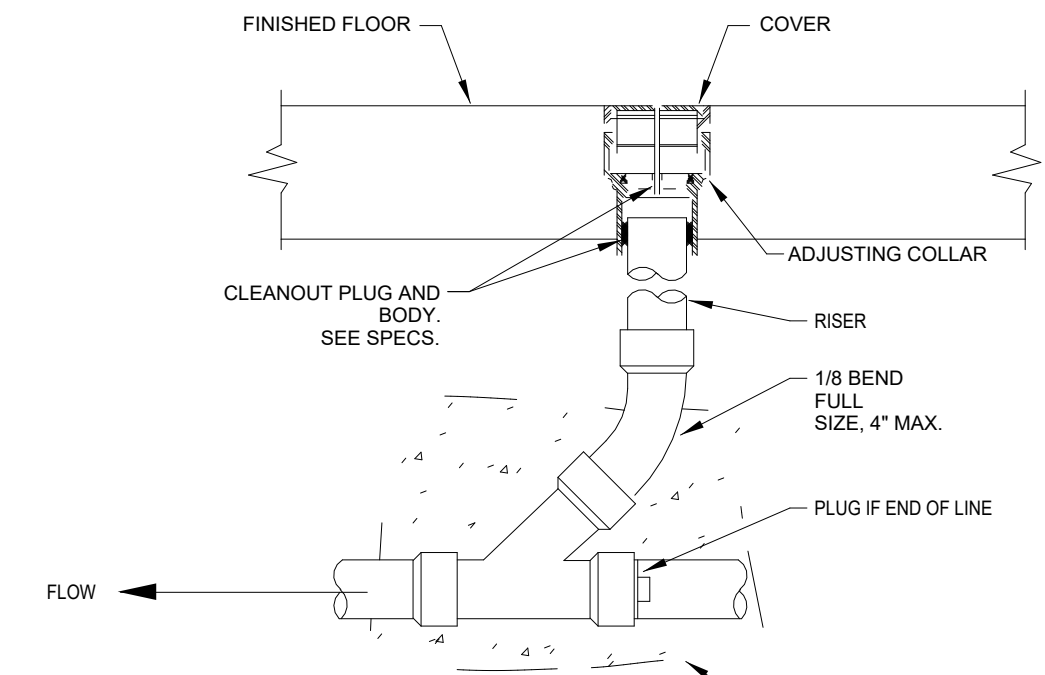
NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE
0	12/07/23	ISSUED FOR BID	POB/BM	POB		SHEET FULL SIZE 34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB		
						CDG PROJECT 21380
						PROJ MGR GEB

PLUMBING ISOMETRIC
MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
ROLLA, MISSOURI
DANGEROUS MATERIALS STORAGE FACILITY

SITE: ROLLA, MISSOURI

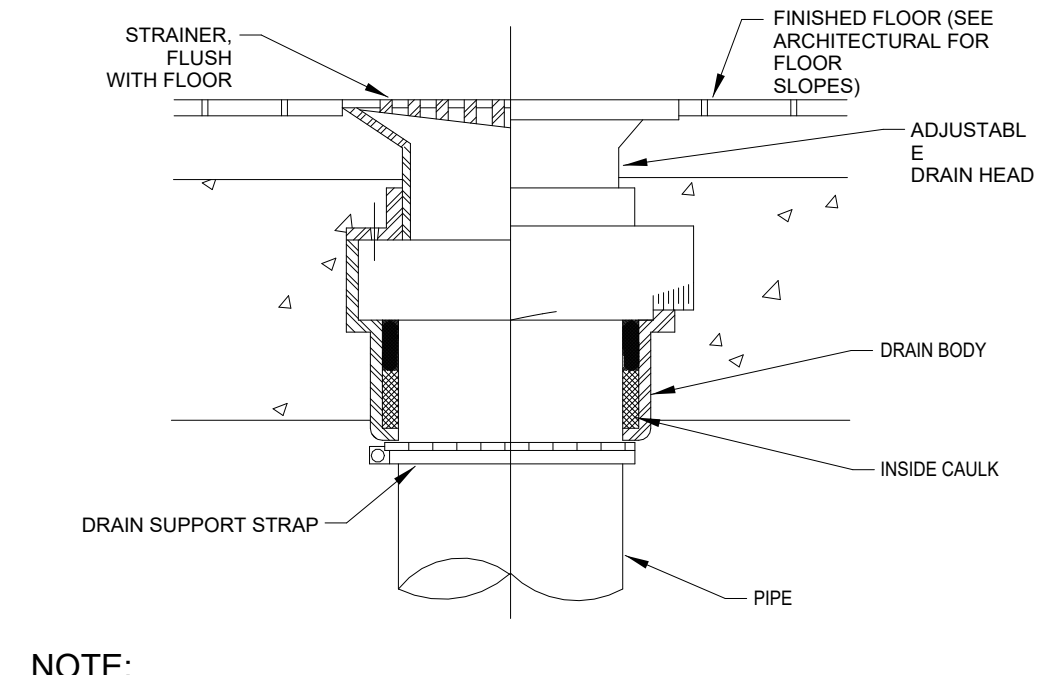
CDG ENGINEERS
One Campbell Plaza St. Louis, Missouri, 63199 314.781.7770 314.781.9075

DRAWING NO.	P400
REVISION NO.	2



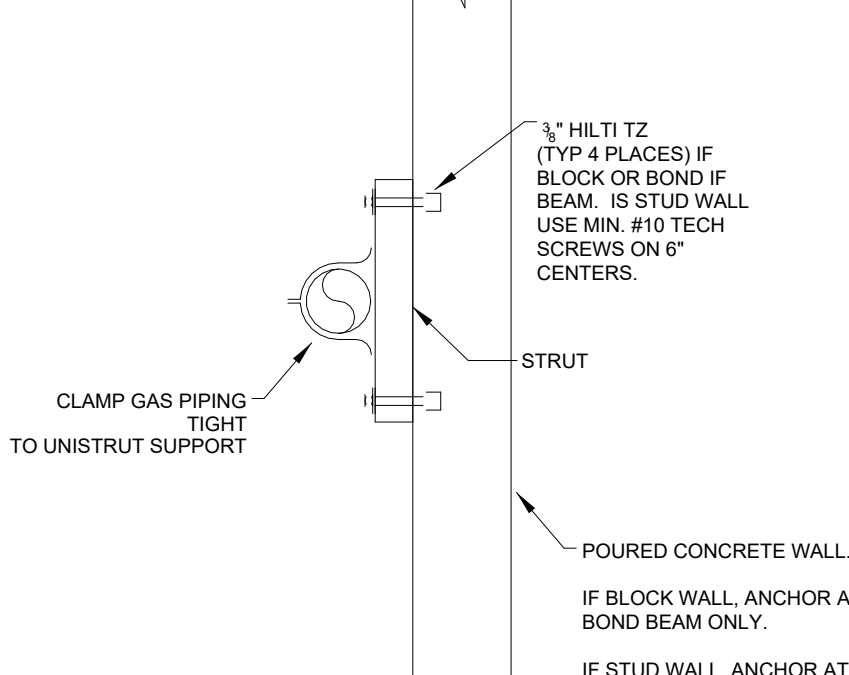
NOTE:
 A CLEANOUT COVER FLUSH WITH TILE OR FLUSH WITH CONCRETE FLOOR IN AREA WITH NO TILE.

1 FLOOR CLEANOUT DETAIL
 P600 SCALE: NO SCALE



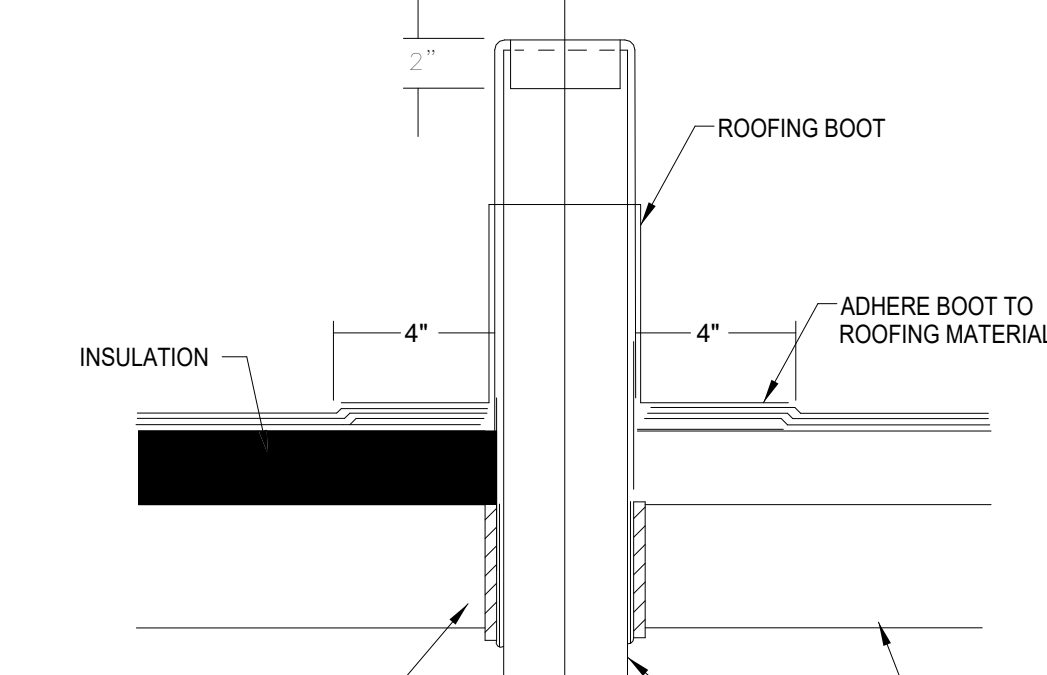
NOTE:
 A FLOOR DRAIN COVER FLUSH WITH TILE OR FLUSH WITH CONCRETE FLOOR IN AREA WITH NO TILE.

2 FLOOR DRAIN DETAIL
 P600 SCALE: NTS



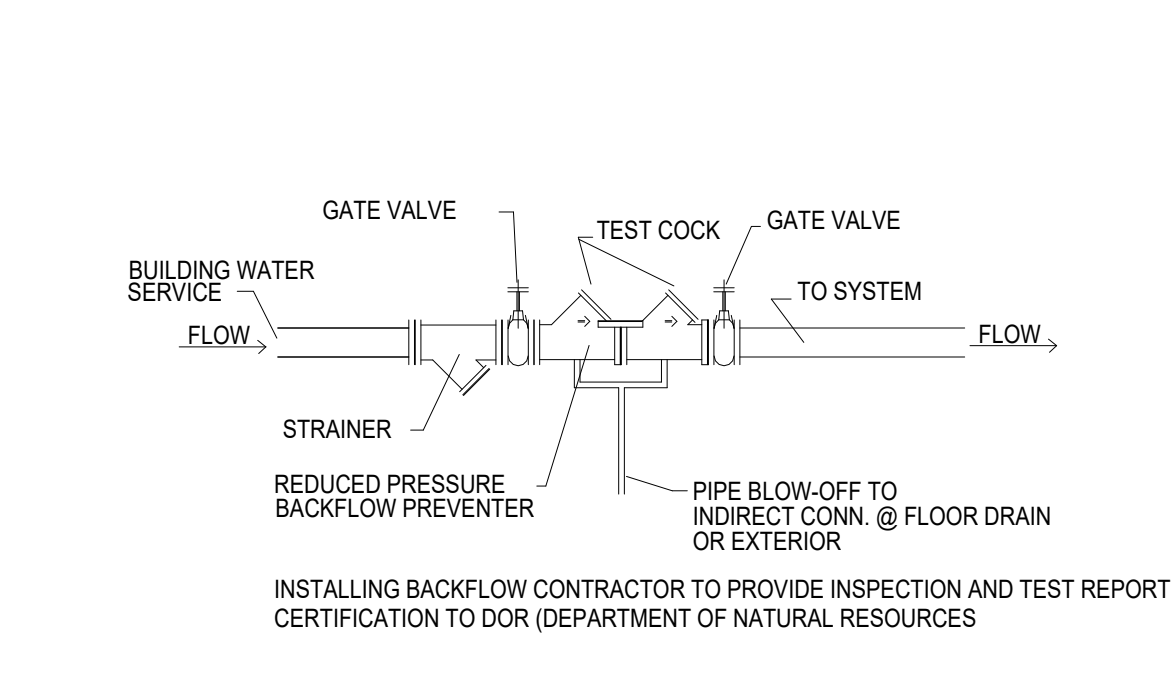
NOTE:
 IF BLOCK WALL, ANCHOR AT BOND BEAM ONLY.
 IF STUD WALL, ANCHOR AT STUD.

3 WALL ANCHOR DETAIL
 P600 SCALE: NTS



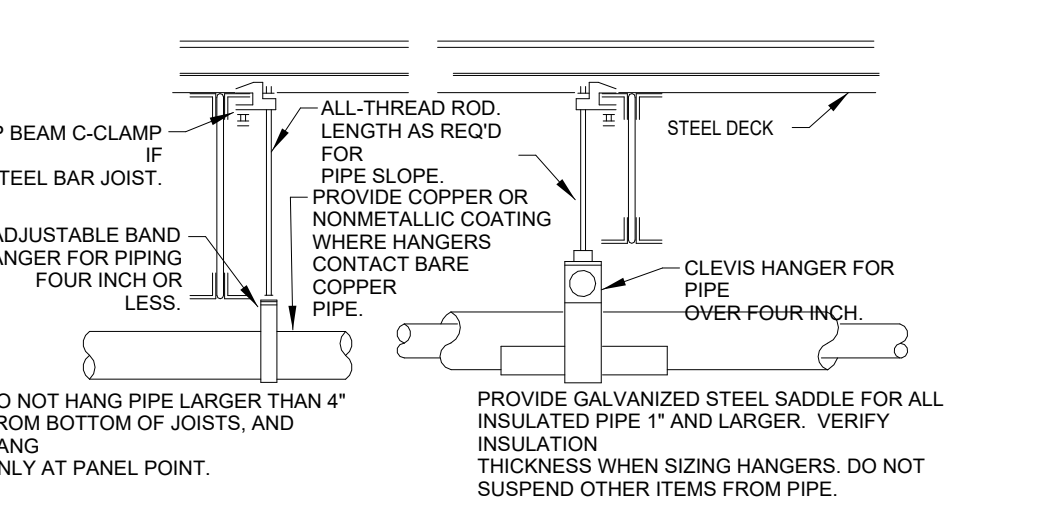
NOTE:
 ADHERE BOOT TO ROOFING MATERIAL.

4 VENT THRU ROOF DETAIL
 P600 SCALE: NTS



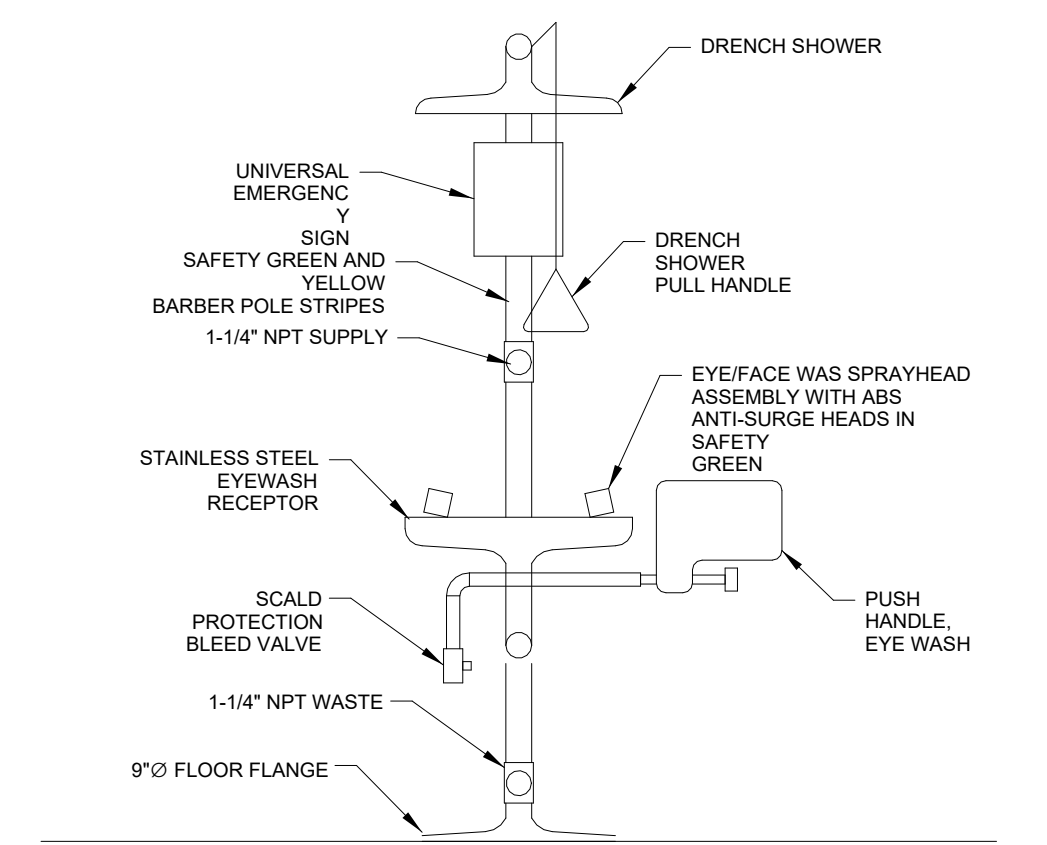
NOTE:
 INSTALLING BACKFLOW CONTRACTOR TO PROVIDE INSPECTION AND TEST REPORT CERTIFICATION TO DOR (DEPARTMENT OF NATURAL RESOURCES)

5 BACKFLOW PREVENTER DETAIL
 P600 SCALE: NO SCALE

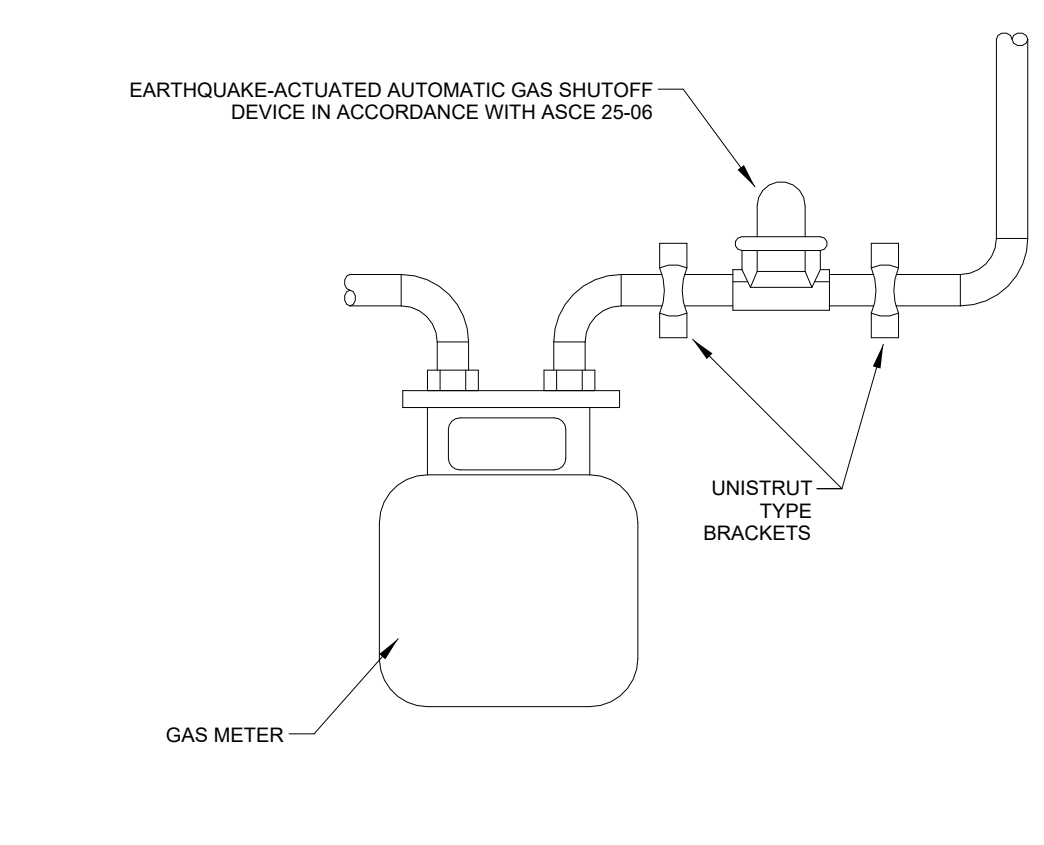


NOTE:
 PROVIDE UPPER ATTACHMENT AS REQUIRED FOR CASES NOT SHOWN HERE. DO NOT INSTALL HANGER INSIDE INSULATION OR OTHERWISE PENETRATE VAPOR BARRIER. DO NOT HANG ONE PIPE FROM ANOTHER EXCEPT IN CHASES. TRAPEZE HANGERS MAY BE USED FOR MULTIPLE PARALLEL PIPES. SLOPE ALL WATER PIPING SLIGHTLY TOWARD DRAINABLE LOCATIONS. HANGER SPACING FOR PIPE SIZE: COPPER: 2\"/>

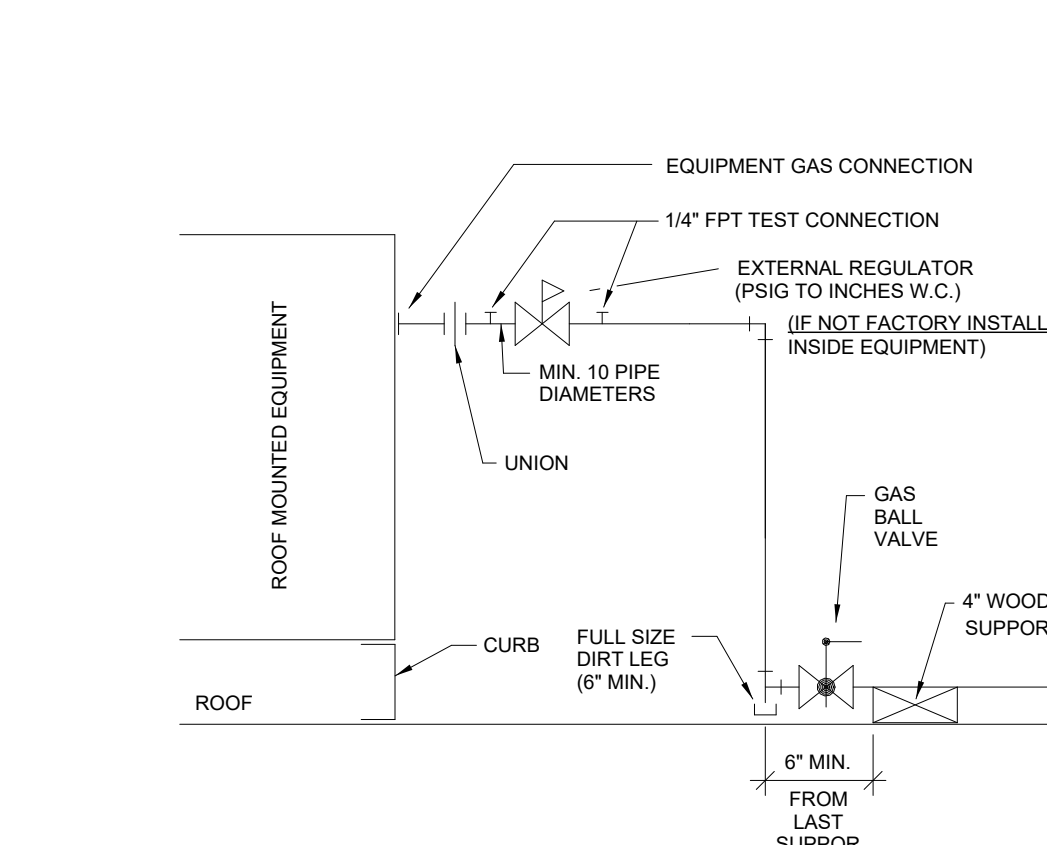
6 PIPE HANGER DETAIL
 P600 SCALE: NTS



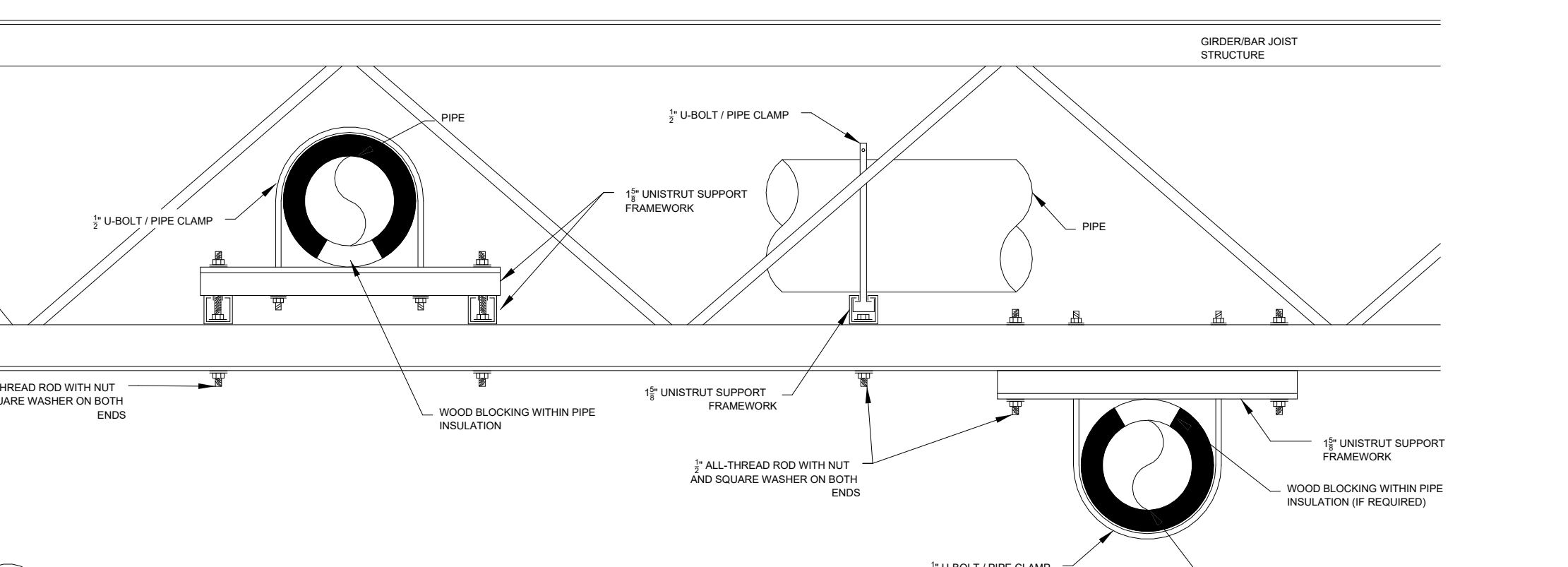
8 EMERGENCY SHOWER DETAIL
 P600 SCALE: NO SCALE



9 SEISMIC GAS SHUT-OFF VALVE
 P600 SCALE: NO SCALE



10 GAS CONNECTION DETAIL
 P600 SCALE: NO SCALE

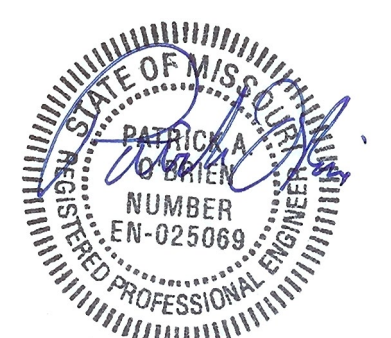


11 PIPE ATTACHED RIGIDLY TO STRUCTURE
 P600 SCALE: NO SCALE

SEISMIC CODE BLOCK FOR PLUMBING SYSTEMS EQUIPMENT AND COMPONENT ANCHORAGE EARTHQUAKE LOAD RESISTANCE

EQUIPMENT & SYSTEM COMPONENTS	SEISMIC ANCHORAGE TO FLOORS, ROOFS, ETC.	SEISMIC SWAY BRACING	LOCATION OF THE PROFESSIONALLY SEALED ANCHORAGE AND SWAY BRACING DETAILS			OTHER PROVISIONS (SEE NOTES)	COMMENTS	
			ON CONSTRUCTION DOCUMENTS		SEPARATE PERMITS & PLANS		IBC SECTION THAT EXEMPTS SEISMIC REQUIREMENTS	ST. LOUIS COUNTY REFERENCE THAT EXEMPTS SEISMIC REQUIREMENTS
			DRAWING NO. OR SPECIFICATION SECTION	SHOP DRAWINGS				
PIPING ≤ 4" (WASTE, VENT, PD)	1.0	X		X				2A
WASTE PIPING ≥ 4" (UNDERGROUND)	1.0	X		X				
VENT PIPING	1.0	X		X				2A
WATER PIPING < 4" (HOT, COLD, HOT RETURN)	1.0	X		X				2A
GAS PIPING > 1" DIAMETER	1.5		X		X	M-601		4,5,6
GAS PIPING ≤ 1" DIAMETER	1.5		X	X				4,5,6,7
ELECTRIC HOT WATER HEATER < 400LBS	1.0	X		X				2C

- TABLE 4.4 ITEM 1, A IMPORTANCE FACTOR OF 1.0, COMPONENT DOES NOT WEIGH MORE THAN 4700LBS. AND IS MOUNTED 4 FEET OR LESS ABOVE THE FLOOR AND FLEX CONNECTIONS ARE PROVIDED.
- TABLE 4.4, NOTE 2.
 - THE FOLLOWING SANITARY DRAIN, WASTE, AND VENT PIPESCH 40 IS LESS THAN 6" OR LESS IN DIA., SERVICE WEIGHT AND NO HUB CAST IRON, 2 INCHES OR LESS IN DIA.
 - THE FOLLOWING STORM DRAIN PIPE SCHEDULE 40 AND 80 PVC, 3 INCHES OR LESS IN DIA., SERVICE WEIGHT AND NO HUB CAST IRON, NOT APPLICABLE.
 - THE FOLLOWING WATER PIPE: TYPE L, & M COPPER 4" INCHES OR LESS IN DIAMETER SCH 40 AND 80 PVC 4 INCHES OR LESS IN DIAMETER
 - FLEXIBLE CONNECTIONS ARE NOT REQUIRED FOR CONNECTIONS TO APPLIANCES OR PLUMBING FIXTURES THAT ARE MOUNTED TO WALLS OR FLOORS
- DUCTILE PIPING STEEL, COPPER PIPING, AND TUBING JOINED BY WELDING, BRAZING, SOLDERING OR FLANGES. REFER TO TABLE 4.4, C
- TABLE 4.4, ITEM 4, PIPING SYSTEM EXEMPTIONS - PIPING IS SUPPORTED BY ROD HANGERS, HANGERS IN THE PIPE RUN ARE 12 INCHES OR LESS IN LENGTH FROM THE TOP OF THE PIPE TO THE SUPPORTING STRUCTURE; HANGERS ARE DETAILED TO AVOID BENDING OF THE HANGERS AND THEIR ATTACHMENTS; AND PROVISIONS ARE MADE FOR PIPING TO ACCOMMODATE EXPECTED DEFLECTIONS. PIPING MEETING ALL CRITERIA IS EXEMPT FROM SEISMIC BRACING REQUIREMENTS.
- TABLE 4.4, ITEM 4, PIPING SYSTEM EXEMPTIONS - HIGH-DEFORMABILITY PIPING (STEEL & COPPER PIPING AND TUBING JOINED BY WELDING, BRAZING/SOLDERING OR BY BOLTED STEEL FLANGES) IS USED; PROVISIONS ARE MADE TO AVOID IMPACT WITH LARGER PIPING OR MECHANICAL COMPONENTS OR TO PROTECT THE PIPING IN THE EVENT OF SUCH IMPACT; AND THE NOMINAL PIPE SIZE IS LIMITED TO 3" OR LESS FOR ip=1.0 & 1" OR LESS FOR ip=1.0
- TABLE 4.4, ITEM 5, GAS PIPING SYSTEM EXEMPTIONS, PART "A" - EXTERIOR GAS PIPING INSTALLED ON ROOFS WHICH SUPPLIES NO MORE THAN 2 PSI AND IS PROTECTED BY AN APPROVED SEISMIC SHUT-OFF VALVE WITHIN 5 FEET OF THE BEGINNING OF THE
- TABLE 4.4, ITEM 5, GAS PIPING SYSTEM EXEMPTIONS, PART "B" - EXTERIOR GAS PIPING INSTALLED ON ROOFS WHICH SUPPLIES NO MORE THAN 2 PSI AND IS PROTECTED BY APPROVED FLEXIBLE PIPING NO LESS THAN 3 FEET IN LENGTH IS INSTALLED WITHIN 5



NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM	SCALE	12" = 1'-0"
0	12/07/23	ISSUED FOR BID	POB/BM	POB		SHEET FULL SIZE	34x22 ANSI D
2	02/14/24	ADDENDUM 2	POB/BM	POB			

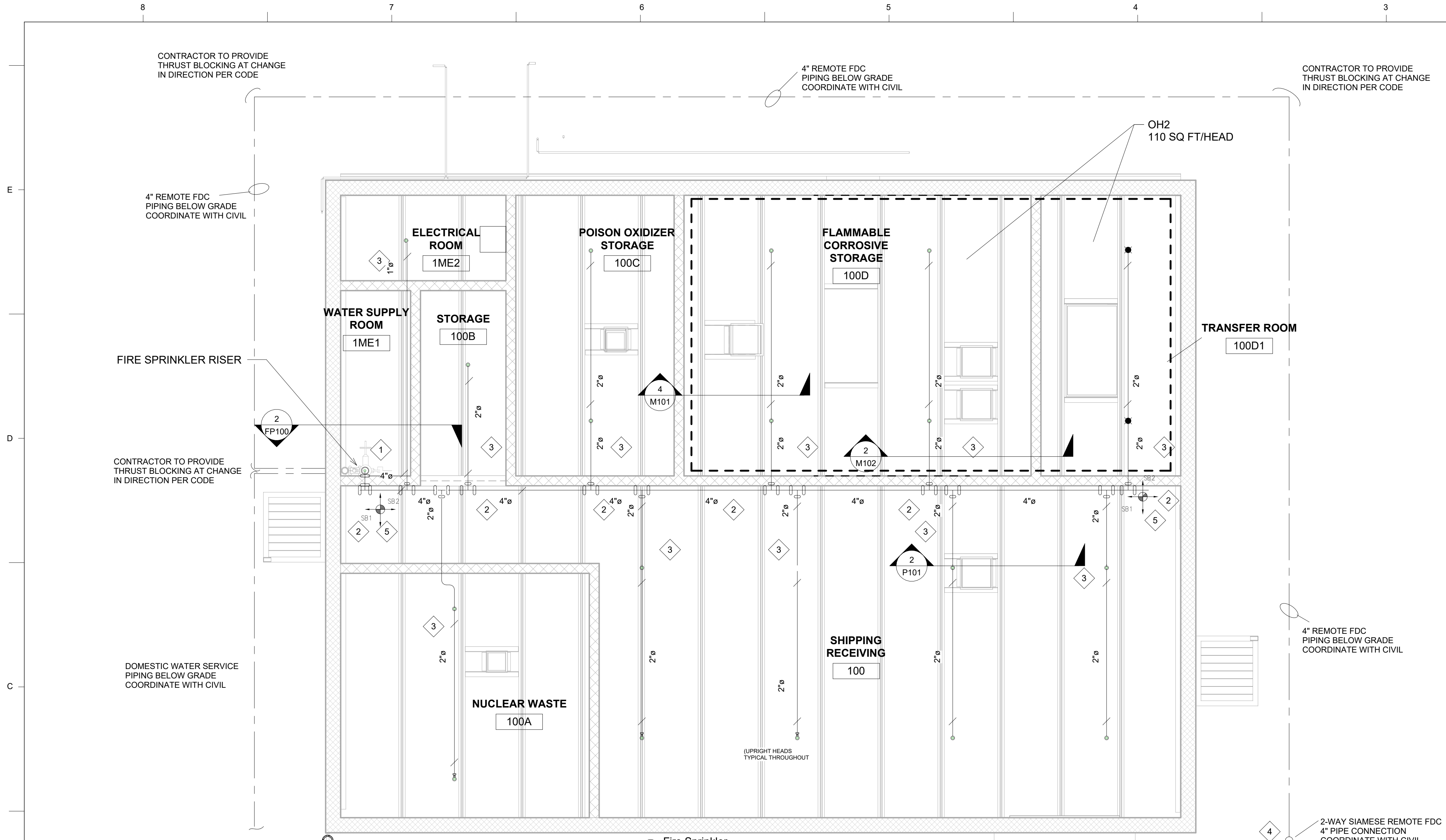
PLUMBING DETAILS
MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
ROLLA, MISSOURI
DANGEROUS MATERIALS STORAGE FACILITY

SITE: ROLLA, MISSOURI

CDG ENGINEERS
 One Campbell Plaza
 St. Louis, Missouri, 63139 314.781.7770
 314.781.9075

DRAWING NO. **P600**

REVISION NO. 2

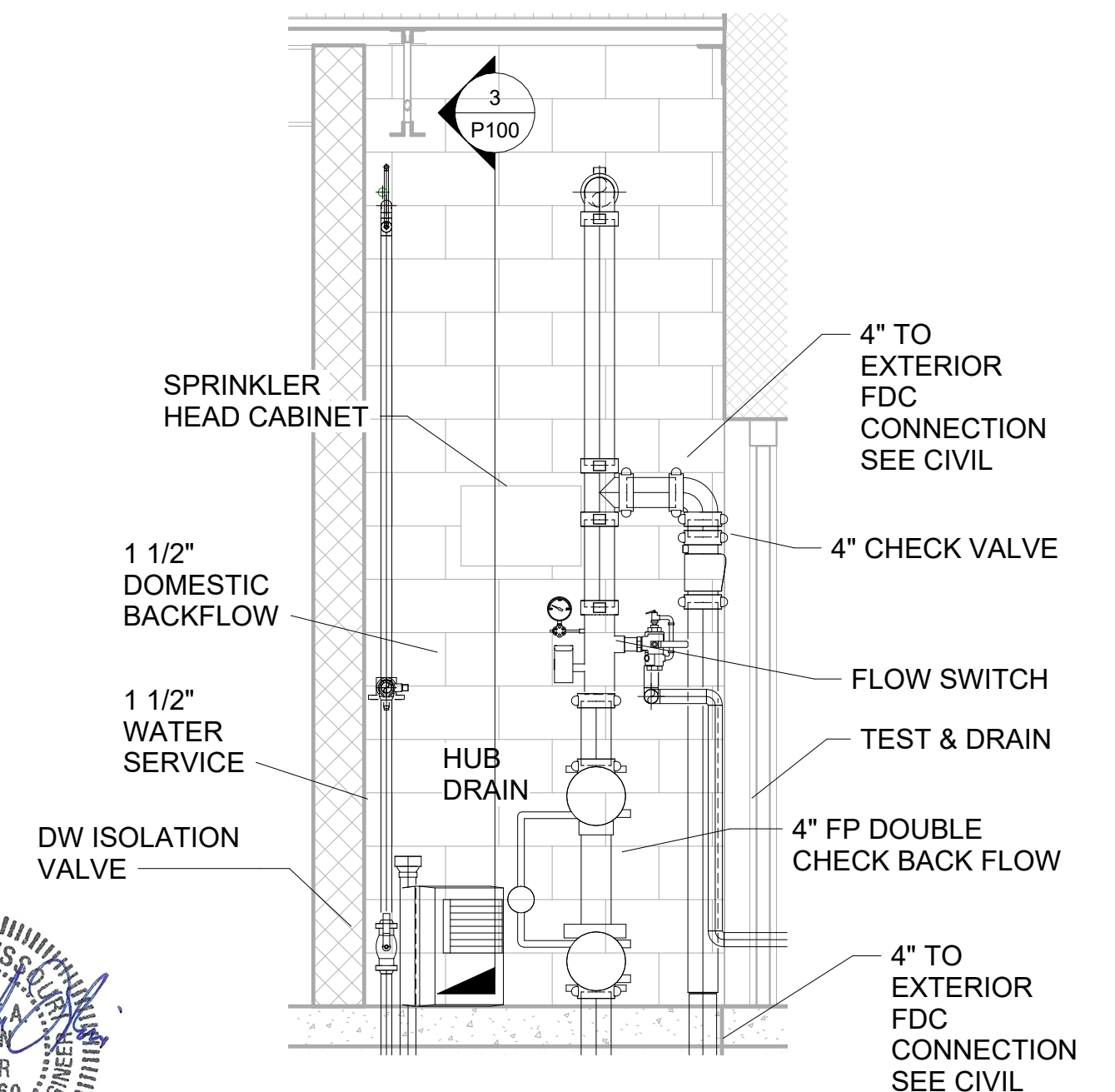


GENERAL NOTES

1. PLAN SHOWN IS FOR REFERENCE ONLY. VERIFY ALL FINAL DIMENSIONS WITH GC AND ARCHITECTURAL DRAWINGS.
2. FIRE SPRINKLER SYSTEM IS A DELEGATED DESIGN BUILD. LAYOUT SHOWN IS FOR GENERAL COORDINATION OF MAIN AND BRANCH LINES WITH OTHER TRADES. INSTALLING CONTRACTOR TO PROVIDE HYDRAULIC CALCULATIONS, FINAL ROUTING, PIPE SIZING, HEAD TYPE, AND LOCATION BASED ON OCCUPANCY AND FIRE HAZARD. THIS LAYOUT SHOWN IS BASED ON DESIGN CRITERIA 2021 NFPA 13 SEC 26. ORDINARY HAZARD GROUP 2 WITH REFERENCE TO NFPA 400 AND MIN OR MAX AMOUNTS OF MAQ'S (MAXIMUM ALLOWED QUANTITIES) FOR EACH ZONE. AREA DOES NOT REQUIRE IN RACK STORAGE AS MAQ'S ARE MINIMAL AND ARE NOT PALLETIZED STORAGE. HAZARDS CONTAINED AND STORED PRIOR TO REMOVAL TO OFF SITE DISPOSAL BY OTHERS.
3. PROVIDE SEISMIC BRACING PER NFPA 13
4. WORKING PSI TOP OF RISER (TOR) APPROXIMATELY 22.3 PSI WITH A GPM OF 304.4. ADD SYSTEM HOSE STREAM 250GPM FOR A TOTAL GPM 554.4. VERIFY FLOW RATES WITH WATER SERVICE PROVIDER. WATER FLOW FROM UTILITY PROVIDER IS A LOW PRESSURE SYSTEMS. CONFIRM FINAL OPERATING PSI. PROVIDE ALTERNATE FOR ADDITIONAL JOCKEY PUMP FOR PSI BELOW REQUIRED FINAL OPERATING PSI.
5. SEE ELECTRICAL FOR ALL LOW VOLTAGE FIRE PROTECTION & SMOKE ALARMING.
6. ALL PIPE THROUGH MASONRY WALLS TO BE CAULKED ON BOTH SIDES WITH FIRE RATED CAULK.

KEYED NOTES

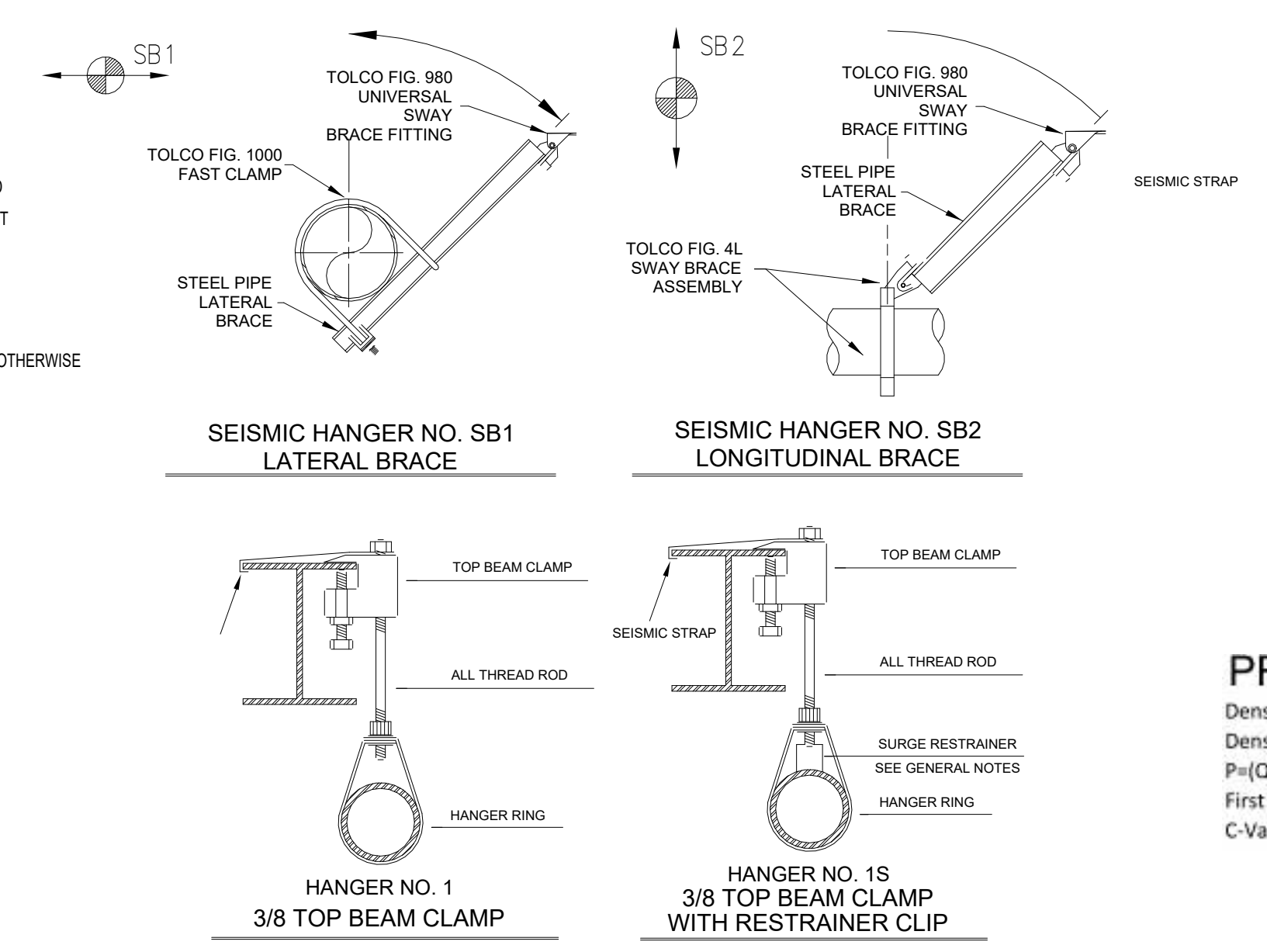
- 1 APPROXIMATE LOCATION OF FIRE SERVICE ENTRANCE AT FLOOR. NEW RISER WITH FLOW SWITCH AND TAMPER DEVICE AS PER LOCAL CODES.
- 2 NEW FIRE SPRINKLER MAIN. COORDINATE WITH STRUCTURE AND OTHER OBSTRUCTIONS. PIPE TO BE SUPPORTED BY LOCAL CODE AND NFPA STANDARDS.
- 3 NEW FIRE SPRINKLER BRANCH LINES TO NEW SPRINKLER HEADS. HEAD SPACING TO BE PER OCCUPANCY AND HAZARD CLASSIFICATION FOR SPACING.
- 4 COORDINATE WITH CIVIL FOR EXTERIOR FDC CONNECT. CONNECTION TO BE MINIMUM 5'-0" FROM FRONT OF BUILDING. VERIFY FINAL LOCATION WITH AHJ.
- 5 APPROXIMATE LOCATION OF SEISMIC BRACING OF MAIN AND BRANCH LINES.



2 FIRE SPRINKLER SECTION
1/2" = 1'-0"

SYMBOLS

SYMBOL	DESCRIPTION
	INDICATES A NEW SPRINKLER LINE TO BE INSTALLED
	INDICATES A NEW HEAD ADDED FROM A NEW OUTLET
	APPROXIMATE HANGER LOCATION
	INDICATES A TAMPER SWITCH LOCATION
	INDICATES A FLOW SWITCH LOCATION
	INDICATES RIGID CPLG. STANDARD UNLESS NOTED OTHERWISE
	INDICATES FLEXIBLE OR REDUCER CPLG.
	INDICATES A BRANCHLINE RESTRAINT LOCATION



PROJECT: MO S & T

Density area by Hazard	:20GPM/1500SQ.FT.	Hazard Category	OH2	gpm/sq.ft	22
Density Area	gpm	sq.ft.	110	PSI	7.5625
P=(Q/K)^2	Q=	K=	8		
First Head q=					
C-Value	120		SCH 40 IRON		



NO.	DATE	DESCRIPTION	DESIGN	ENGR	PM
0	12/07/23	ISSUED FOR BID	POB/BM	POB	
2	02/14/24	ADDENDUM 2	POB/BM	POB	

SCALE	As indicated	34x22 ANSI D
CDG PROJECT	21380	
PROJ MGR	GEB	
SITE: ROLLA, MISSOURI		
DRAWING NO. FP100		
REVISION NO.		2