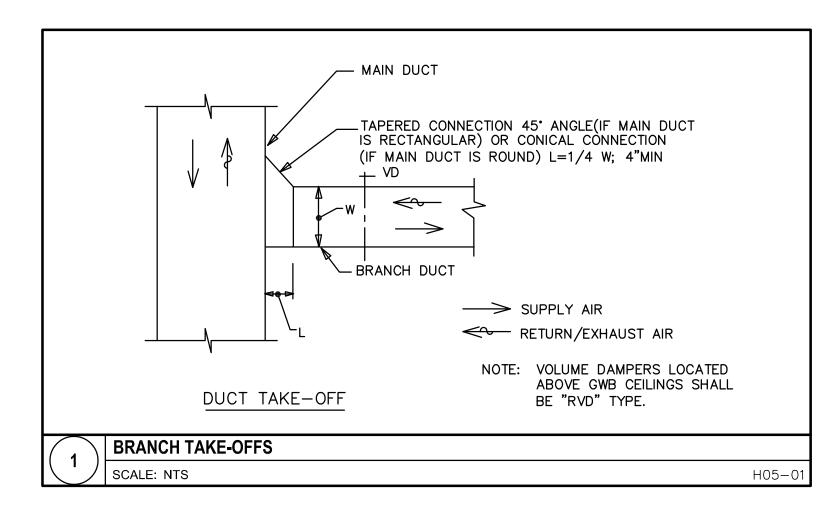
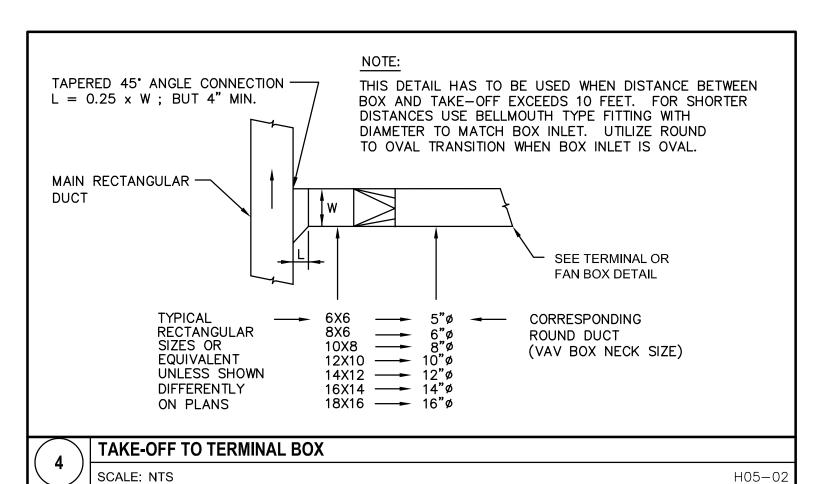


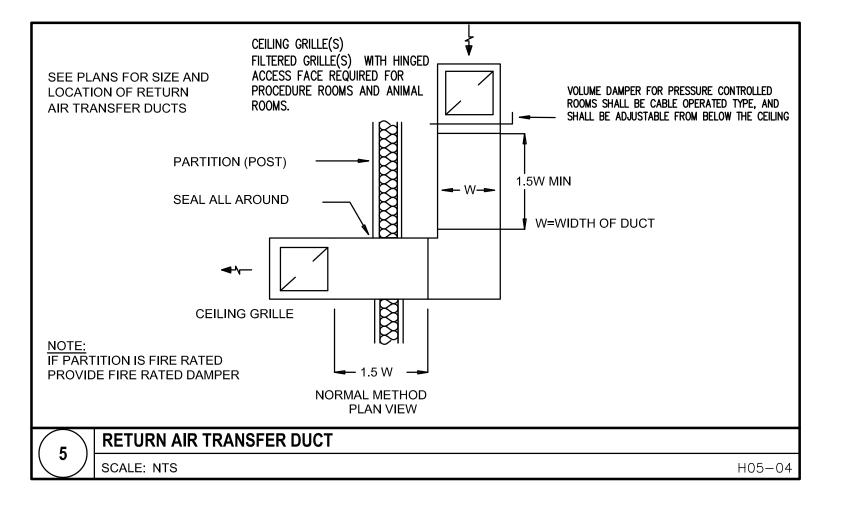
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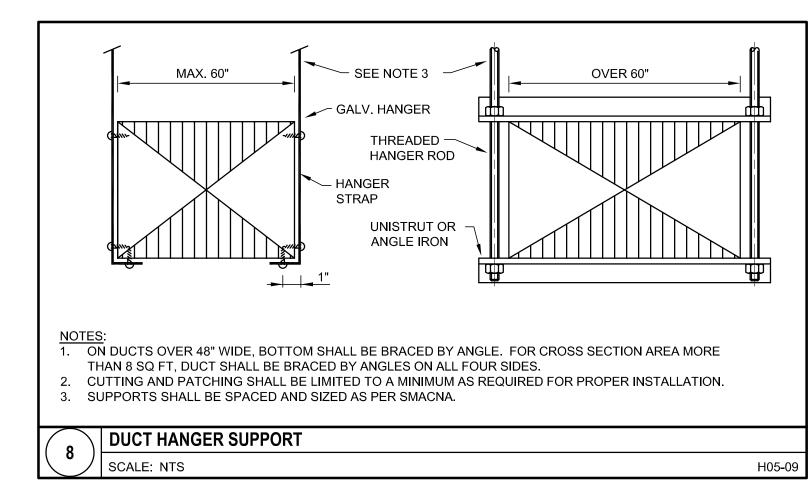
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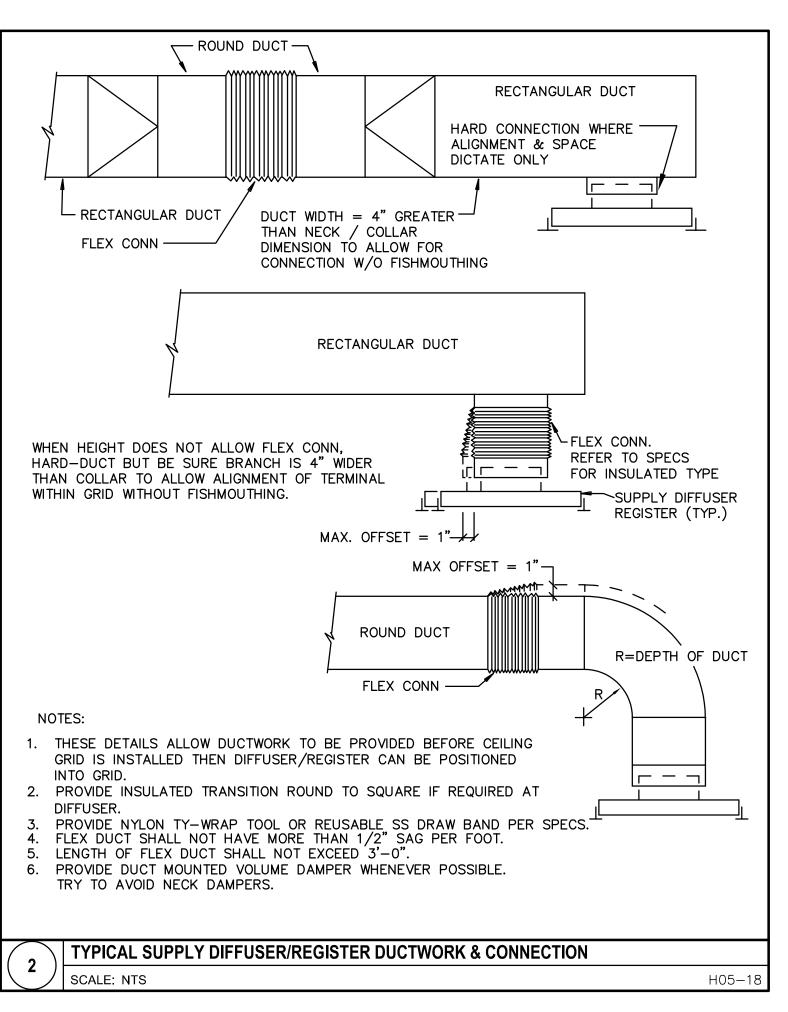
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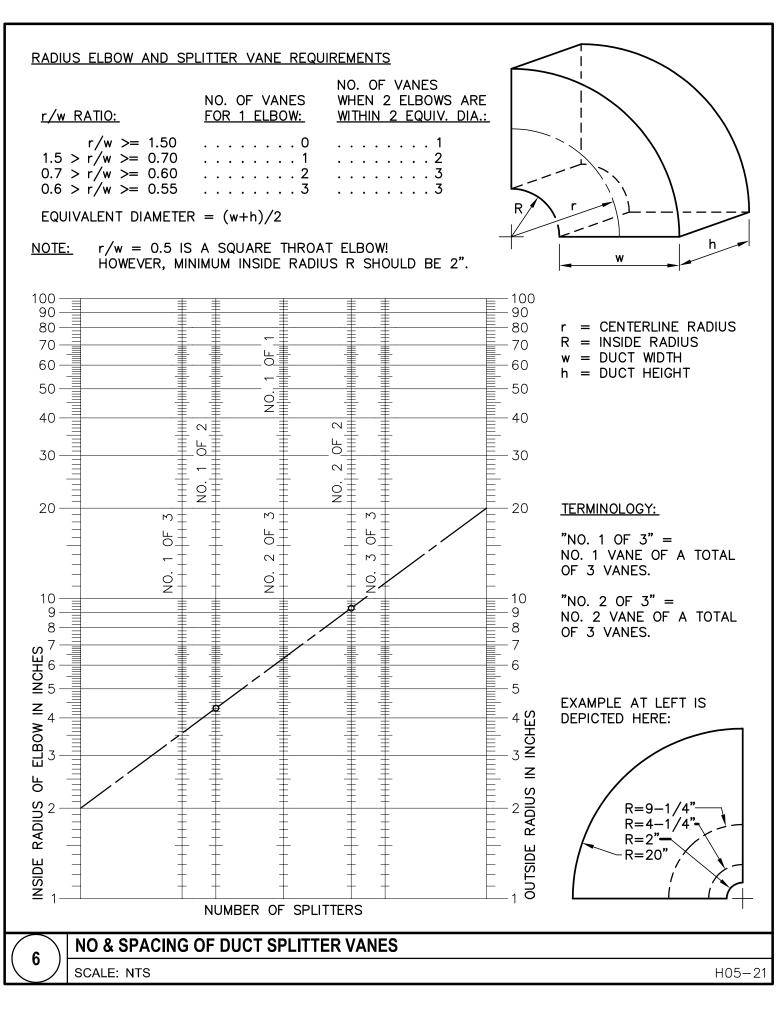


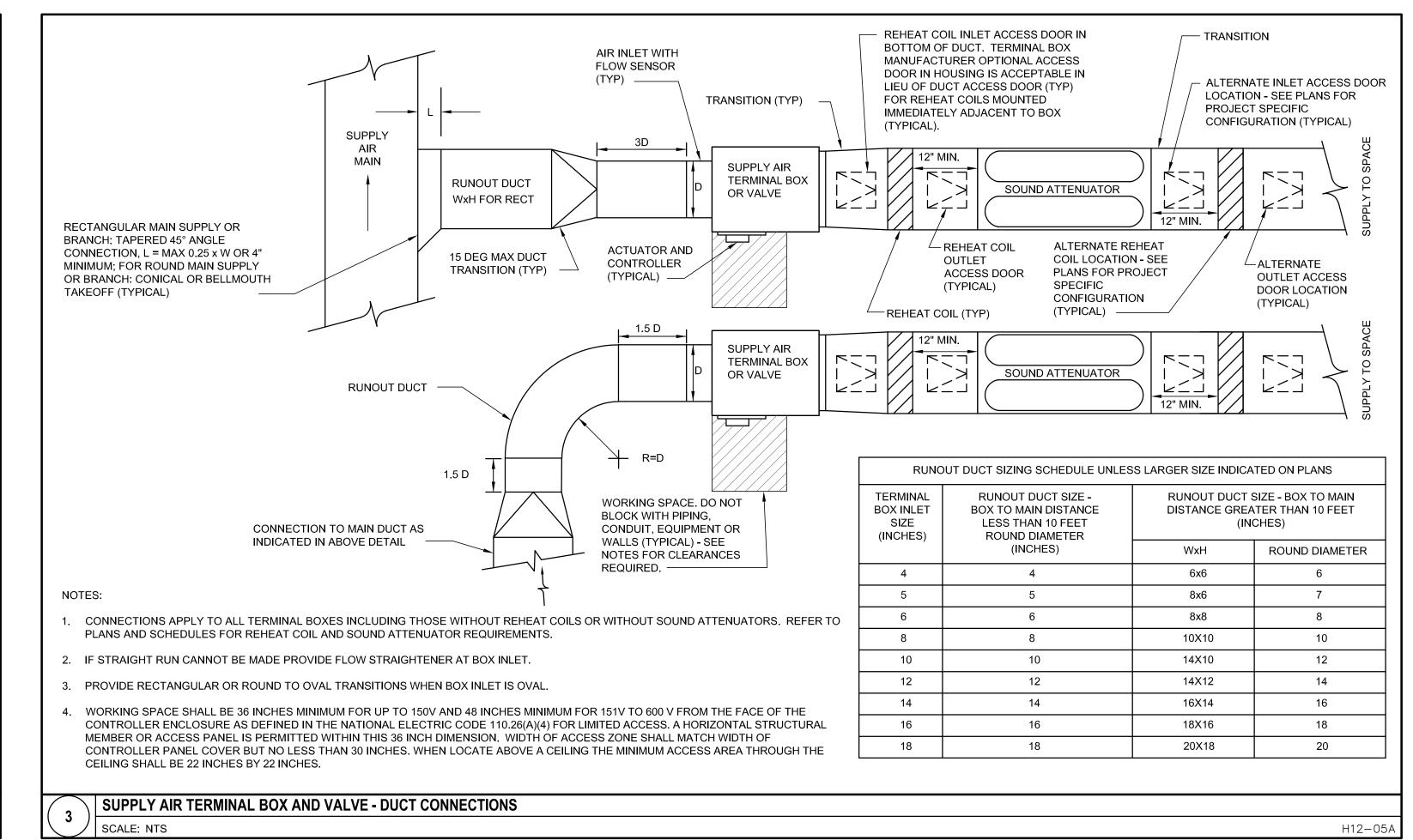


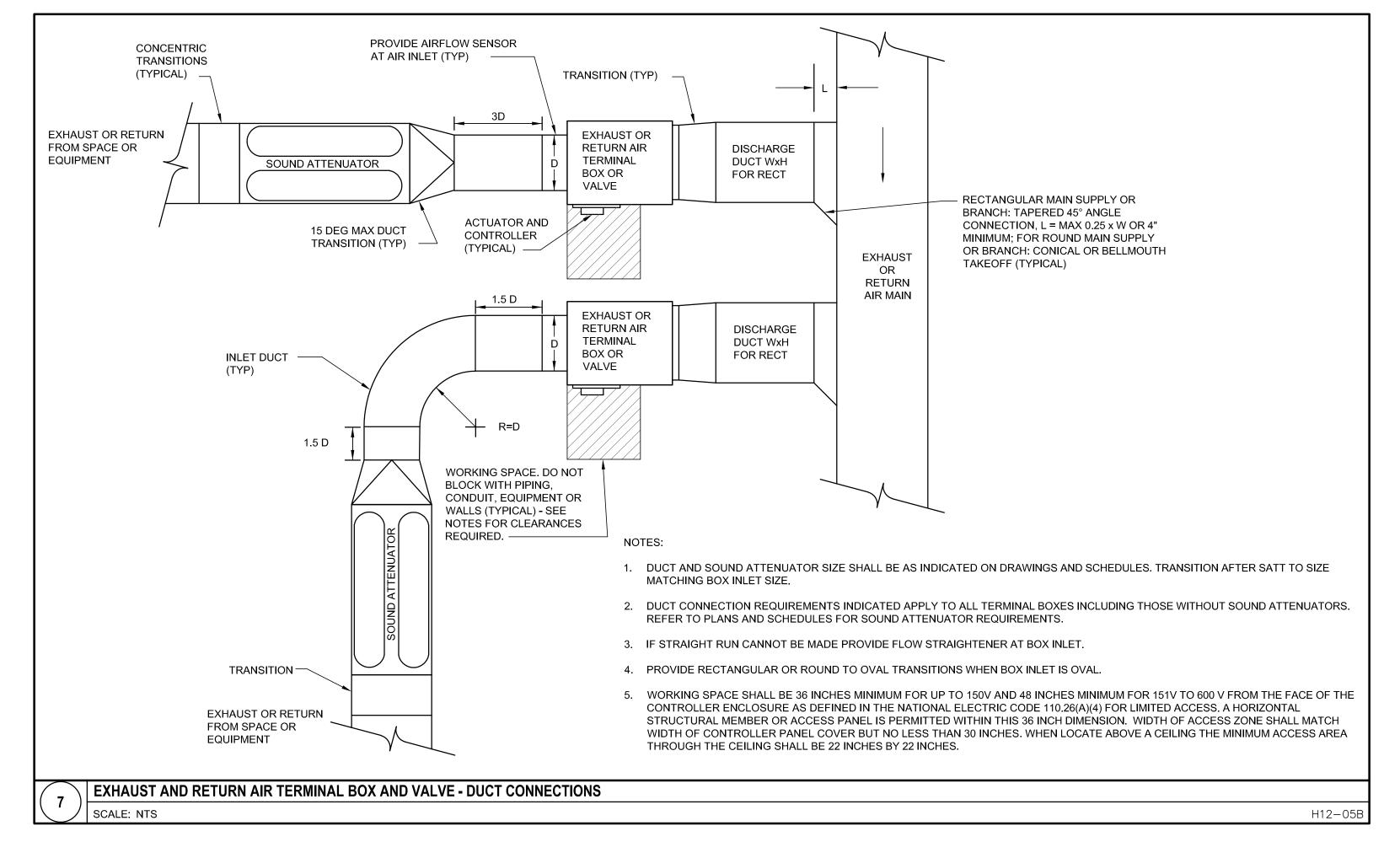


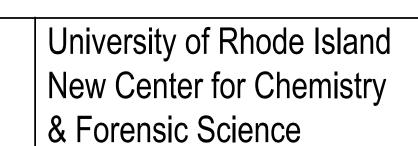












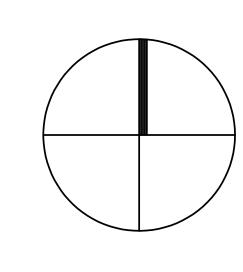
OF RHODE ISLAND

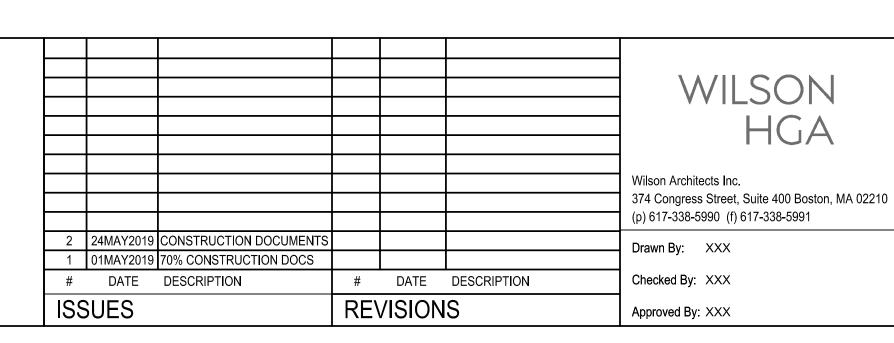
CONSTRUCTION DOCUMENTS

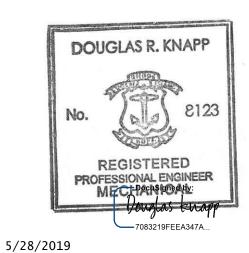
UNIVERSITY Owner Architect Consultants Consultants Wilson Architects Inc Mechanical / Electrical / Plumbing / Fire Protection 374 Congress Stree Odeh Engineers, Inc 274 Summer Street 1223 Mineral Spring Avenue Suite 400 p 401.874.2444 Boston MA 02210 Boston, MA 02210 Providence, RI 02904 p 617.338.5990 p 617.423.7423 p 401.724.1771

Pare Corporation 8 Blackstone Valley Place Lincoln, RI 02865 p 401.334.4100

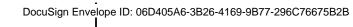
Carol R. Johnson Associates, Inc 115 Broad Street Boston, MA 02110 p 617.896.2500

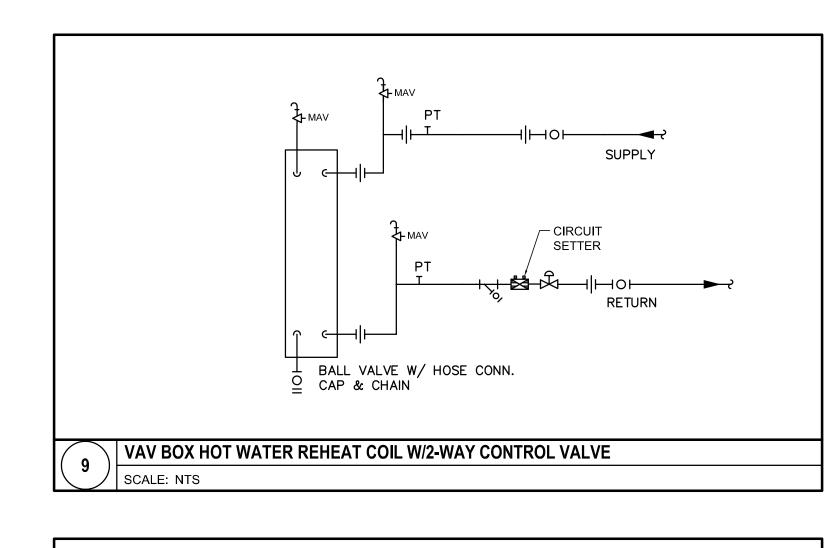


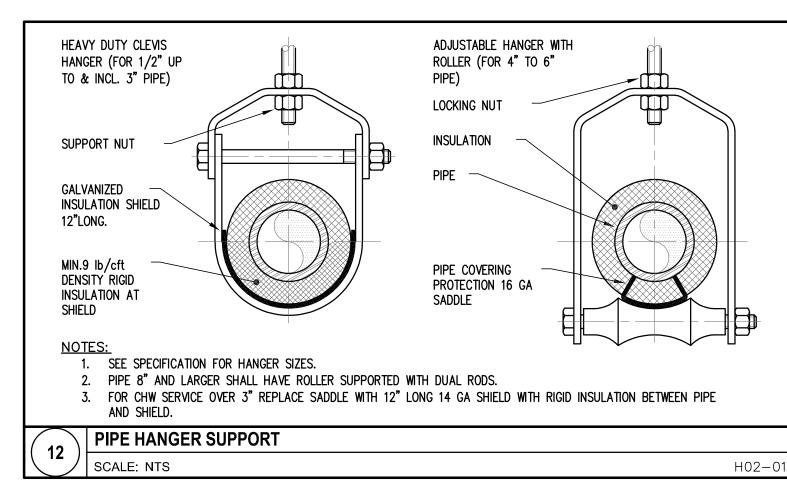


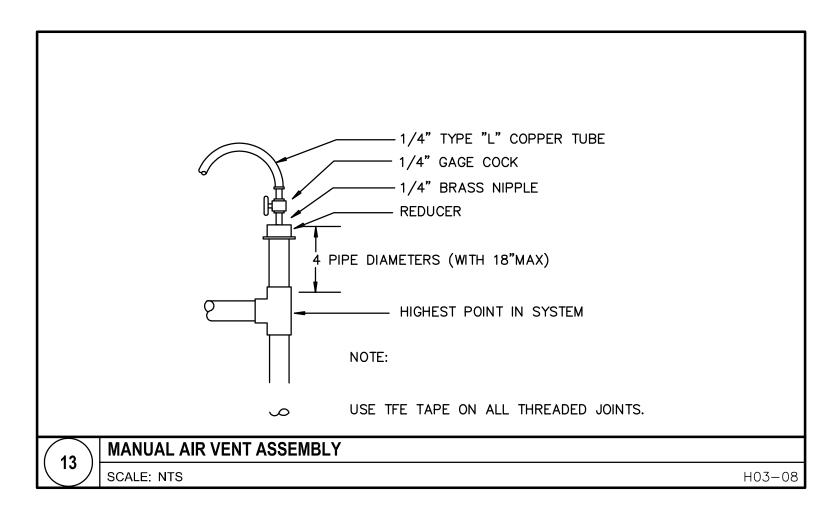


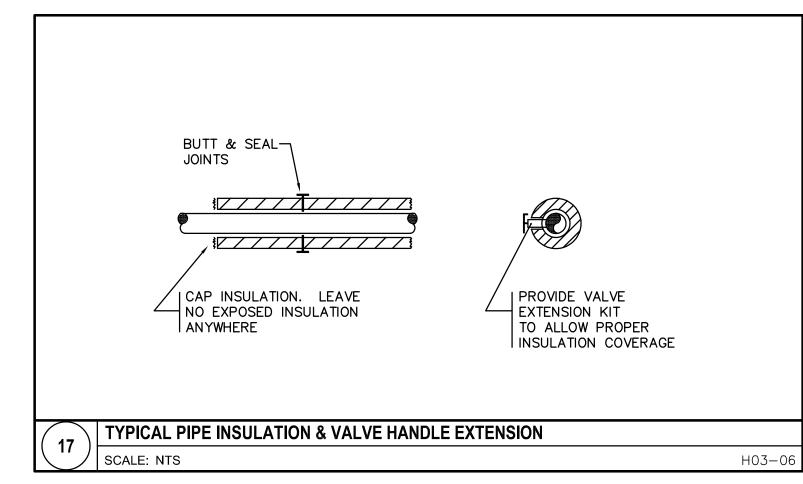
24 MAY 2019 Drawing Scale **HVAC DETAILS**

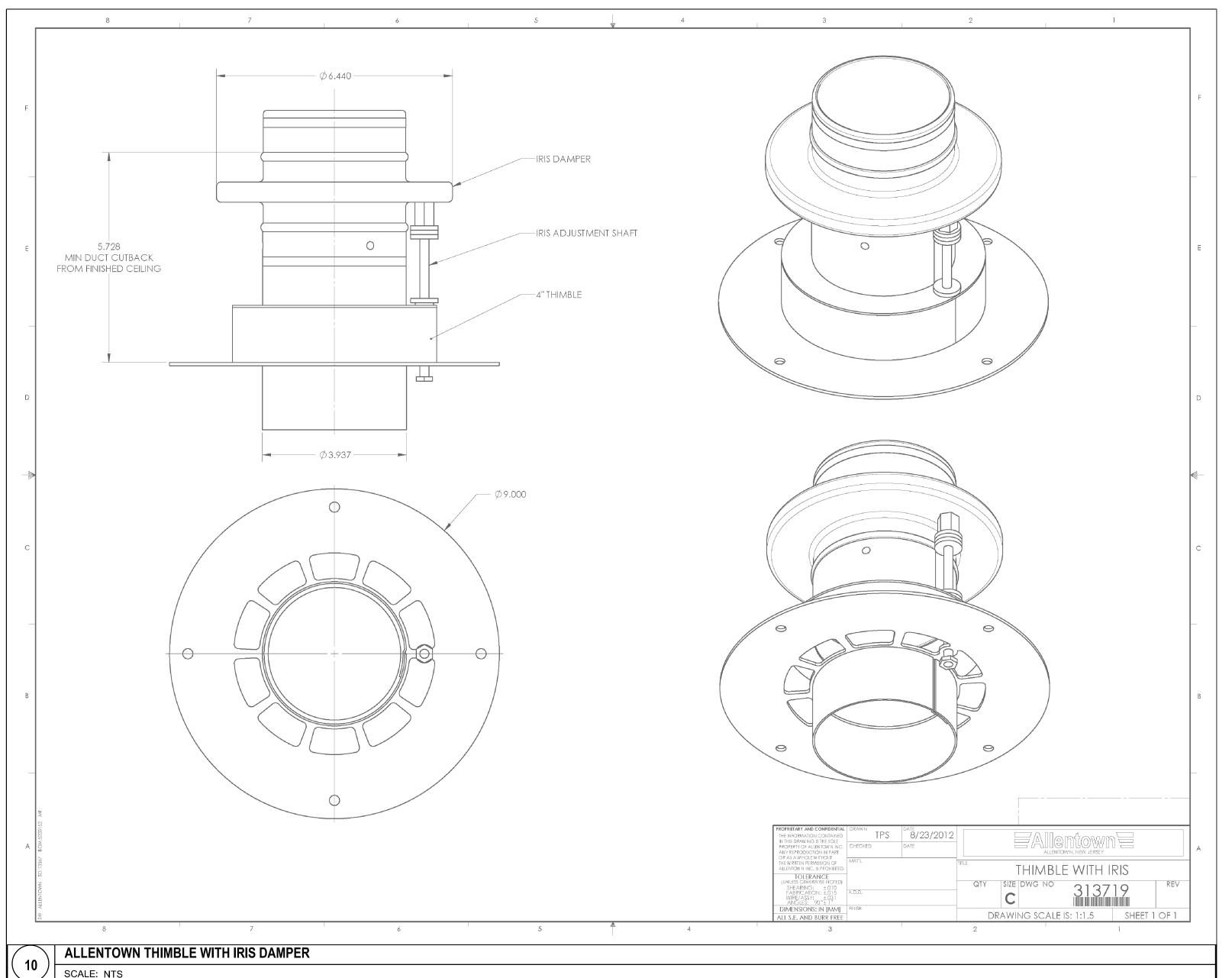


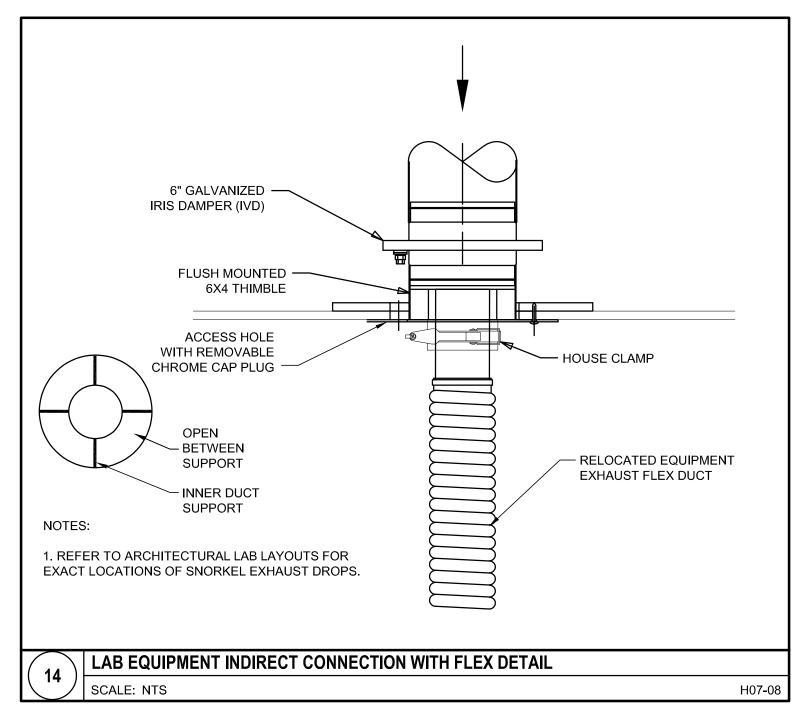


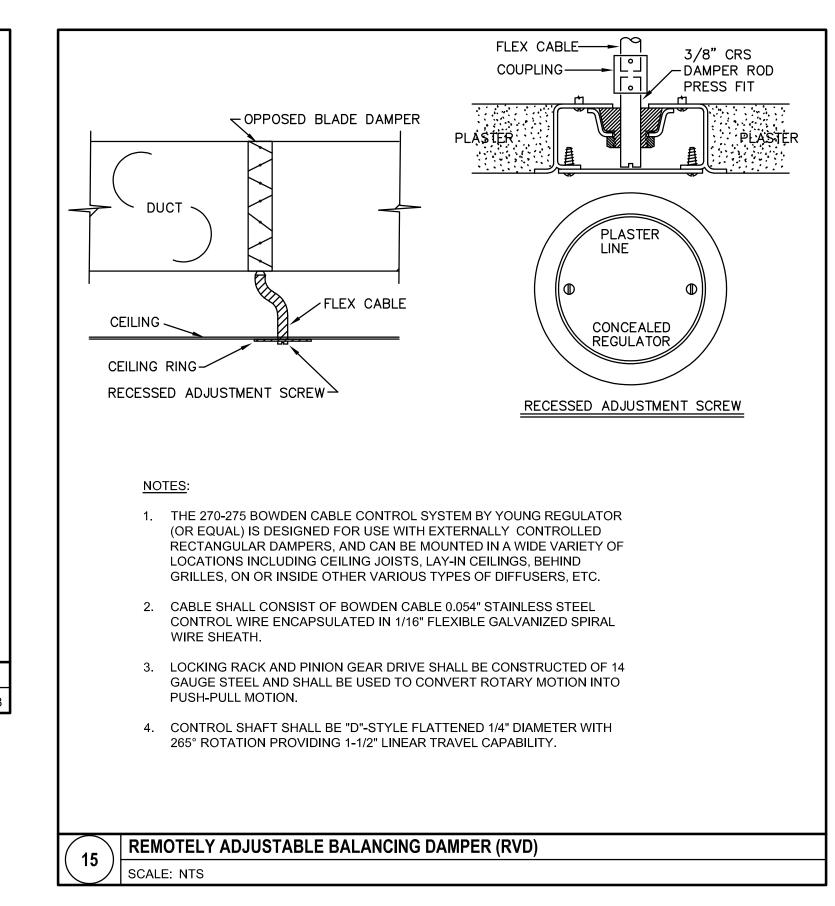


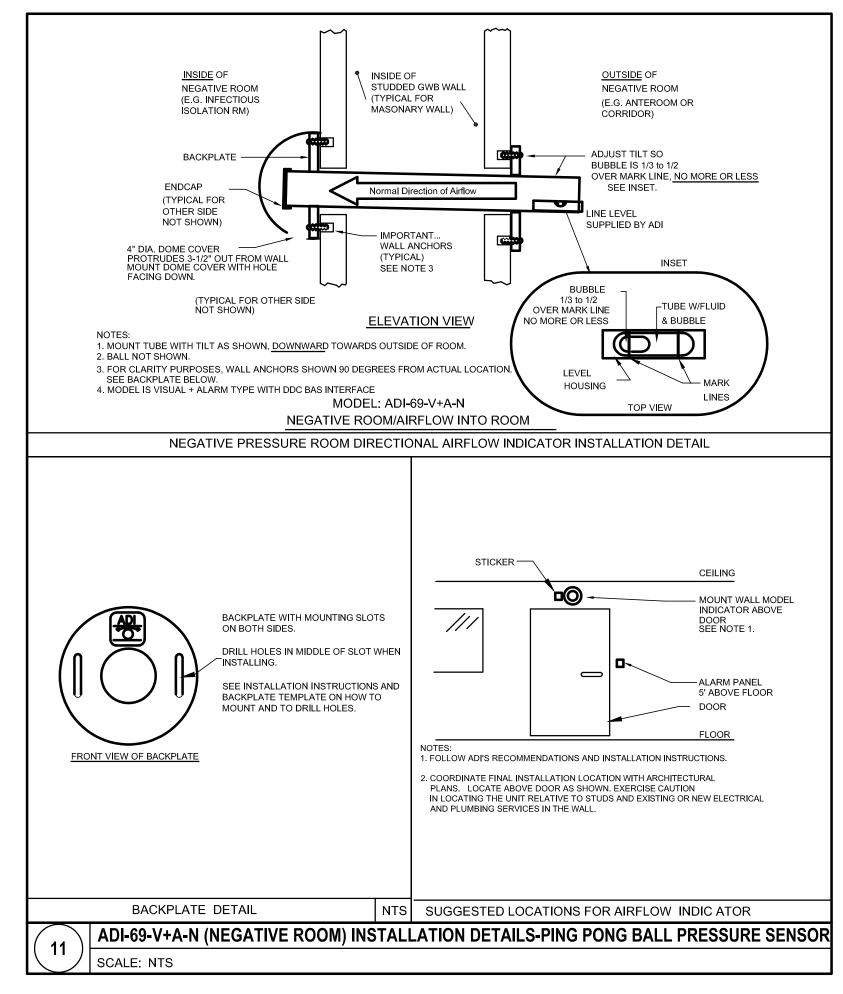


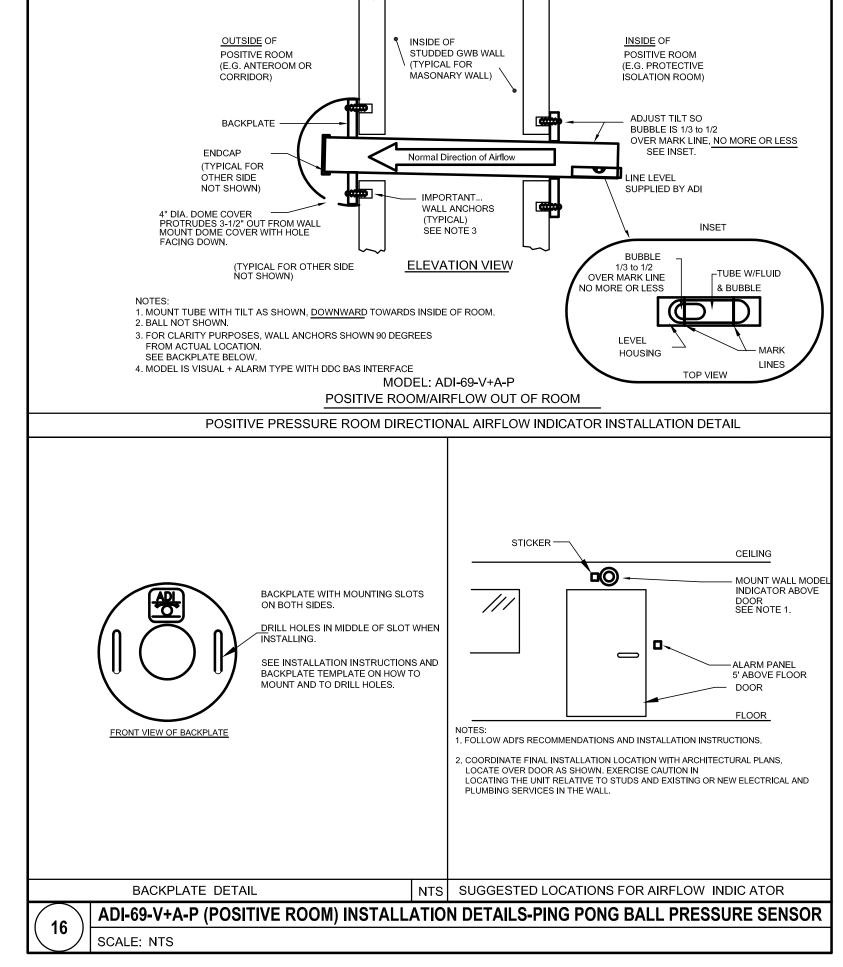


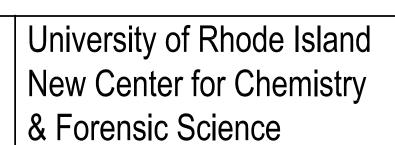










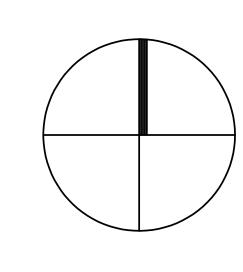


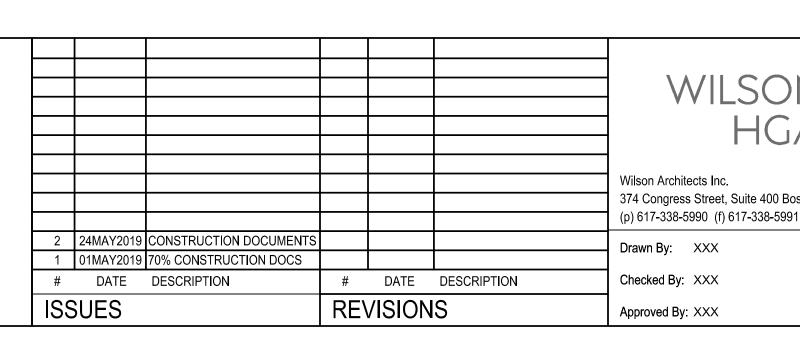
CONSTRUCTION DOCUMENTS

UNIVERSITY Owner Architect Consultants Consultants OF RHODE ISLAND Mechanical / Electrical / Plumbing / Fire Protection Wilson Architects Inc. 374 Congress Street Odeh Engineers, Inc 1223 Mineral Spring Avenue Suite 400 274 Summer Street p 401.874.2444 Boston MA 02210 Boston, MA 02210 Providence, RI 02904 p 617.338.5990 p 617.423.7423 p 401.724.1771

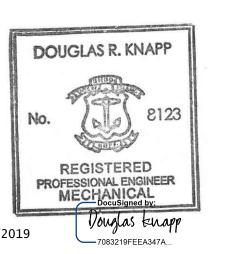
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WILSON DOUGLAS R. KNAPP HGA 374 Congress Street, Suite 400 Boston, MA 02210 5/28/2019



24 MAY 2019 Drawing Scale **HVAC DETAILS**

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DIFFUSER, GRILLE & REGISTER SCHEDULE NECK SIZE/ RUNOUT SIZE FACE SIZE (IN) RANGE MODEL NUMBER SERVICE MOUNTING ACCESSORIES NOTES (CFM) (AS STANDARD) HARD CEILING 1-3 MODULE HARD CEILING 1-3 0-450 PRICE SMD 24x24 24x24" LAY-IN 24x24 0-240 PRICE LFD 1-3 12x12" HARD CEILING 12x12 PRICE 530FF 12x12 1-4

<u>NO1</u>

- 1. BORDER TYPES SHALL BE COMPATIBLE WITH CEILING TYPE FOR THE ROOM IN WHICH IT IS LOCATED. CONTRACTOR SHALL REVIEW THE ARCHITECTURAL REFLECTED CEILING PLANS FOR SPECIFIC CEILING TYPES IN EACH SPACE
- 2. FINISHES, COLOR AND BORDER TYPES SHALL BE APPROVED BY THE ARCHITECT.
- 3. REFER TO PLANS FOR LOCATION, AIR QUANTITIES, TYPE AND BLOW PATTERN OF EACH DEVICE.
- 4. PROVIDE DISPOSABLE 1" FILTER.

	SUPPLY VAV BOX SCHEDULE WITH INTEGRAL SOUND ATTENUATOR & HOT WATER REHEAT COIL																						
UNIT NO	PRIMARY CFM (RANGE)	MIN. PRIMARY CFM	INLET COLLAR SIZE (IN) (UNIT SIZE)	DISCHARGE COLLAR SIZE (IN. x IN.)	INLET SP (IN. WG)	DOWN STREAM SP (IN. WG)	OPER. SP PD	MAX DISCHARGE NC	MAX RADIATED NO	MAX SOUN OCTAVE BANE REFERENCE	T T	EVEL (DB) 4 5	6 7	₇ MBH	ROWS	EAT L.	HOT WATAT EWTF) ("F")	TER REHEAT LWT (*F)	COIL WPD (FT. WG)	APD (FT. WG)	COIL GPM	MANUFACTURER MODEL NUMBER	NOTES
VV-1	65-250	65	6	12x8	1	0.25	0.08	20	-	DISCHARGE RADIATED		46 41 38 34			1	55 8	85 180	150	0.07	0.06	0.6	PRICE SDVQ5	12345
VV-2	251-600	135	8	12x10	1	0.25	0.08	20	-	DISCHARGE RADIATED	1 1	46 41 38 34	1 1	1 20 0	1	55 8	85 180	150	0.07	0.06	1.5	PRICE SDVQ5	12345

- (1) IF NO SPECIFIC DUCT DIMENSION IS SHOWN ON THE FLOOR PLANS CONNECTING TO THE TERMINAL BOX INLETS, THE SIZE SHALL BE DETERMINED PER COLUMN LABELED "INLET COLLAR SIZE"
- (2) IF NO SPECIFIC DUCT DIMENSION IS SHOWN ON THE FLOOR PLANS CONNECTING TO THE TERMINAL BOX DISCHARGE, THE SIZE SHALL BE DETERMINED PER COLUMN LABELED "DISCHARGE COLLAR SIZE"
- 3 BOTH LEFT HAND AND RIGHT HAND CONTROL PANEL CONFIGURATIONS ARE SHOWN ON THE PLANS. THE CONTRACTOR SHALL COORDINATE EXACT CONTROL PANEL LOCATION DURING COORDINATION PROCESS TO PROVIDE REQUIRED SERVICE CLEARANCE
- 4) DDC CONTROLLER TO BE PROVIDED BY THE CONTROLS CONTRACTOR.
- (5) HOSPITAL GRADE INTERNAL INSULATION.

EXHAUST AIR TERMINAL BOX WITH INTEGRAL SOUND ATTENUATOR SCHEDULE													
UNIT NO.	PRIMARY CFM (RANGE)	MINIMUM CONTROL SETPOINT (CFM)	INLET COLLAR SIZE (IN) (UNIT SIZE)	MAX S.P. DROP (IN. WG)	SOUND POWER LEVELS @ 1.0 (IN. NO OCTAVE BAND 2 3 REFERENCE			1.0 (IN. WG) 3 4 5 6 7			7	MANUFACTURER MODEL NUMBER	REMARKS
VVE-1	70-305	70	5"Ø	.33	RADIATED DISCHARGE	62 69	59 68	48 60	43 55	41 53	35 47	PRICE SDEQ	12345
VVE-2	306-440	100	6"Ø	.57	RADIATED DISCHARGE	61 68	58 67	52 63	47 59	43 54	39 49	PRICE SDEQ	12345
VVE-3	441-785	175	8"Ø	.38	RADIATED DISCHARGE	65 71	59 70	52 62	47 59	46 54	42 49	PRICE SDEQ	12345

- 1) IF NO SPECIFIC DUCT DIMENSION IS SHOWN ON THE FLOOR PLANS CONNECTING TO THE TERMINAL BOX INLETS, THE SIZE SHALL BE DETERMINED PER COLUMN LABELED "INLET COLLAR SIZE"
- IF NO SPECIFIC DUCT DIMENSION IS SHOWN ON THE FLOOR PLANS CONNECTING TO THE TERMINAL BOX DISCHARGE , THE SIZE SHALL BE DETERMINED PER COLUMN LABELED "DISCHARGE COLLAR SIZE"
- BOTH LEFT HAND AND RIGHT HAND CONTROL PANEL CONFIGURATIONS ARE SHOWN ON THE PLANS. THE CONTRACTOR SHALL COORDINATE EXACT CONTROL PANEL LOCATION DURING COORDINATION PROCESS TO PROVIDE REQUIRED SERVICE CLEARANCE
- 4 DDC CONTROLLER TO BE PROVIDED BY THE CONTROLS CONTRACTOR.
- 5 HOSPITAL GRADE INTERNAL INSULATION.

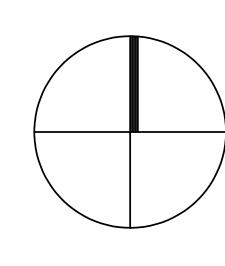
University of Rhode Island
New Center for Chemistry
 & Forensic Science

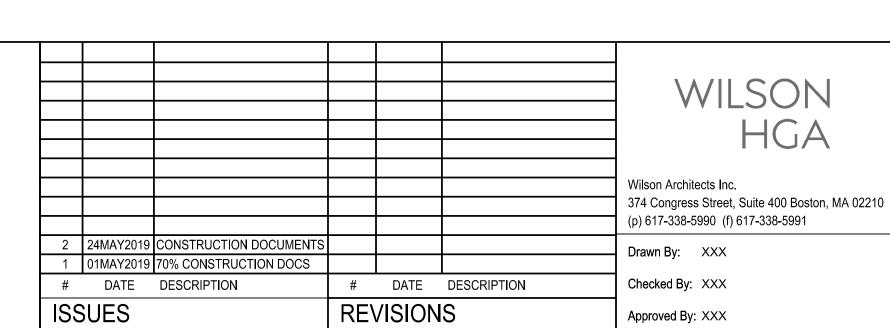
CONSTRUCTION DOCUMENTS

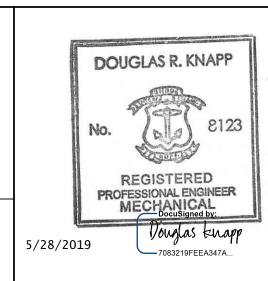
Consultants Architect Consultants Mechanical / Electrical / Plumbing / Fire Protection Wilson Architects Inc. Vanderweil Engineers 374 Congress Street Odeh Engineers, Inc 1223 Mineral Spring Avenue Suite 400 274 Summer Street p 401.874.2444 Boston MA 02210 Boston, MA 02210 Providence, RI 02904 p 617.338.5990 p 617.423.7423 p 401.724.1771

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Landscape Carol R. Johnson Associates, Inc. 115 Broad Street Boston, MA 02110 p 617.896.2500



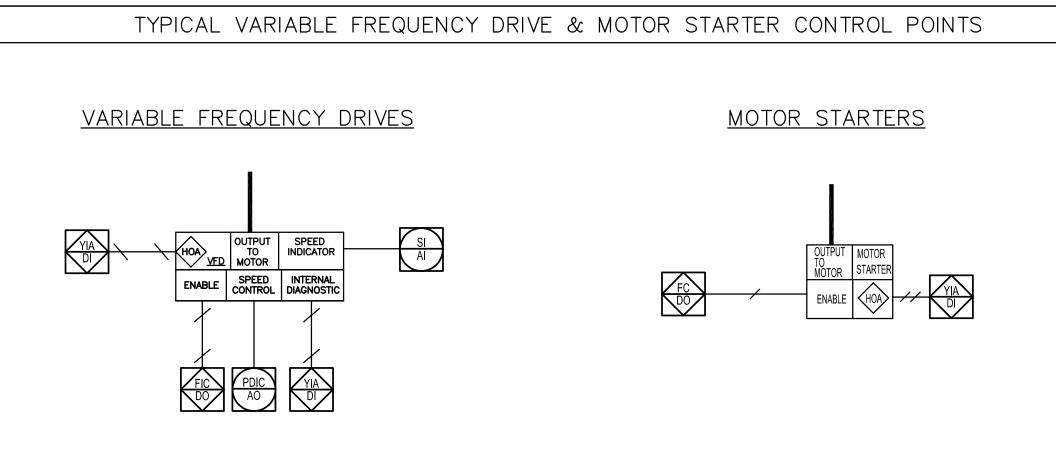




Date Issued 24 MAY 2019
Project Number 4437-001
Drawing Scale NTS
HVAC SCHEDULES

M6.01

P.& I.D. IDENTIFICATION LETTERS FIRST -LETTER SUCCEEDING-LETTERS MEASURED OR READOUT OR MODIFIER MODIFIER PASSIVE FUNCTION INITIATING VARIABLE FUNCTION ANALYSIS ALARM BURNER, COMBUSTION USER'S CHOICE (NOT USED HERE) USER'S CHOICE DIFFERENTIAL (NOT USED HERE) VOLTAGE SENSOR (PRIMARY ELEMENT) FLOW RATE RATIO (FRACTION) USER'S CHOICE GLASS, VIEWING DEVICE (NOT USED HERE) HAND CURRENT (ELECTRICAL) INDICATE POWER TIME, TIME SCHEDULE CONTROL STATION LIGHT LEVEL MOISTURE MOMENTARY MIDDLE. INTERMEDIATE USER'S CHOICE USER'S CHOICE USER'S CHOICE USER'S CHOICE (NOT USED HERE) (NOT USED HERE) (NOT USED HERE) (NOT USED HERE) USER'S CHOICE ORIFICE, RESTRICTION PRESSURE, VACUUM POINT (TEST) CONNECTION QUANTITY INTEGRATE, TOTALIZE RADIATION RECORD SWITCH SPEED (VELOCITY) TRANSMIT TEMPERATURE MULTIVARIABLE MULTIFUNCTION MULTIFUNCTION MULTIFUNCTION VIBRATION VALVE, DAMPER, LOUVER WELL WEIGHT, FORCE SMOKE X AXIS RELAY, COMPUTE, EVENT, STATE OR PRESENCE Y AXIS



NOTES ON EXISTING ROOM VERIFICATION

EXISTING ROOM SEQUENCES ARE LISTED FOR VERIFICATION PURPOSES ONLY. BAS CONTRACTOR SHALL REVIEW DOCUMENTED SEQUENCES, AND VALIDATE THAT THE EXISTING ROOM SEQUENCE IS PERFORMING AS DOCUMENTED. THE

ROOM 480 CORRIDOR - TYPICAL CONTROL ROOM

FOLLOWING ROOM AND ASSIGNED ROOM CONTROL SEQUENCES SHALL BE VERIFIED:

ROOM 480B GOWNING - TYPICAL CONTROL ROOM ROOM 480C RAT HOLDING - TYPICAL SMALL ANIMAL HOLDING ROOM WITH VENTILATED CAGE RACK SEQUENCE ROOM 480F PROCEDURE ROOM - TYPICAL PROCEDURE ROOM ROOM 480G MICE HOLDING - TYPICAL SMALL ANIMAL HOLDING ROOM WITH VENTILATED CAGE RACK SEQUENCE

CONTROL SYSTEM NOTES

- 1. UNLESS OTHERWISE NOTED, ALL CONTROLS SHALL BE DIRECT DIGITAL TYPE (DDC).
- 2. AS A MINIMUM, ONE DDCFP SHALL BE PROVIDED FOR AIR HANDLING UNIT.
- 3. ALL SETPOINTS INDICATED IN THE SEQUENCES SHALL BE ADJUSTABLE AT THE COMPUTER WORKSTATION AND VIA A LAPTOP COMPUTER CONNECTED TO ANY DDCFP. 4. LONWORKS PROTOCOL NOT ACCEPTABLE.
- 5. BACNET PROTOCOL IS ACCEPTABLE, HOWEVER; CRITICAL CONTROL DEVICES SHALL BE HARD WIRED. 6. THE BUILDING AUTOMATION SYSTEM (ALL CONTROL PANELS, WORKSTATION, HOST COMPUTER ETC) SHALL BE CONNECTED TO CRITICAL POWER OR BE PROVIDED WITH UNINTERRUPTIBLE POWER SUPPLY (UPS) FOR SEAMLESS OPERATION AND AVOIDANCE OF NUISANCE BMS OR EQUIPMENT SHUTDOWNS.
 - . SOFTWARE COMMUNICATION SHALL BE REQUIRED BETWEEN THE BAS AND EQUIPMENT MANUFACTURERS PACKAGED CONTROL SYSTEMS WHERE INDICATED.
- 8. REFER TO SPECIFIC NOTES ON VARIABLE FREQUENCY DRIVES (VFD) THIS SHEET.
- 9. REFER TO FLOOR PLANS FOR THE LOCATIONS OF ALL SPACE MOUNTED SENSORS AND TRANSMITTERS, TEMPERATURE TRANSMITERS ARE INDICATED $(\overline{})$, HUMIDITY TRANSMITTERS ARE INDICATED $(\overline{})$, PRESSURE TRANSMITERS ARE
- 10. ALL COMMON INFORMATION (OUTSIDE AIR TEMP & HUMIDITY, ETC.) SHALL BE MEASURED AND COMMUNICATED IN AT LEAST 3 LOCATIONS.
- 11. ALL SEQUENCES SHALL BE PERFORMED BY THE DDCFP AND MONITORED BY THE CENTRAL BAS.
- 12. EACH SEQUENCE WITH A DEFINED OCCUPIED PERIOD SHALL HAVE THE PERIOD ADJUSTABLE GLOBALLY (SO THAT ALL CAN BE ON THE SAME TIME FRAME) AND INDIVIDUALLY (SO THAT ANY ONE OPERATION CAN HAVE A DIFFERENT OCCUPIED PERIOD).
- 13. ALL DDC FIELD PANELS (DDCFPS) SHALL BE CAPABLE OF INDEPENDENT OPERATION REGARDLESS OF THE STATUS OF THE BUILDING AUTOMATION SYSTEM (BAS).

INSTRUMENTATION NUMBERING CONVENTION INSTRUMENT TAG SEE "P & ID IDENTIFICATION LETTERS" TABLE WHEN IDENTICAL, MULTIPLE INSTRUMENTS EXIST WITHIN A LOOP, THEY ARE INDIVIDUALLY, SEQUENTIALLY NUMBERED HERE. —LOOP ID NUMBER NOTE: INSTRUMENTATION IDENTIFICATION TAGS SHOWN ON THE ENCLOSED CONTROL DRAWINGS ARE INTENDED TO BE SPECIFIC FOR EACH SEQUENCE. NO ATTEMPT HAS BEEN MADE TO COORDINATE SEQUENTIAL TAGS IN ALL SEQUENCES AS THIS EFFORT WOULD NOT AID IN THE UNDERSTANDING OF THE DESIGN INTENT. THEREFORE THERE MAY BE INSTRUMENTS ON THE CONTROL DRAWINGS WHICH APPEAR TO HAVE THE SAME IDENTIFICATION NUMBER. THE CONTRACTOR SHALL PROVIDE AND COORDINATE A COMPLETE LIST OF

INSTRUMENTATION, THE ASSOCIATED IDENTIFICATION TAGS AND A CROSS

REFERENCE TO BE USED IN THE BAS (BUILDING AUTOMATION SYSTEM)

PROGRAM CODE.

INSTRUMENT LINE SYMBOLS AND ABBREVIATIONS BINARY (DIGITAL) SIGNAL LINE MODULATING (ANALOG) SIGNAL LINE SENSING LINE PROCESS CONDUIT PROCESS CONDUIT DESCRIPTORS

INSTRUMENT AND FUNCTION SYMBOLS

TAG | FIELD MOUNTED INSTRUMENT CO2 INDICATION AND CONTROL SPEED INDICATION MODULATING ACTUATOR WITH PILOT WITHIN ANALOG LOGIC SOFTWARE POSITIONER - FAILS OPEN RESIDING IN DDC FIELD PANEL. FLOW MEASUREMENT AND INDICATION SPEED TRANSMITTER MODULATING ACTUATOR WITH PILOT WITHIN ANALOG LOGIC SOFTWARE POSITIONER - FAILS CLOSED RESIDING IN DDC FIELD PANEL. SOFTWARE (ANALOG TYPE) LOGIC CONTROL LOOP TEMPERATURE ELEMENT (RTD, THERMISTOR, FLOW INDICATION AND CONTROL INPUT (AI)/OUTPUT (AO) ÍDENTIFIER WITHIN ANALOG LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL MODULATING ACTUATOR WITH AN INTEGRAL PILOT POSITIONER SOFTWARE BINARY (BOOLEAN) LOGIC CONTROL LOOP TEMPERATURE READOUT (BIMETALLIC OR LEVEL INDICATION AND CONTROL INPUT (DI)/OUTPUT (DO) IDENTIFIER MERCURY IN GLASS THERMOMETER) RESIDING IN DDC FIELD PANEL. MODULATING ACTUATOR WITHOUT INTEGRAL PILOT POSITIONER VOLTAGE SENSING SWITCH TEMPERATURE TRANSMITTER RESIDING IN DDC FIELD PANEL. VALVE OR DAMPER ASSOCIATED WITH TEMPERATURE MEASUREMENT AND FAN CONTROL DAMPER MOISTURE (HUMIDITY) INDICATION AND CONTROL WITHIN ANALOG LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. MODULATING ACTUATOR WITHOUT PILOT POSITIONER — FAILS OPEN FLOW ELEMENT VALVE OR DAMPER ASSOCIATED WITH SMOKE MODULATING ACTUATOR WITHOUT WATER FLOW SWITCH ELECTRIC SWITCH ACTIVATED BY ANOTHER DEVICE. PRESSURE INDICATION AND CONTROL WITHIN ANALOG LOGIC SOFTWARE SWITCH INDICATES STATUS (E.G. AUXILIARY SWITCH ON A SERVICE). DISCONNECT TO INDICATE WHETHER PILOT POSITIONER - FAILS CLOSED RESIDING IN DDC FIELD PANEL. DISCONNECT IS OPEN OR CLOSED. PRESSURE DIFFERENTIAL INDICATION AND CONTROL FLOW TRANSMITTER TWO POSITION ACTUATOR. WITHIN ANALOG LOGIC SOFTWARE FAILS OPEN RESIDING IN DDC FIELD PANEL. TEMPERATURE MEASUREMENT AND INDICATION WITHIN ANALOG LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. HAND ACTUATED SWITCH SWITCH ASSOCIATED WITH THE POSITION OF A TWO POSITION ACTUATOR, VALVE OR DAMPER. SWITCH IS ACTIVATED BY FAILS CLOSED THE POSITION OF ANOTHER DEVICE (E.G. DAMPER LOW LEVEL SWITCH WITHIN ANALOG LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. TEMPERATURE INDICATION AND CONTROL CO2 SENSOR TRANSMITTER WITHIN ANALOG LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. BACKPRESSURE REGULATOR, SELF CONTAINED SPEED MEASUREMENT AND INDCATION WITHIN ANALOG LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. VALVE ASSOCIATED WITH LEVEL CONTROL HIGH STATIC PRESSURE SWITCH WITH MANUAL RESET (PRESSURE IS PRESSURE REDUCING REGULATOR SELF CONTAINED MOISTURE (HUMIDITY) TRANSMITTER HIGHER THAN NÒRMAL) RESIDING IN DDC FIELD PANEL. INDICATION AND CONTROL ASSOCIATED WITH ONE OR MORE EVENTS OR STATES WITHIN ANALOG LOGIC SOFTWARE MOISTURE (HUMIDITY) CONTROL VALVE LOW STATIC PRESSURE SWITCH WITH ELECTRIC WIRING INTERFACE/INTERLOCK. RESIDING IN DDC FIELD PANEL. MANUAL RESET (PRESSURE IS SEE DIVISION 16 DWGS PDSL LOW DIFFERENTIAL STATIC PRESSURE LOWER THAN NORMAL) FLOW INDICATION AND ALARM WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. LEVEL INDICATION AND ALARM WITHIN LOW TEMPERATURE SWITCH WITH BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. HIGH DIFFERENTIAL STATIC PRESSURE MANUAL RESET HAND-OFF-AUTOMATIC CONTROL STATION HOA REFER TO DIVISION 16 DWGS WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. DUCT SMOKE DETECTOR WITH REMOTE LIGHT. DIFFERENTIAL STATIC PRESSURE TRANSMITTER AUXILIARY CONTACTS AND MANUAL RESET PRESSURE DIFFERENTIAL INDICATION WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC DIFFERENTIAL PRESSURE BYPASS VALVE TWO WAY VALVE ASSOCIATED WITH PRESSURE DIFFERENTIAL INDICATION AND ALARM WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. HIGH & LOW MOISTURE "OUT OF RANGE" ACTUATOR - SEE DRAWINGS & SPECS FOR VALVE TYPE LIMITS FOR FAULTY SENSOR ALARM PRESSURE READOUT PRESSURE DIFFERENTIAL INDICATION AND CONTROWNTHIN BINARY LOGIC SOFTWARE RESIDING IN DDC STATIC PRESSURE TRANSMITTER THREE WAY VALVE ASSOCIATED WITH
ACTUATOR - SEE DRAWINGS & SPECS FOR VALVE TYPE (REFERENCED TO ATMOSPHERE) HIGH & LOW PRESSURE "OUT OF RANGE" LIMITS FAULTY SENSOR ALARM VALVE OR DAMPER ASSOCIATED WITH STATIC PRESSURE MEASUREMENT AND HIGH & LOW TEMPERATURE "OUT OF RANGE" TEMPERATURE INDICATION AND ALARM WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. LIMITS FAULTY SENSOR ALARM SOFTWARE RESIDING IN DDC FIELD PANEL BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. INSTRUMENT WITH MANUAL INDICATION AND ALARM ASSOCIATED WITH ONE OR MORE EVENTS OR STATES WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC SMOKE INDICATION AND CONTROL WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. SELF CONTAINED THERMOSTAT EVENTS OR STATES WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL DAMPER OR VALVE POSITION INDICATION DAMPER ASSOCIATED WITH FLOW ELEMENT WITH INDICATION ASSOCIATED WITH ONE OR MORE EVENTS OR STATES WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL. ACTUATOR RESIDING IN DDC FIELD PANEL. FLOW TRANSMITTER INDICATION AND CONTROL ASSOCIATED WITH POSITION MEASUREMENT WITHIN BINARY LOGIC SOFTWARE RESIDING IN DDC FIELD PANEL.

SEQUENCE OF CONTROLS — GENERAL

- SEQUENCES OUTLINED (UNLESS OTHERWISE SPECIFIED) SHALL BE PERFORMED BY DIRECT DIGITAL CONTROL FIELD PANELS (DDCFPS) OR LOCALLY MOUNTED DIRECT DIGITAL UNIT CONTROLLERS.
- UNLESS OTHERWISE SPECIFIED, ALL SETPOINTS AND TIME DELAYS SHALL BE ADJUSTABLE BY THE OPERATOR THROUGH THE BAS AND THROUGH MENU ACCESS AT
- ABILITY TO REVIEW ALL MEASURED DATA, CONTROL SETPOINTS AND FUNCTIONS SHALL BE PROVIDED AT BAS WORKSTATION AND DDCFPS.

ALL DDCFPS WITHOUT ANY HARDWARE OR SOFTWARE REVISIONS.

- PROVIDE MENU DRIVEN CAPABILITY TO OVERRIDE AUTOMATED START/STOP OR OPERATING MODES FOR EACH PIECE OF EQUIPMENT (INCLUDING PUMPS, AIR HANDLING UNITS, VV BOXES, ETC...). IF A SEQUENCE IS DISABLED BY MANUAL INPUT AND THE BAS ATTEMPTS AN AUTOMATED CHANGE IN OPERATING MODE, AN ALARM SHALL BE INITIATED AT THE BAS STATING THAT THE SYSTEM WAS UNABLE TO CHANGE THE MODE DUE TO USER INPUT. WHERE APPLICABLE A MANUAL INPUT COMMAND WILL THEN BE REQUIRED FROM THE USER INSTRUCTING THE BAS TO START THE NEXT SEQUENTIAL PIECE OF EQUIPMENT.
- THE DESIGN INTENT IS FOR THE BAS TO MONITOR PRESSURES, TEMPERATURES AND FLOWS AND TO CONTROL VALVES, VARIABLE FREQUENCY DRIVES (VFDS), AHU, PUMPS, ETC.... MONITORED DATA WILL BE USED TO ENERGIZE OR DE-ENERGIZE EQUIPMENT IN ACCORDANCE WITH THE SEQUENCES OUTLINED.
- ALL EQUIPMENT CONTROLLED BY THE BAS SHALL BE CAPABLE OF MANUAL OPERATION THROUGH HAND-OFF-AUTOMATIC (HOA) SWITCHES LOCATED IN THE MOTOR STARTERS. THE POSITIONING OF ALL VALVES CONTROLLED BY THE BAS SHALL BE CAPABLE OF MANUAL POSITIONING (OPEN, CLOSED, MODULATED, AUTO) VIA LABELED POTENTIOMETERS AND SWITCHES PROVIDED BY THE BAS CONTRACTOR. SAFETY DEVICES SHALL FUNCTION AND SHUT DOWN THE ASSOCIATED EQUIPMENT WHEN THE MANUAL SWITCHES ARE IN BOTH THE HAND AND AUTO POSITIONS.
- COORDINATE ALL SENSOR INSTALLATION LOCATIONS WITH HVAC CONTRACTOR AND SUBMIT PROPOSED POSITIONS ON APPLICABLE PIPING AND DUCTWORK COORDINATION SUBMITTALS. COORDINATE AND INSURE MANUFACTURER'S RECOMMENDED UPSTREAM AND DOWNSTREAM PIPE OR DUCT DIAMETERS ARE PROVIDED. SPECIAL ATTENTION IS REQUIRED FOR FLOW ELEMENTS AND TRANSMITTERS. IN THE FOLLOWING SEQUENCES, THE SYMBOL FE REFERS TO FLOW ELEMENTS OF THE PITOT TUBE TYPE, PROVIDED BY THE HVAC CONTRACTOR. THE SYMBOL FT, WHEN ATTACHED TO AN FE, REFERS TO A FLOW TRANSMITTER PROVIDED BY THE BAS CONTRACTOR. THE SYMBOL FT ALONE, REFERS TO A COMBINATION FLOW ELEMENT AND TRANSMITTER, BOTH PROVIDED BY THE BAS CONTRACTOR.
- PROVIDE COMMUNICATIONS INTERFACE (INCLUDING NECESSARY SOFTWARE) BETWEEN THE BAS AND EACH MANUFACTURER SUPPLIED CONTROL PANEL SPECIFIED. BAS SHALL BE CAPABLE OF READING AND DISPLAYING ALL DATA USED BY THE MANUFACTURER'S CONTROL PANEL. SOFTWARE INTERFACE SHALL BE THROUGH BACNET COMPLIANT PROTOCOL. WHERE THE BAS IS REQUIRED TO CONTROL THE OPERATION OF THE EQUIPMENT, PROVIDE INPUT AND OUTPUT INTERFACE AS REQUIRED.
- FAIL SAFE POSITIONS INDICATED ARE POSITIONS THAT DEVICES WILL GO TO WHEN THE ASSOCIATED EQUIPMENT IS DE-ENERGIZED.
- PROVIDE ADEQUATE DAMPING OF ALL MODULATING CONTROL LOOPS TO PREVENT HUNTING. MAXIMUM RESPONSE TIME SHALL BE 30 SECONDS.
- WHENEVER A UNIT IS SHUT DOWN BECAUSE OF ONE OF IT'S SAFETIES, THE BAS SHALL RETAIN IN MEMORY THE READING AND SETPOINT OF EACH ASSOCIATED DEVICE TO
- WHENEVER AN ALARM IS INITIATED, THE BAS SHALL RETAIN IN MEMORY THE READING AND SETPOINT OF EACH ASSOCIATED DEVICE TO HELP THE OPERATOR IN ISOLATING

HELP THE OPERATOR IN ISOLATING THE CAUSE OF THE SHUT DOWN.

- THE CAUSE OF THE ALARM.
- 13. IF ANY DDCFP OR EQUIPMENT MANUFACTURER'S CONTROL PANEL LOSES COMMUNICATION WITH THE BAS NETWORK, AN ALARM SHALL BE INITIATED AT THE BAS INDICATING THE LOCATION OF THE FAULT
- 14. THE FOLLOWING DEFINITIONS APPLY TO THE SEQUENCES OF OPERATION:
- a. BAS: PERSONAL COMPUTER BASED WORKSTATION
- DDCFP: DIRECT DIGITAL CONTROL FIELD PANEL. DDCFPS ARE VARIOUS APPLICATION BASED LOCAL SYSTEM CONTROLLERS WITH INPUTS FROM MONITORED DEVICES, OUTPUTS TO CONTROLLED DEVICES, CONTROLLING LOGIC SOFTWARE, AND NETWORKING CAPABILITY FOR COMMUNICATION WITH THE BAS.
- END DEVICE: MONITORED SENSORS AND CONTROLLED OPERATORS FOR SPECIFIC EQUIPMENT ITEMS. END DEVICES WILL PROVIDE A VARIETY OF ANALOG OR BINARY INPUT SOURCES TO THE DDCFPS AS WELL AS RECEIVE OUTPUTS FROM LOCAL CONTROLLERS OR DDCFPS.
- 15. UNLESS NOTED OTHERWISE THE FOLLOWING SHALL BE INITIAL SPACE TEMPERATURE SETPOINTS (ADJUSTABLE):
- a. AIRLOCK AND STORAGE ROOMS:
- OCCUPIED COOLING OCCUPIED HEATING
- 70°F 80°F UNOCCUPIED COOLING UNOCCUPIED HEATING 65°F
- ANIMAL HOLDING AND PROCEDURE ROOMS:

OCCUPIED COOLING OCCUPIED HEATING UNOCCUPIED COOLING

65°F UNOCCUPIED HEATING REFER TO INDIVIDUAL SEQUENCES FOR ADDITIONAL VARIABLE SETPOINTS

80°F

72°F @ 35%RH

NOTES ON VARIABLE FREQUENCY DRIVES

THE HAND-OFF-AUTOMATIC SWITCH ON THE VFD SHALL PROVIDE FOR THE

FOLLOWING BASIS OF CONTROL:

HAND POSITION: THE BAS SHALL HAVE NO CONTROL OVER THE MOTOR SPEED NOR SHALL IT BE ABLE TO START OR STOP THE MOTOR (EXCEPT FOR SAFETY PURPOSES WHERE THE MOTOR SHALL SHUT DOWN). THE MOTOR SHALL RUN UNDER SPEED CONTROL FROM THE HAND POTENTIOMETER ON THE VFD. ALL SAFETIES CONTROLLING THE SHUTDOWN SHALL BE OPERATIONAL (i.e. SMOKE DETECTORS, PRESSURE SWITCHES, ETC). TEMPERATURE AND HUMIDITY CONTROL SHALL BE AVAILABLE THROUGH THE BAS.

OFF POSITION: THE MOTOR SHALL BE OFF. THE BAS SHALL NOT CONTROL THE MOTOR. ALL OTHER CONTROL POINTS SHALL BE IN THEIR

AUTOMATIC POSITION: THE MOTOR SHALL BE CONTROLLED BY THE BAS AS DESCRIBED HEREIN.

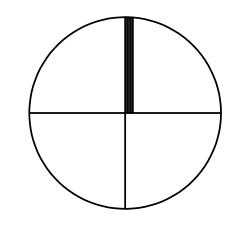
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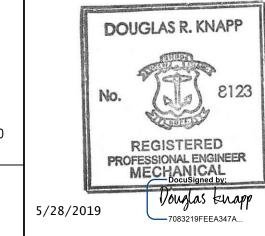
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HGA

Drawing Scale **CONTROLS LEGEND**

24 MAY 2019

OF RHODE ISLAND

AIR INLET

SUPPLY VARIABLE AIR VOLUME BOX (VV)

SUPPLY SPACE TEMPERATURE TRANSMITTER

SEQUENCE OF OPERATION

- 1. REQUIREMENTS APPLY TO ALL SEQUENCES OF "SEQUENCE OF OPERATION GENERAL" ON DRAWING M801.
- 2. VARIABLE AIR VOLUME SUPPLY BOX (VV) SHALL BE CONTROLLED BY A LOCAL (BOX MOUNTED) DIRECT DIGITAL CONTROLLER COMMUNICATING WITH THE BAS. ALL BOXES SHALL BE CAPABLE OF VARIABLE, TWO POSITION AND CONSTANT AIR VOLUME OPERATION. SEE TYPICAL SPACE SEQUENCES FOR OPERATING REQUIREMENTS.
- 3. SETPOINTS AND OCCUPANCY SCHEDULING SHALL BE ADJUSTABLE FROM THE BAS. THE BAS SHALL BE CAPABLE OF ADJUSTING SETPOINTS AND STATUS GLOBALLY AS WELL AS ON AN INDIVIDUAL BOX BASIS.
- 4. LOCAL SPACE TEMPERATURE TRANSMITTER (TT-XX01) SHALL BE CAPABLE OF SETPOINT ADJUSTMENT WITHIN A BAS DEFINED ADJUSTABLE RANGE. THE LOCAL TRANSMITTER SHALL ALSO BE CAPABLE OF OVERRIDING THE BAS UNOCCUPIED SCHEDULE TO ALLOW THE VV BOX TO OPERATE TEMPORARILY IN THE OCCUPIED MODE FOR A BAS DEFINED ADJUSTABLE TIME PERIOD (0.5 TO 12 HOURS).
- 5. ALL BOXES SHALL BE NORMALLY OPEN UNLESS NOTED OTHERWISE.
- 6. VV BOX AIR FLOW RATE SETPOINT AS MEASURED AT FT-XX01 SHALL BE MAINTAINED BY THE LOCAL CONTROLLER REGARDLESS OF UPSTREAM PRESSURE (PRESSURE INDEPENDENT OPERATION). THE BAS SHALL MONITOR AND DISPLAY (UPON REQUEST) THE FLOW RATE OF ANY VV BOX.
- TEMPERATURE TRANSMITTER TT-XX02 SHALL PROVIDE CONTINUOUS DISCHARGE AIR TEMPERATURE SENSING INFORMATION TO THE BAS.

ALARMS

- 1. THE FOLLOWING SHALL INITIATE A SPECIFIC ALARM NOTICE AT THE BAS:
- a. SPACE TEMPERATURE 10 DEGREES F ABOVE SETPOINT TIME DELAY 10 MINUTES.b. SPACE TEMPERATURE 10 DEGREES F BELOW SETPOINT TIME DELAY 10 MINUTES.
- c. AIR FLOW RATE 10% ABOVE SETPOINT FOR 5 CONSECUTIVE MINUTES.
- d. AIR FLOW RATE 10% BELOW SETPOINT FOR 5 CONSECUTIVE MINUTES.

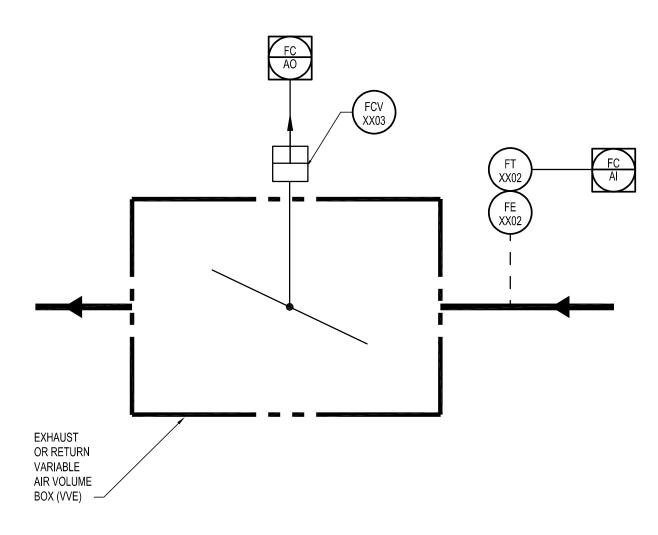
OCCUPIED MODE

- 1. VV BOX SHALL OPERATE BETWEEN PRESET FLOW RATES (CFM) SHOWN ON THE PLANS (OCCUPIED MAXIMUM TO OCCUPIED MINIMUM). THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR ROOM TEMPERATURE AT TT-XX01 AND AIR FLOW RATE AT FT-XX01. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV-XX01 AND HOT WATER FLOW VIA FCV-XX02.
- WHERE THE PLANS INDICATE CONSTANT COLUME SUPPLY FOR OCCUPIED PERIODS (MAXIMUM AND MINIMUM FLOWS EQUAL ON PLANS) THE LOCAL CONTROLLER SHALL MODULATE FCV-XX01 TO MAINTAIN OCCUPIED FLOW
- 3. WHERE THE PLANS INDICATE VARIABLE AIR VOLUME SUPPLY FOR OCCUPIED PERIODS (MAXIMUM AND MINIMUM FLOWS NOT EQUAL ON PLANS) THE LOCAL CONTROLLER SHALL MODULATE FCV-XX01 BETWEEN MAXIMUM AND MINIMUM FLOW SETPOINTS.
- 4. WHEN THE SPACE TEMPERATURE IS AT OR ABOVE OCCUPIED SETPOINT AT TT-XX01, THE HOT WATER VALVE FCV-XX02 SHALL BE FULLY CLOSED AND THE AIR FLOW CONTROL DAMPER FCV-XX01 SHALL BE MODULATED AS REQUIRED TO MAINTAIN MAXIMUM OCCUPIED AIR FLOW SETPOINT AT FT-XX01. AS THE TEMPERATURE AT TT-XX01 DROPS, THE AIR FLOW CONTROL DAMPER SHALL BE MODULATED CLOSED TO REDUCE FLOW AS REQUIRED TO MAINTAIN SETPOINT AT TT-XX01. ONCE AIR FLOW HAS BEEN REDUCED TO MINIMUM OCCUPIED FLOW SETPOINT AT FT-XX01, HOT WATER VALVE FCV-XX02 SHALL BE MODULATED OPEN TO MAINTAIN SETPOINT AT TT-XX01. UPON A RISE IN TEMPERATURE AT TT-XX01, THE REVERSE SHALL OCCUR.

UNOCCUPIED MODE

- 1. VV BOX SHALL OPERATE AT FIXED PRESET FLOW RATE (CFM) SHOWN ON THE PLANS (UNOCCUPIED SETPOINT). THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR ROOM TEMPERATURE AT TRANSMITTER TT-XX01 AND AIR FLOW RATE AT FT-XX01. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV-XX01 AND HOT WATER FLOW VIA FCV-XX02.
- WHEN THE SPACE TEMPERATURE IS AT OR ABOVE THE UNOCCUPIED SETPOINT AT TT-XX01, HOT WATER VALVE FCV-XX02 SHALL BE FULLYCLOSED, AIR FLOW CONTROL DAMPER FCV-XX01 SHALL MODULATE AS REQUIRED TO MAINTAIN UNOCCUPIED FLOW SETPOINT AT FT-XX01. AS THE SPACE TEMPERATURE DROPS, HOT WATER VALVE FCV-XX02 SHALL BE MODULATED OPEN IN ORDER TO MAINTAIN UNOCCUPIED SETPOINT AT TT-XX01. UPON A RISE IN TEMPERATURE AT TT-XX01, FCV-XX02 SHALL MODULATE CLOSED.

TYPICAL VARIABLE AIR VOLUME BOX (VV) CONTROL DETAIL



SEQUENCE OF OPERATION

- 1. REQUIREMENTS APPLY TO ALL SEQUENCES OF "SEQUENCE OF OPERATION GENERAL" ON DRAWING M801.
- 2. VARIABLE AIR VOLUME EXHAUST/RETURN BOX (VVE) SHALL BE CONTROLLED BY A LOCAL (BOX MOUNTED) DIRECT DIGITAL CONTROLLER COMMUNICATING WITH THE BAS. ALL BOXES SHALL BE CAPABLE OF VARIABLE, TWO POSITION AND CONSTANT AIR VOLUME OPERATION. SEE TYPICAL SPACE SEQUENCES FOR OPERATING REQUIREMENTS.
- 3. AIRFLOW SETPOINT AND OCCUPANCY SCHEDULING SHALL BE ADJUSTABLE FROM THE BAS. THE BAS SHALL BE CAPABLE OF ADJUSTING SETPOINTS AND STATUS GLOBALLY AS WELL AS ON AN INDIVIDUAL BOX
- 4. THE VVE BOX SHALL BE SOFTWARE INTERLOCKED WITH SUPPLY VV BOX OR BOXES FEEDING THE APPLICABLE SPACE TO ALLOW FOR TEMPORARY OVERRIDE OFUNOCCUPIED SCHEDULE FOR A BAS DEFINED ADJUSTABLE TIME PERIOD (0.5 TO 12 HOURS).
- 5. ALL BOXES SHALL BE NORMALLY OPEN UNLESS NOTED OTHERWISE.
- 6. VVE BOX AIR FLOW RATE SETPOINT AS MEASURED AT FT-XX02 SHALL BE MAINTAINED BY THE LOCAL CONTROLLER REGARDLESS OF UPSTREAM PRESSURE (PRESSURE INDEPENDENT OPERATION). THE BAS SHALL MONITOR AND DISPLAY (UPON REQUEST) THE FLOW RATE OF ANY VVE

ALARMS

- 1. THE FOLLOWING SHALL INITIATE A SPECIFIC ALARM NOTICE AT THE BAS:
- a. AIR FLOW RATE 10% ABOVE SETPOINT FOR 5 CONSECUTIVE MINUTES.

b. AIR FLOW RATE 10% BELOW SETPOINT FOR 5 CONSECUTIVE MINUTES.

OCCUPIED MODE

1. VVE BOX SHALL OPERATE BETWEEN PRESET FLOW RATES (CFM) SHOWN ON THE PLANS (OCCUPIED MAXIMUM TO OCCUPIED MINIMUM). THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR AIR FLOW RATE AT FT-XX02. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV-XX03

- 2. WHERE THE PLANS INDICATE CONSTANT VOLUME EXHAUST/RETURN FOR OCCUPIED PERIODS (MAXIMUM AND MINIMUM FLOWS EQUAL ON PLANS), THE LOCAL CONTROLLER SHALL MODULATE FCV-XX02 TO MAINTAIN OCCUPIED FLOW SETPOINT.
- 3. WHERE THE PLANS INDICATE VARIABLE AIR VOLUME EXHAUST/RETURN FOR OCCUPIED PERIODS (MAXIMUM AND MINIMUM FLOWS NOT EQUAL ON PLANS), THE LOCAL CONTROLLER FLOW SETPOINT SHALL BE VARIED TO MAINTAIN THE DESIGN AIR FLOW DIFFERENTIAL DEFINED AS THE MATHEMATICAL DIFFERENCE BETWEEN THE SPACE MAXIMUM SUPPLY AND SPACE MAXIMUM EXHAUST/RETURN AS SHOWN ON THE PLANS. THE BAS SHALL MEASURE THE SUPPLY FLOW RATE SERVING THE APPLICABLE ZONE TO DETERMINE TOTAL FLOW INTO THE SPACE. THE BAS SHALL THEN SET THE VVE BOX FLOW SETPOINT AT FT-XX02 TO THE SUPPLY RATE PLUS THE DESIGN FLOW DIFFERENTIAL AS INDICATED ABOVE. THE LOCAL CONTROLLER SHALL MODULATE FCV-XX03 TO MAINTAIN THE VARIABLE SETPOINT FLOW RATE AT FT-XX02.

UNOCCUPIED MODE

- 1. VVE BOX SHALL OPERATE AT PRESET FLOW RATES (CFM) SHOWN ON THE PLANS (UNOCC UPIED SETPOINT). THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR AIR FLOW RATE AT FT-XX02. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV-XX03.
- 2. IN THE UNOCCUPIED MODE, VVE BOX SHALL CONTINUE TO OPERATE AS DESCRIBED FOR THE OCCUPIED PERIODS IN ORDER TO MAINTAIN DESIGN AIR FLOW DIFFERENTIAL. SEE OCCUPIED SEQUENCE ABOVE.

TYPICAL EXHAUST/RETURN VARIABLE AIR VOLUME BOX (VVE) CONTROL DETAIL

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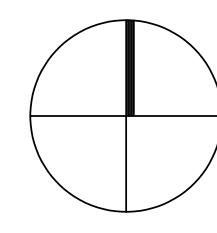
Architect

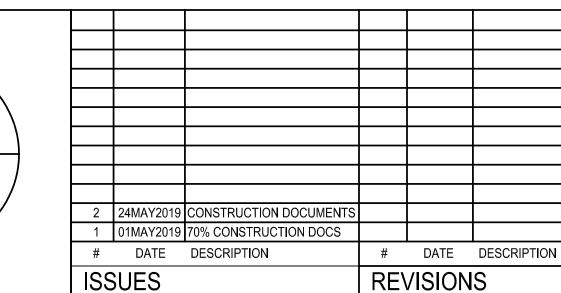
CONSTRUCTION DOCUMENTS

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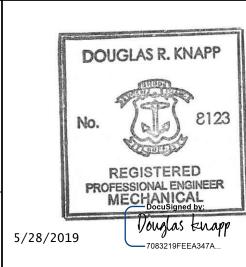
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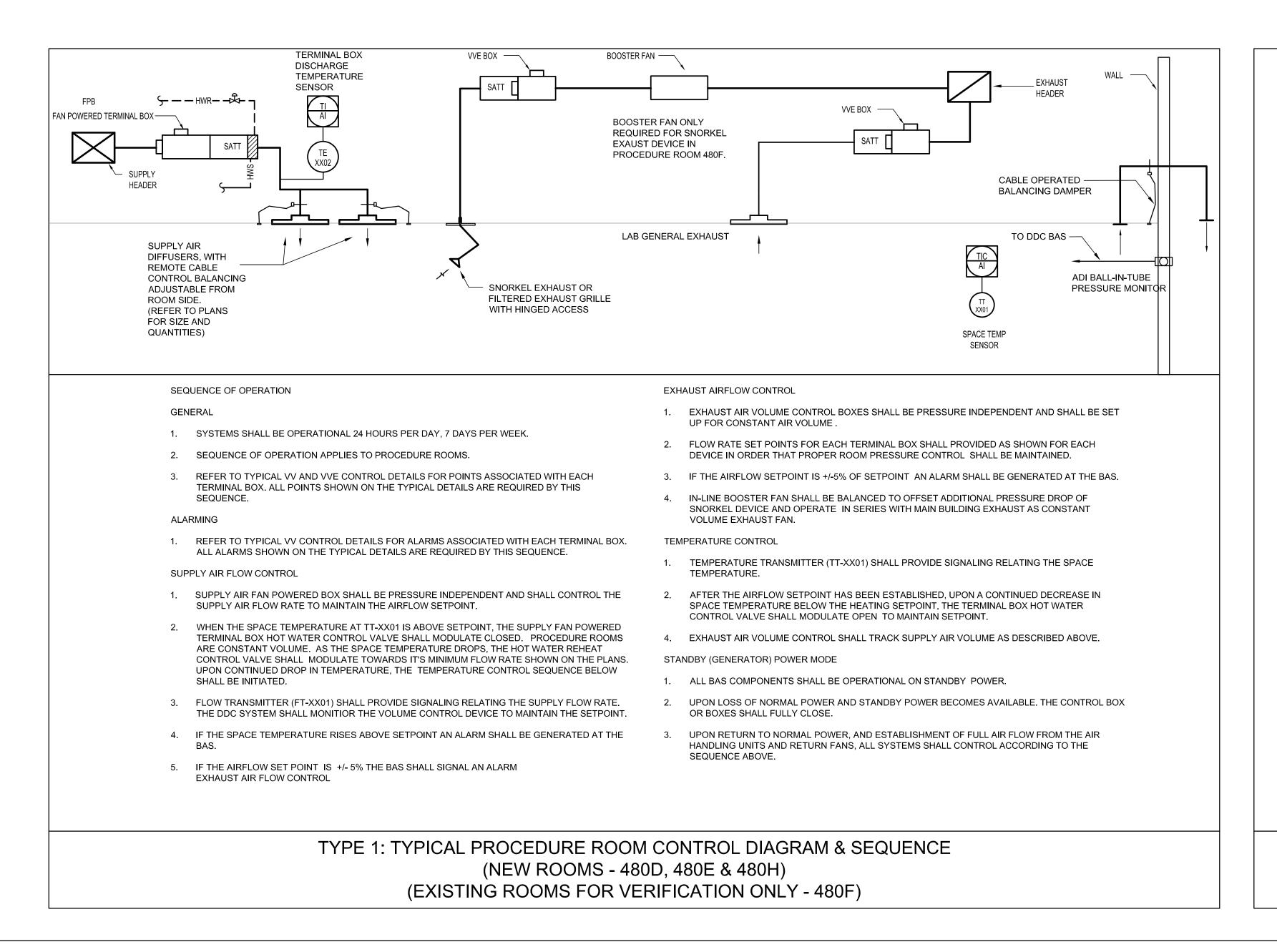
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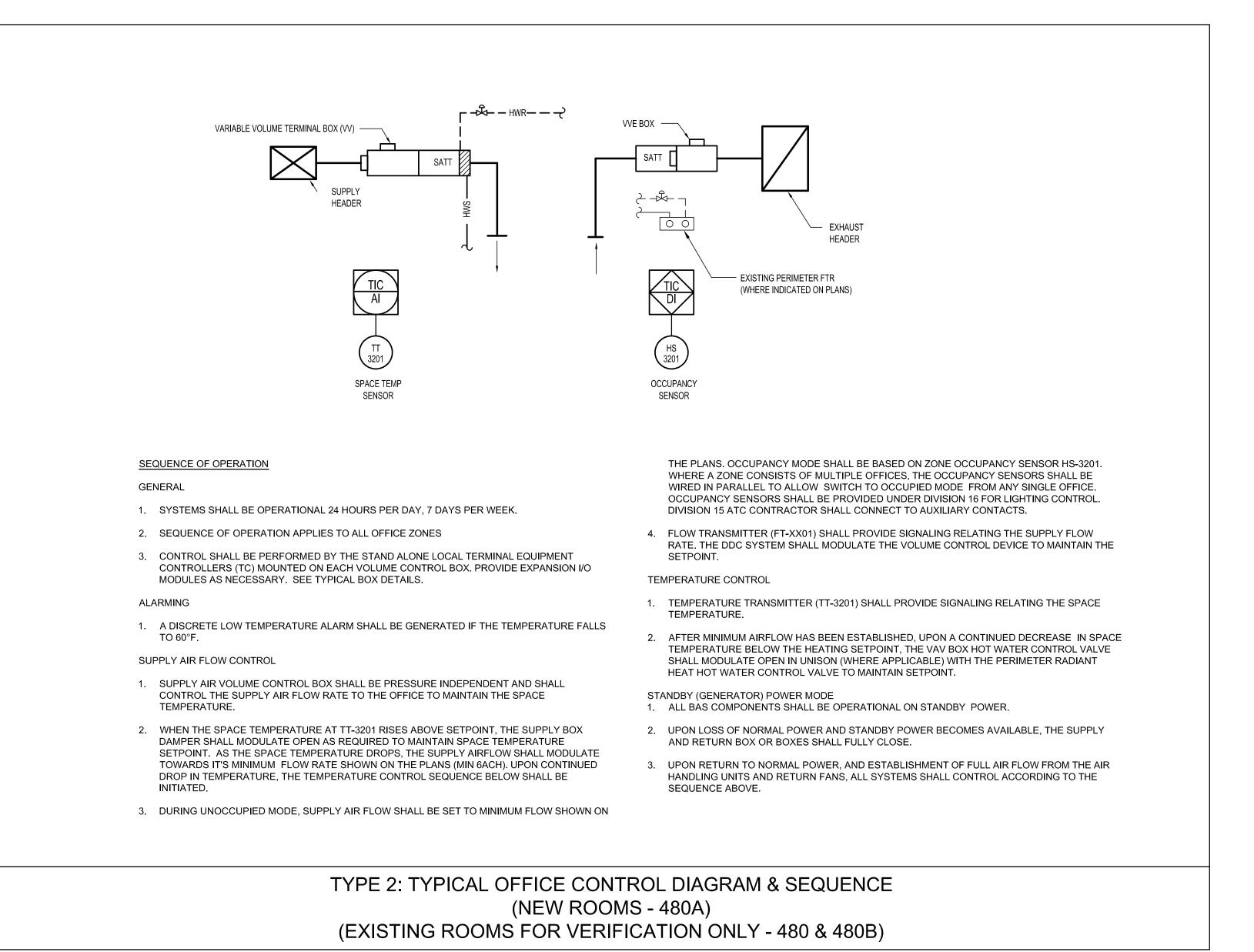
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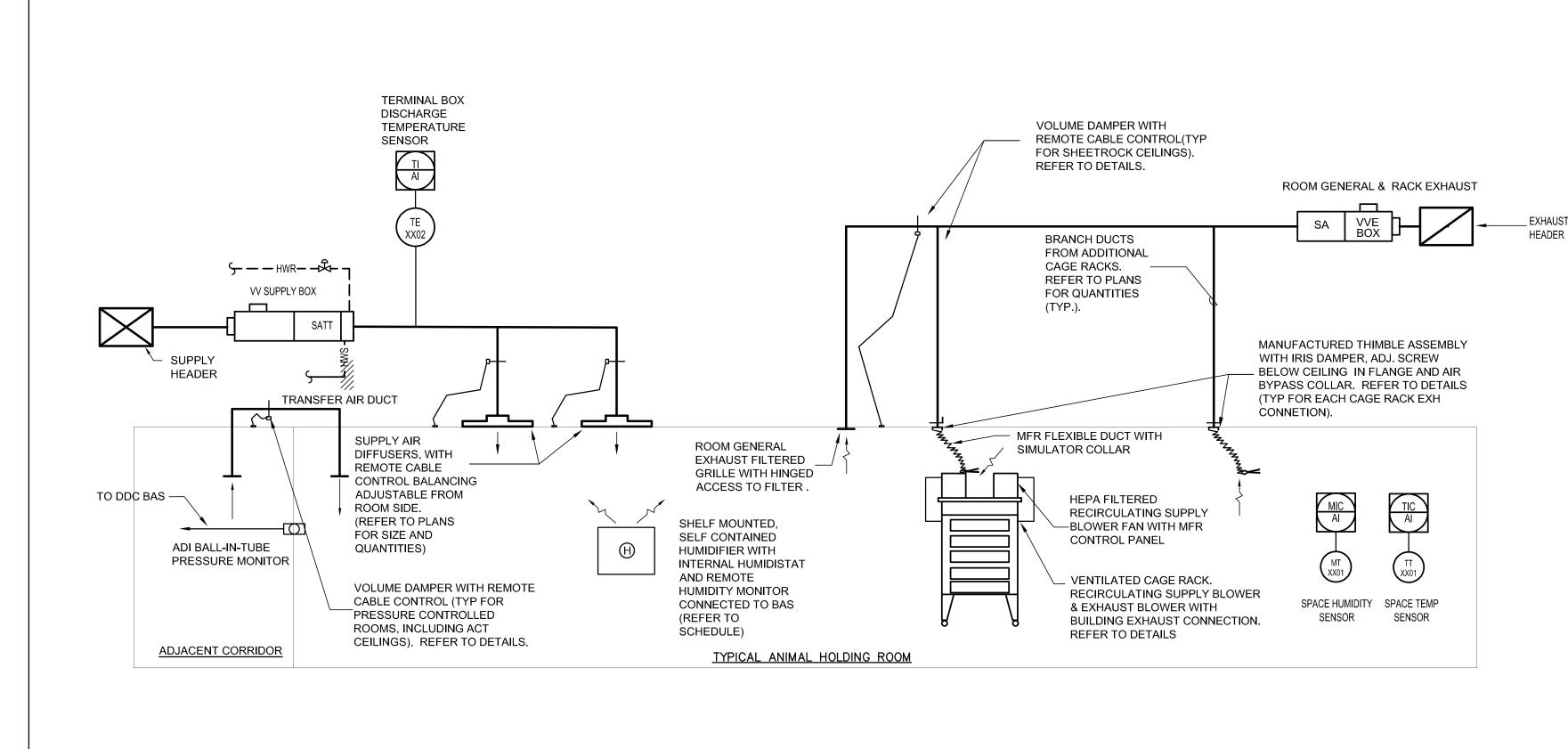
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SEQUENCE OF OPERATION

- 1. REQUIREMENTS OF "SEQUENCE OF OPERATION GENERAL" ON DRAWING M801 APPLY TO ALL SEQUENCES.
- 2. SUPPLY, VV AND EXHAUST, VVE BOX SYSTEMS SHALL BE OPERATIONAL 24 HOURS PER DAY, 7 DAYS PER WEEK
- 3. THIS SEQUENCE OF OPERATION APPLIES TO PROCEDURE ROOMS WITH VENTILATED CAGE RACKS.
- AS CONSTANT VOLUME WITH AN OFFSET TO ACHIEVE DESIRED ROOM PRESSURIZATION.

TYPICAL ANIMAL HOLDING ROOM SUPPLIED BY ONE SUPPLY VV BOX AND ONE EXHAUST VVE BOX. TERMINAL BOXES TYPICALLY OPERATE

- 4. REFER TO TYPICAL VV AND VVE BOX CONTROL DETAILS FOR POINTS ASSOCIATED WITH EACH TERMINAL BOX. ALL POINTS SHOWN ON THE TYPICAL DETAILS ARE REQUIRED BY THIS SEQUENCE.
- VENTILATED CAGE RACKS SHALL HAVE THE REQUIRED PRESSURE CONTROL SETTING ADJUSTED BY THE AIR BALANCER VIA MFR CONTROL PANEL. VIVARIUM STAFF SHALL COORDINATE THE CAGE RACK PRESSURE CONTROL SETTING WITH VIVARIUM OPERATIONS MANAGER AND AIR BALANCER AND CONTROLS CONTRACTOR. VIVARIUM OPERATIONS MANAGER SHALL CONFIRM CAGE RACK PRESSURE CONTROL SETTING DOES NOT CONFLICT WITH OVERALL ROOM PRESSURE CONTROL SET POINT CONDITIONS, WHICH ARE AVAILABLE FOR VIEWING VIA THE BAS.

- 1. ALARM POINTS SHOWN ON THE TYPICAL VV AND VVE BOX DETAILS ARE REQUIRED BY THIS SEQUENCE.
- 2. UPON A RISE IN SPACE HUMIDITY AT MT-3401 ABOVE SETPOINT(40% WINTER(ADJ.), 50% SUMMER), AN ALARM SHALL BE INITIATED AT THE BAS - DELAY 10 MINUTES. AFTER 1/2 HOUR A SECOND ALARM TO THE BAS SHALL PAGE VIVARIUM OPERATIONS MANAGER.
- 3. UPON A DROP IN SPACE HUMIDITY AT MT-XX01 BELOW 30 % SUMMER OR WINTER (ADJ.) SETPOINT, AN ALARM SHALL BE INITIATED AT THE BAS - DELAY 10 MINUTES. AFTER 1/2 HOUR A SECOND ALARM TO THE BAS SHALL PAGE VIVARIUM OPERATIONS MANAGER.
- 4. HUMIDITY HIGH LIMIT: IF HIGH LIMIT HUMIDITY SENSOR, MT -XX01 EXCEEDS 70% RH AN ALARM SHALL BE INITIATED AT THE BAS-DELAY 10 MINUTES. AFTER 1/2 HOUR THE BAS SHALL PAGE THE VIVARIUM OPERATIONS MANAGER.
- 5. NOTE THAT THE ROOM HUMIDIFIER UNIT IS OPERATED MANUALLY BY LAB STAFF.
- 6. UPON A RISE OR DROP IN SPACE TEMPERATURE AT TT-XX01 2°F ABOVE OR BELOW SETPOINT. AN ALARM SHALL BE INITIATED AT THE BAS-DELAY 10 MINUTES. AFTER 1/2 HOUR A SECOND ALARM TO THE BAS SHALL PAGE VIVARIUM OPERATIONS MANAGER.
- ROOM/RACK EXHAUST BOX SHALL BE CONSTANT AIR VOLUME TYPE. SETPOINT SHALL BE EQUAL TO THE TOTAL CAGE FLOW PLUS ROOM GENERAL EXHAUST (WHERE APPLICABLE) AS SHOWN ON PLANS. THE BAS SHALL MONITOR THE TOTAL FLOW AND ALARM IF MORE THAN 5% ABOVE OR BELOW SETPOINT.
- 8. ROOM SUPPLY BOX SHALL BE CONSTANT AIR VOLUME TYPE. SETPOINT SHALL BE AS SHOWN ON PLANS. THE BAS SHALL MONITOR THE TOTAL FLOW AND ALARM IF MORE THAN 5% ABOVE OR BELOW SETPOINT. EXHAUST AIR FLOW CONTROL
- TYPICAL ANIMAL HOLDING ROOMS
- A. ROOM EXHAUST VVE BOXES SHALL BE CONSTANT AIR VOLUME TYPE. FLOW SETPOINT SHALL BE AS SHOWN ON THE PLANS.
- B. THE EXHAUST VVE BOX FLOW TRANSMITTER SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE EXHAUST FLOW RATE THROUGH THE BOX.

SUPPLY AIR FLOW CONTROL

1. TYPICAL ANIMAL HOLDING ROOMS

- A. SUPPLY VARIABLE AIR VOLUME BOX (VV) SHALL CONTROL TO PROVIDE REQUIRED MAKEUP AIR TO THE ANIMAL HOLDING ROOM. THE SUPPLY BOX SHALL TRACK THE EXHAUST FROM THE VVE BOX TO DETERMINE SETPOINT AND OPERATE AT CONSTANT VOLUME CONTROL AS BALANCED BY THE AIR BALANCE AND CONTROLS CONTRACTORS.
- B. DURING ALL TIME PERIODS THE SUPPLY BOX OR BOXES SHALL PROVIDE FLOW, AND MAINTAIN ROOM PRESSURIZATION AS REQUIRED(REFER TO PLANS).
- C. THE VV BOX FLOW TRANSMITTER SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE SUPPLY FLOW RATE THROUGH THE BOX.

ROOM PRESSURE MONITORING

ROOM PRESSURE MONITORING VIA BALL IN TUBE "PING PONG BALL" VISUAL + BAS ALARM PRESSURE INDICATOR. IF A ROOM PRESSURE MONITOR DOES NOT MEET POSITIIVE OR NEGATIVE PRESSURE REQUIREMENTS, THE OCCUPANTS SHALL NOTIFY THE VIVARIUM OPERATIONS MANAGER AND THE BAS SHALL ALSO SEND ALARM AND NOTIFY VIVARIUM OPERATIONS MANAGER.

TEMPERATURE CONTROL

- 1. TEMPERATURE SENSOR TTE XX01 SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE SPACE TEMPERATURE.
- UPON A DECREASE IN SPACE TEMPERATURE BELOW THE HEATING SETPOINT, THE VV BOX HOT WATER CONTROL VALVE SHALL MODULATE OPEN TO MAINTAIN SETPOINT. UPON RISE IN TEMPERATURE, THE REVERSE SHALL OCCUR. THE HOT WATER VALVE SHALL BE FULLY CLOSED WHEN THE SPACE TEMPERATURE IS AT OR ABOVE SETPOINT.
- 3. VIVARIUM OPERATIONS MANAGER SHALL BE CAPABLE OF MODIFYING ROOM TEMPERATURE SET POINTS VIA THE BAS WITHIN A DESIGNATED TEMPERATURE RANGE WHEN REQUESTED BY OCCUPANTS OR BY ROOM WALL MOUNTED THERMOSTAT

SPACE HUMIDITY CONTROL

- HUMIDITY SENSOR MT-XX01 SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE SPACE HUMIDITY. HUMIDITY SENSOR SHALL BE LOCATED ON THE WALL ADJACENT TO THE ROOM THERMOSTAT.
- HUMIDIFIERS ARE MANUALLY CONTROLLED BY OCCUPANTS

STANDBY (GENERATOR) POWER MODE

ALL BAS COMPONENTS SHALL BE OPERATIONAL ON STANDBY POWER.

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- 2. UPON LOSS OF NORMAL POWER AND STANDBY POWER BECOMES AVAILABLE, THE SUPPLY AND EXHAUST VOLUME CONTROL BOXES SHALL OPERATE AS INDICATED ABOVE.
- MAIN BUILDING SUPPLY AND EXHAUST AIR SYSTEMS HAVE REDUCED NUMBER OF UNITS IN OPERATION DURING A POWER OUTAGE AND ONLY A LIMITED AMOUNT OF AIR MAY BE AVAILABLE FOR THE VIVARIUM DURING THIS TIME. AIR BALANCE AND CONTROLS CONTRACTORS SHALL DETERMINE HOW MUCH AIR IS AVAILABLE FOR THE VIVARIUM DURING AN EMERGENCY POWER OUTAGE SITUATION DURING THE COMMISSIONING OF THE NEW VIVARIUM SUITE AND DOCUMENT AIR QUANTITIES FOR THIS SCENARIO.
- 4. UPON RETURN TO NORMAL POWER, AND ESTABLISHMENT OF FULL AIR FLOW FROM THE PENTHOUSE AIR HANDLING UNITS AND EXHAUST FANS, ALL SYSTEMS SHALL CONTROL ACCORDING TO THE SEQUENCES ABOVE.

HISTORIES/TRENDING & REPORTS

THE BAS SOFTWARE SHALL BE CAPABLE OF RECORDING AND PRODUCING REPORTS TO DOCUMENT ALL READINGS ASSOCIATED WITH EACH ZONE AND DEVICE SHOWN. INCLUDE GRAPHING CAPABILITY IN REPORT GENERATING SOFTWARE. DATA RECORDING SHALL BE CAPABLE OF STORING THE READINGS, PER THE FREQUENCY REQUIRED BY THE VIVARIUM STAFF IN ORDER TO MEET THEIR AAALAC OBLIGATIONS. SOFTWARE SHALL ALSO BE CAPABLE OF REPORTING DAILY AND MONTHLY HIGH/LOW PEAK READINGS. REPORTS ARE INTENDED TO BE SUBMITTED AS PART OF AAALAC ACCREDITATION DOCUMENTATION. REPORTING FREQUENCY SHALL BE VALIDATED BY

TYPE 3: TYPICAL SMALL ANIMAL HOLDING ROOM WITH VENTILATED CAGE RACK SEQUENCE (EXISTING ROOMS FOR VERIFICATION ONLY - 480C & 480G)

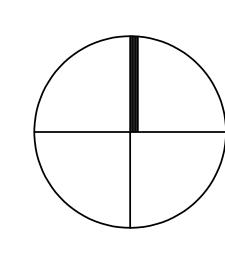
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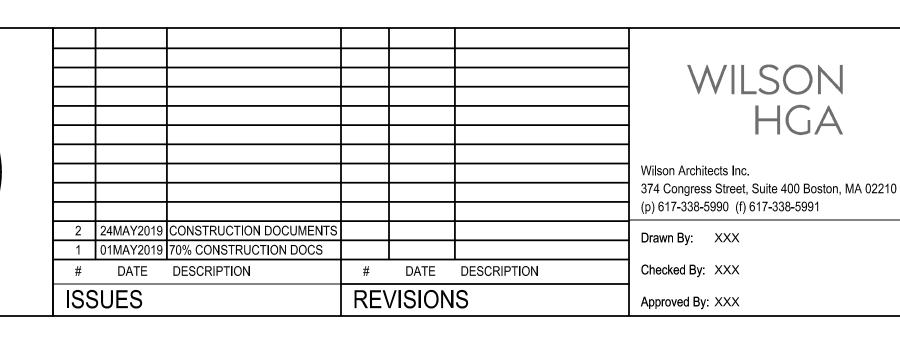
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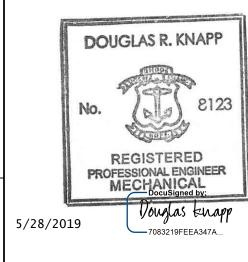
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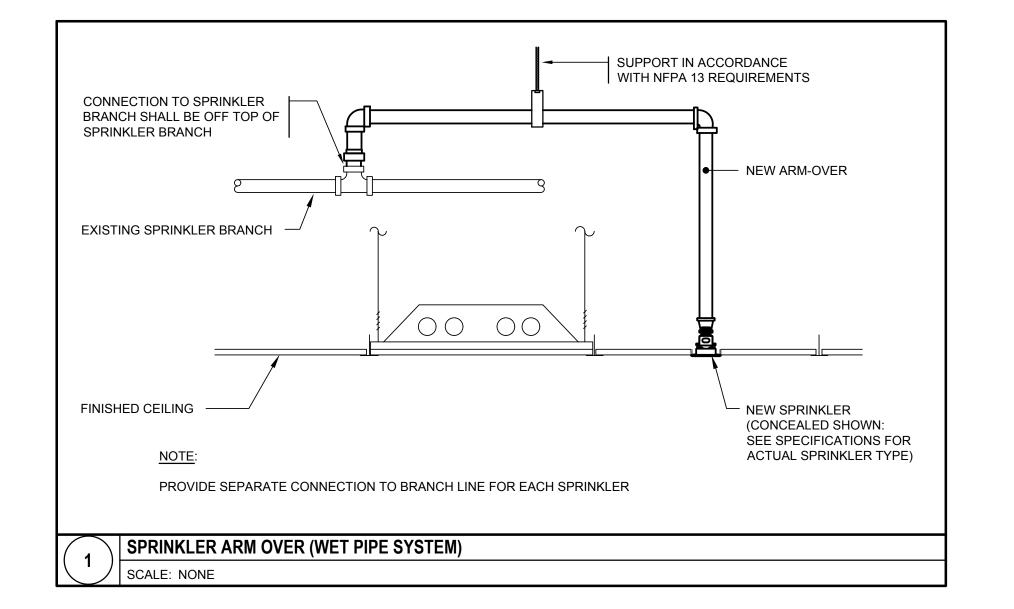
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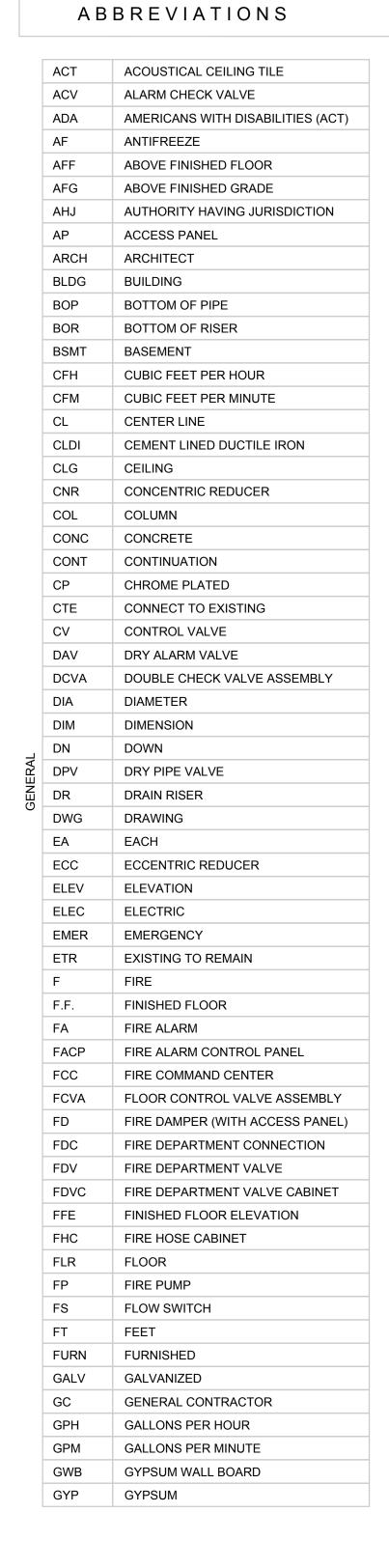


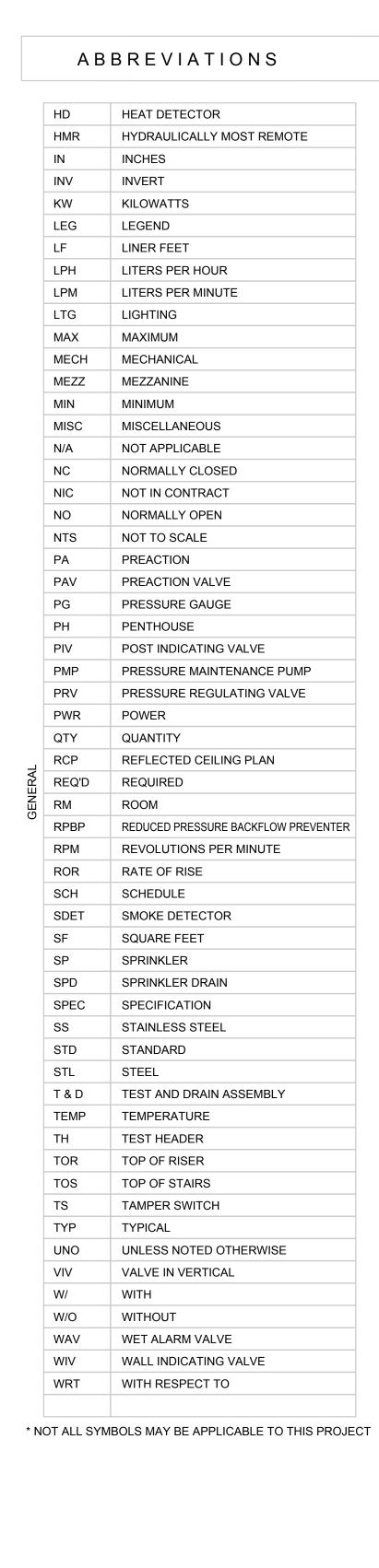




24 MAY 2019 Drawing Scale **CONTROLS**











p 401.874.2444

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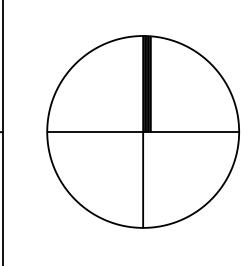
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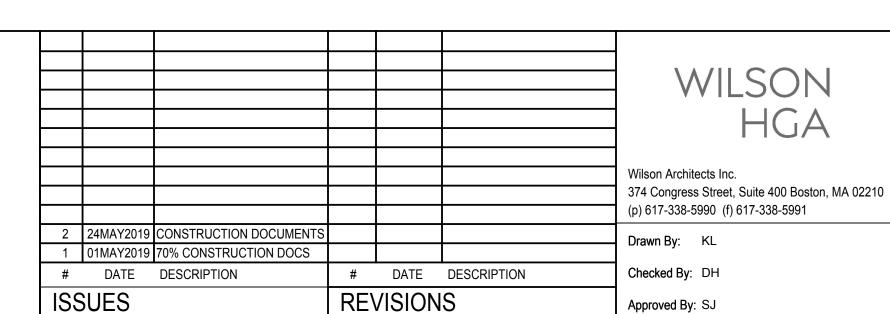
CONSTRUCTION DOCUMENTS

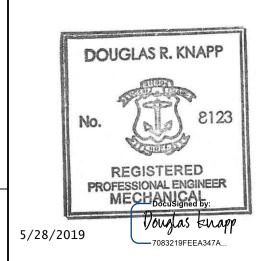
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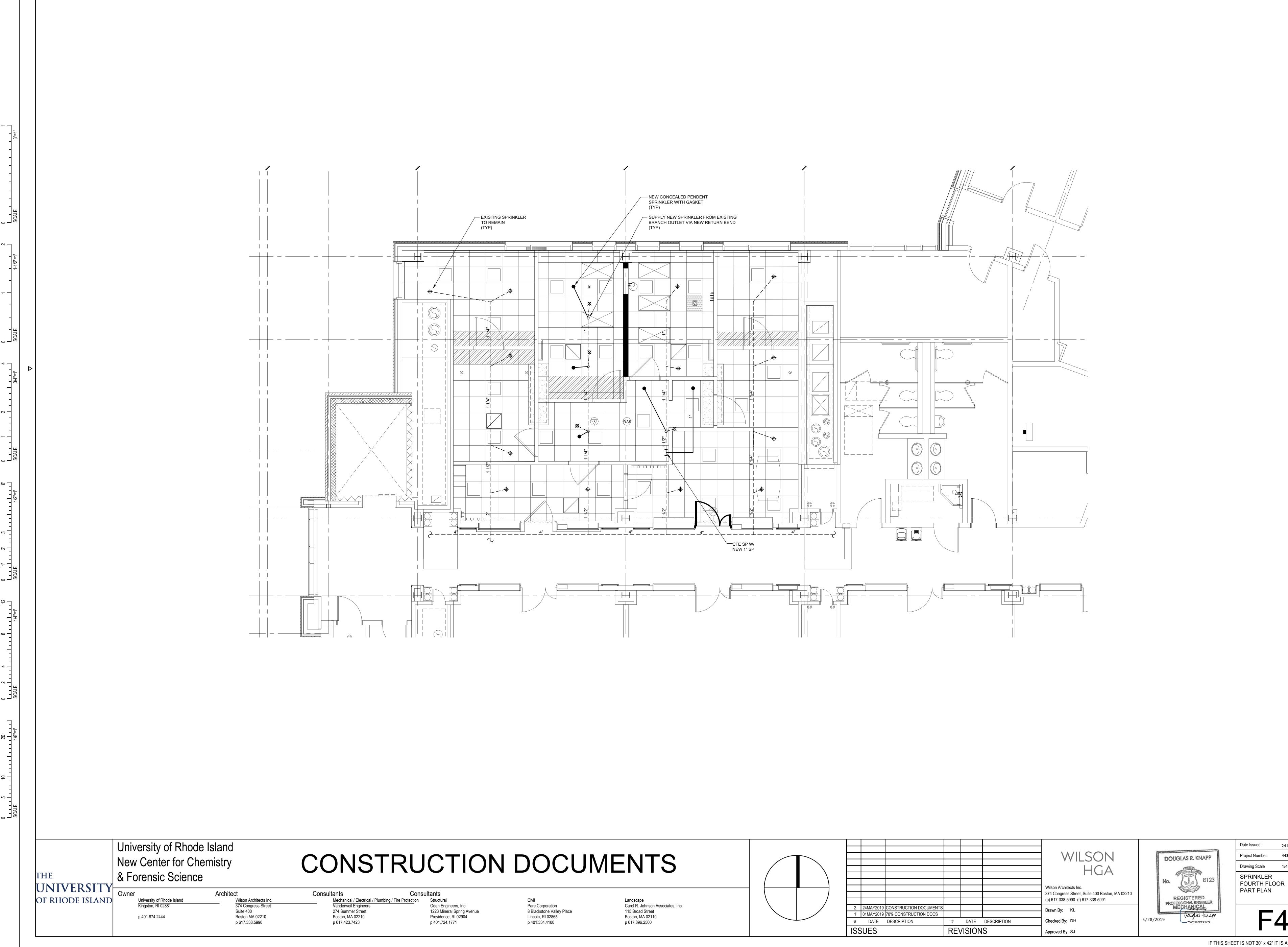
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Date Issued 24 MAY 2019 Drawing Scale SPRINKLER LEGEND



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24 MAY 2019

GENERAL NOTES

- 1. GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO ALL DRAWINGS
- 2. DRAWINGS ARE DIAGRAMMATIC: DETERMINE LOCATIONS OF SYSTEMS AND
- 3. DIMENSIONS SHOWN ON PLAN ARE HORIZONTAL. DIMENSIONS SHOWN IN ELEVATION ARE VERTICAL.
- 4. DETERMINE EXACT LOCATIONS OF EXISTING UTILITIES IN FIELD, WHETHER OR NOT SHOWN ON DRAWINGS. EXERCISE CAUTION AND IDENTIFY LOCATIONS OF UNMARKED UTILITY LINES AS NECESSARY TO PERFORM WORK OF THIS SECTION.
- 5. ALL PLUMBING WORK SHALL BE IN ACCORDANCE WITH THE LATEST PLUMBING CODE AND ALL APPLICABLE LOCAL CODES.
- 6. IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO COORDINATE THE WORK WITH THAT OF ALL OTHER TRADES, INCLUDING BUT NOT LIMITED TO, ELECTRICAL, HVAC, PROCESS PIPING, SPRINKLER, PLUMBING STRUCTURAL AND GENERAL ARCHITECTURE.
- 7. ANY INTERFERENCE SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE, AND SHALL BE RESOLVED PRIOR TO THE INSTALLATION OF THE
- 8. ALL PIPING PENETRATING CEILINGS AND WALLS SHALL BE INSTALLED WITH ESCUTCHEONS AT THE PENETRATION. ALL PIPING PENETRATING EXTERIOR WALLS AND ROOFS SHALL BE FLASHED IN AN APPROVED MANNER AND SHALL BE SEALED WEATHERTIGHT. PIPING PENETRATING FIRE RATED PARTITIONS SHALL BE PROVIDED WITH FIRE RATED SEALS AS REQUIRED BY LOCAL CODE AUTHORITY.
- 9. MANUFACTURERS' MODEL NUMBERS ARE SPECIFIED SOLELY TO ESTABLISH STANDARDS OF QUALITY FOR PERFORMANCE AND MATERIALS.
- 10. INSTALLATION SHALL ADHERE TO MANUFACTURERS' RECOMMENDATIONS.
- 11. PROVIDE ACCESS PANELS TO SYSTEM COMPONENTS THAT ARE CONCEALED AND REQUIRE PERIODIC SERVICE.
- 12. TOPS OF ALL FLOOR DRAINS SHALL BE SET FLUSH WITH FINISHED FLOOR. ALL PIPING ABOVE GRADE SHALL BE PROPERLY SUPPORTED BY THE BUILDING STRUCTURE AND SHALL NOT REST ON CEILING STRUCTURE OR COMPONENTS.
- 13. ALL PLUMBING EQUIPMENT, PIPING, INSULATION, ETC., INSTALLED IN HVAC PLENUM SPACES SHALL MEET CODE REQUIREMENTS FOR SMOKE AND
- 14. PROVIDE SHUTOFF VALVES ON ALL BRANCH PIPING AND ON ALL SUPPLIES TO INDIVIDUAL FIXTURES AND EQUIPMENT. PROVIDE BALL VALVES ON ALL WATER MAIN BRANCHES IN CORRIDORS AND WHERE INDICATED ON DRAWINGS.
- 15. PROVIDE CLAMPS, OFFSETS, EXPANSION JOINTS, ANCHORS AND GUIDES AS NECESSARY TO PREVENT STRESS ON PIPING.
- 16. PROVIDE VENTS AT HIGH POINTS IN PIPING SYSTEMS AND DRAIN VALVES AT LOW
- 17. PITCH PRESSURE PIPING IN DIRECTION OF FLOW.
- 18. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT.

SPECIFICATION INFO

1. REFER TO BASE BUILDING SPECIFICATIONS FOR MATERIALS AND INSTALLATION REQUIREMENTS.

DEMOLITION NOTES

1. PROJECT CONDITIONS

- a. THE CONTRACTOR SHALL COMPLETELY FAMILIARIZE HIMSELF WITH ALL EXISTING BUILDING AND SITE CONDITIONS AND LIMITATIONS WHICH MAY HAVE A BEARING ON THE OPERATIONS HEREIN SPECIFIED. AND SHALL INCLUDE ALL WORK REQUIRED TO COMPLETE THE PROJECT AS SHOWN ON THE DRAWINGS. NO EXTRA COMPENSATION WILL BE ALLOWED FOR UNFORESEEN CONDITIONS THAT CAN BE DETERMINED FROM A CAREFUL EXAMINATION OF THE SITE AND AREAS TO BE
- b. ITEMS OF VALUE WHICH ARE NOT INDICATED TO BE RETURNED TO THE OWNER, SHALL BECOME THE PROPERTY OF THE CONTRACTOR. STORAGE OR SALE OF ITEMS ON THE PROJECT SITE IS PROHIBITED.
- c. PROTECTION: ENSURE THE SAFE PASSAGE OF PERSONS IN AND AROUND THE BUILDING DURING DEMOLITION. PREVENT INJURY TO PERSONS AND DAMAGE TO PROPERTY. PROVIDE ADEQUATE SHORING AND BRACING TO PREVENT COLLAPSE. IMMEDIATELY REPAIR DAMAGED PROPERTY TO THE CONDITION BEFORE BEING DAMAGED. TAKE EFFECTIVE MEASURES TO PREVENT DUST MIGRATION.
- d. UTILITIES: MAINTAIN ALL UTILITIES EXCEPT THOSE REQUIRING REMOVAL OR RELOCATION. KEEP UTILITIES IN SERVICE AND PROTECT FROM DAMAGE. DO NOT INTERRUPT UTILITIES SERVING USED AREAS WITHOUT FIRST OBTAINING PERMISSION FROM THE OWNER. PROVIDE TEMPORARY SERVICES AS REQUIRED. COORDINATE ALL WORK WITH

e. ALL WORK MUST BE COORDINATED W/ OWNER PRIOR TO ANY COMMENCEMENT OF WORK.

2. SCOPE OF WORK

PERFORM WORK AND PROVIDE MATERIAL AND EQUIPMENT AS SHOWN ON DRAWINGS AND AS SPECIFIED IN THIS SECTION OF SPECIFICATIONS. GIVE NOTICES, FILE PLANS, OBTAIN PERMITS FROM AUTHORITIES THAT HAVE JURISDICTION AS REQUIRED TO PERFORM WORK IN ACCORDANCE WITH ALL LEGAL REQUIREMENTS AND WITH SPECIFICATIONS AND DRAWINGS.

- 3. REGULATORS REQUIREMENTS
- a. STRICTLY COMPLY WITH APPLICABLE CODES, REGULATIONS AND REQUIREMENTS OF AUTHORITY HAVING JURISDICTION.
- 4. HANDLING OF MATERIALS
- a. REMOVE ALL MATERIAL DEBRIS FROM THE SITE AS IT ACCUMULATES. DO NOT STORE, SELL, BURN, OR OTHERWISE DISPOSE OF DEBRIS ON SITE. REMOVE ALL MATERIALS IN SUCH MANNER AS TO PREVENT SPILLAGE. KEEP ALL PAVEMENTS AND AREAS ADJACENT TO AND LEADING FROM THE SITE, CLEAN AND FREE OF MUD, DIRT, AND DEBRIS AT ALL TIMES.
- 5. TRANSFER OF RESPONSIBILITY AND DISPOSITION OF MATERIALS
- a. UPON RECEIPT OF NOTICE TO PROCEED WITH THE WORK, THE TITLE TO ALL MATERIALS FOR DEMOLITION SHALL BE VESTED IN THE CONTRACTOR WHEREUPON THE OWNER WILL NOT BE RESPONSIBLE FOR THE CONDITION, LOSS, OR DAMAGE TO SAID PROPERTY. ALL SUCH ITEMS SHALL BE REMOVED FROM THE OWNER'S PROPERTY.
- 6. CLEAN-UP AND REPAIR

a. UPON COMPLETION OF DEMOLITION WORK, REMOVE TOOLS, EQUIPMENT AND DEMOLISHED MATERIALS FROM SITE. REMOVE PROTECTION AND LEAVE INTERIOR AREAS BROOM CLEAN.

b. REPAIR DEMOLITION PERFORMED IN EXCESS OF THAT REQUIRED. RETURN STRUCTURES AND SURFACES TO EXISTING CONDITION PRIOR TO COMMENCEMENT OF SELECTIVE DEMOLITION WORK. REPAIR ADJACENT CONSTRUCTION OR SURFACES SOILED OR DAMAGED BY SELECTIVE DEMOLITION WORK.

ABBREVIATIONS

	CWS	CHILLED DRINKING WATER SUPPLY						
OZ.	CWR	CHILLED DRINKING WATER RETURN						
WATER	CW	COLD WATER (-)						
	 	EMERGENCY TEMPERED WATER						
DOMESTIC	HW	HOT WATER ()						
Ž.	HWR	HOT WATER RETURN ()						
2	NPCW	NON-POTABLE COLD WATER (NP-)						
	W	WATER SERVICE						
	140F HW	140° HOT WATER SUPPLY (140°F)						
	140F HWR	140° HOT WATER RETURN (140°F)						

AREA DRAIN

AD

		BWV	BACK WATER VALVE
		CI	CAST IRON
		СО	CLEANOUT
		DD	DECK DRAIN
		DS	DOWN SPOUT BOOT
		FCO	FLOOR CLEANOUT
		FD	FLOOR DRAIN
		FM	FORCE MAIN
		FS	FLOOR SINK
		GV	GARAGE VENT
		GD	GARAGE DRAIN
		GCO	GRADE CLEANOUT
		Gl	GREASE INTERCEPTOR
		GT	GREASE TRAP
		IW	INDIRECT WASTE
	پږ	KW	KITCHEN WASTE
	DRAINAGE	OED	OPEN END DRAIN
	RA	OD	OVERFLOW ROOF DRAIN (SECONDARY)
	۵	PD	PLANTER DRAIN W/ MESHSCREEN
		RW	RAINWATER
		SAN	SANITARY
		RD	ROOF DRAIN
		SS	SOIL STACK

SUB SOIL DRAINAGE

TRENCH DRAIN

VENT STACK

WALL CLEANOUT

WASTE STACK

VENT

WASTE

W & V WASTE & VENT

	AR	ARGON								
	ВА	BREATHING AIR								
	C02	CARBON DIOXIDE								
	CA	COMPRESSED AIR								
	CAI	COMPRESSED AIR INTAKE								
	CA -#	COMPRESSED AIR - #PSI								
	EOC	EMERGENCY OXYGEN CONNECTION								
	G	GAS (NATURAL)								
	GAP	GAS ALARM PANEL								
	GVC	GAS VALVE CABINET								
	HE	HELIUM								
	H2	HYDROGEN								
	LGAP	LOCAL GAS ALARM PANEL								
	MGAP	MASTER GAS ALARM PANEL								
!	MA	MEDICAL AIR								
5	MGCV	MEDICAL GAS CONTROL VALVE								
	EVAC	MEDICAL GAS EVACUATION								
	MVAC	MEDICAL VACUUM								
	N2	NITROGEN								
	N2 -#	NITROGEN - #PSI								
	NCP	NITROGEN CONTROL PANEL								
	N20	NITROUS OXIDE								
	02	OXYGEN								
	03	OZONE								
	PA	PATIENT AIR								
	Р	PROPANE								
	SP	SPECIAL GAS								
	VAC	VACUUM								
	VE	VACUUM EXHAUST								
	\/T	VACUULA TRAD								

* NOT ALL SYMBOLS MAY BE APPLICABLE TO THIS PROJECT

VACUUM TRAP

ZONE VALVE BOX

ABBREVIATIONS

ABOVE FINISHED FLOOR

FINISHED FLOOR ELEVATION

FAIL OPEN

GALVANIZED

GATE VALVE

GALLON PER DAY

GALLON PER MINUTE

GAS WATER HEATER

GENERAL CONTRACTOR

HANDICAPPED ACCESSIBLE

GRADE CLEANOUT

HORSE POWER

INDIRECT WASTE

INSIDE DIAMETER

HERTZ

INCHES

INVERT

MANHOLE

MOUNTED

MIXING VALVE

NORMALLY CLOSED

NORMALLY OPEN

NOT IN CONTRACT

POLYPROPYLENE

OUTSIDE SCREW & YOKE

PLUMBING CONTRACTOR

POUNDS PER SQUARE INCH

PRESSURE REDUCING VALVE

PRESSURE VACUUM BREAKER

REINFORCED CONCRETE PIPE

T & P TEMPERATURE & PRESSURE RELIEF VALVE

POLYVINYL CHLORIDE

ROUNDS PER MINUTE

STEAM WATER HEATER

SQUARE FOOT

TRAP PRIMER

WATER METER

ACID VENT

ACID WASTE

LABORATORY VENT

LABORATORY WASTE

LW-DW LABORATORY WASTE-DOUBLE WALL

LW-FM LABORATORY WASTE-FORCE MAIN

SPECIAL VENT SPECIAL WASTE

LABORATORY WASTE MANHOLE

VALVE IN VERTICAL

VENT THROUGH THE ROOF

WATER HAMMER ARRESTOR

DOUBLE WALL CONTAINMENT SYSTEM

ST.ST. STAINLESS STEEL

PROVIDED UNDER OTHER SECTION

REDUCED PRESSURE BACKFLOW PREVENTOR

OUTSIDE DIAMETER OR OVERFLOW DRAIN

NOT TO SCALE

ON CENTER

PHRASE

FO

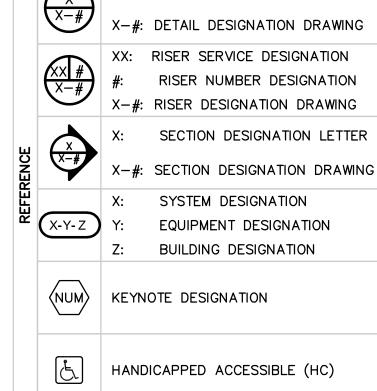
GPM

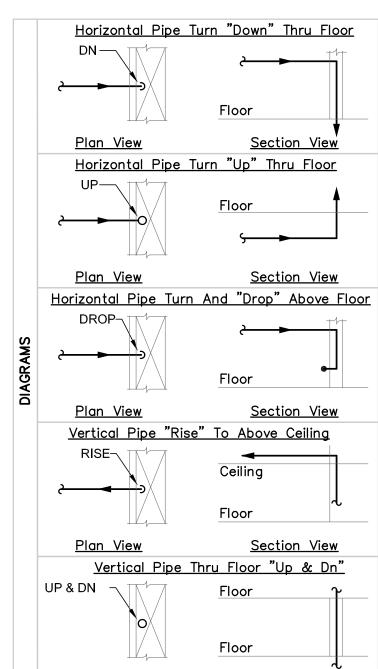
HZ

MTD

AIR CHAMBER ————————————————————————————————————							
ACCESS PANEL VENT PIPE (ABOVE GRADE)							
ATMOSPHERIC VACUUM BREAKER — — PIPE (BELOW GRADE)							
BALL VALVE VENT PIPE (BELOW GRADE)							
BUILDING							
CUBIC FEET PER MINUTE							
CUBIC FEET PER SECOND		_	OHIDMENT				
CAST IRON			QUIPMENT				
CEILING							
CEMENT LINED DUCTILE IRON		L(2)	EMERGENCY EYEWASH				
CHECK VALVE	જ						
HOT WATER CIRCULATING PUMP #	EOL		EMERGENCY SHOWER				
CHROME PLATED	AN		EMERGENCT SHOWER				
CONTINUATION	GEL		RPBP OR RPZ				
CONNECT TO EXISTING	M N						
DIAMETER		₽₽	CARTRIDGE FILTER				
DOWN		Ų	CANTRIDGE FIETER				
DRAWING							
ELEVATION							
ELECTRIC WATER HEATER REFERENCE							
EQUAL							
EXISTING TO BE REMOVED							
EXISTING TO REMAIN X: DETAIL DESIGNATION NUMBER							
FAIL CLOSED		$\left(\frac{x}{x-\#}\right)$	V " DETAIL DECIDINATION DE AMINO				
	ACCESS PANEL ATMOSPHERIC VACUUM BREAKER BALL VALVE BUILDING CUBIC FEET PER MINUTE CUBIC FEET PER SECOND CAST IRON CEILING CEMENT LINED DUCTILE IRON CHECK VALVE HOT WATER CIRCULATING PUMP # CHROME PLATED CONTINUATION CONNECT TO EXISTING DIAMETER DOWN DRAWING ELEVATION ELECTRIC WATER HEATER EQUAL EXISTING TO BE REMOVED EXISTING TO REMAIN	ACCESS PANEL ATMOSPHERIC VACUUM BREAKER BALL VALVE BUILDING CUBIC FEET PER MINUTE CUBIC FEET PER SECOND CAST IRON CEILING CEMENT LINED DUCTILE IRON CHECK VALVE HOT WATER CIRCULATING PUMP # CHROME PLATED CONTINUATION CONNECT TO EXISTING DIAMETER DOWN DRAWING ELEVATION ELECTRIC WATER HEATER EQUAL EXISTING TO BE REMOVED EXISTING TO REMAIN	ACCESS PANEL ATMOSPHERIC VACUUM BREAKER BALL VALVE BUILDING CUBIC FEET PER MINUTE CUBIC FEET PER SECOND CAST IRON CEILING CEMENT LINED DUCTILE IRON CHECK VALVE HOT WATER CIRCULATING PUMP # CHROME PLATED CONTINUATION CONNECT TO EXISTING DIAMETER DOWN DRAWING ELEVATION ELECTRIC WATER HEATER EQUAL EXISTING TO BE REMOVED EXISTING TO REMAIN				

REFERENCE





<u>Plan View</u>

Drawn By: KL

Checked By: DH

Approved By: SJ

PIPE LINETYPES SYMBOLS

	PIPE (EXISTING)	Ď,	AUTO-VENT
	PIPE (ABOVE GRADE)	≥— BF	BLIND FLANGE
	VENT PIPE (ABOVE GRADE)	•	CONNECT TO EXISTI
	PIPE (BELOW GRADE)	٦	CAP OR END OF PI
	VENT PIPE (BELOW GRADE)	•	CONCENTRIC REDUC
			CONCENTRIC REDUC
		≟ OR ≒	CUT LINE
FOII	IDMENT	>	DIRECTION OF FLOW

DIRECTION OF SLOPE

☐ | ECCENTRIC REDUCER

☐ ECCENTRIC REDUCER

■ ECCENTRIC REDUCER

M FLEXIBLE CONNECTION

← HC HOSE CONNECTION (GENERIC)

C PIPE FITTING DOWN OR DROP

Z QUICK DISCONNECT − FEMALE

PIPE SLEEVE OR BEAM PENETRATION

O PIPE FITTING TEE DOWN

UNION FITTING

VACUUM RELIEF

Y STRAINER W/ VALVE

→ WATER HAMMER ARRESTOR

WATERPROOF SLEEVE

BACK WATER VALVE

□ ROOF DRAIN (PRIMARY)

☑ ROOF DRAIN (OVERFLOW)

O PIPE FITTING UP

ETBR

HEAT TRACE

如证 IN-LINE MIXER

PIPE ANCHOR

PIPE BREAK

⊶© SIGHT GLASS

──────── WALL HYDRANT

☐ FLOOR DRAIN

TRENCH DRAIN

ANGLE VALVE

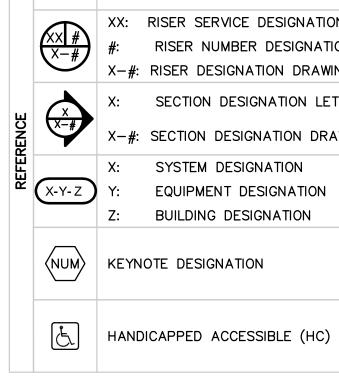
DO P TRAP

CLEANOUT

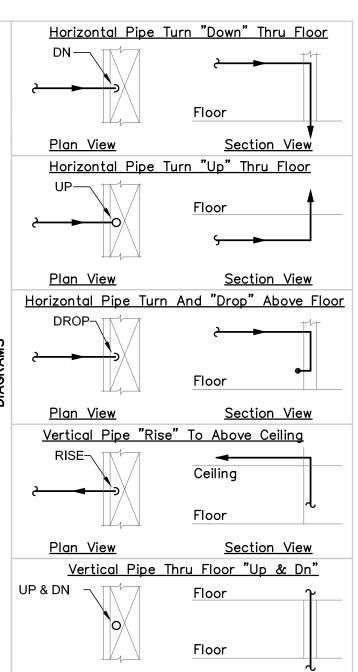
HOOH EXPANSION JOINT

EQUIPMENT

MISCELLANEOUS		EMERGENCY EYEWASH					
	③	EMERGENCY SHOWER					
	\bowtie	RPBP OR RPZ					
	کیاب	CARTRIDGE FILTER					



PIPE DIRECTION



■ BALL VALVE BALANCING VALVE I∕I BUTTERFLY VALVE
 M
 CHECK VALVE
 DIAPHRAGM VALVE (CLOSED) DIAPHRAGM VALVE (OPEN) FOUR WAY VALVE FUSIBLE LINK VALVE

▼ GAS COCK GATE VALVE (CLOSED) GATE VALVE (OPEN)

□ GATE VALVE (OPEN) KNIFE GATE VALVE MIXING VALVE NEEDLE VALVE

NEEDLE VALVE OS&Y VALVE PINCH VALVE POST VALVE PRESSURE REDUCING VALVE

THREE WAY BALL VALVE THREE WAY CONTROL VALVE TWO WAY CONTROL VALVE → VALVE IN THE VERTICAL

SOLENOID VALVE

TEMP. & PRESSURE RELIEF VALVE

FLOW METER FLOW SWITCH

-@ PRESSURE INDICATOR W/BALL VALVE RESISTIVITY METER TEMP. INDICATOR W/BALL VALVE

University of Rhode Island New Center for Chemistry

CONSTRUCTION DOCUMENTS

p 401.874.2444

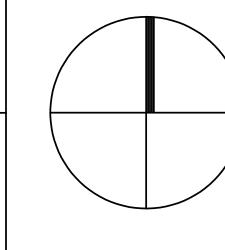
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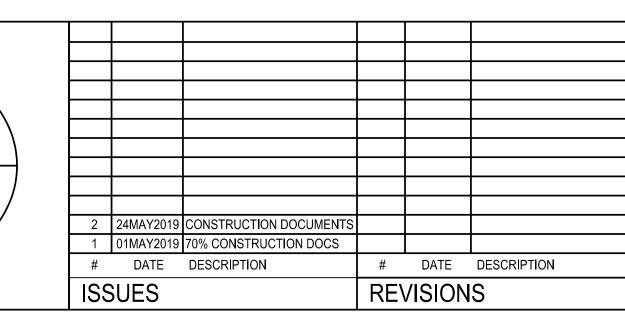
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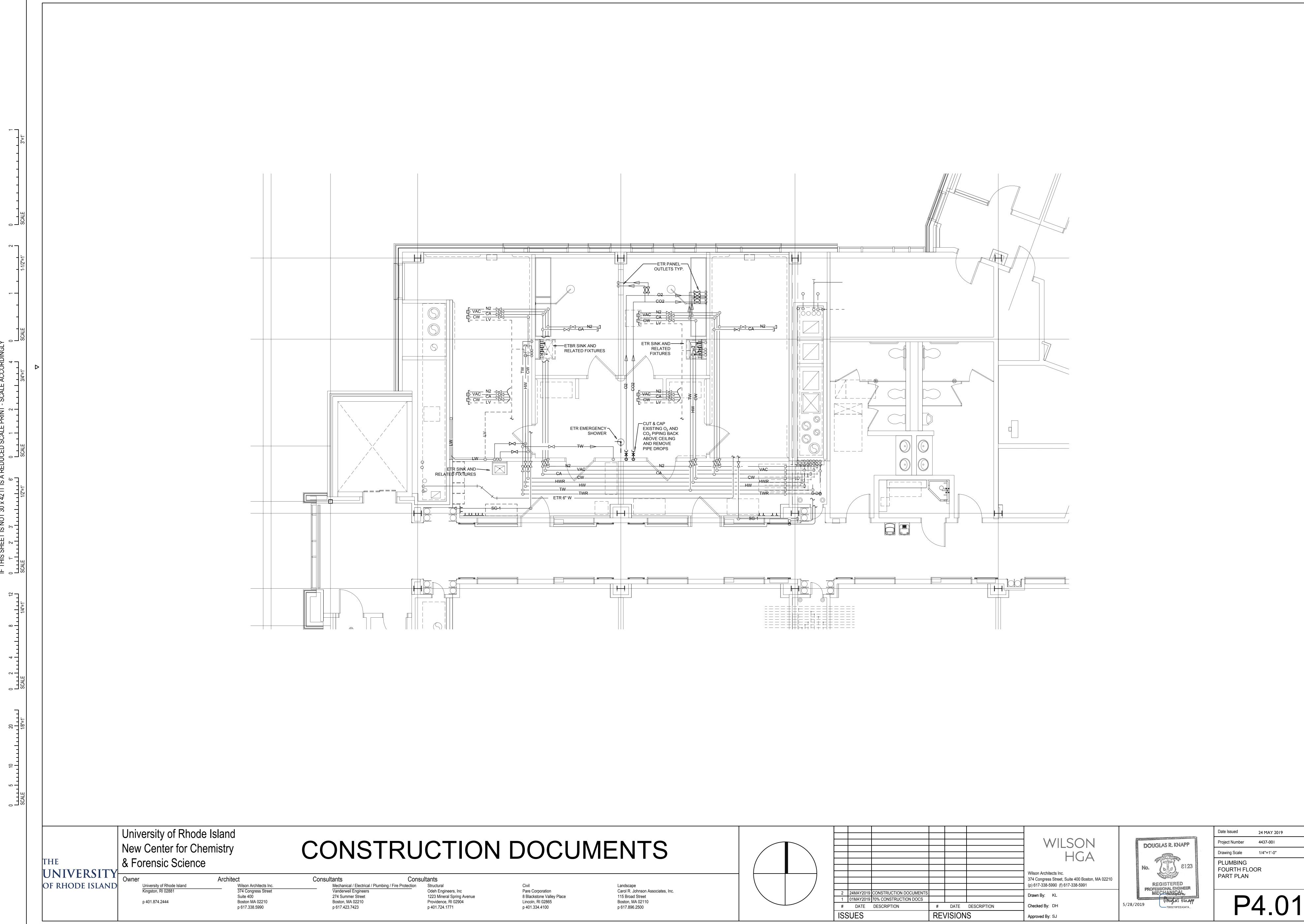
<u>Section View</u>

DOUGLAS R. KNAPP PROFESSIONAL ENGINEER
MECHANIGATO Pouglas Enapp 5/28/2019

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