



LEVEL 1 PAT LAB



ANNEX BUILDING - LEVEL 1

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E1.11	ELECTRICAL NEW WORK PLANS

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Issuance Schedule		
Number	Date	Description

LEVEL 1 PAT LAB

VERTEX PHARMACEUTICALS

1 HARBOR STREET, BOSTON MA 02210

ISSUED FOR CONSTRUCTION

Date Issued: 8/26/16

Project Number: 179-07-00

ABBREVIATIONS

L	ANGLE	FOC	FACE OF CONCRETE	PL	PLATE
M	ANGLE	FOF	FACE OF FINISH	PLAM	PLASTIC LAMINATE
N	ANGLE	FOM	FACE OF MASONRY	PLAS	PLASTIC
O	CENTERLINE	FOS	FACE OF STUD	PLBG	PLUMBING
P	DIAMETER	FRFR	PREFROPPING	PLYWD	PLYWOOD
Q	ROUND	FS	FULL SIZE	PNEU	PNEUMATIC
AE	ARCHITECT / ENGINEER	FSH	FIRE SPRINKLER HEAD	PNL	PANEL
AB	ANCHOR BOLT	FT	FEET	PNT	PANT
ACBL	ACCESSIBLE (ADA COMPLIANT)	FTT	FOOT OR FEET	PNTD	PAINTED
ACOUS	ACOUSTICAL	FTG	FOOTING	POL	POLISHED
ACP	ACOUSTICAL CEILING PANEL	FURN	FURNITURE	POLY	POLYETHYLENE
AD	ACCESS DOOR	FURR	FURRING	PR	PAIR
ADA	THE AMERICANS WITH DISABILITIES ACT	FUT	FUTURE	PRCST	PRECAST
ADBL	ADAPTABLE (ADA COMPLIANT)			PREFAB	PREFABRICATED
ADOL	ADDITIONAL	G	GAS	PREFIN	PREFINISHED
ADH	ADHESIVE	GAL	GAGE	PTD	PAPER TOWEL DISPENSER
ADI	ADJUSTABLE	GB	GRAB BAR	PTN	PARTITION
ADUC	ADJUNCT	GEN	GENERATOR	PTR	PAPER TOWEL RECEPTACLE
AF	ACCESS FLOOR	GFR	GLASS FIBER REINFORCED CONCRETE	PVG	PAVING
ACF	ABOVE FINISHED FLOOR	GFRG	GLASS FIBER REINFORCED GYPSUM	QT	QUARRY TILE
AFI	AIR FLOW INDICATOR			QTY	QUANTITY
AGGR	AGGREGATE	GLMU	GLASS MASONRY UNIT	QUAL	QUALITY
AL	ALUMINUM	GMMU	GLASS MESH MORTAR UNIT		
ALT	ALTERNATE	GND	GROUND	R	RISER
ALN	ALIGNED	GR	GRADE	RAD	RADIUS
AP	ACCESS PANEL	GRG	GRILLE	RBR	RUBBER
ARCH	ARCHITECT	GTG	GRATING	RD	ROOT DRAIN
ASC	ABOVE SUSPENDED CEILING	GSKT	GASKET	REC	RECESSED
ASPH	ASPHALT	GT	GROUT	REF	REFERENCE
AVAF	AUDIOVISUAL ALARM	GVL	GRAVEL	REFR	REFRIGERATOR
		GWB	GYPSUM WALL BOARD	REG	REGISTER
		GYP	GYPSUM	REIN	REINFORCED OR REINFORCING
BD	BOARD	HB	HOSE BIBB	REQD	REQUIRED
BLDG	BUILDING	HCC	HOLLOW CORE	RESIL	RESILIENT
BLKG	BLOCKING	HDBD	HARDBOARD	RFG	RAILING
BM	BEAM	HDWD	HARDWOOD	RH	RIGHT HAND
BOT	BOTTOM	HDR	HARDWARE	RHR	ROUGH AND REVERSE
BUR	BUILT-UP ROOFING	HGR	HANGER	RLG	RAILING
CA	CARD ACCESS	HGT	HEIGHT	RM	ROOM
CAB	CABINET	HLLM	HOLLOW METAL	RO	ROUGH OPENING
CB	CASING HEAD	HMD	HOLLOW METAL DOOR	RV	ROOF VENT
CEMT	CEMENT	HNDL	HANDRAIL	RWL	RAIN WATER LEADER
CEMTS	CEMENTITIOUS	HORIZ	HORIZONTAL	S	SOUTH
CER	CERAMIC	HPT	HIGH POINT	SCHD	SCHEDULE
CGE	CORNER GUARD	HR	HOUR	SCRD	SCREEN
CHN	CHANNEL	HSAD	HORIZONTAL SLIDING ACCORDION FIRE DOOR	SCN	SOIL DISPENSER
CHBD	CHALKBOARD	HVAC	HEATING VENTILATION, AIR CONDITIONING	SECT	SECTION
CHFR	CHAFFER	HYDR	HYDRAULIC	SG	SINGLE
		ID	INSIDE DIAMETER	SHR	SHOWER
CL	CENTER LINE	IF	INSIDE FACE	SHT	SHEET
CLJ	CEILING	IN	INCH OR INCHES	SHTG	SHEATHING
CLG	CONTROL JOINT	INSUL	INSULATION	SHV	SHELVING
CLO	CLOSET	INTR	INTERIOR	SIM	SIMILAR
CLR	CLEAR	IWH	INSTANTANEOUS WATER HEATER	SK	SINK
CM	CLASSROOM	JAN	JANITOR	SLE	SLEEVE
CMPT	COMPOSITE	JCT	JOINT	SM	SHEET METAL
CMU	CONCRETE MASONRY UNIT	JT	JOINT	SND	SANITARY NAPKIN DISPENSER
CNTY	COUNTER	KT	KITCHEN	SNR	SANITARY NAPKIN RECEPTACLE
CO	CASED OPENING	KO	KNOCKOUT	SPEC	SPECIFICATION
COL	COLUMN	KPK	KNOCKOUT PANEL	SO	SQUARE
COMP	COMPUTER	KPL	KICK PLATE	SSP	SOLID SURFACE POLYMER
CONC	CONCRETE	L	LEFT	SSS	STAINLESS STEEL
CONN	CONNECTION	LAB	LABORATORY	ST	STREET
CONSTR	CONSTRUCTION	LAD	LADDER	STA	STATION
CONT	CONTINUOUS	LAM	LAMINATION	STD	STANDARD
CONTR	CONTRACTOR	LAV	LAVATORY	STL	STEEL
CORR	CORRIDOR	LB	POUND	STL	STORAGE
CPRS	CHAIR PAD	LBL	LABEL	STRUCT	STRUCTURAL
CRS	COLD ROLLED STEEL	LF	LINEAR FOOT	SUSP	SUSPENDED
CS	CAST STONE	LG	LENGTH	SYM	SYMBOL
CSK	COUNTERSINK	LG	LENGTH	SYMM	SYMMETRICAL
CSMT	CASEMENT	LH	LEFT HAND	SYS	SYSTEM
CSCWCK	CASEWORK	LHR	LEFT HAND REVERSE		
CYL	CYLINDER	LB	LIBRARY	T	THERMOSTAT
		LN	LINEAR	T&B	TOP AND BOTTOM
DBL	DOUBLE	LKR	LOOKER	T&G	TONGUE AND GROOVE
DEMO	DEMOLITION	LKH	LONG LEH HORIZONTAL	TB	TOWEL BAR
DEPT	DEPARTMENT	LLV	LONG LEH VERTICAL	TBM	TOP OF BEAM
DF	DRINKING FOUNTAIN	LTSP	LONG LEH T	TC	TOP OF CONCRETE
DG	DECORATIVE GLASS	LTST	LONG LEH T	TD	TEL. DATA
DIAM	DIAMETER	LTSP	LONG LEH T	TEL	TELEPHONE
DM	DIMENSION	LTST	LONG LEH T	TEMP	TEMPERARY
DISP	DISPENSER	LW	LOW WATER	TER	TERRAZZO
DIV	DIVISION	LT	LIGHT	TF	TOP OF FOOTING
DMBD	DRY MARKER BOARD	LWT	LIGHTWEIGHT	TFE	TOP OF FINISHED FLOOR
DAMPF	DAMP PROOFING	LG	LENGTH	THK	THICKNESS
DN	DOWN	LVR	LEVER OR LOUVER	THRS	THRESHOLD
				THRU	THROUGH
DO	DITTO	MACH	MACHINE	TKBD	TACKBOARD
DOP	DOOR OPENING	MAINT	MAINTENANCE	TMPO	TEMPERED
DPG	DECORATIVE PLASTIC GLAZING	MATL	MATERIAL	TOL	TOLERANCE
DS	DOWNSTOP	MAX	MAXIMUM	TP	TOP OF PAVEMENT
DSP	DRY STAMPING	MECH	MECHANICAL	TPH	TOWEL HOLDER
DST	DOOR STOP	MED	MEDIUM	TS	TACKABLE SURFACE
DWG	DRAWING	MEMB	MEMBRANE	TSR	TOP OF SLAB
DWR	DRAINER	MET	METAL	TST	TOP OF STEEL
E	EAST	MEZZ	MEZZANINE	TV	TELEVISION
EA	EACH	MFG	MANUFACTURER	TYP	TOP OF WALL
EIFS	EXTERIOR INSULATION & FINISH SYSTEM	MIN	MINIMUM	TYR	TYPICAL
EL	ELEVATION	MIR	MIRROR	UNC	UNLOCATED
ELAST	ELASTOMERIC	MISC	MISCELLANEOUS	UNFIN	UNFINISHED
ELEC	ELECTRIC	ML	METAL LATH	UNLN	UNLESS OTHERWISE NOTED
LEV	ELEVATOR	MOLD	MOLDING	UPS	UNINTERRUPTIBLE POWER SUPPLY
EMER	EMERGENCY	MLLWK	MILLWORK		
ENCL	ENCLOSURE	MO	MASONRY OPENING		
ENGR	ENGINEER	MRTD	MORTAR	URNL	URNAL
ENTR	ENTRANCE	MORT	MORTAR	UV	ULTRAVIOLET
EO	EMERGENCY POWER	MULL	MULLION		
EOP	ELECTRICAL PANEL	MBL	MOVABLE	VAC	VACUUM
EPDM	ETHYLENE PROPYLENE DIENE MONOMER			VAF	VISUAL ALARM
EXPLO	EXPLOSION PROOF	N	NORTH	VCT	VINYL COMPOSITION TILE
EQ	EQUAL	NA	NOT AVAILABLE	VERT	VERTICAL
EQUIP	EQUIPMENT	NAT	NATURAL	VEST	VESTIBLE
ESCAL	ESCALATOR	NIC	NOT IN CONTRACT	VIF	VERIFY IN FIELD
EW	EACH WAY	NMD	NOMINAL	VNR	VENTILATOR
EWC	ELECTRIC WATER COOLER	NOM	NOMINAL	VR	VAPOR RETARDER
EXHA	EXHAUST	NTS	NOT TO SCALE		
EXH	EXHAUST	OA	OVERALL	W	WEST
EXP	EXPANSION	OC	ON CENTER	WO	WITHOUT
EXT	EXTERIOR	OD	OUTSIDE DIAMETER	WC	WATERCLOSET
		OF	OUTSIDE FACE	WO	WOOD
FF	FACE TO FACE	OFCI	OWNER UNFINISHED CONTRACTOR INSTALLED	WLD	WELDED
FA	FIRE ALARM	OFF	OFFICE	WSCT	WANSOCT
FACP	FIRE ALARM CONTROL PANEL	OPNG	OPENING	WGT	WEIGHT
FB	FLAT BAR	OPT	OPTIONAL	WTRPRF	WATERPROOFING
FCO	FLOOR CLEAN OUT	OXY	OXYGEN	WWF	WELDED WIRE FABRIC
FDR	FIRE DEPARTMENT CONNECTION				
FDN	FOUNDATION				
FEC	FIRE EXTINGUISHER CABINET				
FE	FIRE EXTINGUISHER				
FGL	FIBERGLASS				
FHC	FIRE HOSE CABINET				
FHP	FULL HEIGHT PARTITION				
FHL	FULL HEIGHT	PB	PANIC BAR		
FIN	FINISH	PERF	PERFORATED		
FL	FLASHING	PERIM	PERIMETER		
FLR	FLOOR OR FLOORING	PERP	PERPENDICULAR		
FLUR	FLOORING	POBD	PED BOARD		
FLUR	FLUORESCENT				

SYMBOLS

ACCESSIBILITY SYMBOL

ACCESSIBILITY CLEARANCES

BUILDING SECTION

CASEWORK TAG

CEILING TYPE/HT.

COLUMN GRIDS

CURTAIN WALL PANEL SYMBOL

DATUM POINT

DETAIL

DOOR MARK

1541-A
ROOM # - PRIMARY, SECONDARY, ETC.

ELEVATION / LEVEL MARKER

TOP OF SLAB
ELEV = 100'-0"

ELEVATION EXTERIOR

ELEVATION INTERIOR

EQUIPMENT SYMBOL

FINISH TAG

FURNITURE SYSTEM SYMBOL

MATCH LINE

PARTITION SYMBOL

PLAN / SECTION DETAIL

REVISION SYMBOL

ROOM TAG

Room Name

101

F B W C

123 SF

ROOM NUMBER

FINISH KEY

APPROX ROOM AREA

CEILING

WALL

BASE

FLOOR

VIEW NAME: PLAN, SECTION, ELEVATION, DETAILS

1 View Name

1/8" = 1'-0"

VIEW NAME WITH REFERENCE

1 A1.01 View Name







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

WALL SECTION

WINDOW / LOUVER SYMBOL

WINDOW / LOUVER MARK













LINE TYPES

 OVERHEAD (OVER COUNTER AND SOFFITS)
 CALLOUT
 BREAK LINE
 GRID LINE
 BELOW OR BEYOND (UNDER COUNTER AND FOOTINGS)
 SCOPE OF WORK

DOORS / WINDOWS / WALLS

	CASED OPENING
	TYPICAL DOOR
	EXISTING TO REMAIN
	EXISTING TO BE REMOVED
	PAIR
	DOOR WITH SIDELIGHT
	VARYING LEAF
	SLIDING
	DOUBLE ACTING
	TYPICAL WINDOW
	DEMOLISHED WALL
	EXISTING WALL
	NEW WALL

MATERIALS

	ALUMINUM
	CONCRETE
	CMU
	EARTH
	EXISTING BUILDINGS
	GYPSUM BOARD
	INSULATION
	RIGID INSULATION
	RUBBER
	SAND
	STEEL
	WOOD FINISH



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ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

GENERAL NOTES, ABBREVIATIONS, LEGENDS

Scale: 1/4" = 1'-0" Date Issued: 8/26/16

A0.00

Project Number: 179-07-00



1 LEVEL 1 - LIFE SAFETY PLAN
SCALE: 3/32" = 1'-0"

LIFE SAFETY NOTES

CODE REVIEW BASED ON MASSACHUSETTS 8TH EDITION AMENDMENTS TO THE INTERNATIONAL BUILDING CODE 2009

SCOPE
FIT OUT OF EXISTING WAREHOUSE TO PROVIDE LAB SPACE.

CLASSIFICATION
WORK AREA CLASSIFICATION OF WORK LEVEL 2 ALTERATIONS THE WORK AREA INVOLVES THE RECONFIGURATION OF SPACES. THE LEVEL OF WORK IS THEREFORE CLASSIFIED AS LEVEL 2 ALTERATIONS AND MUST COMPLY WITH IEBC CHAPTERS 6 & 7. LEVEL 2 ALTERATIONS ALLOW FOR THE RECONFIGURATION OF SPACES, THE ADDITION OR ELIMINATION OF DOORS AND WINDOWS, THE RECONFIGURATION OR EXTENSION OF SYSTEMS, AND/OR THE INSTALLATION EQUIPMENT OF LESS THAN 50% OF THE AGGREGATE OF THE BUILDING.

ALTERATIONS - LEVEL 1 (IEBC CHAPTER 6)
THE EXISTING BUILDING OR PORTIONS THEREOF SHALL NOT BE ALTERED SUCH THAT THE BUILDING BECOMES LESS SAFE THAN ITS EXISTING CONDITION, UNLESS THE PORTION ALTERED CONFORMS TO THE REQUIREMENTS OF 780 CMR.

ALTERATIONS - LEVEL 2 (IEBC CHAPTER 7)
ALL NEW CONSTRUCTION ELEMENTS, COMPONENTS, SYSTEMS, AND SPACES SHALL COMPLY WITH THE REQUIREMENTS OF 780 CMR FOR NEW CONSTRUCTION. EXCEPTION: NEWLY INSTALLED ELECTRICAL EQUIPMENT SHALL COMPLY WITH IEBC 706.

USE GROUP: (B) BUSINESS

KEY CALCULATIONS AND DIMENSIONS
DEAD END CORRIDORS NOT TO EXCEED 70' (IEBC 705.6 EX.3)
LENGTH OF EXIT ACCESS TRAVEL = 300' (WITH SPRINKLER) (1016.1)
LENGTH OF COMMON PATH OF EGRESS TRAVEL IN GROUP B = 100' (WITH SPRINKLER) (1014.3)
MINIMUM CORRIDOR WIDTH = 44" (1016.2)
CORRIDOR FIRE RESISTANCE RATING = 0 HRS (WITH SPRINKLER) (TABLE 1016.1)

OCCUPANT LOAD (TABLE 1004.1.1)
GROUP B = 845 SF / 100 SF
TOTAL OCCUPANT LOAD = 9

CONSTRUCTION TYPE:
SINCE THE PROJECT DOES NOT INCLUDE A CHANGE OF USE OR ADDITION, THE PROPOSED WORK DOES NOT TRIGGER COMPLIANCE WITH HEIGHT AND AREA LIMITATIONS OR MINIMUM CONSTRUCTION TYPE. THEREFORE, THE RENOVATION IS ONLY REQUIRED TO MAINTAIN AND BE CONSISTENT WITH THE EXISTING CONSTRUCTION TYPE.

FIRE RESISTANCE RATINGS:
THE PROJECT DOES NOT INCLUDE THE ALTERATION OR INSTALLATION OF ANY NEW BUILDING ELEMENTS THAT REQUIRE A FIRE RESISTANCE RATING. THIS INCLUDES THE NEW CORRIDOR WALLS. AS THE BUILDING IS PROVIDED WITH SPRINKLER PROTECTION THROUGHOUT (TABLE 1016.1), THEREFORE NO FURTHER UPGRADES ARE TRIGGERED BY THE PROPOSED WORK.

VERTICAL OPENINGS:
BECAUSE THE BUILDING IS PROVIDED WITH SPRINKLER PROTECTION THROUGHOUT, EXISTING UNPROTECTED VERTICAL FLOOR OPENINGS ARE NOT REQUIRED TO BE ENCLOSED PER IEBC 703.2.1 EX. 5.2. NEW VERTICAL OPENINGS ARE REQUIRED TO COMPLY WITH 780 CMR 709.2.

INTERIOR FINISHES
THE INTERIOR FINISH OF WALLS AND CEILINGS IN THE WORK AREA MUST COMPLY WITH THE CODE REQUIREMENTS FOR NEW CONSTRUCTION (IEBC 703.4).

MEANS OF EGRESS
MEANS OF EGRESS THROUGHOUT THE WORK AREA ARE REQUIRED TO COMPLY WITH CHAPTERS 6 & 7 OF THE EXISTING BUILDING CODE. THE REMAINING PORTIONS OF THE BUILDING MUST MAINTAIN OR IMPROVE THEIR CURRENT LEVEL OF EGRESS (IEBC 6.04.1 & 705.1).

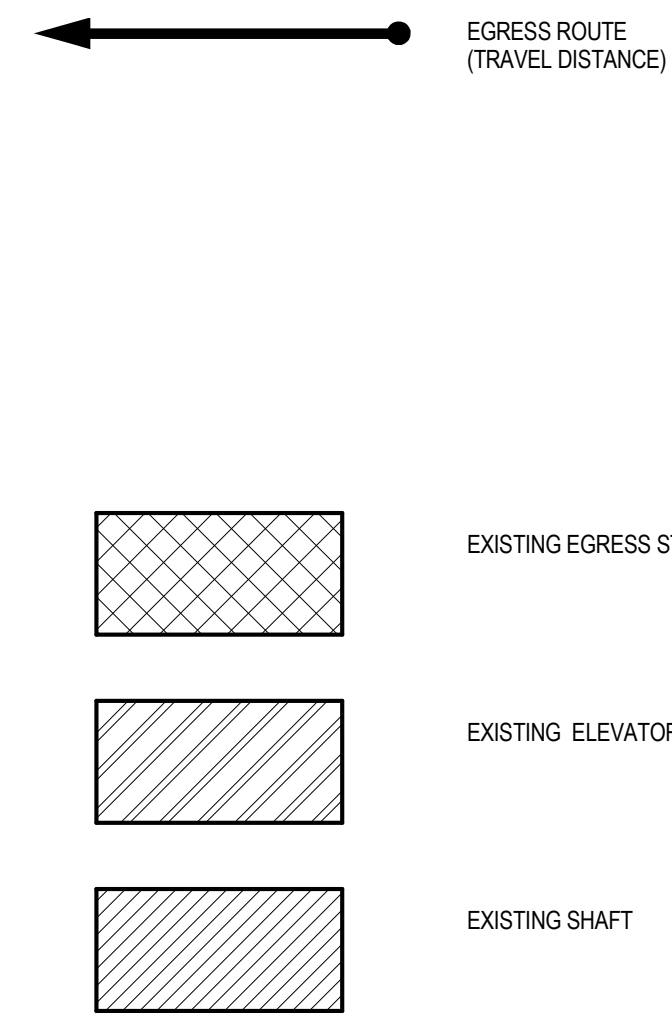
MULTIPLE EGRESS DOORS (1015.1) ARE NOT REQUIRED IN THE WORK AREA BECAUSE THE COMMON PATH OF TRAVEL IS LESS THAN 100 FEET (1014.3 EXCEPTION 1) AND THE OCCUPANT LOAD IS LESS THAN 49 (TABLE 1015.1).

THE WORK AREA EGRESS DOORS ARE NOT REQUIRED TO SWING IN THE DIRECTION OF EGRESS TRAVEL SINCE THERE ARE FEWER THAN 50 OCCUPANTS (780 CMR 1008.1.2). PANIC HARDWARE IS NOT REQUIRED (780 CMR 1008.1.10).

SINCE THE PROJECT DOES NOT INCLUDE AN INCREASE IN THE NUMBER OF OCCUPANTS OR A REDUCTION IN THE AVAILABLE EGRESS CAPACITY, THE EXISTING MEANS OF EGRESS CAPACITY IS ASSUMED TO BE ADEQUATE.

ENERGY CODE PROVISIONS FOR EXISTING BUILDINGS
THE BUILDING IS SUBJECT TO THE 2012 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) INCLUDING THE AMENDMENTS CONTAINED IN 780 CMR CHAPTER 13. LEVEL 2 ALTERATIONS TO EXISTING BUILDINGS ARE PERMITTED WITHOUT REQUIRING THE ENTIRE BUILDING TO COMPLY WITH THE ENERGY REQUIREMENTS OF THE IECC. THE NEW ELEMENTS SHALL CONFORM TO THE ENERGY REQUIREMENTS OF THE IECC AS THEY RELATE TO NEW CONSTRUCTION ONLY (IEBC 711.1).

LIFE SAFETY LEGEND



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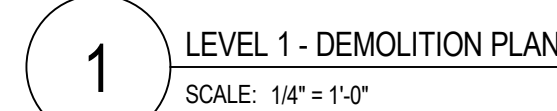
LEVEL 1 PAT LAB

LIFE SAFETY

Scale: As indicated Date Issued: 8/26/16

A0.10

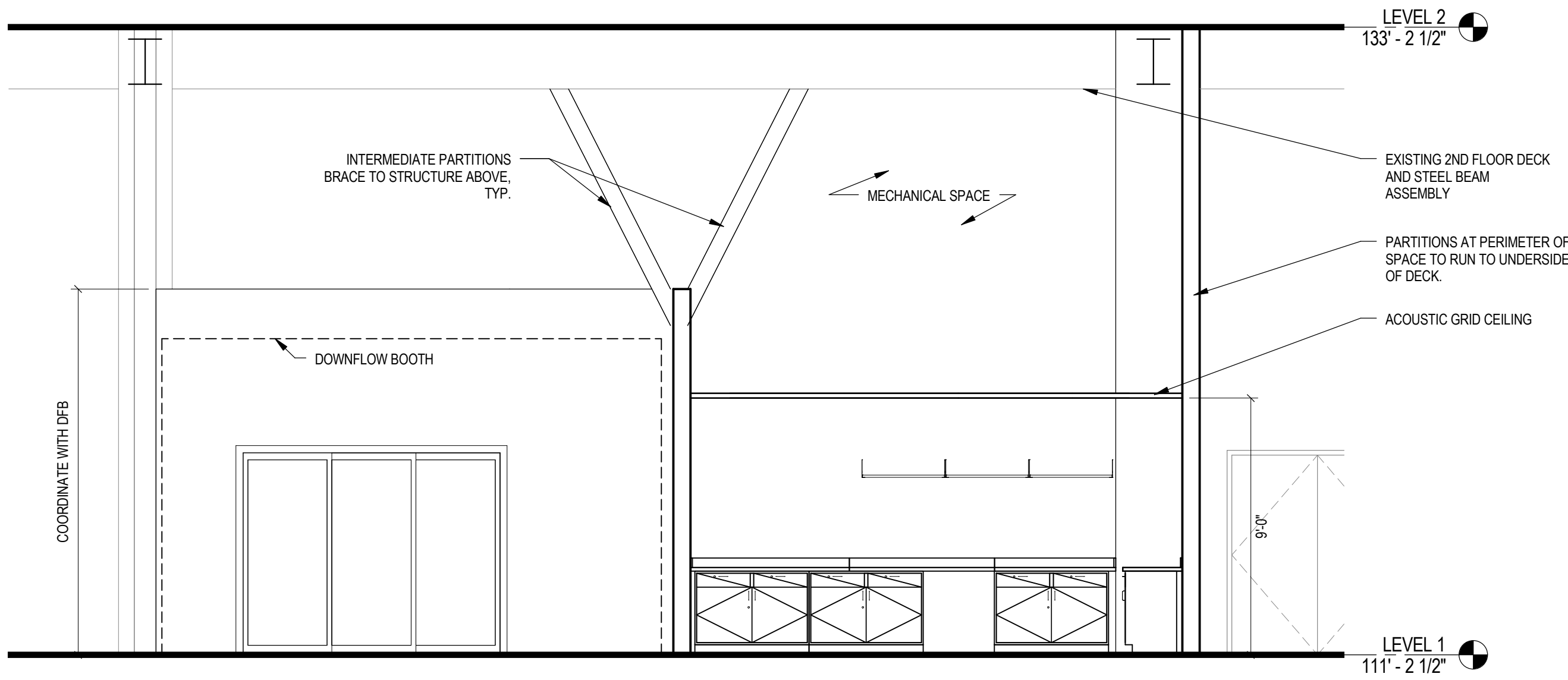
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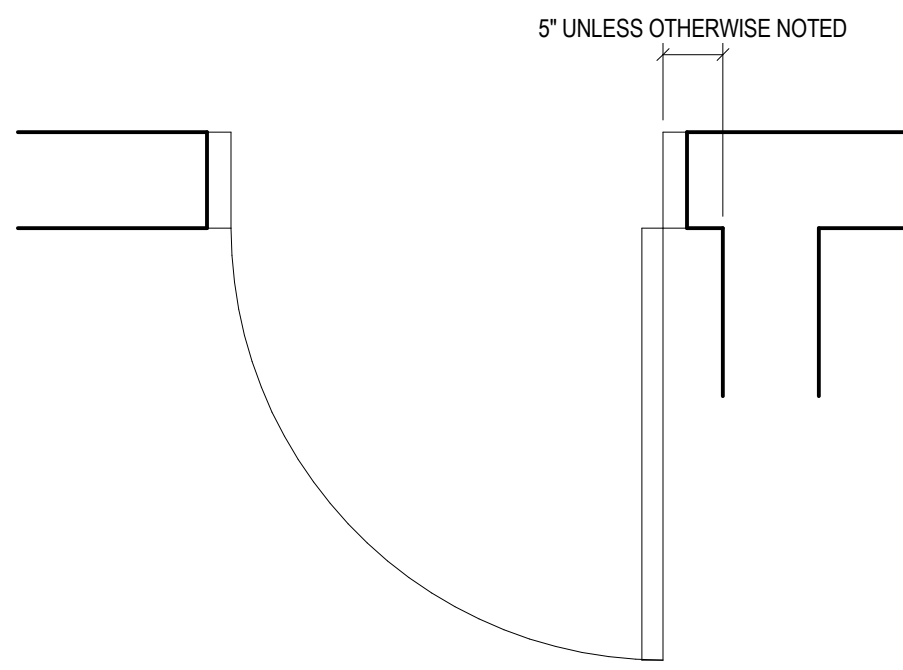
04 REMOVE PORTION OF MASONRY PARTITION IN COORDINATION WITH NEW DOOR AND/OR WINDOW.
21 REMOVE PORTION OF FLOORING AND CONCRETE SLAB ON GRADE IN COORDINATION WITH UNDERGROUND
PIPING (COORDINATE WITH MEP DRAWINGS). INFILL SLAB AND INSTALL NEW FINISH FLOORING TO MATCH
EXISTING. COORDINATE WITH FINISH PLAN. GC TO IDENTIFY AND COORDINATE LEAST DISRUPTIVE ROUTE.
90 SALVAGE CORNERGUARDS FOR RE-USE.

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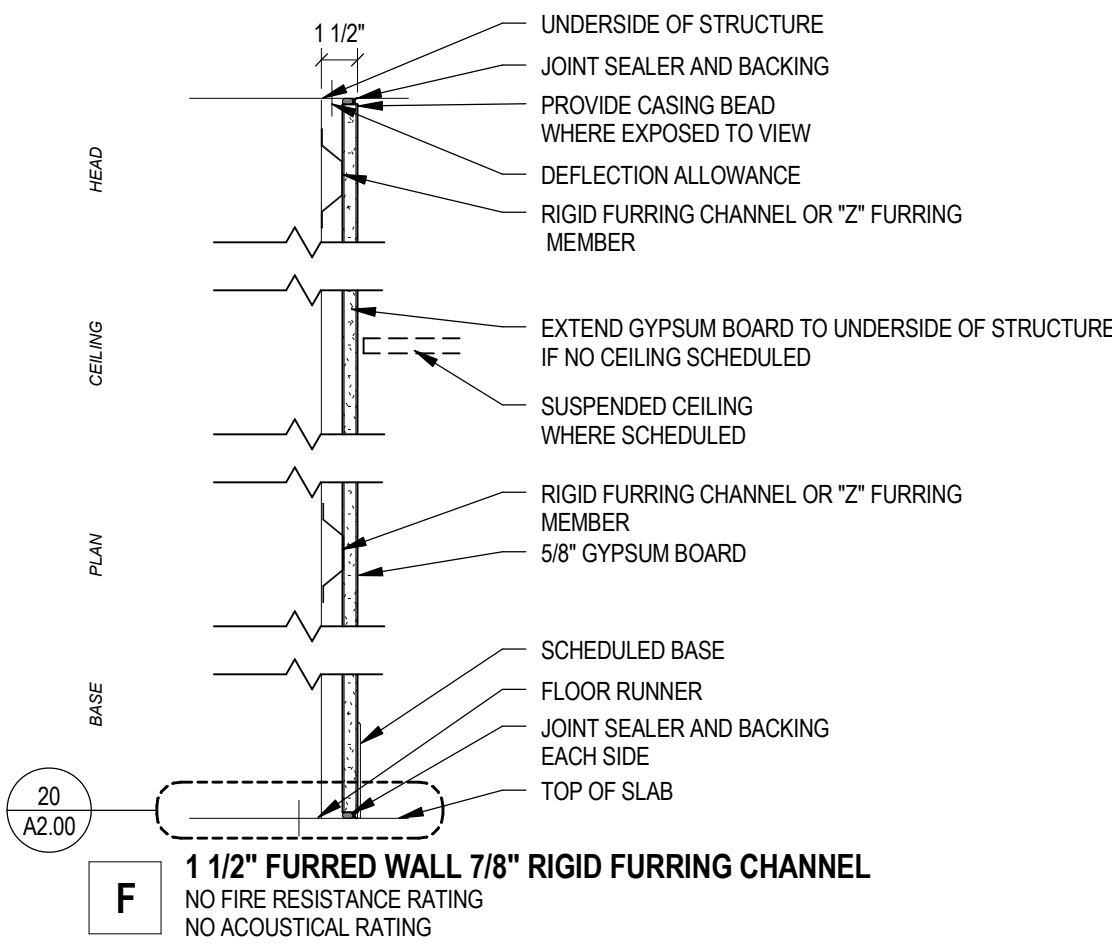
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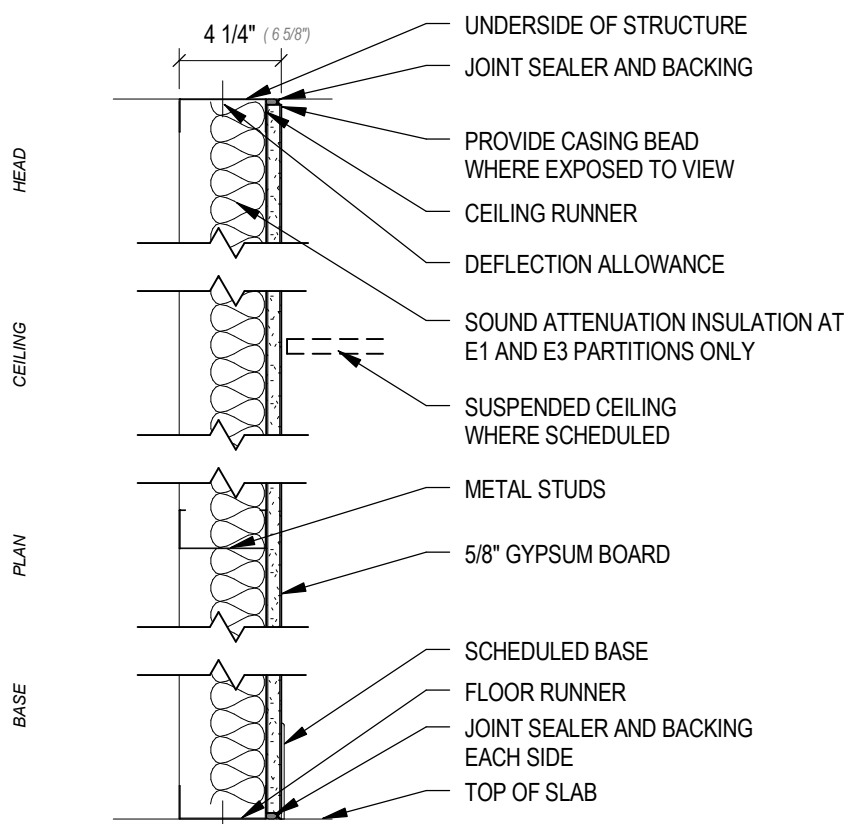
30 SECTION DETAIL
CEILINGS AND STRUCTURE
SCALE: 1/4" = 1'-0"



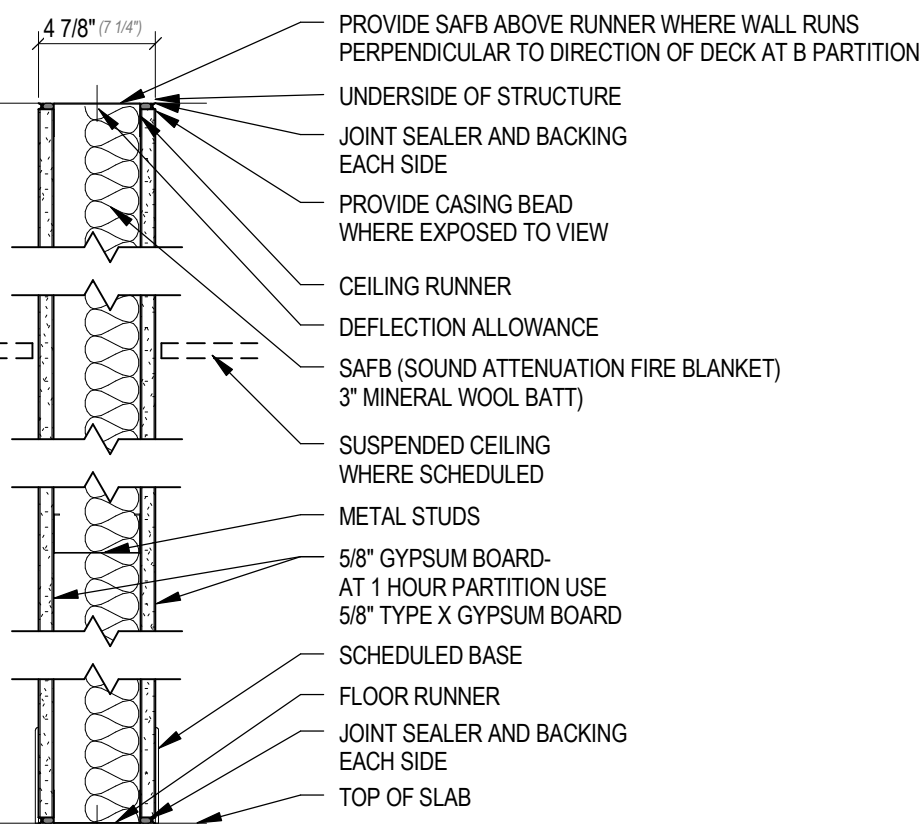
22 PLAN DETAIL
DOOR FRAME LOCATION
SCALE: 3/4" = 1'-0"



13 SECTION DETAIL
PARTITION TYPE F
SCALE: 1 1/2" = 1'-0"



12 SECTION DETAIL
PARTITION TYPE E, E1, E2 & E3
SCALE: 1 1/2" = 1'-0"



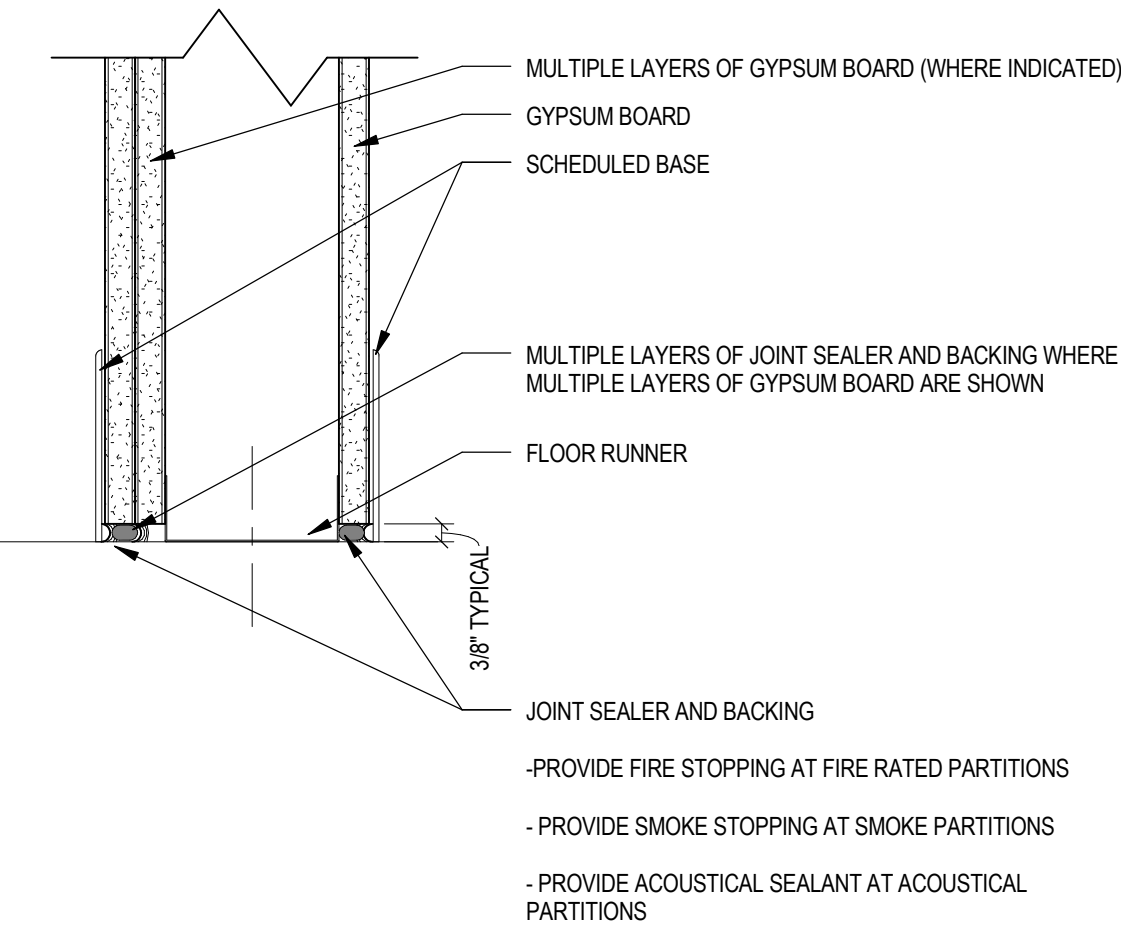
11 SECTION DETAIL
PARTITION TYPE B, B1, B2, AND B3
SCALE: 1 1/2" = 1'-0"

GENERAL NOTES

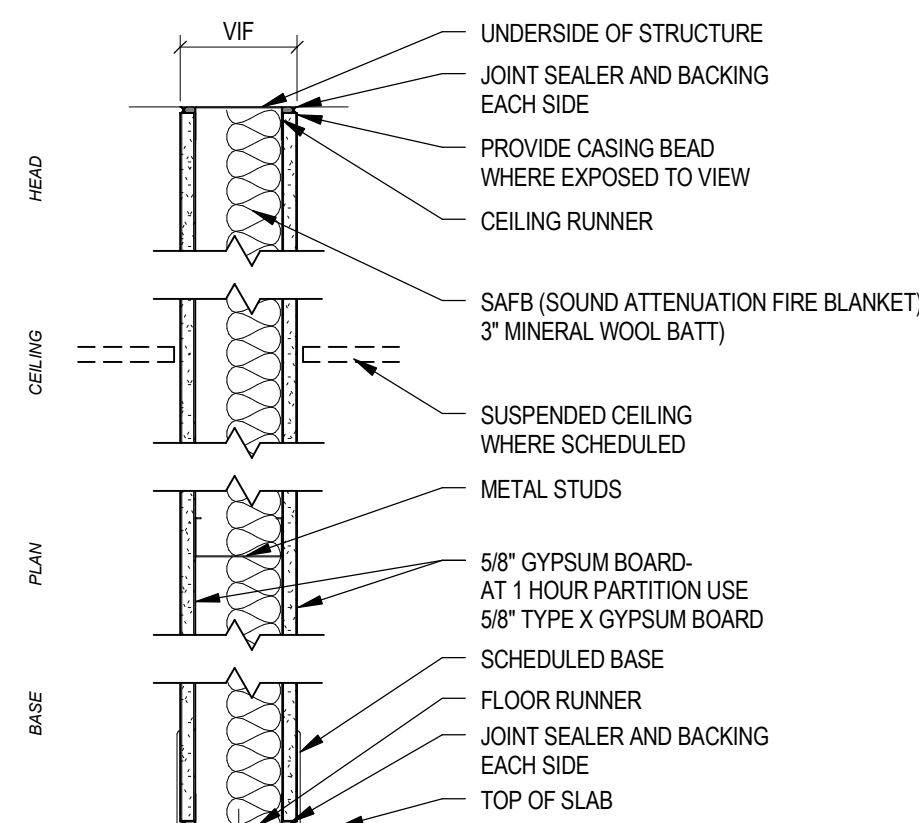
- ALL WORK SHALL BE PERFORMED PER APPLICABLE CODES, ORDINANCES AND PER REQUIREMENTS OF ALL APPLICABLE REGULATORY AGENCIES AND AUTHORITIES HAVING JURISDICTION.
- ALTERATIONS/RENOVATIONS ON THIS AND OTHER FLOORS NOT SPECIFICALLY CALLED OUT AS RENOVATION AREAS ARE TO BE DONE AS NECESSARY TO COMPLETE WORK SHOWN ON THE CONTRACT DOCUMENTS. REFER TO ENGINEER CONSULTANT AND VENDOR DRAWINGS TO IDENTIFY THE SCOPE OF WORK IN AREAS IDENTIFIED OUTSIDE THE ARCHITECTURAL DOCUMENTS. THE G.C. SHALL BE RESPONSIBLE FOR THE REMOVAL AND RESTORATION OF ALL EXISTING FINISHES DISTURBED BY THE WORK. WHERE TEMPORARY M.E.P. CONNECTIONS ARE REQUIRED, ALL FINISHES SHALL BE RESTORED IMMEDIATELY TO MAINTAIN OPERATION OF THE FACILITY, EVEN IF THE WORK WILL REQUIRE TO BE REMOVED AGAIN DURING THIS PROJECT.
- ALL OPENINGS, IN EXISTING FLOORS AND WALLS ABOVE AND BELOW THE CEILING PLENUM, BOTH EXISTING AND AS A RESULT OF DEMOLITION ACTIVITIES SHALL BE PATCHED TO COMPLETE AND FINISH EXISTING WALLS AND FLOORS CONSISTENT WITH NEW WORK. ALL PATCHES SHALL BE MADE WITH MATERIALS CONSISTENT WITH THE WALL IN WHICH THE PATCH WILL BE LOCATED.
- THE G.C. SHALL COORDINATE AND SCHEDULE ALL WORK WITH THE CLIENT AND/OR CLIENTS AUTHORIZED REPRESENTATIVE/PROJECT MANAGER. WORK SCHEDULED IN OCCUPIED AREAS SHALL BE UNDERTAKEN IN A MANNER SO AS NOT TO DISTURB THE OPERATION OF THE FACILITY.
- WHERE A NEW SERVICE PENETRATES AN EXISTING WALL WHICH EXTENDS TO THE UNDERSIDE OF THE STRUCTURE, THE G.C. WILL BE RESPONSIBLE FOR PATCHING AND FIRE SAFING THE WALL AND FOR PROVIDING THE REQUIRED FIRE RATING AND FINISH.
- PROVIDE BLOCKING IN WALL THROUGHOUT AS INDICATED ON DRAWINGS FOR ALL WALL MOUNTED ITEMS, INCLUDING ITEMS FURNISHED BY OWNER.
- ITEMS IDENTIFIED AS NOT IN CONTRACT (NIC) ARE TO BE PURCHASED AND INSTALLED BY THE OWNER. THE G.C. SHALL COORDINATE INSTALLATION OF ALL ITEMS NIC WITH THE OWNER.
- PROVIDE ALL HEADERS, LINTELS AND SUPPORTS AS NECESSARY FOR ALL WALLS AND PARTS OF WALLS SHOWN TO BE REMOVED. ALL NEW MEMBERS SHALL BE IN CONFORMANCE WITH THE MASSACHUSETTS STATE BUILDING CODE, 6TH EDITION. THE G.C. IS RESPONSIBLE FOR IDENTIFYING ANY STRUCTURAL BEARING CONDITIONS THAT BECOME APPARENT DURING DEMOLITION. ANY FOUND STRUCTURAL CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT PRIOR TO REMOVAL OF STRUCTURAL MEMBERS.
- IT IS THE INTENT OF THIS DOCUMENT THAT ALL NEW WIRING, PIPING, FIXTURES, FITTINGS AND DEVICES BE RECESSED INTO EXISTING WALLS. THE CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING, PATCHING, REPAIRING, ETC. AS REQUIRED TO RECESS ITEMS IDENTIFIED ABOVE.
- WHERE WALL MOUNTED ITEMS HAVE BEEN REMOVED, PATCH AND REPAIR EXISTING WALL.

PARTITION NOTES

- WHERE NEW WALL IS NOT DIMENSIONED LAYOUT TO ASSUME NEW WALL IS ALIGNED WITH ADJACENT WALL.
- ALL PARTITIONS ARE TO EXTEND TO THE UNDERSIDE OF THE EXISTING DECK AND TO BE SEALED ON BOTH SIDES, UNLESS OTHERWISE NOTED.
- ALL PENETRATIONS IN SMOKE AND FIRE RATED PARTITIONS ABOVE CEILING TO BE FIRE STOPPED.
- ALL PENETRATIONS IN NON-RATED PARTITIONS ABOVE CEILING TO BE SEALED.



20 SECTION DETAIL
TYPICAL PARTITION AT BASE DETAIL
SCALE: 3" = 1'-0"



10 SECTION DETAIL
PARTITION TYPE A, AND A1
SCALE: 1 1/2" = 1'-0"

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Issuance Schedule

Number	Date	Description
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ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

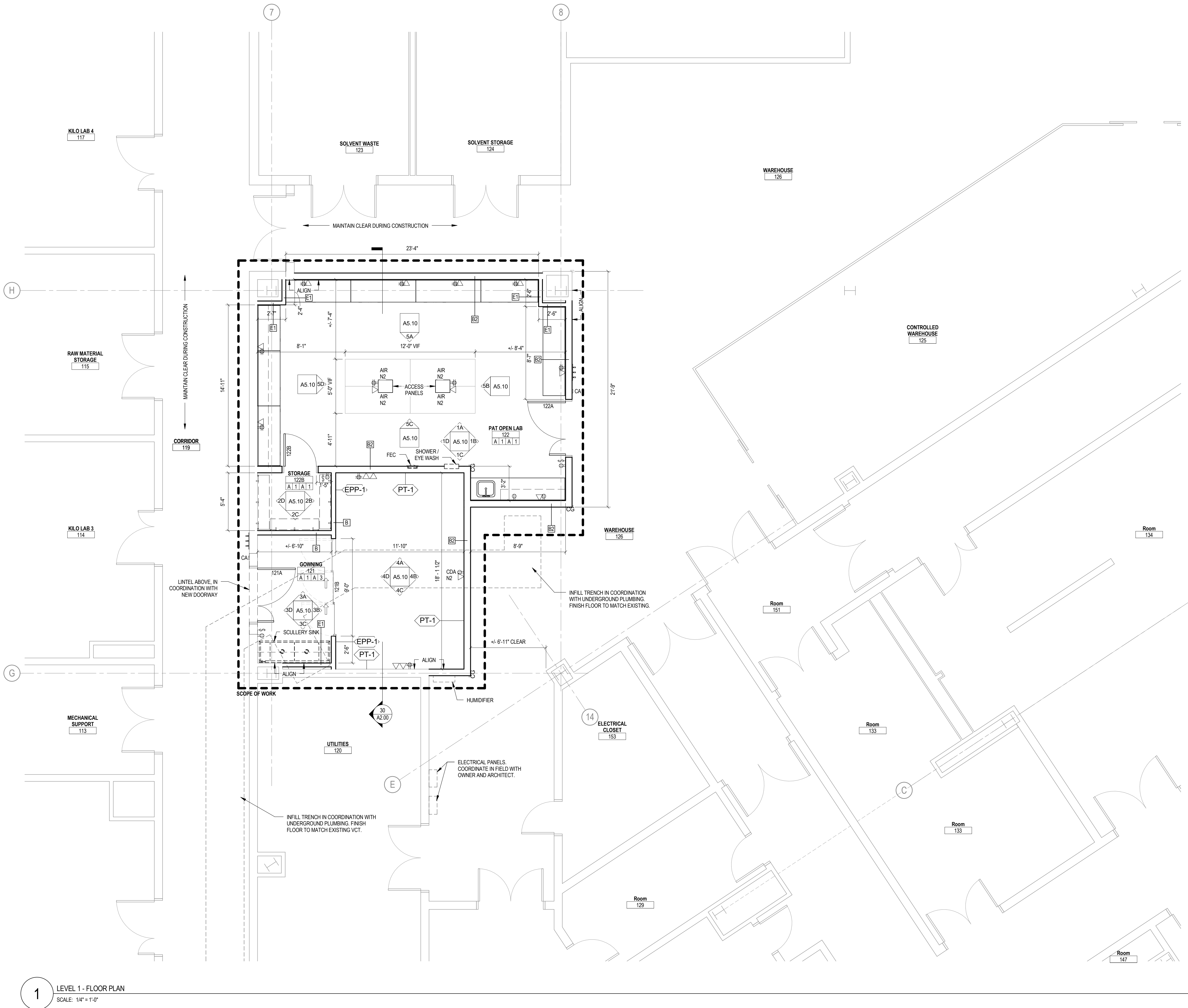
LEVEL 1 PAT LAB

FLOOR PLANS GENERAL NOTES, KEYS, LEGENDS

Scale: As indicated Date Issued: 8/26/16

A2.00

Project Number: 179-07-00



FINISH NOTES

- ALL HOLLOW METAL DOORS, AND FRAMES TO BE PAINTED PT-2.
- PROVIDE TRANSITION STRIPS AT ALL CHANGE IN FLOORING MATERIAL INTERSECTIONS.
- ALL FLOORING TO CONTINUE UNDER MILLWORK/CASEWORK UNLESS OTHERWISE NOTED.
- FINISH TAGS NOT SPECIFICALLY TAGGING AN INDIVIDUAL ITEM (NO LEADER ARROW) OR NOT ASSOCIATED WITH A HATCH, REFER TO ALL ITEMS WITHIN THE ROOM OR AREA IN WHICH THE NOTE IS LOCATED.
- ALL FINISHES TO MATCH EXISTING VERTEX ANNEX STANDARDS. VERIFY ALL SPECIFIED FINISHES MATCH EXISTING.
- FOR FACES OF NEW PARTITIONS FACING WAREHOUSE 126, PROVIDE PT-1 PAINT (TO MATCH EXISTING) AND RUBBER WALL BASE (TO MATCH EXISTING).

GENERAL CASEWORK NOTES

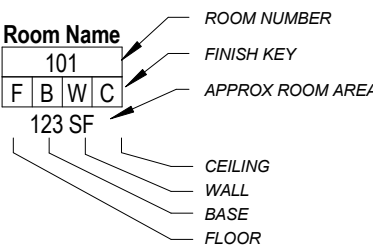
THE FOLLOWING NOTES SHALL BE THE DEFAULT, EXCEPT AS NOTED OTHERWISE ON THE DRAWINGS.

- COUNTERTOPS SHALL BE EPOXY.
- PROVIDE BLOCKING IN WALLS BEHIND ALL CASEWORK.
- PRIOR TO INSTALLATION, GC TO ENSURE THAT FLOOR LEVEL TOLERANCE IN A GIVEN DESK OR RUN OF CASEWORK SHALL NOT EXCEED 1/32 INCH IN 8 FEET.
- PROVIDE INTEGRAL BACKPLASHES AND SIDESPLASHES TO MATCH COUNTERTOP SURFACE. BACKPLASHES/SIDESPLASHES SHALL BE 3/4" X 4".

FINISH KEY

(F) FLOOR		(W) WALL	
A	EPOXY EPF-1	A	EPOXY PAINT EPP-1
B	VCT	B	PAINT
(B) BASE		(C) CEILING	
1	EPOXY COVE EPB-1	1	2x4 ACT ACT-1
2	RUBBER BASE	2	2x2 ACP
		3	GWB WITH EPOXY PAINT

ROOM TAG



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VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

FLOOR PLANS

Scale: As indicated Date Issued: 8/26/16

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Project Number: 179-07-00

FINISH SCHEDULE

FINISH	MANUFACTURER	STYLE/NUMBER	COLOR	NOTES
ACT-1	ARMSTRONG	VL PERFORATED 871	WHITE	2x4 LAY-IN ACOUSTIC CEILING TILE
EPB-1	DUR-A-FLEX	4" COVE	DARK GREY	INTEGRAL EPOXY BASE TO MATCH FLOORING
EPP-1	DUR-A-FLEX	POLY CRETE SLB	DARK GREY	EPOXY FLOORING
EPP-1	PPG	PITT GLAZE 16-510	WHITE SEMI-GLOSS	EPOXY PAINT
GBC-1	PPG	PITT GLAZE 16-510	WHITE	GYPSUM BOARD CEILING WITH EPOXY PAINT
PT-1				TO MATCH EXISTING
PT-2	SHERWIN WILLIAMS	B66W00651	EXTRA WHITE SEMI-GLOSS	DOOR FRAME PAINT

ACCESSORY KEY

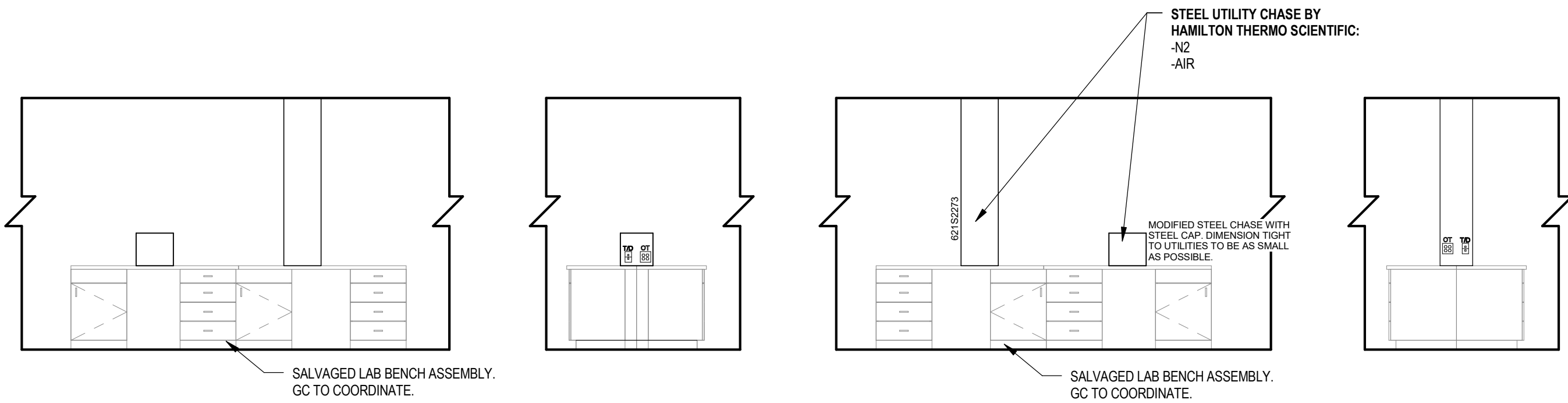
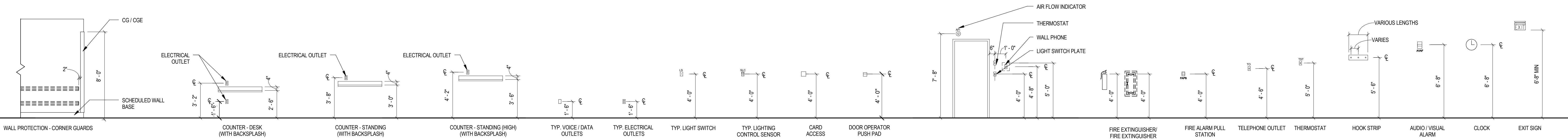
CG CORNER GUARDS

CH COAT HOOKS

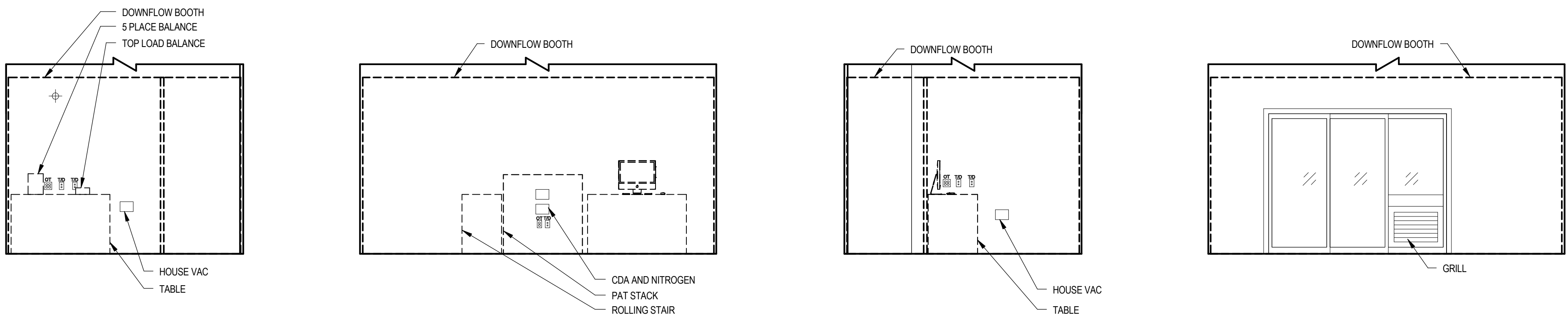
FE FIRE EXTINGUISHER

TYPICAL MOUNTING HEIGHTS

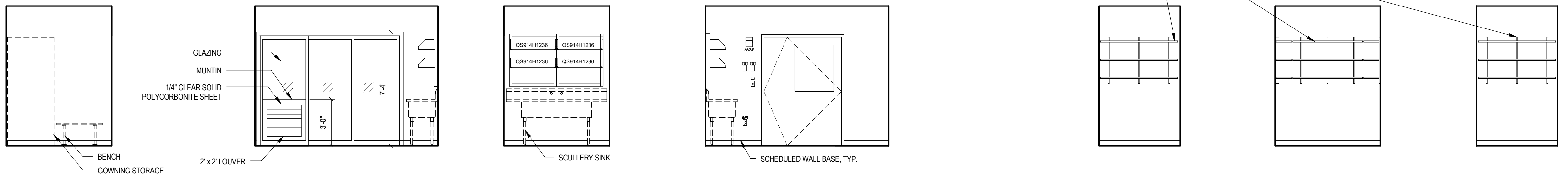
GENERAL NOTE: HEIGHTS INDICATED ARE FOR GENERAL CONDITIONS, UNLESS OTHERWISE NOTED. REFER TO INTERIOR ELEVATIONS FOR SPECIFIC MOUNTING HEIGHTS.



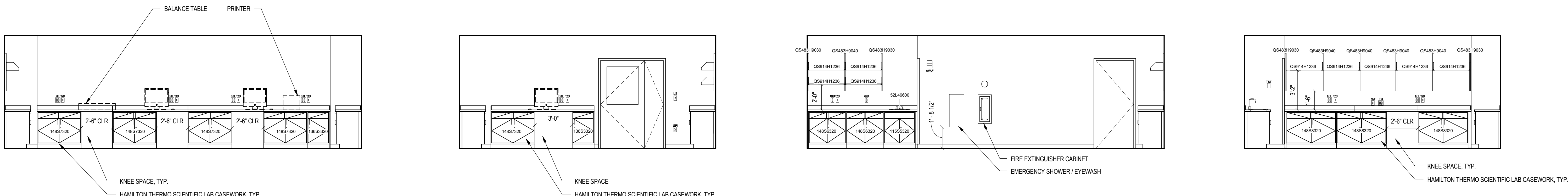
5A ISLAND LAB BENCH 1/4" = 1'-0" 5B 5C 5D



4A DOWN FLOW BOOTH (DFB) 1/4" = 1'-0" 4B 4C 4D



3A GOWNING 121 1/4" = 1'-0" 3B 3C 3D 2B STORAGE ROOM 122B 1/4" = 1'-0" 2C 2D



1A PAT LAB 1/4" = 1'-0" 1B 1C 1D

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VERTEX PHARMACEUTICALS

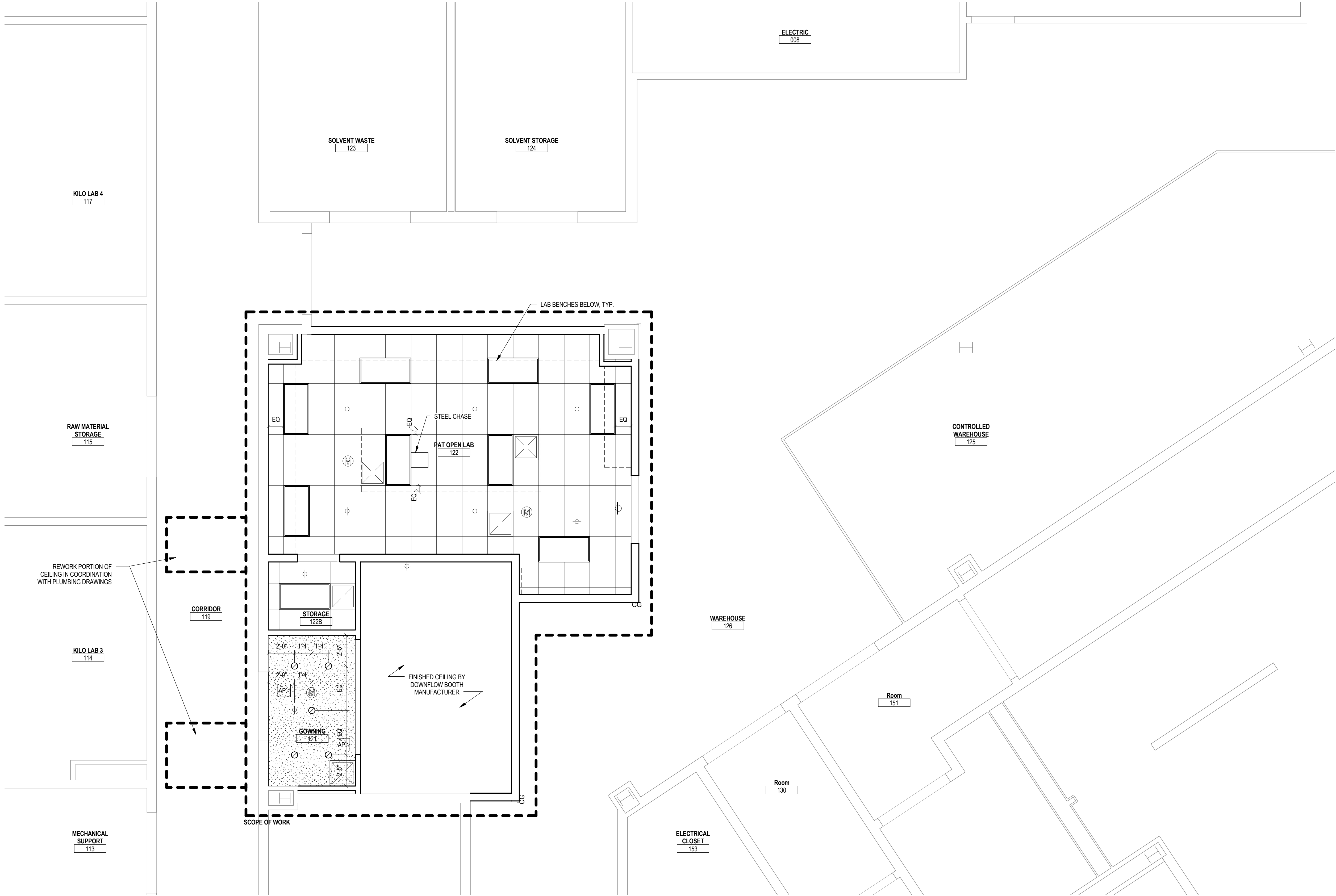
LEVEL 1 PAT LAB

INTERIOR ELEVATIONS, KEYS, LEGENDS

Scale: 1/4" = 1'-0" Date Issued: 8/26/16

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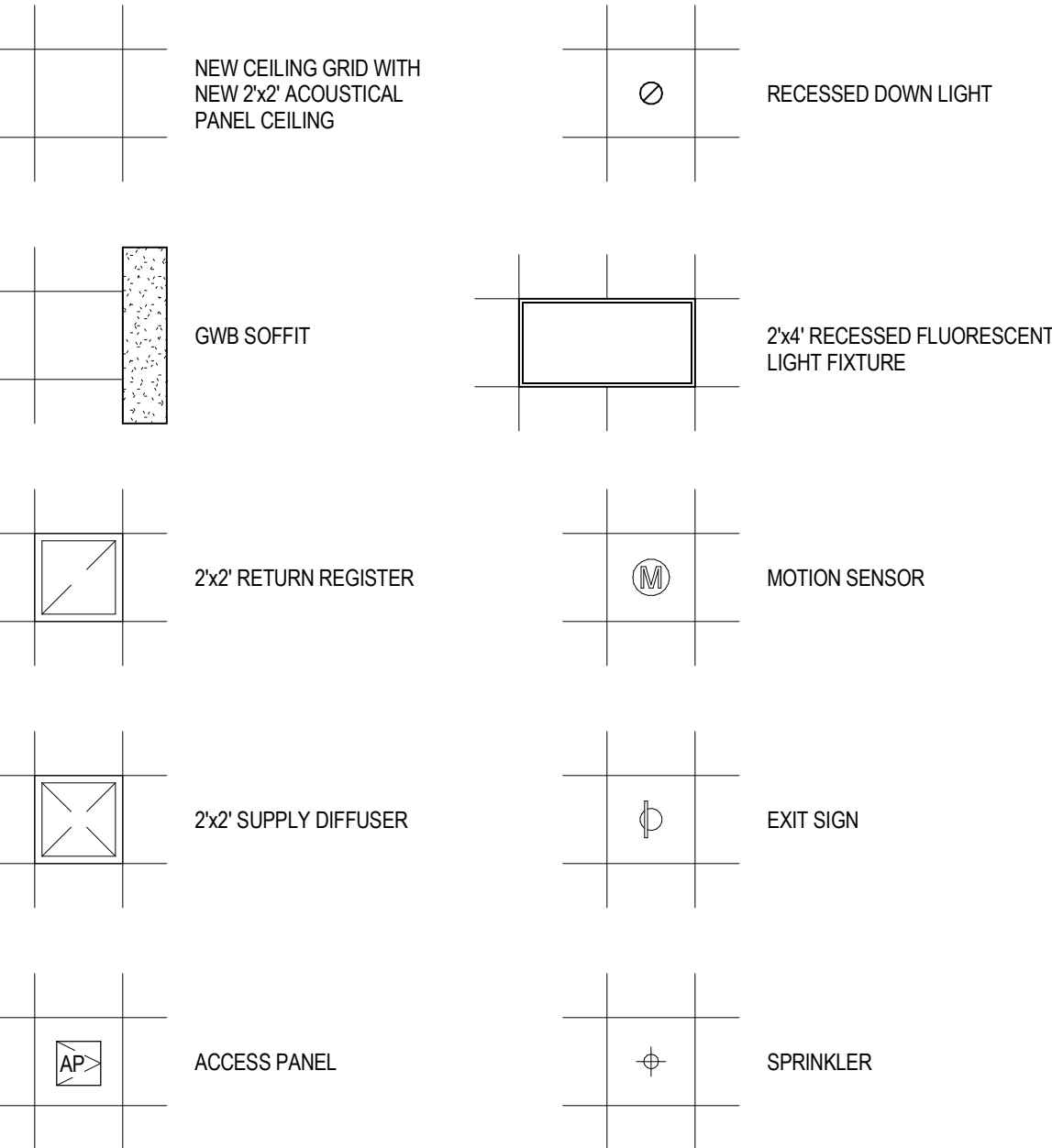
Project Number: 179-07-00



GENERAL CEILING NOTES

1. ALL TYPICAL AGT CEILING HEIGHTS 8'-0" UNLESS OTHERWISE NOTED.
2. CEILINGS SHALL NOT BE INSTALLED WITHOUT REVIEWED MEP COORDINATION DRAWINGS AS REQUIRED BY THE PROJECT SPECIFICATIONS.
3. AT NO TIME SHALL THE CONTRACTOR ADJUST THE CEILING HEIGHT AS INDICATED ON DOCUMENTS WITHOUT REVIEW WITH ARCHITECT. ARCHITECT SHALL BE INFORMED OF ALL CEILING HEIGHT CONFLICTS WHEN DISCOVERED FOR REVIEW.
4. COORDINATE ALL SOFFITS ABOVE CABINETS WITH INTERIOR ELEVATIONS AND CASEWORK DETAILS.
5. ALL DEVICES SHALL BE ALIGNED AND CENTERED WITHIN GRID UNLESS OTHERWISE NOTED.
6. REFER TO ALL ENGINEERING CONSULTANT AND VENDOR DRAWINGS FOR ALL RELATED SCOPE FOR COORDINATION.

CEILING PLAN KEY



1 LEVEL 1 - REFLECTED CEILING PLAN
SCALE: 1/4" = 1'-0"

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VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

REFLECTED CEILING PLANS

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A6.10

Project Number: 179-07-00

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DOOR AND FRAME SCHEDULE																
LOCATION		DOOR									FRAME					
MARK	OPERATION	OPENING		PANEL							TYPE	MATL	RATING	HDWR	COMMENTS	
		WIDTH	HEIGHT	TYPE	MATL	THICK	CONFIG	PANEL WIDTH	LEAF TYPE	LEAF WIDTH						
121A	DOUBLE - UNEQUAL	5'-0"	7'-0"	G-1HG	HM	1 3/4"	UNEQUAL	3'-6"	F		1'-6"	B	PS		1	CARD READER
121B	GLASS SLIDING DOORS	9'-0"	7'-0"	FG	AL	1 3/4"		VARIES				BY MFR	AL			SEE SPECIFICATIONS SLIDING GLASS DOORS
122A	DOUBLE - UNEQUAL	5'-0"	7'-0"	G-1HG	HM	1 3/4"	UNEQUAL	3'-6"	F		1'-6"	B	PS		2	CARD READER
122B	SINGLE - HINGED	3'-0"	7'-0"	F	HM	1 3/4"	SINGLE	3'-0"				A	PS		3	STORAGE SET

DOOR ABBREVIATIONS

DOOR AND WINDOW CONSTRUCTION:

ACOUS ACOUSTICAL CORE WOOD
AC ALUMINUM CLAD WOOD
AL ALUMINUM
HC HOLLOW CORE WOOD
HM HOLLOW METAL
LL LEAD LINED FRAME
SC SOLID CORE WOOD
SS STAINLESS STEEL
TG TEMPERED SAFETY GLASS

DOOR GLASS TYPE:

- NO GLASS REQUIRED
CR CLEAR WIRE
FR FIRE RATED PER SPECIFICATIONS
IG INSULATING GLASS
LG LAMINATED GLASS
TF CLEAR TEMPERED FLOAT
TI TEMPERED INSULATING
LE LEAD GLASS

FIRE RATING:

BLANK NO FIRE RATING REQUIRED
A180 3 HOUR RATING (A LABEL REQUIRED)
B60 1 HOUR RATING (B LABEL REQUIRED)
B90 1-1/2 HOUR RATING (B LABEL REQUIRED)
C45 3/4 HOUR (C LABEL REQUIRED)
20 10 HOUR RATING
30 1/2 HOUR RATING

DOOR FACING AND FINISH:

AF ALUMINUM FACTORY FINISH
CC COPPER CLADDING
CL HARDWOOD, TRANSPARENT FINISH
MF METAL FACTORY FINISH
MP METAL PAINTED
WD WOOD PAINTED

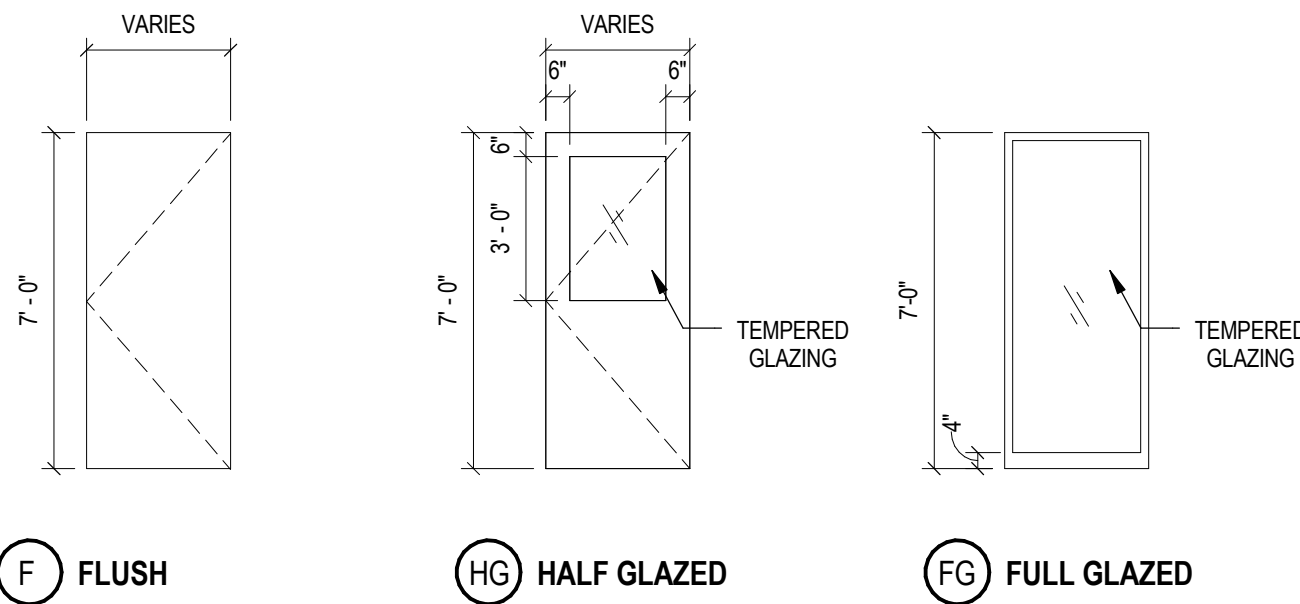
FRAME CONSTRUCTION:

AC ALUMINUM CLAD WOOD
AL ALUMINUM
PS PRESSED STEEL
SS STAINLESS STEEL
WD WOOD

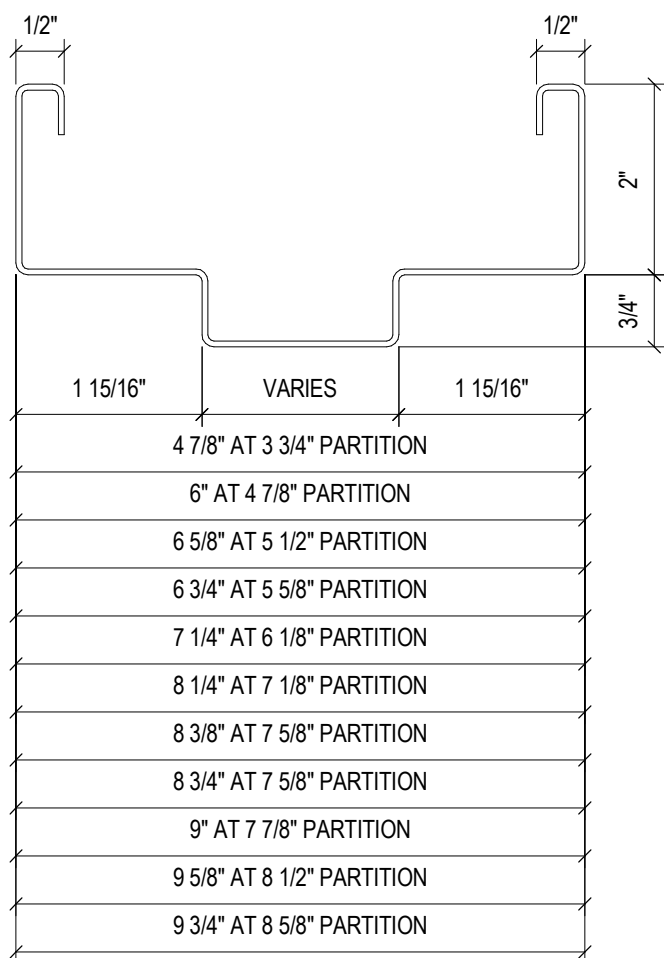
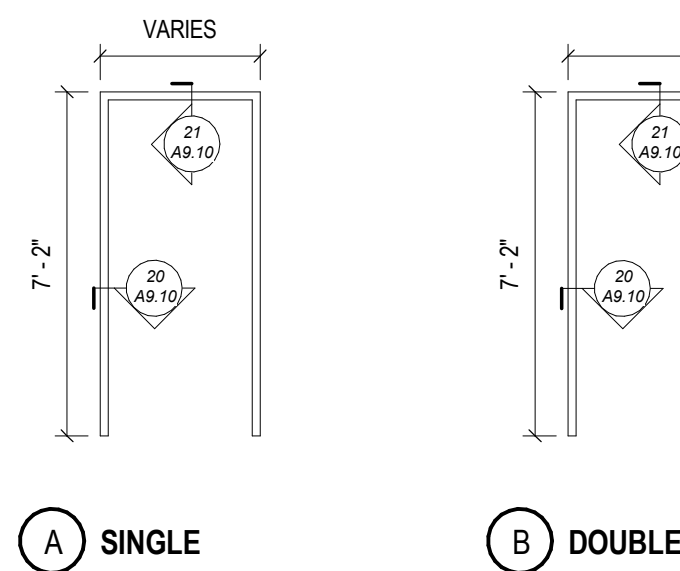
REMARKS:

- TRANSOM OR SIDELIGHT ADJACENT
- SPECIAL HEIGHT DOOR
- SPECIAL ALUMINUM DOOR AND FRAME
- SECURITY TIE IN REQUIREMENTS
- SPECIAL WOOD DOOR AND FRAME
- SOUND GASKETING
- WEATHERING STRIP
- MAGNETIC HOLD OPENS
- LIGHT GASKET
- FIELD MEASUREMENT REQUIRED
- DOUBLE ACTING REMOVE FRAME STOP
- LEAD LINING REQUIRED
- AUTOMATIC DOORS
- CODE ACCESS HARDWARE
- EXISTING DOOR
- STAINLESS STEEL KICK PLATE
- ROTON-HINGE

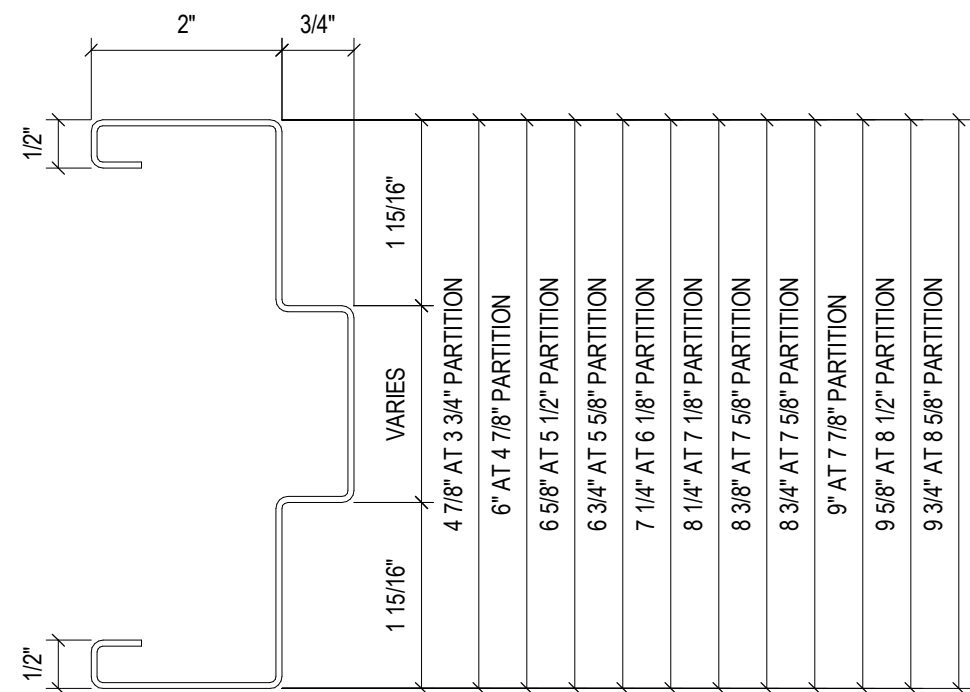
DOOR PANEL TYPES



DOOR FRAME TYPES



21 SECTION DETAIL
DOOR FRAME HEAD
SCALE: 6" = 1'-0"



20 SECTION DETAIL
DOOR FRAME JAMB
SCALE: 6" = 1'-0"

Issuance Schedule

Number Date Description

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VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

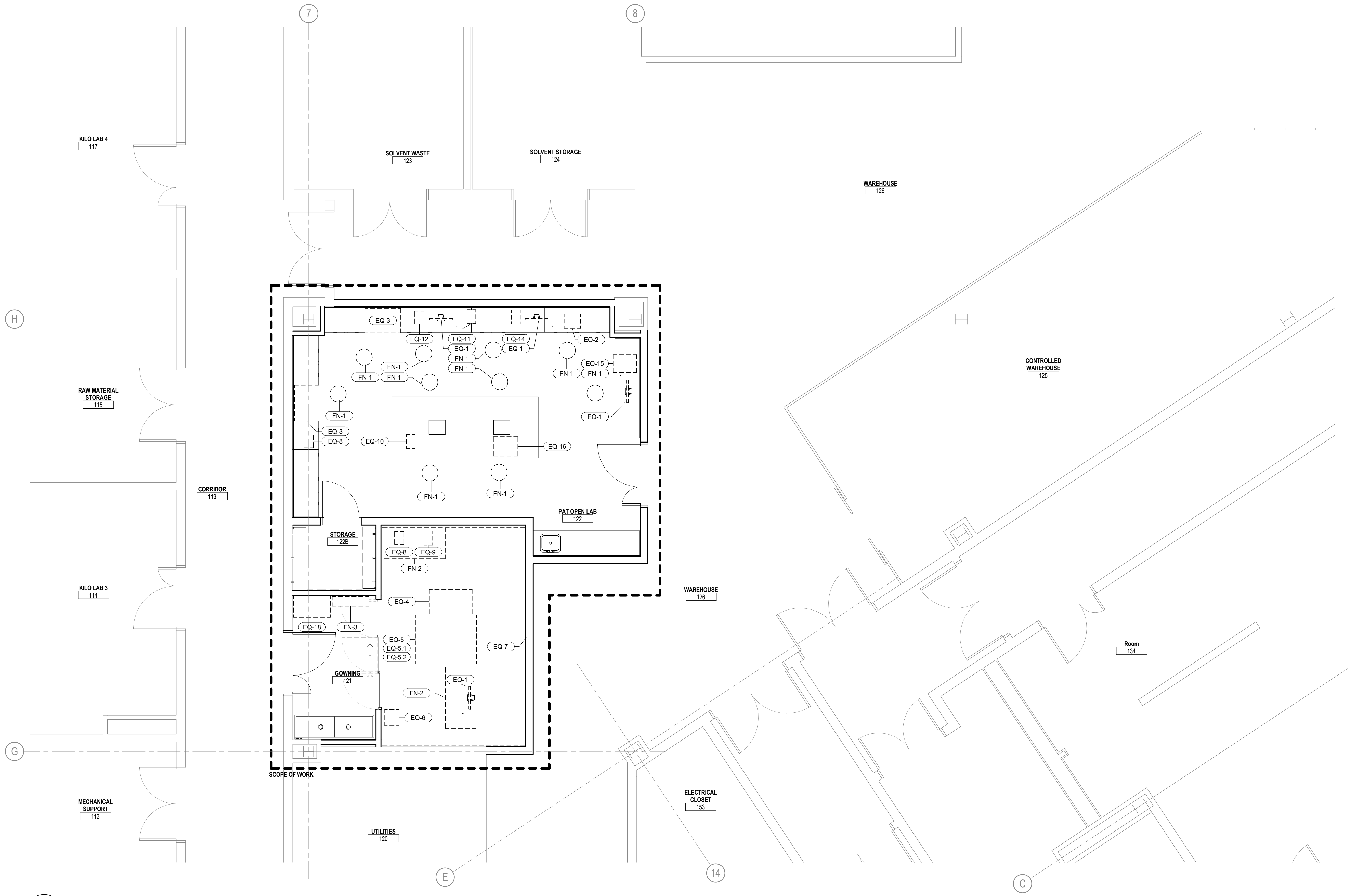
DOOR FRAME TYPES &
DETAILS

Scale: As indicated Date Issued: 8/26/16

A9.10

Project Number: 179-07-00

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1 LEVEL 1 - FURNITURE & EQUIPMENT PLAN
SCALE: 1/4" = 1'-0"

FURNITURE & EQUIPMENT SCHEDULE							
Type Mark	Count	Description	Manufacturer	Model	OFCI	OFOI	Comments
	1	Sturdybit TRIPPLE Compartment Scurley Sinks, drainboard both sides	ELKAY	Sturdybit SS8230LR	X		PROVIDE ELKAY LK18 DRAIN FITTING, T&S 8-0133 FLEX HOSE, CHICAGO 887-CP FAUCET. COORDINATE WITH PLUMBING DRAWINGS.
EQ-1	4	COMPUTER STATION			X		
EQ-2	1	DESKTOP PRINTER			X		
EQ-3	2	BALANCE TABLE			X		
EQ-4	2	MOBILE STAIRS			X		
EQ-5	1	PAT STACK SYSTEM	GEA		X		
EQ-5.1	1	PAT STACK - NIR	GEA / SENTRONICS		X		
EQ-5.2	2	PAT STACK - MALVERN INSITEC	MALVERN		X		
EQ-6	1	SOILED GOWNING TRASH BIN			X		
EQ-7	1	5.5m LS DOWNFLOW BOOTH	WALKER BARRIER SYSTEMS	EXTRACT TECHNOLOGY DFB	X		
EQ-8	2	5 PLACE BALANCE	METTLER TOLEDO	XPE205	X		
EQ-9	1	TOP LOADING BALANCE	SARTORIUS	CUBIS MSE 125P-100.DU	X		
EQ-10	1	BLEN0 MONITOR	ABB	EXPO 6PAT801	X		
EQ-11	1	RF SYSTEM VACUUM	METROHM	874	X		
EQ-12	1	AUTO TABLET TESTER	KRAEMER	UTS 4.1	X		
EQ-14	1	SPECTROMETER	BRUKER	MATRIX-1 FT-NIR	X		
EQ-15	1	PIAT SYSTEM ANALYZER	KAISER	RAMAN R0N-1	X		
EQ-16	1	PIAT R0N-1 ANALYZER	KAISER	RAMAN R0N-1	X		
EQ-18	1	METRO RACK SHELVING		24"x36"	X		
FN-1	10	LAB STOOL			X		
FN-2	2	30"x60" TABLE ON LOCKABLE CASTERS			X		
FN-3	1	GOWNING BENCH		36" LONG	X		

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VERTEX PHARMACEUTICALS

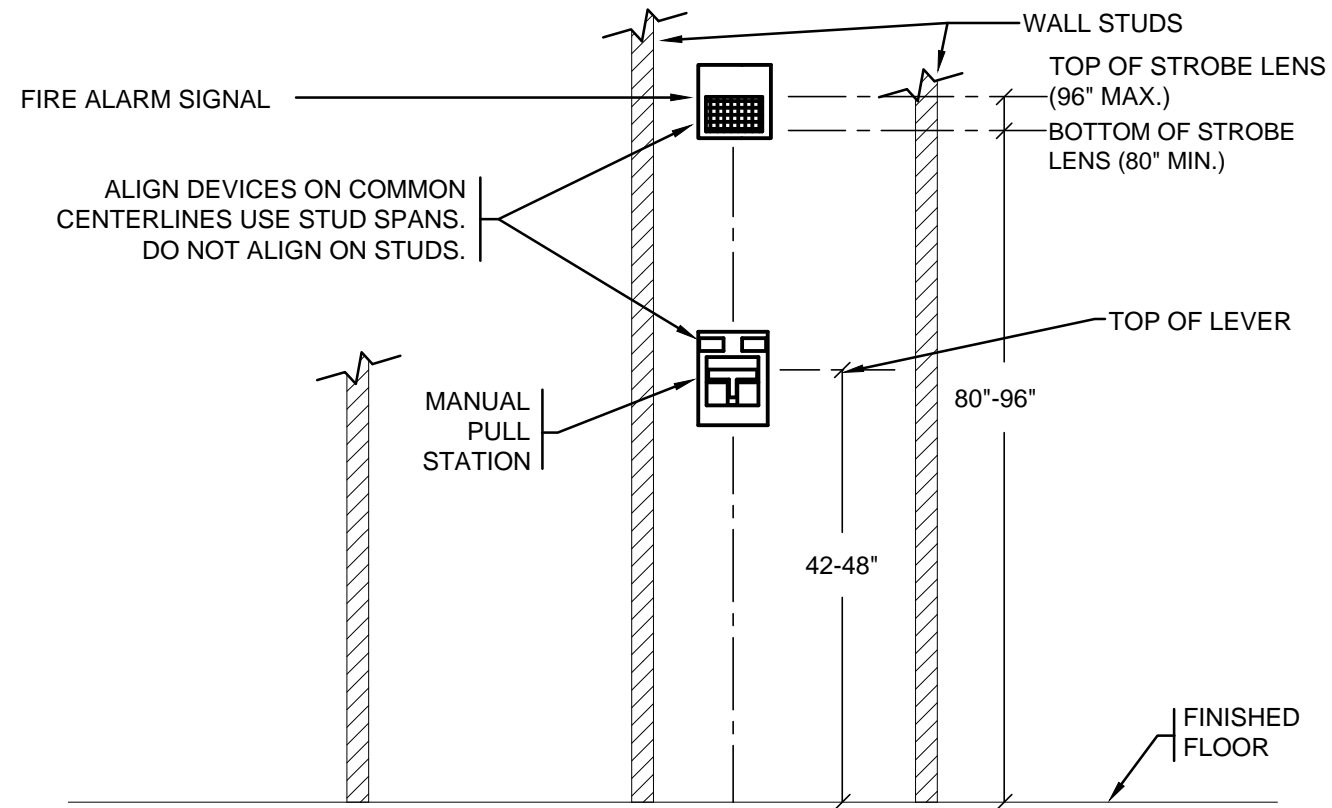
LEVEL 1 PAT LAB

FURNITURE & EQUIPMENT

Scale: 1/4" = 1'-0" Date Issued: 8/26/16

A10.00

Project Number: 179-07-00



1 TYPICAL DEVICE MOUNTING DIAGRAM (WALL MOUNTED)
SCALE: NTS

FIRE ALARM NOTES

- ALL WIRING FOR THE FIRE ALARM SYSTEM SHALL BE AS FOLLOWS:
 - ABOVE SUSPENDED CEILINGS: METAL CLAD CABLE, TWISTED PAIR, IN CONFORMANCE WITH SYSTEM MANUFACTURER'S REQUIREMENTS AND AS PER APPROVED SHOP DRAWINGS.
 - FROM SUSPENDED CEILING TO SURFACE MOUNTED DEVICE: TWISTED PAIR, IN SURFACE MOUNTED RACEWAYS, IN CONFORMANCE WITH SYSTEM MANUFACTURER'S REQUIREMENTS AND AS PER APPROVED SHOP DRAWINGS.
 - ON CMU/CONCRETE WALLS AND CEILINGS: TWISTED PAIR, IN CONDUITS, IN CONFORMANCE WITH SYSTEM MANUFACTURER'S REQUIREMENTS AND AS PER APPROVED SHOP DRAWINGS.
 - ON PLASTERED WALLS/CEILINGS: METAL CLAD CABLE, TWISTED PAIR, IN CONFORMANCE WITH SYSTEM MANUFACTURER'S REQUIREMENTS AND AS PER APPROVED SHOP DRAWINGS.
- ALL WALL MOUNT DEVICES (HORN/STROBES, MANUAL PULL STATIONS ETC.) SHALL BE INSTALLED AS FOLLOWS:
 - FOR ALL PLASTERED WALLS:
 - MOUNT DEVICES ON A RECESSED BACK BOX IN WALL.
 - WIRING TO THE DEVICE SHALL BE CONCEALED IN WALL FROM THE SUSPENDED CEILING ABOVE.
 - FOR ALL CMU/CONCRETE WALL:
 - MOUNT DEVICES ON A MANUFACTURER'S PROVIDED STEEL BACK BOX.
- MOUNTING HEIGHT AND CANDELA RATING OF FIRE ALARM DEVICES SHALL BE IN COMPLETE COMPLIANCE WITH THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD REGULATIONS (MAAB 521 CMR).
- PRIOR TO FURNISHING AND INSTALLING FIRE ALARM SYSTEM EQUIPMENT, DEVICES, AND WIRING, THE ELECTRICAL CONTRACTOR SHALL CONFER WITH LOCAL FIRE AUTHORITY FOR ALL REQUIREMENTS.
- ALL EXPOSED WIRING SHALL BE IN MINIMUM 1/2" CONDUIT. WIRING ABOVE CEILINGS SHALL BE MINIMUM PLENUM RATED.
- THE BASE BUILDING EDWARDS EST-3 FIRE ALARM SYSTEM IS EXISTING TO REMAIN. FURNISH AND INSTALL NEW DEVICES AS INDICATED ON THESE CONTRACT DRAWINGS AND WIRE NEW DEVICES TO EXISTING BASE BUILDING FIRE ALARM SYSTEM. NEW DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
- CONTRACTOR IS RESPONSIBLE FOR ENSURING ALL NEW VISUAL NOTIFICATION DEVICES ARE SYNCHRONIZED WITH EXISTING DEVICES.
- UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR ADD ANY NEW DETECTION OR NOTIFICATION DEVICES TO EXISTING BY MEANS OF T-TAPPING.
- PROVIDE NEW POWER SUPPLIES AS NEEDED TO ADD NEW DEVICES TO THE EXISTING FIRE ALARM SYSTEM.

FIRE ALARM LEGEND

-----	EXISTING FIRE ALARM SYSTEM TO REMAIN (SHOWN LIGHT)	-----	EXISTING FIRE ALARM SYSTEM TO REMAIN (SHOWN LIGHT)
	EXISTING DEVICE TO BE REMOVED (X-OUT)		EXISTING DEVICE TO BE REMOVED (X-OUT)
	EXISTING ADDRESSABLE MONITOR MODULE TO REMAIN		ADDRESSABLE MONITOR MODULE
	EXISTING CONTROL MODULE TO REMAIN		CONTROL MODULE
	EXISTING FIRE ALARM STROBE ONLY, NUMERAL INDICATES CANDELA RATING TO REMAIN		FIRE ALARM STROBE ONLY, NUMERAL INDICATES CANDELA RATING
	EXISTING FIRE ALARM STROBE AND HORN NUMERAL INDICATES CANDELA RATING TO REMAIN		FIRE ALARM STROBE AND HORN, NUMERAL INDICATES CANDELA RATING
	EXISTING FIRE ALARM MANUAL PULL STATION TO REMAIN		FIRE ALARM MANUAL PULL STATION
	EXISTING SMOKE DETECTOR. 'D' INDICATES DUCT MOUNTED SMOKE DETECTOR TO REMAIN		SMOKE DETECTOR. 'D' INDICATES DUCT MOUNTED SMOKE DETECTOR
	EXISTING SMOKE DETECTOR TO REMAIN. 'R' INDICATES ELEVATOR RECALL INITIATION		SMOKE DETECTOR TO REMAIN. 'R' INDICATES ELEVATOR RECALL INITIATION
	EXISTING SMOKE DETECTOR WITH REMOTE TROUBLE LIGHT TO REMAIN		SMOKE DETECTOR WITH REMOTE TROUBLE LIGHT
ETR	LIGHT LINE INDICATES EXISTING WORK TO REMAIN	ETR	LIGHT LINE INDICATES EXISTING WORK TO REMAIN
RE	REMOVE EXISTING DEVICE	RE	REMOVE EXISTING DEVICE
XL	NEW LOCATION OF EXISTING DEVICE	XL	NEW LOCATION OF EXISTING DEVICE
XR	RELOCATE EXISTING DEVICE	XR	RELOCATE EXISTING DEVICE
LFAC	LIMIT OF FIRE ALARM CONTRACT	LFAC	LIMIT OF FIRE ALARM CONTRACT
NIFAC	NOT IN FIRE ALARM CONTRACT	NIFAC	NOT IN FIRE ALARM CONTRACT

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LEVEL 1 PAT LAB

FIRE ALARM LEGEND, NOTES, & DETAIL

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FA0.01

Project Number: 179-07-00

<div>FIRE ALARM SPECIFICATIONS</div> <div><div>I. GENERAL</div><div>A. THE WORK CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO INSTALL, COMPLETE AND READY FOR CONTINUOUS OPERATION, THE FIRE ALARM SYSTEMS, APPARATUS AND EQUIPMENT AS SHOWN IN THE PROPOSED CONSTRUCTION DOCUMENTS HEREIN.</div><div>B. SHOP DRAWINGS OF ALL SPECIFIED FIXTURES, EQUIPMENT AND APPARATUS SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL.</div><div>C. CODES: ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE ELECTRICAL SUB-CONTRACTS AND LABOR PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE MASS STATE BUILDINGS AND ELECTRICAL CODES, LOCAL ORDINANCES AND REGULATIONS OF THE CITY OR TOWN, NATIONAL FIRE PROTECTION ASSOCIATION AND INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.</div><div>D. PERMITS: ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THE SPECIFICATION INCLUDING ALL FEES OR EXPENSES INCURRED.</div><div>E. INSTRUCTIONS: DURING THE ASSEMBLY AND INSTALLATION OF ALL ELECTRICAL SYSTEMS, THE OWNER'S OPERATING PERSONNEL SHALL BE INSTRUCTED REGARDING ITS OPERATION AND MAINTENANCE. AN INSTRUCTION PERIOD SHALL BE PROVIDED AFTER COMPLETION OF PROJECT. OPERATION AND MAINTENANCE MANUALS SHALL BE REQUIRED.</div><div>F. GUARANTEE: ALL MATERIALS AND EQUIPMENT, FURNISHED AND INSTALLED, SHALL BE GUARANTEED IN WRITING FOR ONE (1) YEAR FROM THE DATE OF ACCEPTANCE OF THE BUILDING BY THE OWNER.</div><div>G. RECORD DRAWINGS: THE FIRE ALARM SUBCONTRACTOR SHALL MAINTAIN AT THE JOB, AT ALL TIMES, A COMPLETE AND SEPARATE SET OF BLACKLINE PRINTS OF THE ELECTRICAL DRAWINGS OF HIS TRADE ON WHICH HE SHALL MARK CLEARLY, NEATLY, ACCURATELY AND PROMPTLY AS THE WORK PROGRESSES. MYLAR REPRODUCIBLE "AS-BUILTS" SHALL BE FURNISHED BY THE ELECTRICAL SUBCONTRACTOR AT THE JOB COMPLETION.</div><div>H. INSPECTION: ALL WORK SHALL BE SUBJECT TO THE INSPECTION OF THE OWNER AND SUCH OTHER INSPECTORS HAVING JURISDICTION. PROPERLY EXECUTED CERTIFICATE OF INSPECTION SHALL BE PROVIDED.</div><div>I. TESTS: THE FIRE ALARM SUBCONTRACTOR SHALL PERFORM ALL TESTS AT THE COMPLETION OF THE WORK AND THE RESULTS FURNISHED TO THE OWNER IN WRITING. TESTS SHALL INCLUDE BUT NOT BE LIMITED TO: ALL SYSTEMS TEST FREE OF SHORTS OR GROUNDS, PROPER NEUTRAL CONNECTIONS, GROUND SYSTEM RESISTANCE.</div><div>J. UPON COMPLETION OF ALL WORK, THE FIRE ALARM SUBCONTRACTOR SHALL FURNISH, IN DUPLICATE, CERTIFICATES OF INSPECTIONS FROM ALL INSPECTORS AND AUTHORITIES HAVING JURISDICTION, NOTARIZED LETTERS FROM THE MANUFACTURERS STATING THAT AUTHORIZED FACTORY ENGINEERS HAVE INSPECTED AND TESTED THE INSTALLATION OF THEIR RESPECTIVE SYSTEMS AND FOUND SAME TO BE IN PERFECT OPERATING CONDITION.</div></div> <div><div>II. SCOPE</div><div>A. THE WORK OF THIS SECTION CONSISTS OF ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO PROVIDE ALL ELECTRICAL WORK, NOT SPECIFICALLY DESCRIBED IN OTHER TRADES COMPLETE, IN PLACE, AS SHOWN ON THE DRAWINGS, SPECIFIED HEREIN AND AS NECESSARY FOR A PROPER INSTALLATION.</div><div>B. THE EXTENT OF THE WORK SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:<div><div>1. PROVIDE AN EXTENSION TO EXISTING EDWARDS EST-3 BASE BUILDING FIRE ALARM AND CONTROL SYSTEM WITH AUDIO/VISUAL OCCUPANT NOTIFICATION SIGNALS FOR THE RENOVATED AREAS IN COMPLIANCE WITH APPLICABLE SPECIFICATIONS AND DRAWINGS. THE SYSTEM SHALL INTERFACE TO OTHER BUILDING SYSTEMS TO CONDUCT MONITORING AND CONTROL FUNCTIONS AS DESCRIBED HEREIN.</div><div>2. ALL NEW DEVICES SHALL BE OF THE SAME MANUFACTURER AS EXISTING SYSTEM AND SHALL BE COMPATIBLE WITH EXISTING EQUIPMENT.</div></div></div><div><div>III. SUBMITTALS</div><div>A. SUBMIT FOR APPROVAL, WITHIN THIRTY (30) DAYS AFTER SIGNING THE CONTRACT AND PRIOR TO THE SUBMISSION OF ANY SHOP DRAWINGS, AN ITEMIZED LIST OF MANUFACTURERS OF MATERIALS AND EQUIPMENT AND OF SUBCONTRACTORS PROPOSED TO BE USED UNDER THIS SECTION.</div><div>B. AFTER APPROVAL OF THE LIST, PROVIDE SUBMITTALS IN ACCORDANCE WITH THE "SUBMITTALS" SECTION OF THIS SPECIFICATION. ALL SHOP DRAWINGS FOR EQUIPMENT SUBMITTED FOR REVIEW SHALL INCLUDE COMPLETE SPECIFICATIONS, INCLUDING TYPE OF MATERIALS, OPERATING PRESSURES AND TEMPERATURES, CAPACITIES, PERFORMANCE AND POWER REQUIREMENTS TO DETERMINE COMPLIANCE WITH CONTRACT DOCUMENTS. WIRING DIAGRAM SUBMITTED SHALL BE COMPLETE FOR ALL EQUIPMENT AND SHALL APPLY ONLY TO THIS SPECIFIC PROJECT.</div><div>C. THE SHOP DRAWINGS AND MANUFACTURERS DATA SHALL BE SUBMITTED IN A TIMELY MANNER SUFFICIENTLY IN ADVANCE TO GIVE AMPLE TIME FOR CHECKING, CORRECTING, RESUBMITTING AND RECHECKING IF NECESSARY. NO CLAIM FOR DELAY WILL BE GRANTED FOR FAILURE TO COMPLY WITH THIS REQUIREMENT.</div><div>D. SUBMIT SHOP DRAWINGS ON THE FOLLOWING:<div><div>1. CABLE AND WIRE.</div><div>2. CONDUIT.</div><div>3. DEVICES.</div><div>4. FIRE ALARM SYSTEM.</div><div>5. LOW VOLTAGE AND BATTERY CALCULATIONS.</div></div><div><div>- COMPLETE POINT-TO-POINT RISER DIAGRAM AND DEVICE LOCATION PLANS SHOWING ALL EQUIPMENT AND SIZE, TYPE, LOCATION, AND NUMBER OF ALL CONDUCTORS AND DEVICES.</div><div>- LARGE SCALE DRAWINGS OF THE FACP AND REMOTE PANELS SHOWING MODULE PLACEMENT AND SPARE CAPACITY ALLOWANCES.</div><div>- ADDRESSES FOR ALL FIELD DEVICES SHOWN ON FLOOR PLANS AND KEY LISTS. KEY LISTS SHALL INCLUDE DEVICE TYPE, ADDRESS, LOCATION AND CORRESPONDING LCD MESSAGE TEXT. THE INSTALLING CONTRACTOR SHALL COORDINATE MESSAGE ASSIGNMENTS WITH THE OWNER AND LOCAL AUTHORITIES PRIOR TO SYSTEM PROGRAMMING.</div></div></div><div><div>IV. SEISMIC RESTRAINTS</div><div>A. INSTALLATION OF NEW FIRE ALARM EQUIPMENT, ACCESSORIES AND COMPONENTS SHALL BE IN ACCORDANCE WITH THE SEISMIC REQUIREMENTS IDENTIFIED IN THE MASSACHUSETTS STATE BUILDING CODE, EIGHTH (8TH) EDITION.</div></div><div><div>V. MATERIALS</div><div>A. WIRE AND CABLE:<div><div>1. ALL WIRE AND CABLE SHALL HAVE COPPER CONDUCTORS. COPPER WIRES SHALL BE SOFT DRAWN, ANNEALED, 98 PERCENT CONDUCTIVITY, AND INSULATED FOR 600 VOLTS. WIRE SIZES #14 THROUGH #6 AWG SHALL BE TYPE THHN-THWN.</div><div>2. FIRE-PROTECTIVE SIGNALING WIRING SHALL BE IN ACCORDANCE WITH THE ELECTRICAL CODE, ARTICLE 760, FIRE PREVENTION SYSTEMS FOR BUILDING FIRE ALARM SYSTEMS, AND AS INDICATED ON THE DRAWINGS. ALL WIRES FOR THE LOCAL FIRE ALARM SYSTEM SHALL BE COLOR-CODED AND SIZED AS RECOMMENDED BY THE MANUFACTURER OF THE FIRE ALARM SYSTEM, AND SHALL BE INSTALLED IN CONDUIT. THE COMBINED CROSS-SECTIONAL AREA OF ALL CONDUCTORS OR CABLES SHALL NOT EXCEED THE PERCENTAGE OF FILL SPECIFIED IN TABLE 1, CHAPTER 9 OF THE ELECTRICAL CODE.</div></div></div></div></div></div>

<div><div>1. PROVIDE COMPLETE WIRING AND CONDUIT BETWEEN ALL EQUIPMENT. ALL DEVICES SHALL BE MOUNTED UPON AND TERMINATIONS MADE IN TERMINAL CABINETS. WIRING SPLICES AND TRANSPOSING OR CHANGING OF COLORS WILL NOT BE PERMITTED.</div><div>2. ALL WIRING TYPES AND SIZES SHALL BE AS FOLLOWS OR AS OTHERWISE REQUIRED BY THE EQUIPMENT MANUFACTURER:<div><div>- ADDRESSABLE SLC LOOP WIRING SHALL UTILIZE MINIMUM #16 AWG WIRING.</div><div>- NOTIFICATION APPLIANCE CIRCUITS SHALL UTILIZE #14 THHN.</div></div></div><div>B. OUTLET, JUNCTION AND PULL BOXES:<div><div>1. FURNISH AND INSTALL OUTLET, JUNCTION AND PULL BOXES AS SPECIFIED HEREIN AND WHERE SHOWN ON THE CONTRACT DRAWINGS AND AT ALL OTHER LOCATIONS WHERE THEY ARE REQUIRED TO FACILITATE THE PULLING, SUPPORTING OR CONNECTION OF WIRES AND CABLES.</div></div></div><div><div>A. MOUNTING HEIGHTS</div><div>1. ALL ELECTRICAL EQUIPMENT SHALL BE MOUNTED AT THE FOLLOWING HEIGHTS UNLESS NOTED OR DETAILED OTHERWISE ON THE FIRE ALARM DRAWINGS OR ARCHITECTURAL DRAWINGS. ALL MOUNTING HEIGHTS SHALL COMPLY WITH THE FEDERAL ADA (AMERICANS WITH DISABILITIES ACT) AND THE STATE OF MASSACHUSETTS PUBLICATION 521 CMR: ARCHITECTURAL BARRIERS BOARD FOR (BUILDINGS, FACILITIES, ETC. FOR THE VISUALLY AND PHYSICALLY HANDICAPPED).</div><div><div>- FIRE ALARM PULL STATIONS: 4'-0" ABOVE FINISHED FLOOR TO THE TOP OF THE ACTIVATING LEVER.</div><div>- FIRE ALARM SIGNALS: (HORN/STROBES) 6'-8" ABOVE FINISHED FLOOR TO BOTTOM OF THE STROBE</div></div><div>VI. FIRE ALARM EQUIPMENT</div><div><div>A. THE SYSTEM IS SUPPORTED BY STANDBY BATTERIES. PROVIDE NEW BATTERY CALCULATIONS AND REPLACE BATTERIES, BASED ON THE FOLLOWING CRITERIA:<div><div>1. IN THE EVENT OF A LOSS OF PRIMARY POWER, BATTERIES SHALL SUPPORT 24 HOURS OF FULL SUPERVISORY OPERATION FOLLOWED BY 5 MINUTES OF ALARM. PROVIDE INCREASED CAPACITY OF 20% FOR SAFETY AND BATTERY DEGRADATION.</div><div>2. ALL EQUIPMENT SHALL BE NEW AND UNUSED. ALL COMPONENTS AND SYSTEMS SHALL BE DESIGNED FOR UNINTERRUPTED DUTY. ALL EQUIPMENT, MATERIALS AND ACCESSORIES COVERED BY THESE REQUIREMENTS SHALL BE PROVIDED BY A SINGLE MANUFACTURER OR, IF PROVIDED BY DIFFERENT MANUFACTURERS, RECOGNIZED AS COMPATIBLE BY BOTH MANUFACTURERS.</div></div></div><div><div>C. CIRCUITING GUIDELINES: EACH MANUAL OR AUTOMATIC DETECTION DEVICE AND INDICATING CIRCUIT SHALL BE INDIVIDUALLY ADDRESSABLE. CIRCUIT WIRING SHALL MATCH EXISTING WIRE CONVENTION.</div><div>1. NOTIFICATION APPLIANCE CIRCUITS SHALL ALLOW SILENCING OF THE AUDIBLE SIGNALS WHILE MAINTAINING AN ACTIVE VISUAL INDICATION.</div><div>D. SYSTEM COMPONENTS:<div><div>1. ISOLATION MODULES: PROVIDE ISOLATION MODULES TO MAINTAIN CIRCUIT INTEGRITY IN THE EVENT OF AN OPEN, SHORT OR GROUND FAULT. AS A MINIMUM, EACH ADDRESSABLE LOOP SHALL HAVE 1 ISOLATION MODULE FOR EVERY 25 DEVICES, OR 1 PER FLOOR, WHICHEVER IS GREATER.</div><div>2. VISUAL SIGNALS: FURNISH AND INSTALL SELF-SYNCHRONIZING XENON STROBES RATED BY UL 1971 TEST CRITERIA AND IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT AND NFPA 72. VISUAL SIGNALS SHALL HAVE A MINIMUM EFFECTIVE INTENSITY RATING OF 15 CANDELA.</div><div>3. AUDIBLE SIGNALS: PROVIDE AUDIBLE SIGNALS (SPEAKERS 25.0 VRMS NOMINAL) TO PRODUCE A MINIMUM REVERBERANT SOUND LEVEL OF 85DB, OR 150DB ABOVE AMBIENT @ 10FT. WHICHEVER IS GREATER.</div><div>4. AUXILIARY STROBE POWER SUPPLIES: PROVIDE DISTRIBUTED INTELLIGENT POWER SUPPLIES WHERE REQUIRED TO ACCOMMODATE THE POWER REQUIREMENTS OF NOTIFICATION APPLIANCE CIRCUITS. POWER SUPPLIES SHALL COMMUNICATE WITH THE FACP VIA DATA COMMUNICATIONS, WHEREBY EACH POWER SUPPLY SHALL REPORT A LOSS OF AC POWER, BATTERY FAIL OR GROUND FAULT, AND EACH NOTIFICATION APPLIANCE CIRCUIT SERVED SHALL BE INDIVIDUALLY MONITORED FOR WIRING INTEGRITY.</div><div>5. SMOKE DETECTORS: FURNISH AND INSTALL, WHERE INDICATED ON THE PLANS, MICROPROCESSOR-BASED ANALOG/ADDRESSABLE PHOTOELECTRIC SMOKE DETECTORS WITH BASES WHICH MATCH EXISTING DEVICES. DETECTORS SHALL BE LISTED BY UNDERWRITERS' LABORATORIES, INCORPORATED UNDER THE CURRENT STANDARDS FOR PHOTOELECTRIC TYPE SMOKE DETECTORS, UL 268.</div></div></div><div><div>VII. DEMOLITION</div><div>A. ALL DEMOLITION WORK, AS INDICATED ON THE DRAWINGS, SHALL BE PERFORMED BY THE FIRE ALARM CONTRACTOR. DEMOLISHED ITEMS SHALL BE REMOVED FROM THE PREMISES.</div><div>B. ALL EXISTING DEVICES, WIRING, ETC. SHALL BE DEMOLISHED UNLESS OTHERWISE NOTED OR INDICATED ON THE DRAWINGS. CARE SHALL BE TAKEN DURING DEMOLITION WORK TO MAINTAIN THE INTEGRITY OF THE EXISTING WIRING WHICH MAY BE REUSED.</div><div>C. EXISTING CONDUCTORS AND CABLES RUN ABOVE CEILING, NOT RUN IN METAL RACEWAY AND NOT TEFLON COATED, SHALL BE DISCONNECTED, REMOVED AND REPLACED SO AS TO BE SUITABLE FOR AIR HANDLING PLENUMS, PER LOCAL, STATE AND NATIONAL CODES.</div><div>D. EXISTING FIRE ALARM RACEWAYS, WIRING, JUNCTION BOXES, OUTLET BOXES AND PULL BOXES MAY BE REUSED WHEREVER POSSIBLE. THE FIRE ALARM CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE MECHANICAL INTEGRITY OF ANY EXISTING RACEWAY SYSTEMS THAT ARE TO BE REUSED.</div><div>E. WHERE REQUIRED, THE EXISTING RACEWAY SYSTEM SHALL BE EXTENDED TO NEW DEVICE LOCATIONS AS INDICATED ON THE DRAWINGS. IN GENERAL, ALL NEW RACEWAYS IN FINISHED AREAS SHALL BE RUN CONCEALED IN BUILDING CONSTRUCTION, ABOVE HUNG CEILINGS, IN MASONRY OR STUD WALLS, ETC. WHERE REQUIRED, NEW RACEWAYS RUN IN THE EXISTING BUILDING MAY BE RUN EXPOSED. THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE ARCHITECT REGARDING LOCATION AND ROUTING OF ANY EXPOSED RACEWAYS PRIOR TO INSTALLING SAME.</div><div>F. CLEANING UP<div><div>1. UPON COMPLETION OF ALL INSTALLATION, AND TESTING, THOROUGHLY INSPECT ALL EXPOSED PORTIONS OF THE FIRE ALARM INSTALLATION AND COMPLETELY REMOVE ALL EXPOSED LABELS, MARKINGS, AND FOREIGN MATERIAL.</div><div>2. THE INTERIOR OF ALL BOXES AND CABINETS SHALL BE LEFT CLEAN; EXPOSED SURFACES SHALL BE CLEANED AND PLATED SURFACES POLISHED.</div><div>3. REPAIR DAMAGE TO FINISH SURFACES RESULTING FROM WORK UNDER THIS SECTION.</div><div>4. REMOVE MATERIAL AND EQUIPMENT FROM AREAS OF WORK AND STORAGE AREAS.</div></div></div></div></div></div></div></div>

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Issuance Schedule

Number	Date	Description
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ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

FIRE ALARM SPECIFICATION

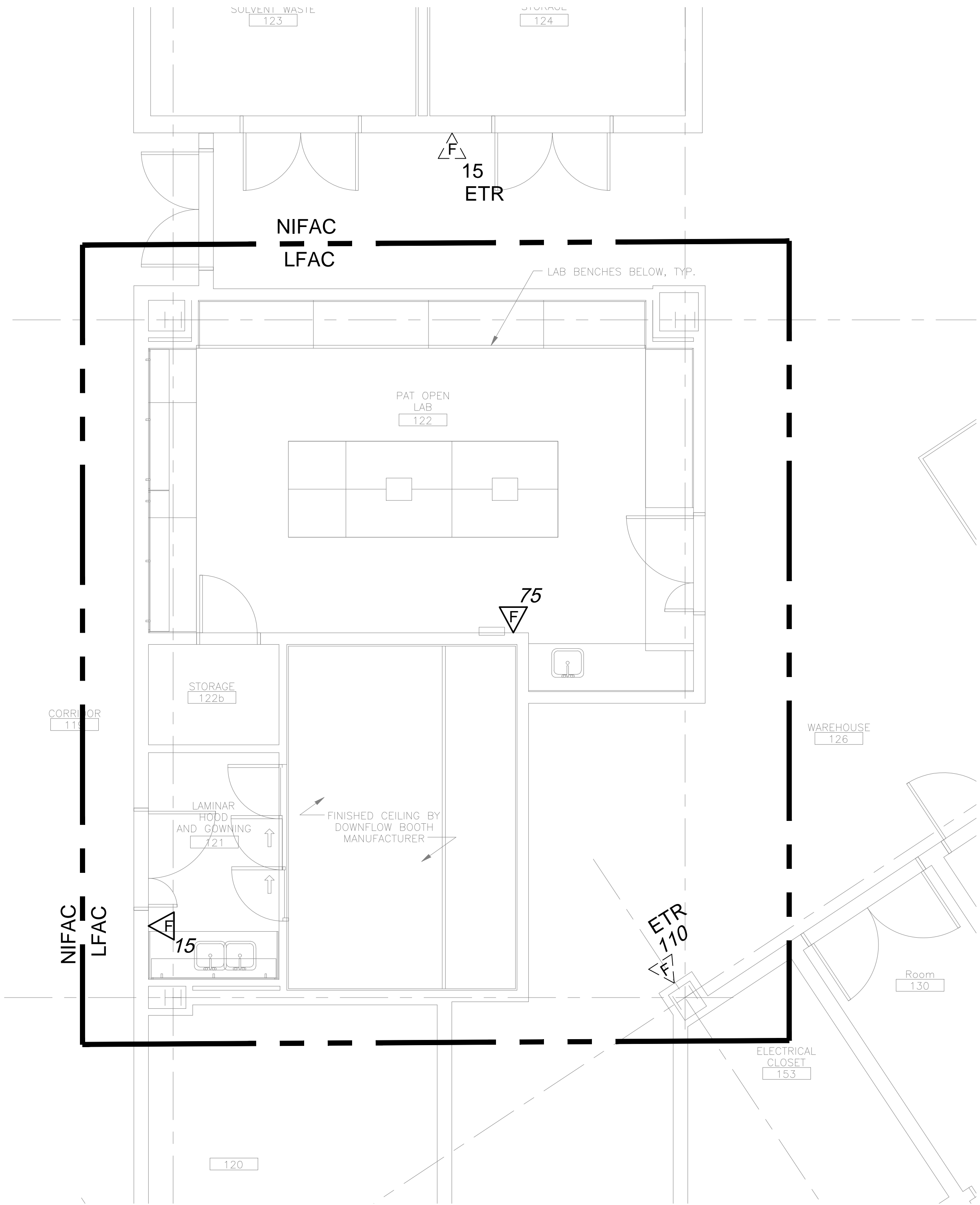
Scale: N.T.S. Date Issued: 8/26/16

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Project Number: 179-07-00

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1 LEVEL 1 PAT LAB - FIRE ALARM NEW WORK PLAN
SCALE: 1/4"=1'-0"

Issuance Schedule		
Number	Date	Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

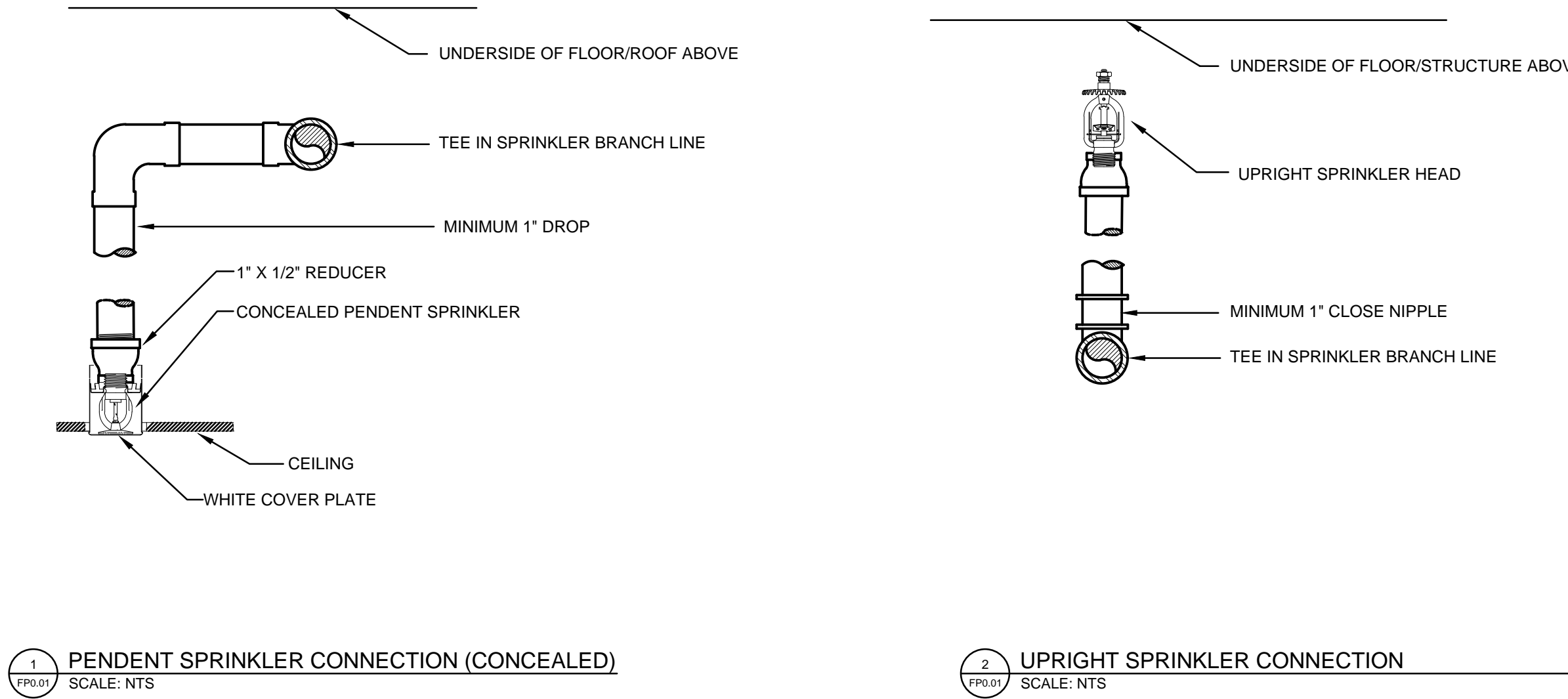
LEVEL 1 PAT LAB

FIRE ALARM
NEW WORK
PLAN

Scale: 1/4"=1'-0" Date Issued: 8/26/16

FA1.11

Project Number: 179-07-00



HYDRANT FLOW TEST DATA:

STATIC PRESSURE: 106psi
RESIDUAL PRESSURE: 80psi
FLOW: 2,200gpm
DATE: MAY 3, 2016
BY: J.C. CANNISTRARO, LLC

FIRE PROTECTION GENERAL NOTES

1. FOLLOW THE LATEST REQUIREMENTS OF NFPA 13, 2013 EDITION, MASSACHUSETTS STATE BUILDING CODE 8TH EDITION, FM GLOBAL STANDARDS, AND THOSE OF ANY CITY, STATE, OR FEDERAL AGENCY HAVING JURISDICTION OVER THIS PROJECT.
2. PLANS INDICATE GENERAL SCOPE OF WORK. REFER TO CONTRACT DOCUMENTS AND SPECIFICATIONS FOR DETAILS ON ENTIRE SCOPE OF WORK. NEW WORK SHOWN IS DIAGRAMMATIC ONLY. THE DRAWINGS ARE NOT MEANT TO SHOW ALL OFFSETS AND PIPING ELEVATION CHANGES. THE CONTRACTOR SHALL VERIFY ALL NEEDED OFFSETS AND PIPE ELEVATIONS TO INSTALL THE PROPOSED SPRINKLER SYSTEM.
3. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE WORK WITH THAT OF ALL OTHER TRADES. THE INSTALLING CONTRACTOR SHALL COORDINATE ALL WORK TO THE EXISTING AND/OR NEW FIELD CONDITIONS.
4. ANY INTERFERENCE SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE AND SHALL BE RESOLVED PRIOR TO THE INSTALLATION OF WORK. ANY SIZES OF NEW PIPING SHOWN ON THE PLAN ARE MEANT TO BE A GUIDE FOR ESTIMATING THE WORK.
5. SIZES OF PIPING SHOWN ON THE PLAN ARE MEANT TO BE A GUIDE FOR ESTIMATING THE WORK. THE CONTRACTOR SHALL PERFORM HYDRAULIC CALCULATIONS TO VERIFY PIPE SIZES ARE ADEQUATE TO PROVIDE THE NECESSARY SYSTEM DEMANDS.
6. THE DRAWINGS ARE NOT MEANT TO SHOW ALL OFFSETS AND PIPING ELEVATION CHANGES. THE CONTRACTOR SHALL VERIFY ALL NEEDED OFFSETS AND PIPE ELEVATIONS TO INSTALL THE PROPOSED SPRINKLER SYSTEM.
7. SPRINKLER CONTRACTOR SHALL PROVIDE HYDRAULIC CALCULATIONS FOR ALL MODIFIED AREAS OF THE SPRINKLER SYSTEM.
8. ALL SPRINKLERS LOCATED IN LIGHT AND ORDINARY HAZARD AREAS SHALL BE QUICK RESPONSE TYPE.
9. SEPARATE SHOP DRAWING PERMITS ARE REQUIRED FOR FIRE PROTECTION AND FIRE ALARM SYSTEMS. SHOP DRAWINGS SHALL BE SIGNED & SEALED BY A LICENSED REGISTERED ENGINEER IN THE STATE OF MASSACHUSETTS.
10. THIS CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND SUBMITTALS TO FM GLOBAL FOR APPROVAL BEFORE SUBMITTING TO THE THE ENGINEER OR THE LOCAL AUTHORITIES FOR APPROVAL. SUBMIT ENGINEERS APPROVAL DOCUMENTATION WITH SHOP DRAWINGS TO THE LOCAL AUTHORITIES AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION.
11. ALL MATERIALS SHALL BE UUFM APPROVED AND CONFORM TO FM GLOBAL STANDARDS. ALL SPRINKLER HEADS SHALL BE UL LISTED AND FM APPROVED FOR THE SPECIFIC OCCUPANCY AND HAZARD. ALL QUICK RESPONSE SPRINKLERS SHALL BE FM LISTED FOR STANDARD RESPONSE.
12. SPRINKLER SYSTEMS SHALL BE HYDRAULICALLY DESIGNED AND CALCULATED BY THE FIRE PROTECTION CONTRACTOR. THE FIRE PROTECTION CONTRACTOR SHALL SUBMIT ALL REQUIRED HYDRAULIC CALCULATIONS TO PROVE THE HYDRAULICALLY MOST REMOTE AREAS ARE BEING PROTECTED. MAINTAIN A MINIMUM OF 10 PSI CUSHION BETWEEN REQUIRED PRESSURE AND AVAILABLE PRESSURE. COMPLY WITH ALL FM GLOBAL AND LOCAL CODE AUTHORITIES REQUIREMENTS INCLUDING MAXIMUM WATER FLOW VELOCITY IN THE FIRE PROTECTION SYSTEMS, AND DENSITIES AS PROVIDED BELOW.

FIRE PROTECTION LEGEND

-----	EXISTING FIRE PROTECTION SYSTEM
_____	NEW FIRE PROTECTION WORK
— SP —	SP STANDPIPE (WET)
— WS —	WS WET SPRINKLER PIPE
— SD —	SD SPRINKLER DRAIN
— CAP —	CAP CAPPED PIPE
— SLOPE —	SLOPE ARROW INDICATES DIRECTION OF SLOPE DOWN
— SOV —	SOV SHUT-OFF VALVE
— CV —	CV CHECK VALVE
[FCVA]	FCVA EXISTING FLOOR CONTROL VALVE ASSEMBLY TO REMAIN
[NS]	NS NONSPRINKLERED SPACE
[H]	H HYDRAULIC REFERENCE POINT
[UPR]	EXISTING UPRIGHT SPRINKLER HEAD (SHOWN LIGHT) TO REMAIN
[P]	EXISTING PENDENT SPRINKLER HEAD TO REMAIN
[P/RE]	CONCEALED PENDENT SPRINKLER HEAD WITH WHITE COVER PLATE
[RE]	REMOVE EXISTING UPRIGHT SPRINKLER AND INSTALL 1" ARM-OVER AND NEW CONCEALED PENDENT SPRINKLER
[RE]	EXISTING SPRINKLER HEAD TO BE REMOVED
[H/S]	EXTENDED COVERAGE HORIZONTAL SIDEWALL SPRINKLER
[R]	RISER PIPE (THRU FLOOR OR CEILING)
[FDV]	FDV EXISTING FIRE DEPARTMENT VALVE TO REMAIN
[CTE]	CONNECT TO EXISTING
[NFPC]	NFPC NOT IN FIRE PROTECTION CONTRACT
[LFPC]	LFPC LIMIT OF FIRE PROTECTION CONTRACT
[NTS]	NTS NOT TO SCALE
[TYP]	TYPICAL
[AFF]	AFF ABOVE FINISHED FLOOR
[AFG]	AFG ABOVE FINISHED GRADE
[OED]	OED OPEN END DRAIN WITH TRAP
[GC]	GC GENERAL CONTRACTOR
[FPC]	FPC FIRE PROTECTION CONTRACTOR
[EC]	EC ELECTRICAL CONTRACTOR
[NC]	NC NORMALLY CLOSED
[NO]	NO NORMALLY OPEN

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Issuance Schedule		
Number	Date	Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS
LEVEL 1 PAT LAB

FIRE PROTECTION LEGEND,
NOTES, AND DETAILS

Scale: N.T.S. Date Issued: 8/26/16

FP0.01

Project Number: 179-07-00

FIRE PROTECTION SPECIFICATIONS

I. GENERAL

A. GENERAL: THE SCOPE OF WORK CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO COMPLETELY INSTALL THE APPARATUS AND EQUIPMENT READY FOR CONTINUOUS OPERATION OF THE PROPOSED FIRE PROTECTION SYSTEM AS SHOWN IN THE PROPOSED CONSTRUCTION DOCUMENTS HERIN.

B. SHOP DRAWINGS: SHOP DRAWINGS OF ALL SPECIFIED EQUIPMENT AND APPARATUS SHALL BE SUBMITTED TO THE ARCHITECT FOR APPROVAL.

C. CODES: ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE FIRE PROTECTION SUB-CONTRACT AND LABOR AND TESTING PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE MASSACHUSETTS STATE BUILDING CODE 8TH EDITION, LOCAL ORDINANCES AND REGULATIONS OF THE CITY OR TOWN, NATIONAL FIRE PROTECTION ASSOCIATION AND INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.

D. PERMITS: ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THE SPECIFICATION INCLUDING ALL FEES OR EXPENSES INCURRED.

E. INSTRUCTIONS: DURING THE ASSEMBLY AND INSTALLATION OF ALL FIRE PROTECTION SYSTEMS, THE OWNER'S OPERATING PERSONNEL SHALL BE INSTRUCTED REGARDING ITS OPERATION AND MAINTENANCE. AN INSTRUCTION PERIOD SHALL BE PROVIDED AFTER COMPLETION OF PROJECT. OPERATION AND MAINTENANCE MANUALS SHALL BE REQUIRED.

F. GUARANTEE: ALL MATERIALS AND EQUIPMENT FURNISHED AND INSTALLED SHALL BE GUARANTEED IN WRITING FOR ONE (1) YEAR FROM THE DATE OF ACCEPTANCE OF THE BUILDING BY THE OWNER.

G. RECORD DRAWINGS: THE FIRE PROTECTION SUBCONTRACTOR SHALL MAINTAIN AT THE JOB, AT ALL TIMES, A COMPLETE AND SEPARATE SET OF BLACKLINE PRINTS OF THE FIRE PROTECTION DRAWINGS OF HIS TRADE ON WHICH HE SHALL MARK CLEARLY, NEATLY, ACCURATELY AND PROMPTLY AS THE WORK PROGRESSES. TWO CAD DISKS, AUTOCAD 2002 OR COMPATIBLE SYSTEM AS WELL AS MYLAR REPRODUCIBLE "AS-BUILTS" SHALL BE FURNISHED BY THE FIRE PROTECTION SUBCONTRACTOR AT THE JOB COMPLETION. THE FIRE PROTECTION CONTRACTOR'S DESIGN ENGINEER SHALL CERTIFY THAT THE COMPLETED INSTALLATION COMPLIES WITH ALL APPLICABLE CODES AND UNDERWRITERS' REQUIREMENTS.

H. INSPECTION: ALL WORK SHALL BE SUBJECT TO THE INSPECTION OF THE OWNER, THE ARCHITECT AND SUCH OTHER INSPECTORS HAVING JURISDICTION. A PROPERLY EXECUTED CERTIFICATE OF INSPECTION SHALL BE PROVIDED.

I. EXAMINATION OF SITE: THE FIRE PROTECTION SUBCONTRACTOR, BEFORE SUBMITTING PRICES OR BEGINNING WORK, SHALL THOROUGHLY EXAMINE THE SITE AND CONTRACT DOCUMENTS. NO CLAIM FOR EXTRA COMPENSATION WILL BE RECOGNIZED IF DIFFICULTIES WHICH AN EXAMINATION OF SITE CONDITIONS AND CONTRACT DOCUMENTS PRIOR TO EXECUTING CONTRACT WOULD HAVE REVEALED.

J. COORDINATION: COORDINATE ALL WORK INSTALLED UNDER THIS SPECIFICATION WITH THAT OF ALL OTHER TRADES.

K. PROTECTION OF PROPERTY: PROTECT ALL NEW AND EXISTING WORK BEFORE, DURING AND AFTER INSTALLATION.

L. TESTS: THE FIRE PROTECTION SUBCONTRACTOR SHALL PERFORM ALL TESTS AT THE COMPLETION OF THE WORK AND THE RESULTS FURNISHED TO THE OWNER AND ARCHITECT IN WRITING.

M. CERTIFICATES OF APPROVAL: UPON COMPLETION OF ALL WORK, THE FIRE PROTECTION SUBCONTRACTOR SHALL FURNISH, IN DUPLICATE, CERTIFICATES OF INSPECTIONS FROM ALL INSPECTORS AND AUTHORITIES HAVING JURISDICTION, NOTARIZED LETTERS FROM THE MANUFACTURERS STATING THAT AUTHORIZED FACTORY ENGINEERS HAVE INSPECTED AND TESTED THE INSTALLATION OF THEIR RESPECTIVE SYSTEMS AND FOUND SAME TO BE IN PERFECT OPERATING CONDITION.

N. CONTRACT DRAWINGS: THE CONTRACT DRAWINGS ARE DIAGRAMMATIC AND INDICATE ONLY THE GENERAL ARRANGEMENTS OF WORK. IT IS NOT THE INTENT OF THESE DRAWINGS TO SHOW EVERY PIPE, RISE, DROP, ELBOW, ETC. ANY ADDITIONAL WORK NOT SHOWN AND REQUIRED TO INSTALL THE FIRE PROTECTION SYSTEMS SHALL BE INCLUDED AS PART OF THIS CONTRACT.

O. REMOVAL WORK: PARTICULAR CARE SHALL BE TAKEN TO AVOID CREATING HAZARDS ON THE SITE OR CAUSING DISRUPTION OF SERVICE IN THE BUILDING. ALL EXISTING EQUIPMENT TO BE REMOVED SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER. ALL EXISTING EQUIPMENT TO BE TURNED OVER TO THE OWNER SHALL BE PRESENTED TO THE OWNER IN GOOD CONDITION AT A LOCATION DESIGNATED BY THE OWNER. ALL OTHER EQUIPMENT SHALL BE REMOVED FROM THE PREMISES. REMOVE ALL ABANDONED PIPING AND EQUIPMENT NOT BUILT INTO BUILDING CONSTRUCTION. WHERE CEILING OR WALLS ARE REMOVED, ALL ABANDONED PIPING SHALL BE REMOVED AND ENDS OF LIVE SERVICES CAPPED. ABANDONED ELEMENTS BUILT INTO WALLS OR LOCATED ABOVE EXISTING INACCESSIBLE CEILINGS SHALL REMAIN AND ENDS CAPPED AND MARKED ABANDONED.

P. CONTINUITY OF SERVICES: SERVICES SHALL BE MAINTAINED IN ALL AREAS WHICH WILL BE OCCUPIED DURING THE CONSTRUCTION PERIOD. IF AN INTERRUPTION OF SERVICE BECOMES NECESSARY, SUCH SHALL BE MADE ONLY UPON CONSENT OF THE OWNER AT A TIME OUTSIDE NORMAL WORKING HOURS AS HE SHALL DESIGNATE. REFER TO THE OVERALL SCHEDULING OF THE WORK OF THE PROJECT. SCHEDULE WORK TO CONFORM TO THIS SCHEDULE AND INSTALL WORK TO NOT DELAY NOR INTERFERE WITH THE PROGRESS OF THE PROJECT.

Q. SEISMIC RESTRAINTS: INSTALLATION OF FIRE PROTECTION EQUIPMENT, ACCESSORIES AND COMPONENTS SHALL BE IN ACCORDANCE WITH THE SEISMIC REQUIREMENTS IDENTIFIED IN THE MASSACHUSETTS STATE BUILDING CODE.

II. SCOPE

A. THE WORK OF THIS SECTION CONSISTS OF ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO PROVIDE ALL FIRE PROTECTION WORK COMPLETE, IN PLACE, AS SHOWN ON THE DRAWINGS, SPECIFIED HEREIN AND AS NECESSARY FOR A PROPER INSTALLATION.

B. THE EXTENT OF THE FIRE PROTECTION SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:

1. ALTERATIONS, ADDITIONS AND/OR REMOVAL OF EXISTING AUTOMATIC WET PIPE SPRINKLER WITHIN THE RENOVATED AREAS IN ORDER TO CONFORM TO NEW SPACE REQUIREMENTS.

2. HYDRAULIC CALCULATIONS.

3. SUBMITTALS AND ACCEPTANCE TESTING.

III. RELATED WORK

A. THE FOLLOWING EQUIPMENT ITEMS AND WORK SHALL NOT BE THE RESPONSIBILITY OF THIS CONTRACTOR:

1. CUTTING AND PATCHING

2. TEMPORARY WATER, HEAT, FIRE PROTECTION AND TOILET FACILITIES

3. TEMPORARY POWER AND LIGHTING

4. FLASHING AND CAULKING

5. FINISH PAINTING

6. HEATING, VENTILATING AND AIR CONDITIONING

7. PLUMBING

8. ELECTRICAL POWER AND WIRING

9. FIRE EXTINGUISHERS AND CABINETS

10. INSTALLATION OF ACCESS PANELS

IV. MATERIALS

A. PIPE AND FITTINGS SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

TYPE A: SCHEDULE 40 BLACK STEEL PIPE WITH BLACK CAST IRON SCREWED SPRINKLER FITTINGS SUITABLE FOR 175 PSI WORKING WATER PRESSURE FOR PIPE SIZES 2" AND BELOW.

TYPE B: SCHEDULE 10 WELDED AND SEAMLESS STEEL PIPE IN ACCORDANCE WITH ASTM 135 JOINED WITH GROOVE FITTINGS AND COUPLINGS APPROVED FOR SERVICE TH GROOVES ROLLED ON THE PIPE BY AN APPROVED GROOVE ROLLING MACHINE. MINIMUM WALL THICKNESS SHALL BE SCHEDULE 10 FOR SIZES 2-1/2" TO 6 INCH PIPE. FITTINGS AND COUPLINGS SHALL BE DESIGNED SPECIFICALLY FOR USE IN GROOVED PIPING SYSTEMS AND SUITABLE FOR 175 PSI MINIMUM WORKING PRESSURE. FITTINGS, COUPLINGS AND GASKETS SHALL BE OF THE SAME MANUFACTURER.

PIPE AND FITTINGS SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

1. TYPE A & B FOR SPRINKLER SYSTEMS

2. TYPE A & B FOR SPRINKLER DRAINS

- B. PIPE SLEEVES, HANGERS AND SUPPORTS
1. HANGERS FOR PIPING OF SIZES 4 INCHES AND SMALLER SHALL BE CARPENTER & PATERSON FIGURE NO. 800 ADJUSTABLE SWIVEL RING, CRANE COMPANY, GRINNELL COMPANY OR APPROVED EQUAL, BLACK STEEL AND HANGER RODS WITH MACHINE THREADS. ALL HANGERS SHALL BE UL/FM APPROVED.
2. PIPE SLEEVES SHALL BE INSTALLED AND PROPERLY SECURED AT ALL POINTS WHERE PIPES PASS THROUGH MASONRY, CONCRETE OR WOOD. PIPE SLEEVES SHALL BE OF SUFFICIENT DIAMETER TO PROVIDE APPROXIMATELY 1/4 INCH CLEARANCE. PIPE SLEEVES THROUGH MASONRY PARTITIONS AND FLOORS SHALL BE SCHEDULE 40 GALVANIZED PIPE. WALL SLEEVES SHALL HAVE CHROMIUM-PLATED ESCUTCHEONS WITH SET SCREWS OR CLIPS FOR FIRMLY HOLDING IN PLACE. SLEEVES THROUGH WALLS SHALL END FLUSH WITH SURFACE OF WALLS. SLEEVES IN FLOORS SHALL EXTEND ONE INCH ABOVE THE FLOOR AND AFTER INSTALLATION OF PIPING SHALL BE PACKED AND MADE WATER TIGHT. PROVIDE CORE DRILLING. CORE OPENINGS SHALL HAVE LINK-SEAL FIRE RATED PENETRATION CLOSURES. SLEEVES IN EXTERIOR WALLS SHALL HAVE WATER STOP PLATES. SHALL END FLUSH WITH THE SURFACE OF THE WALLS AND SHALL HAVE LINK-SEAL PENETRATION CLOSURES.
3. WHERE PIPES PENETRATE FIRE RATED FLOORS AND PARTITIONS (CONSULT WITH ARCHITECT FOR LOCATIONS), THE OPENINGS SHALL BE PACKED WITH A MATERIAL WHICH WILL MAINTAIN THE INTEGRITY OF THE FIRE RATING.
- C. PIPE IDENTIFICATION
1. ALL FIRE PROTECTION PIPING SHALL BE LABELED AT EACH BRANCH, AT EACH PASSAGE THROUGH WALL AND AT INTERVALS OF NOT MORE THAN 20 FEET WITH SEMI-RIGID SETMARK PIPE MARKERS WITH ARROWS INDICATING THE DIRECTION OF FLOW.
- D. SPRINKLER HEADS
1. SPRINKLER HEADS, IN GENERAL, SHALL BE AUTOMATIC CLOSED TYPE WITH TEMPERATURE RATINGS TO SUIT INSTALLED CONDITIONS. SPRINKLER HEADS SHALL BE LOCATED IN THE CENTER OF THE CEILING TILES. WHEN THE CEILING TILE IS DIVIDED INTO SECTIONS BY GROOVED DEPRESSIONS, THE SPRINKLER HEAD SHALL BE LOCATED IN THE CENTER OF ONE OF THE PANELS.
2. SPRINKLER HEADS IN AREAS TO BE FINISHED WITH CEILINGS SHALL BE CONCEALED PENDENT TYPE WITH WHITE COVER PLATES. SPRINKLER HEADS IN UNFINISHED SPACES SHALL BE NATURAL BRONZE PENDENT OR UPRIGHT.
3. INSTALL TYCO MODEL SW-20 (K-11.2, 155°F) EXTENDED COVERAGE ORDINARY HAZARD HORIZONTAL SIDEWALL SPRINKLER (TYS332) WITH CHROME FINISH FOR SPRINKLER COVERAGE IN DOWNFLOW BOOTH. INSTALL DEFLECTOR 6-12 INCHES BELOW BOOTH CEILING.
4. SPARE HEADS, CABINET AND WRENCH SHALL BE PROVIDED IN ACCORDANCE WITH NFPA-13.
5. SPRINKLER HEADS SHALL BE QUICK RESPONSE TYPE IN LIGHT AND ORDINARY HAZARD SPACES.
6. ALL SPRINKLER ARM-OVERS SHALL BE NO LESS THAN 1 INCH AND INSTALLED OFF BRANCH FITTINGS WITH NO LESS THAN 1" OUTLETS.
- V. DESIGN CRITERIA
1. SPRINKLER SYSTEMS SHALL BE HYDRAULICALLY DESIGNED AND CALCULATED BY THE FIRE PROTECTION CONTRACTOR. THE FIRE PROTECTION CONTRACTOR SHALL SUBMIT ALL REQUIRED HYDRAULIC CALCULATIONS TO PROVE THE HYDRAULICALLY MOST REMOTE AREAS ARE BEING PROTECTED PER SYSTEM AND OCCUPANCY HAZARD. FABRICATION DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE SUBMITTED TO THE AUTHORITY HAVING JURISDICTION AND INSURANCE UNDERWRITERS (IF REQUIRED) PRIOR TO SUBMITTING TO THE ARCHITECT FOR REVIEW. FABRICATION DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BEAR THE SEAL OF REGISTRATION OF A QUALIFIED REGISTERED PROFESSIONAL FIRE PROTECTION ENGINEER. MAINTAIN A MINIMUM OF 10 PSI CUSHION BETWEEN REQUIRED PRESSURE AND AVAILABLE PRESSURE. COMPLY WITH ALL UNDERWRITERS' AND CODE AUTHORITIES REQUIREMENTS INCLUDING MAXIMUM WATER FLOW VELOCITY IN THE FIRE PROTECTION SYSTEM.
2. AUTOMATIC SPRINKLER SYSTEMS IN AREAS OF LIGHT HAZARD OCCUPANCY SHALL BE DESIGNED WITH A MINIMUM DESIGN DENSITY OF 0.10 GPM PER SQUARE FOOT OVER THE HYDRAULICALLY MOST REMOTE 1,500 SQUARE FEET. MAXIMUM PROTECTION AREA PER SPRINKLER HEAD SHALL BE 225 SQUARE FEET FOR UPRIGHT AND PENDENT SPRINKLER HEADS, AND 196 FEET FOR SIDEWALL SPRINKLER HEADS. PROVIDE A 100 GPM HOSE STREAM ALLOWANCE. LIGHT HAZARD AREAS INCLUDE GOWNINGS AND SIMILAR ROOMS.
3. AUTOMATIC SPRINKLER SYSTEMS IN STORAGE ROOMS SHALL BE DESIGNED TO ORDINARY HAZARD GROUP 1 OCCUPANCY WITH A MINIMUM DESIGN DENSITY OF 0.15 GPM PER SQUARE FOOT OVER THE HYDRAULICALLY MOST REMOTE 1,500 SQUARE FEET. MAXIMUM PROTECTION AREA PER SPRINKLER HEAD SHALL BE 130 SQUARE FEET. PROVIDE A 250 GPM HOSE STREAM ALLOWANCE.
4. AUTOMATIC SPRINKLER SYSTEMS IN PAT OPEN LAB AND DOWNFLOW BOOTH SHALL BE DESIGNED TO ORDINARY HAZARD GROUP 2 OCCUPANCY WITH A MINIMUM DESIGN DENSITY OF 0.20 GPM PER SQUARE FOOT OVER THE HYDRAULICALLY MOST REMOTE 1,500 SQUARE FEET. MAXIMUM PROTECTION AREA PER SPRINKLER HEAD SHALL BE 130 SQUARE FEET. PROVIDE A 250 GPM HOSE STREAM ALLOWANCE.

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Issuance Schedule		
Number	Date	Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

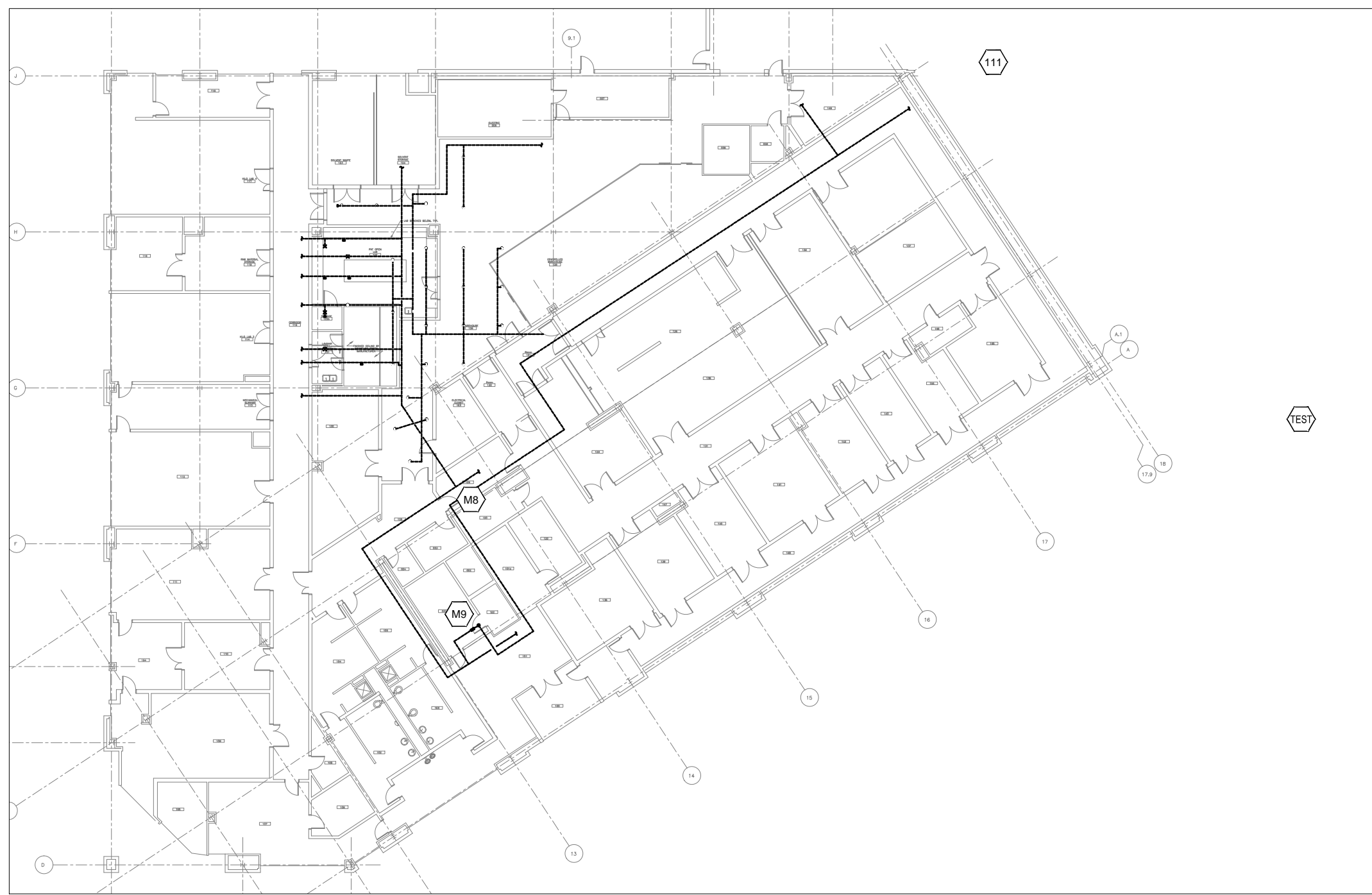
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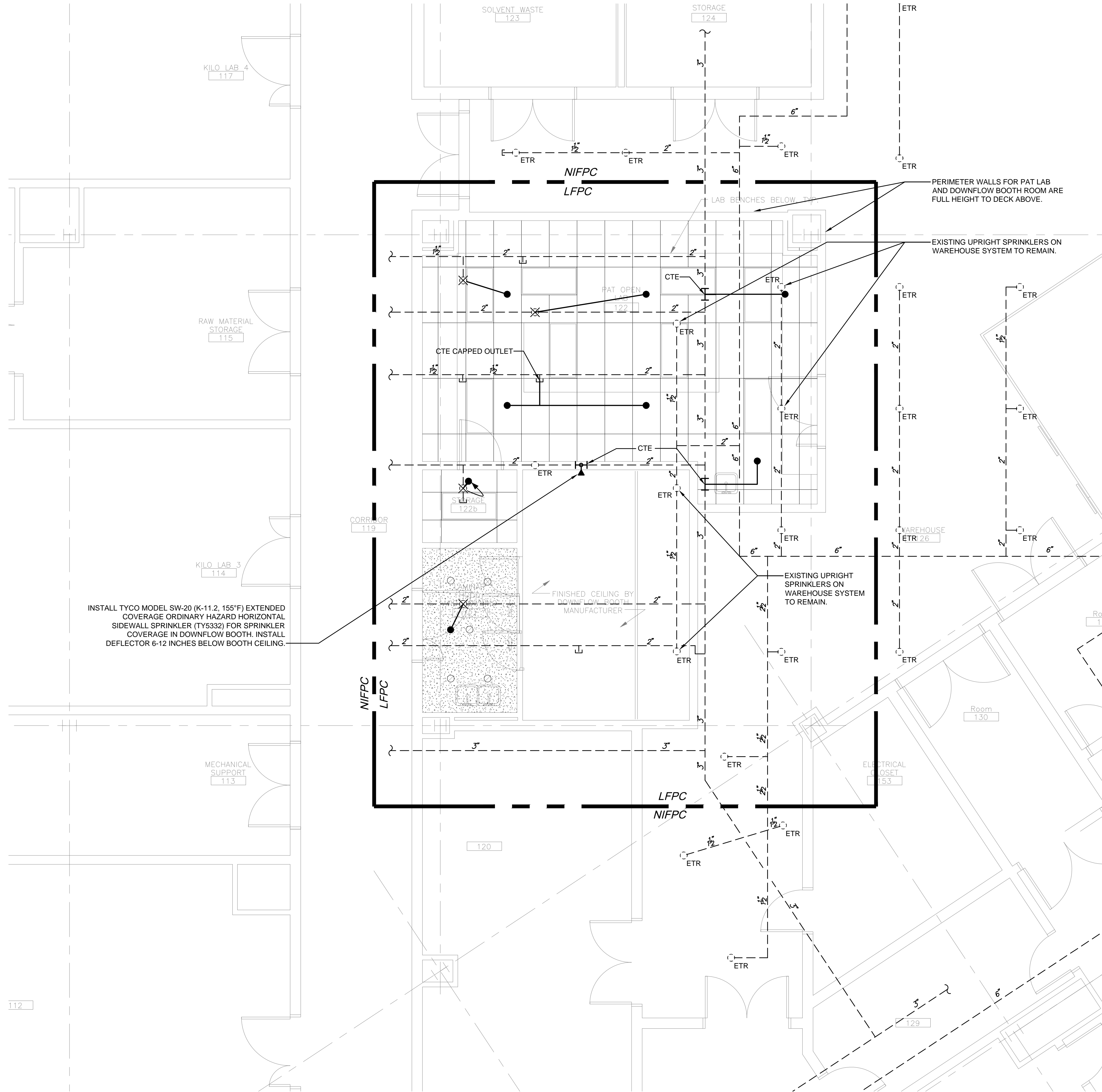
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2 KEY PLAN FOR HYDRAULIC REFERENCE ONLY
SCALE: NO SCALE



1 LEVEL 1 PAT LAB - FIRE PROTECTION NEW WORK PLAN
SCALE: 1/4"=1'-0"

Issuance Schedule		
Number	Date	Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

**FIRE PROTECTION
NEW WORK PLAN**












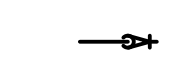


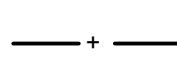
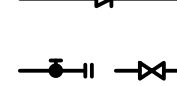
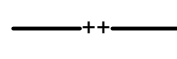
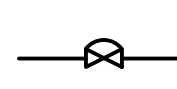
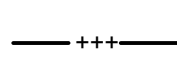




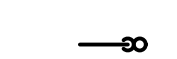
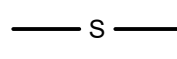
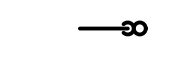
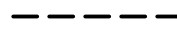
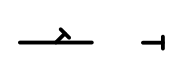







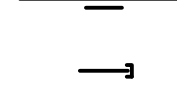
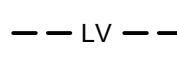
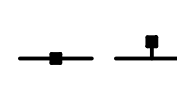
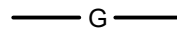
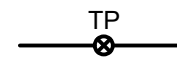

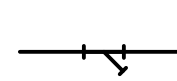

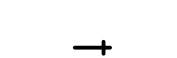





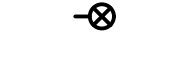

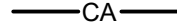


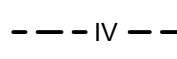
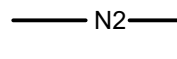




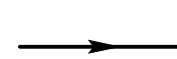
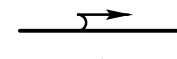

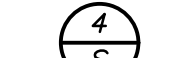
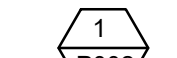



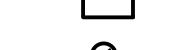



Scale: 1/4"=1'-0" Date Issued: 8/26/16

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Project Number: 179-07-00

PLUMBING DEMO NOTES
1. PROJECT CONDITIONS
a. THE CONTRACTOR SHALL COMPLETELY FAMILIARIZE THEMSELF 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 RENOVATED.
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. KEEP UTILITIES IN SERVICE AND PROTECT FROM DAMAGE. DO NOT INTERRUPT UTILITIES SERVING USED AREAS WITHOUT FIRST OBTAINING PERMISSION
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 OWNER.
e. ALL WORK MUST BE COORDINATED W/ OWNER PRIOR TO ANY COMMENCEMENT OF WORK.
2. SCOPE OF WORK
a. 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.

PLUMBING GENERAL NOTES
1. GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO ALL PLUMBING DRAWINGS.
2. DRAWINGS ARE DIAGRAMMATIC DETERMINE LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD.
3. DIMENSIONS SHOWN ON PLAN ARE HORIZONTAL. DIMENSIONS 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 THIS WORK.
5. ALL PLUMBING WORK SHALL BE IN ACCORDANCE WITH THE MASSACHUSETTS STATE PLUMBING CODE AND 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, 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 WORK.
8. ALL PIPING PENETRATING CEILINGS AND WALLS SHALL BE INSTALLED WITH ESCUTHEONS 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 ASSEMBLIES SHALL BE PROVIDED WITH FIRE RATED SEALS AS REQUIRED BY LOCAL CODE AUTHORITY.
9. MANUFACTURER'S MODEL NUMBERS ARE SPECIFIED SOLELY TO ESTABLISH STANDARD OF QUALITY FOR PERFORMANCE AND MATERIALS.
10. INSTALLATION SHALL ADHERE TO MANUFACTURER'S 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 ALL CODE REQUIREMENTS FOR SMOKE AND COMBUSTIBILITY.
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 POINTS.
17. PROVIDE GAUGE FITTINGS AND THERMOMETER WELLS AT HOT WATER SUPPLY AND RETURN BRANCHES AND AT PUMP INLETS AND OUTLETS.
18. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO INSTALLING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT.

PLUMBING LEGEND					
PIPING SYSTEMS			PIPING SPECIALTIES		
	ETR	LIGHT LINE INDICATES EXISTING PIPE TO REMAIN		SOV	SHUT-OFF VALVE
	RE	REMOVE EXISTING		BV	BALANCING VALVE
	CTE	CONNECT TO EXISTING		PRV	PRESSURE REDUCING VALVE
	C & C	CUT & CAP		SV	SOLENOID VALVE
	CW	COLD WATER		CV	CONTROL VALVE
	HW	HOT WATER		VIV	VALVE IN VERTICAL
	HWC	HOT WATER RECIRCULATION		CV	CHECK VALVE
	NCW	NON-POTABLE COLD WATER		DV	HOSE END DRAIN VALVE
	NHW	NON-POTABLE HOT WATER			DIAPHRAGM VALVE (NORMALLY OPEN)
	NHW-C	NON-POTABLE HOT WATER RECIRCULATION			DIAPHRAGM VALVE (NORMALLY CLOSED)
	TW	TEMPERED WATER		BWV	BACKWATER VALVE
	TWR	TEMPERED WATER RECIRCULATION		W & T	WASTE & TRAP
	S or W	SOIL OR WASTE		OED	OPEN END DRAIN W/TRAP
	V	VENT		CO	CLEANOUT PLUG
	RW	STORM/CONDUCTOR		FCO	FLUSH FLOOR CLEANOUT
	CWW	CLEAR WATER WASTE			UNION
	CWV	CLEAR WATER VENT		SL	SLEEVE
	LW	LABORATORY WASTE			CAPPED PIPE
	LV	LABORATORY VENT		SAVA'	WATER HAMMER ARRESTOR & TYPE
	G	NATURAL GAS		TP	AUTOMATIC TRAP PRIMER
	GTV	GAS TRAIN OR APPLIANCE OR REGULATOR VENT			STRAINER
	IW	INDIRECT WASTE		HB	HOSE BIBB
	UIW	INDIRECT WASTE BELOW FLOOR		ES	EMERGENCY SHOWER
	PD	PUMPED DISCHARGE		ES/EW	EMERGENCY SHOWER EYEWASH COMBINATION UNIT
	LPD	LABORATORY WASTE PUMPED DISCHARGE		EW	EYEWASH
	CA	COMPRESSED AIR	MISCELLANEOUS		
	CO2	CARBON DIOXIDE (GASEOUS)			
	CDA	CLEAN DRY (PROCESS) AIR			
	IV	INERT GAS VENT			
	N2	NITROGEN (GASEOUS)			
	N2Q	PROCESS NITROGEN (GASEOUS)			
	VAC	VACUUM			
	VC	HOUSE VACUUM			
	PW	PURIFIED (USP) WATER			
	RO	REVERSE OSMOSIS DEIONIZED (PURE) WATER			
				ARROW INDICATES DIRECTION OF FLOW	
				ARROW INDICATES DIRECTION OF SLOPE DOWN	
				RISER DESIGNATION	
				CAPPED CONNECTION - TOP DENOTES SIZE (IN.) BOTTOM DENOTES SERVICE TYPE	
				DETAIL DESIGNATION - TOP DENOTES DETAIL NUM. BOTTOM DENOTES DETAIL DRAWING	
				FD'A'	FLOOR DRAIN & TYPE
				RPBFP	REDUCED PRESSURE BACKFLOW PREVENTER
				T	THERMOMETER
				EX LP	EXPANSION LOOP
				PG	PRESSURE GAUGE WITH ISOLATION VALVE
				T & P	TEMPERATURE & PRESSURE RELIEF VALVE
					VACUUM RELIEF VALVE
PLUMBING ABBREVIATIONS					
AFF	ABOVE FINISHED FLOOR				
AIP	ABANDON IN PLACE				
CFOI	CONTRACTOR FURNISHED/OWNER INSTALLED				
CWVTR	CLEAR WATER VENT THRU ROOF				
DF	DRINKING FOUNTAIN				
EC	ELECTRICAL CONTRACTOR				
EW-C	ELECTRIC WATER COOLER				
F & I	FURNISH & INSTALL				
FFE	FINISHED FLOOR ELEVATION				
FPC	FIRE PROTECTION CONTRACTOR				
GC	GENERAL CONTRACTOR				
GTVTR	GAS TRAIN VENT THRU ROOF				
HVAC	HVAC CONTRACTOR				
HWC-R	HOT WATER RECIRCULATION RISER				
HWR	HOT WATER RISER				
INV	INVERT				
LAV	LAVATORY				
LPC	LIMIT OF PLUMBING CONTRACT				
LVS	LABORATORY VENT STACK				
LVTR	LABORATORY VENT THRU ROOF				
LWS	LABORATORY WASTE STACK				
MSB	MOP SERVICE BASIN				
NC	NORMALLY CLOSED				
NIPC	NOT IN PLUMBING CONTRACT				
NO	NORMALLY OPEN				
NTS	NOT TO SCALE				
OF-CI	OWNER FURNISHED/CONTRACTOR INSTALLED				
OF-I	OWNER FURNISHED & INSTALLED				
PC	PLUMBING CONTRACTOR				
S=.01	SLOPE = 1/8" PER FOOT				
S=.02	SLOPE = 1/4" PER FOOT				
S=.04	SLOPE = 1/2" PER FOOT				
SH	SHOWER				
SK	SINK				
SS	SOIL STACK				
SSK	SERVICE SINK				
TYP	TYPICAL				
UR	URINAL				
VS	VENT STACK				
VTR	VENT THRU ROOF				
WC	WATER CLOSET				
WS	WASTE STACK				



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Issuance Schedule		
Number	Date	Description

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VERTEX PHARMACEUTICALS

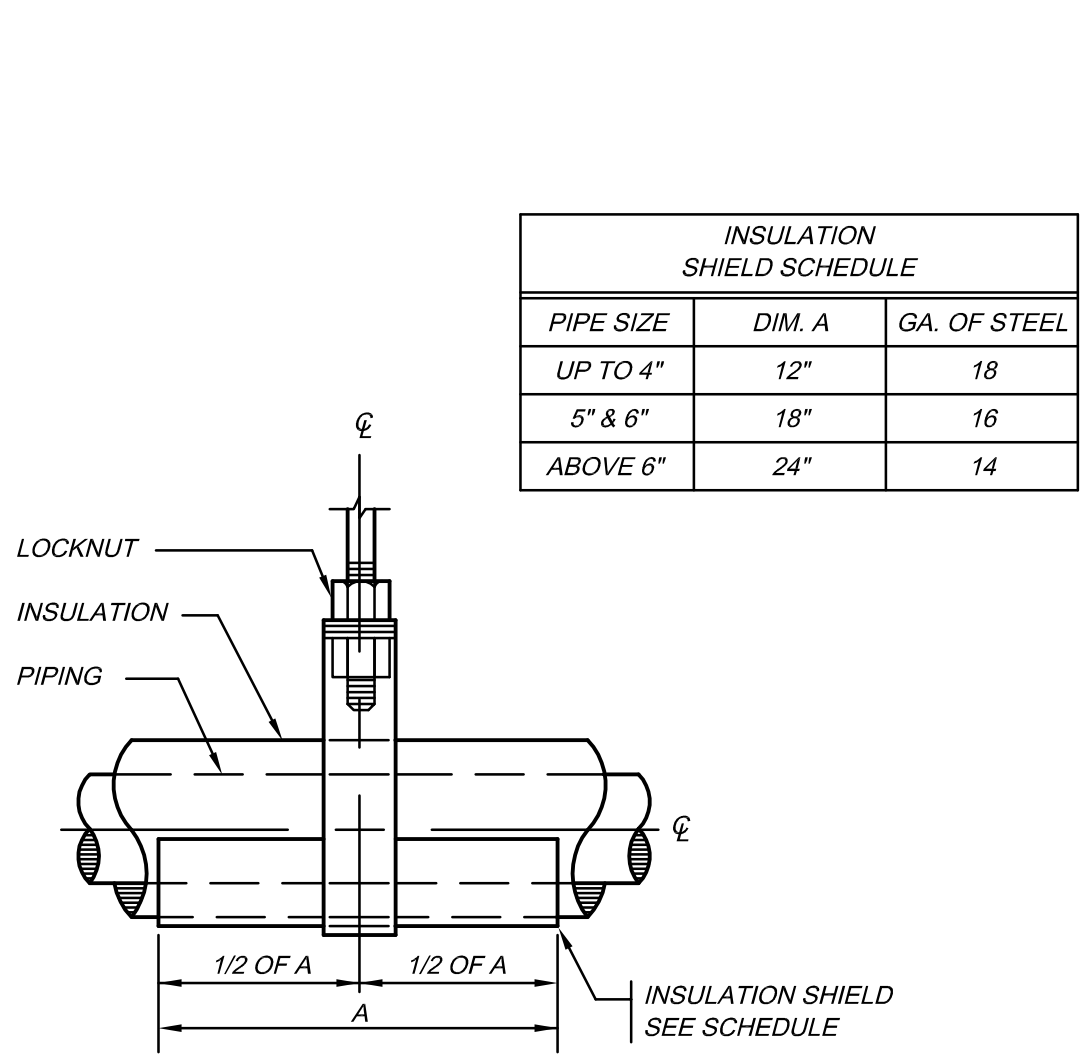
LEVEL 1 PAT LAB

PLUMBING
LEGEND &
GENERAL NOTES

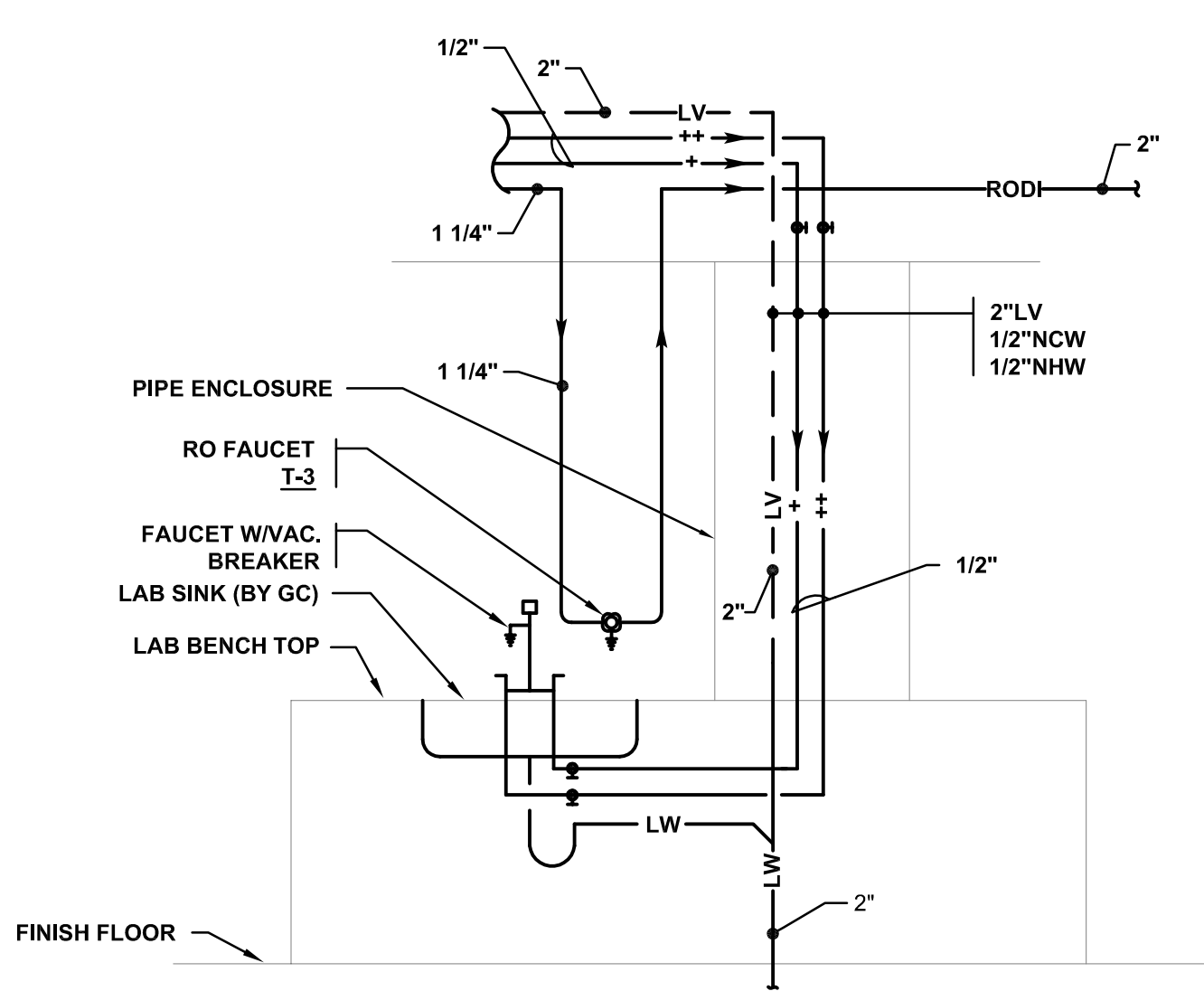
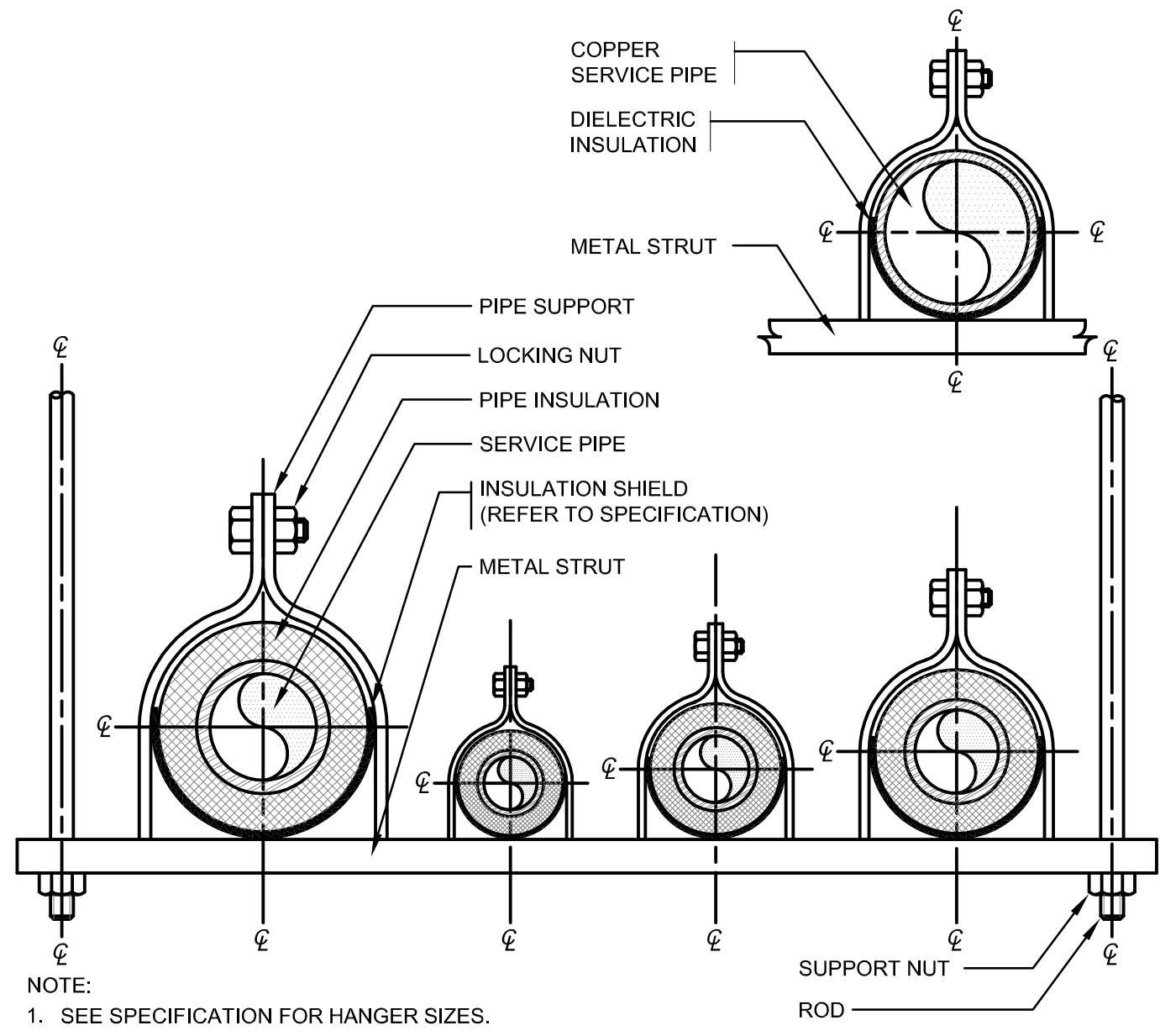
Scale: N.T.S. Date Issued: 8/26/16

P0.01

Project Number: 179-07-00




INSULATION SHIELD SCHEDULE		
PIPE SIZE	DIM. A	GA. OF STEEL
UP TO 4"	12"	18
5" & 6"	18"	16
ABOVE 6"	24"	14



- 1 PIPE HANGER/SHIELD DETAIL
SCALE: N/A
- 2 PIPE HANGER DETAIL
SCALE: N/A
- 3 TYPICAL PURE WATER OUTLET PIPING DETAIL
SCALE: N/A
- 4 NOT USED
SCALE: N/A

PLUMBING FIXTURE SCHEDULE

SYMBOL	FIXTURE				MANUFACTURER	FITTING		TRAP	CARRIER	FLOW RATE	SYMBOL	NAME	CW	HW	W/S	VENT	IW	REMARKS
	MANUFACTURER	TYPE	MODEL	SIZE		TYPE	SUPPLY						SIZE	SIZE				
LS-1	EPOXY SINK PROVIDED WITH CASEWORK. REFER TO ARCHITECTURAL PLANS.				WATERSAVER	CT414VB-BH55 LABORATORY MIXING FAUCET DECK MOUNTED, VACUUM BREAKER W/ 4" WRIST BLADE HANDLES W/ L3001 FOOT OPERATED MIXING VALVE, FLOOR MOUNTED	1/2" NCW & NHW W/ANGLE STOPS	1 1/2" POLYPROPYLENE P-TRAP	-	1.5 GPM	LS	LAB SINK	REFER TO LABORATORY FIXTURE CONNECTION SCHEDULE		PROVIDE W/LAMINAR FLOW 1.5 GPM FLOW RESTRICTING AERATOR			
LS-2	ELKAY	STAINLESS STEEL SCULLERY SINK - 3-POT	558354R W/ RIGHT DRAINBOARD	79 1/2"x18"x24"	WATERSAVER	CT414VB-BH55 LABORATORY MIXING FAUCET DECK MOUNTED, VACUUM BREAKER W/ 4" WRIST BLADE HANDLES	1/2" NCW & NHW W/ANGLE STOPS	1 1/2" POLYPROPYLENE P-TRAP	-	1.5 GPM	LS	LAB SINK	REFER TO LABORATORY FIXTURE CONNECTION SCHEDULE		PROVIDE W/LAMINAR FLOW 1.5 GPM FLOW RESTRICTING AERATOR			
EWES-1	GUARDIAN	GBF2452	RECESSED SAFETY STATION W/ DRAIN PAN & DAYLIGHT DRAIN, S.S. SHOWER HEAD CLEANROOM CONSTRUCTION	-	-	-	1 1/4"TW	-	-	20 GPM	EWES	RECESSED COMBINATION UNIT	REFER TO LABORATORY FIXTURE CONNECTION SCHEDULE					

EQUIPMENT CONNECTION SCHEDULE

SYMBOL	NAME	NCW	NHW	TW	LAB	LAB	IW	PW	N2	CO2	RO	CDA	PG	VACUUM		COMPRESSED AIR		REMARKS
		SIZE	SIZE	SIZE	WASTE	VENT								PRESS	SIZE	PRESS	SIZE	
LS-1	LAB SINK - EPOXY	1/2"	1/2"	-	2"	2"	-	-	-	-	2"	-	-	-	-	-	-	
LS-2	LAB SINK - S.S. 2-POT	1/2"	1/2"	-	2"	2"	-	-	-	-	2"	-	-	-	-	-	-	
EWES-1	SAFETY STATION	-	-	1 1/4"	-	-	-	-	-	-	-	-	-	-	-	-	-	
US-1	UTILITY STATION	-	-	-	-	-	-	-	1/2"	-	-	1/2"	-	19"	3/4"	-	-	PROVIDE EACH W/ ONE T-4, T-5, & T-6

FIXTURE TRIM FITTINGS SCHEDULE

SYMBOL	MANUFACTURER	SERVICE	INDEXING	BUTTON COLOR	LETTERING COLOR	REMARKS
T-1	WATER SAVER	COMPRESSED AIR	AIR	ORANGE	BLACK	CT2870-141FT - FINE CONTROL NEEDLE VALVE ASSEMBLY, WALL MOUNTED DOUBLE, FLOATING ESCUTCHEON. POWDER COAT WHITE FINISH.
T-2	WATER SAVER	NITROGEN	NIT	BROWN	WHITE	CT2870-141FT - FINE CONTROL NEEDLE VALVE ASSEMBLY, WALL MOUNTED DOUBLE, FLOATING ESCUTCHEON. POWDER COAT WHITE FINISH.
T-3	ASAHI-AMERICA	PURE WATER	RODI	WHITE	BLACK	CUSTOM, EXPOSED ZERO STATIC VALVE. DROP CONTINUOUS LOOP ON UMBILICAL WALL & EXTEND FAUCET TO DISCHARGE OVER SINK. FIELD ADJUST LENGTH AS NEEDED.
T-4	SWAGELOK	COMPRESSED AIR	AIR	ORANGE	BLACK	SERIES SS-6, THREE PIECE BALL VALVE WITH QUICK CONNECT OUTLET FITTING.
T-5	SWAGELOK	NITROGEN	NIT	BROWN	WHITE	SERIES SS-6, THREE PIECE BALL VALVE WITH QUICK CONNECT OUTLET FITTING.
T-6	SWAGELOK	VACUUM	VAC	YELLOW	BLACK	SERIES SS-6, THREE PIECE BALL VALVE WITH QUICK CONNECT OUTLET FITTING.

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Issuance Schedule		
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ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

PLUMBING
DETAILS & SCHEDULES

Scale: N/A Date Issued: 8/26/16

P0.02

Project Number: 179-07-00

PLUMBING SPECIFICATIONS	
<div>1. GENERAL</div> <div>A. BEFORE SUBMITTING BID, VISIT AND CAREFULLY EXAMINE SITE TO IDENTIFY EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT WORK OF THIS SECTION. NO EXTRA PAYMENT WILL BE ALLOWED FOR ADDITIONAL WORK CAUSED BY UNFAMILIARITY WITH SITE CONDITIONS THAT ARE VISIBLE OR READILY CONSTRUED BY EXPERIENCED OBSERVER.</div> <div>B. PERFORM WORK AND PROVIDE MATERIAL AND EQUIPMENT FOR SYSTEMS SHOWN ON DRAWINGS AND AS SPECIFIED IN THIS SECTION. COMPLETELY COORDINATE WORK OF THIS SECTION WITH WORK OF OTHER SECTIONS AND PROVIDE COMPLETE AND FULLY FUNCTIONAL INSTALLATION. DRAWINGS AND SPECIFICATIONS FORM COMPLEMENTARY REQUIREMENTS; PROVIDE WORK SPECIFIED AND NOT SHOWN, AND WORK SHOWN AND NOT SPECIFIED AS THOUGH EXPRESSLY REQUIRED BY BOTH.</div> <div>C. PERFORM WORK STRICTLY AS REQUIRED BY RULES, REGULATIONS, STANDARDS, CODES, ORDINANCES, AND LAWS OF LOCAL, STATE, AND FEDERAL GOVERNMENTS, AND OTHER AUTHORITIES THAT HAVE LAWFUL JURISDICTION.</div> <div>D. MATERIALS AND EQUIPMENT SHALL BE LISTED BY UNDERWRITERS LABORATORIES (UL), AND APPROVED BY ASME AND AGA FOR INTENDED SERVICE.</div> <div>E. ON JANUARY 4, 2014, THE "REDUCTION OF LEAD IN DRINKING WATER ACT" BECOMES EFFECTIVE NATIONWIDE. THIS AMENDMENT TO THE 1974 SAFE DRINKING WATER ACT REDUCES THE ALLOWABLE LEAD CONTENT OF DRINKING WATER PIPES, PIPE FITTINGS AND OTHER PLUMBING FIXTURES. SPECIFICALLY, AS OF JANUARY 4, 2014, IT SHALL BE ILLEGAL TO INSTALL PIPES, PIPE FITTINGS, AND OTHER PLUMBING FIXTURES THAT ARE NOT "LEAD FREE." "LEAD FREE" IS DEFINED AS RESTRICTING THE PERMISSIBLE LEVELS OF LEAD IN THE WETTED SURFACES OF PIPES, PIPE FITTINGS, OTHER PLUMBING FITTINGS AND FIXTURES TO A WEIGHTED AVERAGE OF NOT MORE THAN 0.25%. THIS NEW REQUIREMENT DOES NOT APPLY TO PIPES, PIPE FITTINGS, PLUMBING FITTINGS OR FIXTURES THAT ARE USED EXCLUSIVELY FOR NON-POTABLE SERVICES SUCH AS MANUFACTURING, INDUSTRIAL PROCESSING, IRRIGATION, OUTDOOR WATERING, OR ANY OTHER USES WHERE WATER IS NOT ANTICIPATED TO BE USED FOR HUMAN CONSUMPTION. THE LAW ALSO EXCLUDES TOILETS, BIDETS, URINALS, FILL VALVES, FLUSHOMETER VALVES, TUB FILLERS, SHOWER VALVES, SERVICE SADDLES, OR WATER DISTRIBUTION MAIN GATE VALVES THAT ARE 2 INCHES IN DIAMETER OR LARGER.</div> <div>2. GUARANTEE</div> <div>A. GUARANTEE WORK OF THIS SECTION IN WRITING FOR ONE YEAR FROM DATE OF OWNERS ACCEPTANCE OF CERTIFICATE OF SUBSTANTIAL COMPLETION. REPAIR OR REPLACE DEFECTIVE MATERIALS, EQUIPMENT, WORKMANSHIP AND INSTALLATION THAT DEVELOP WITHIN THIS PERIOD, PROMPTLY AND TO OWNER'S SATISFACTION AND CORRECT DAMAGE CAUSED IN MAKING NECESSARY REPAIRS AND REPLACEMENTS UNDER GUARANTEE WITHIN CONTRACT PRICE.</div> <div>3. SCOPE OF WORK</div> <div>A. 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.</div> <div>B. NEW SCOPE OF WORK WORK SHALL INCLUDE BUT SHALL NOT TO BE LIMITED TO THE FOLLOWING: - NEW HOT AND COLD (POTABLE & NON-POTABLE) WATER PIPING INCLUDING CONNECTIONS TO EXISTING SYSTEM - NEW EMERGENCY (TEPID) WATER PIPING SYSTEM - NEW REVERSE OSMOSIS DEIONIZED (RODI) WATER PIPING SYSTEM - NEW LABORATORY WASTE AND VENT PIPING INCLUDING CONNECTIONS TO EXISTING WASTE SYSTEM - NEW PROCESS COMPRESSED AIR SYSTEM INCLUDING CONNECTIONS TO THE EXISTING SYSTEM - NEW LABORATORY VACUUM PIPING INCLUDING CONNECTIONS TO THE EXISTING SYSTEM - NEW PROCESS NITROGEN PIPING SYSTEM - NEW VALVES - NEW INSULATION - FINAL CONNECTIONS TO OWNER RELOCATED EQUIPMENT, ETC.</div> <div>4. SUBMITTALS</div> <div>A. PROVIDE PRODUCT DATA FOR EQUIPMENT SPECIFIED OR SHOWN ON DRAWINGS PREPARED BY MANUFACTURERS, SUPPLIERS AND VENDORS COMPRISING: - TESTING REPORT - ALL CUT SHEETS OF THE FOLLOWING, BUT NOT LIMITED TO: FIXTURES, PIPE MATERIALS, ALL ASSOCIATED FITTINGS, INSULATION, HANGERS ETC.</div> <div>5. PLUMBING FIXTURES AND TRIM</div> <div>A. REFER TO ARCHITECTURAL AND PLUMBING DRAWINGS FOR QUANTITIES, LOCATIONS AND MOUNTING HEIGHTS OF FIXTURES PROVIDED UNDER THIS SECTION.</div> <div>B. FIXTURE TRIM, TRAPS, FAUCETS, ESCUTCHEONS AND WASTE PIPES EXPOSED TO VIEW IN FINISHED SPACES SHALL BE I.P.S. BRASS WITH POLISHED CHROMIUM PLATING OVER NICKEL FINISH.</div> <div>C. PRODUCT INSTALLATION SHALL ADHERE TO MANUFACTURER'S RECOMMENDATIONS.</div> <div>6. PIPE MATERIALS</div> <div>A. SERVICE: ABOVE GROUND HOT AND COLD WATER PIPING (DOMESTIC, TEPID, AND NON-POTABLE). PIPE MATERIAL: TYPE L HARD DRAWN SEAMLESS COPPER TUBING, CONFORMING TO ASTM B-88 FITTINGS: WROUGHT COPPER, SOLDER JOINTS. ASME B16.22 PIPE JOINT: ASTM B-32 SOLDER FILLED MATERIAL, ALLOY S85 395/5. ASTM B-813 LIQUID OR PASTE FLUX. BALL VALVES: ALL BRONZE, 2 PIECE, FULL PORT, PTFE SEATS, SOLDER END CONNECTIONS, 600 PSIG WOG. NOTE: ALL PIPING, VALVES & JOINTS ON DOMESTIC & TEPID WATER SYSTEMS TO BE "LEAD FREE" IN ACCORDANCE WI STATE REQUIREMENTS.</div> <div>B. SERVICE: PROCESS AIR & PROCESS NITROGEN (CDA & N2O) PIPE MATERIAL: SEAMLESS COPPER TUBE, MEDICAL GAS, HARD DRAWN TEMPER, TYPE L. ASTM B-819. FITTINGS: WROUGHT COPPER, SOLDER-JOINT. ASME B16.22 OR PRESS TO FIT FITTING BY NIBCO OR VIEGA JOINTS: ANSI/ASME B8 BRAZING FILLER MATERIAL, BCUP SERIES, NO FLUX. BALL VALVES: ALL BRONZE, 3 PIECE, FULL PORT, PTFE SEATS, STAINLESS STEEL BALL AND STEM, SOLDER END CONNECTIONS. 600 PSIG WOG. *NOTE - VALVES, FITTINGS, COMPONENTS, AND EACH LENGTH OF TUBE SHALL BE FACTORY CLEANED AND SUITABLE FOR MEDICAL OXYGEN SERVICE IN ACCORDANCE WITH CGA PAMPHLET G-4.1. THEY SHALL BE PERMANENTLY LABELED AND DELIVERED PLUGGED, CAPPED, BAGGED, OR OTHERWISE SEALED. PLUG CAPS OR OTHER SEALS SHALL REMAIN IN PLACE UNTIL FINAL ASSEMBLY.</div> <div>C. SERVICE: LABORATORY VACUUM (VAC) PIPE MATERIAL: SEAMLESS COPPER TUBE, DRAWN TEMPER, TYPE L. ASTM B-88 FITTINGS: WROUGHT COPPER, SOLDER JOINTS. ASME B16.22 OR PRESS TO FIT FITTINGS BY NIBCO OR VIEGA PIPE JOINT: ASTM B-32 SOLDER FILLED MATERIAL, ALLOY S85 395/5. ASTM B-813 LIQUID OR PASTE FLUX. BALL VALVES: ALL BRONZE, 3 PIECE, FULL PORT, PTFE SEATS, STAINLESS STEEL BALL AND STEM, SOLDER END CONNECTIONS, 600 PSIG WOG.</div> <div>D. SERVICE: LABORATORY PIPING EXPOSED TO VIEW ALL TUBING, FITTINGS, AND VALVES SHALL BE FACTORY CLEANED FOR OXYGEN SERVICE AND SEALED WITH END CAPS. "CLEANED FOR SPECIAL SERVICE" CERTIFICATION SHALL BE PROVIDED FOR ALL TUBING, FITTINGS AND VALVES. ONLY SWAGelok OR ENGINEERING APPROVE EQUAL COMPRESSION END FITTINGS ARE ACCEPTABLE. ALL TUBE, VALVES, FITTINGS AND OTHER COMPONENTS SHALL BE CLEANED IN ACCORDANCE WITH THE PROVISIONS WITHIN THE COMPRESSED GAS PAMPHLET G-4.1 "CLEANING EQUIPMENT FOR OXYGEN SERVICE". SUCH MATERIAL SHALL BE DELIVERED CAPPED OR PLUGGED.</div> <div>TUBING DESIGN:</div> <div>HIGH-QUALITY, FULLY ANNEALED, 316/316L, STAINLESS STEEL. BRIGHT ANNEALED TUBING, ASTM A269 OR A213, OR EQUIVALENT, HARDNESS NOT TO EXCEED 90 HRB OR 200 HV. TUBING TO BE FREE OF SCRATCHES CHEMICALLY CLEANED AND PASSIVATED TUBING SUITABLE FOR BENDING. POLISHED 25RA FINISH ID & MILL FINISH EXTERIOR. TUBING MAY BE BENT FOR ¼ TO 1/2" IN ORDER TO MINIMIZE THE USE OF COMPRESSION FITTINGS.</div> <div>FITTING DESIGN:</div> <div>COMPRESSION ENDS: ½ O.D. THRU 1" O.D. ASME-BPE COMPLIANCE, 316 STAINLESS STEEL, DUO-FERRULE COMPRESSION ENDS, MILL FINISH INTERIOR AND EXTERIOR, CHEMICAL COMPOSITION AND ACCEPTANCE CRITERIA SHALL MEET ASME BPE-LATEST EDITION, CLEAN FOR OXYGEN SERVICE. SWAGelok OR ENGINEER APPROVED EQUAL.</div> <div>ALL TUBE FITTINGS WILL HAVE A GAUGEABLE SHOULDER TO CHECK FOR SUFFICIENT PULL-UP ON INITIAL INSTALLATION. THE GAUGEABLE SHOULDER WILL ALLOW A GAP INSPECTION GAUGE TO BE INSERTED BETWEEN THE HEX OF THE NUT AND HEX OF THE BODY SHOULDER. CONSISTENTLY, THE GAP INSPECTION GAUGE WILL NOT FIT BETWEEN THE NUT AND SHOULDER HEXES OF A SUFFICIENTLY TIGHTENED FITTING ON THE INITIAL INSTALLATION.</div> <div>BALL VALVE DESIGN: 1/4" O.D. THRU 1" O.D. ASME-BPE COMPLIANCE, STAINLESS STEEL, TYPE 316, BALL VALVE, 3-PIECE, SWING OUT BODY, STAINLESS STEEL HANDLE WITH VINYL SLEEVE, PTFE SEAT & SEAL, MILL FINISH INTERIOR AND EXTERIOR, LIVE LOADED STEM PACKING, LEVER OPERATED W/LOCK-OUT HANDLE, DUO-FERRULE COMPRESSION ENDS, SWAGelok 60 SERIES.</div> <div>F. SERVICE: ABOVE GROUND LABORATORY WASTE AND VENT (LW, LV) PIPE MATERIAL: SCHEDULE 40 POLYPROPYLENE PIPE (PPRP) FLAME RETARDANT MANUFACTURED TO MEET SCHEDULE 40 IRON PIPE SIZE DIMENSIONAL STANDARDS IN ACCORDANCE WITH ASTM D2122, SECTION 4 AND 7. FITTINGS: DWV PATTERN FLAME RETARDANT FITTINGS BASED ON LAYING LENGTH DIMENSIONS IN ANSI B16-12. WALL THICKNESS SHALL CONFORM TO ASTM D2122, SECTION 4. JOINTS: FUSION METHOD WITH FUSION COILS OR FIXED FUSION FITTINGS FABRICATED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. JOINTS MADE BETWEEN PP PIPE AND DISSIMILAR MATERIALS SHALL BE JOINED WITH PROPER ADAPTERS AND TRANSITION FITTINGS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS. UNDER COUNTER JOINTS SHALL BE MECHANICAL. NOTE: ALL NEW LAB WASTE & VENT PIPING, AND ANY THAT WILL BE AS A RESULT OF THE NEW LAYOUT, THAT IS RUN WITHIN A RETURN AIR PLENUM (IN GENERAL THIS SHALL INCLUDE ALL CEILINGS WHICH ARE ABOVE NON LAB SPACES) SHALL BE COMPLETELY WRAPPED IN UL/FM APPROVED FIRE WRAP WHICH IS RATED FOR SUCH INSTALLATION.</div> <div>ACCEPTABLE PRODUCTS SHALL BE EQUAL TO FyreWRAP® 0.5 PLENUM INSULATION IS A HIGH TEMPERATURE INSULATION BLANKET SPECIFICALLY DESIGNED TO PROVIDE A SINGLE LAYER, FLEXIBLE ENCLOSURE AROUND COMBUSTIBLE ITEMS LOCATED WITHIN FIRE RATED RETURN AIR PLENUMS, NEW CONSTRUCTION, BUILDING RENOVATIONS OR MODIFICATIONS TO THE ELECTRICAL AND MECHANICAL SYSTEMS MAY RESULT IN THE INSTALLATION OF PLASTIC PIPE THAT CANNOT MEET THE MINIMUM COMBUSTIBILITY REQUIREMENTS DEFINED IN THE MECHANICAL CODE. FyreWRAP 0.5 PLENUM INSULATION PROVIDES FIRE PROTECTION FOR THESE INSTALLED ITEMS BY PREVENTING FLAME PROPAGATION AND SMOKE DEVELOPMENT IN THE PLENUM AREA.</div> <div>PRODUCTS AS MANUFACTURED BY 3M, HILTI, & SPEC SEAL SHALL BE ACCEPTABLE.</div> <div>G. SERVICE: REVERSE OSMOSIS DEIONIZED PURE WATER SUPPLY (RODI) PIPE MATERIAL: POLYURE NATURAL POLYPROPYLENE AS MANUFACTURED BY ASAHI/AMERICA, INC. IN ACCORDANCE WITH ASTM D 4101-96a AND DIN 16774. FITTINGS: STANDARD SOCKET FUSION POLYPURE FITTINGS AS MANUFACTURED BY ASAHI, 150 PSI. UNIONS: SOCKET FUSION TRU-UNION TYPE AS MANUFACTURED BY ASAHI BALL VALVES: TRU-UNION ASAHI TYPE 21 DIAPHRAGM VALVES: ASAHI TYPE 342043 TWO-WAY/ZDL. BACK PRESSURE VALVES, FRANK REGULATORS CHECK VALVES: CLASS 150, BALL TYPE PROLINE PP WITH EPDM SEATS AS MANUFACTURED BY ASAHI, 150 PSI @ 73.4" f.</div>	<div>10. PIPE IDENTIFICATION</div> <div>A. PROVIDE COLOR-CODED PIPE IDENTIFICATION MARKERS ON PIPING INSTALLED UNDER THIS SECTION. PIPE MARKERS SHALL BE SNAP-ON LAMINATED PLASTIC PROTECTED BY CLEAR ACRYLIC COATING. PIPE MARKERS SHALL BE APPLIED AFTER ARCHITECTURAL PAINTING WHERE SUCH IS REQUIRED.</div> <div>B. PROVIDE ARROW MARKER WITH EACH PIPE CONTENT MARKER TO INDICATE DIRECTION OF FLOW. IF FLOW CAN BE IN EITHER DIRECTION, USE DOUBLE-HEADED ARROW MARKER.</div> <div>C. PROVIDE PIPE MARKERS AT INTERVALS NO LONGER THAN 20'</div> <div>11. VALVE TAGS</div> <div>A. UPON COMPLETION OF WORK, ATTACH ENGRAVED LAMINATED BRASS TAGS TO ALL VALVES AND INSTRUMENTATION. TAGS SHALL HAVE BLACK CHARACTERS ON WHITE FACE, CONSECUTIVELY NUMBERED AND PREFIXED WITH LETTER P FOR GENERAL VALVES.</div> <div>B. TAGS SHALL BE AT LEAST 1.25" DIAMETER WITH NUMERALS AT LEAST 3/8" HIGH AND ATTACHED BY S HOOKS AND CHAINS.</div> <div>12. INSULATION</div> <div>A. INSULATION SHALL BE BY OWENS-CORNING, CERTAIN-TEED OR MANVILLE.</div> <div>B. INSULATION, JACKETS AND ADHESIVES SHALL BE FLAME RETARDANT AND SHALL HAVE ASTM E-84 FIRE HAZARD RATINGS OF 25 FLAME SPREAD, 50 SMOKE DEVELOPED AND 50 FUEL CONTRIBUTED.</div> <div>C. HOT WATER PIPING SHALL BE INSULATED WITH HEAVY DENSITY FIBERGLASS WITH SELF-SEALING LAP AND ALL SERVICE JACKET. FITTINGS AND VALVES SHALL BE INSULATED WITH TWO LAYERS BLANKET INSULATION WITH PVC COVERS. INSULATION SHALL BE RATED FOR MAXIMUM OPERATING TEMPERATURE OF 450°F. INSULATION THICKNESS SHALL BE 1".</div> <div>D. COLD WATER, EMERGENCY TEPID WATER & CONDENSATE PIPING, VALVES AND FITTINGS SHALL BE INSULATED AS SPECIFIED FOR HOT WATER SUPPLY PIPING. IN ADDITION, CONTINUOUS VAPOR BARRIER SHALL BE BE MAINTAINED, INSULATION THICKNESS SHALL BE 1/2".</div> <div>13. HANGERS, ANCHORS, CLAMPS AND INSERTS</div> <div>A. PROVIDE ADJUSTABLE CLEVIS HANGERS FOR PIPING 2" & LARGER, AND CAST BRASS SPLIT-RING HINGED HANGERS FOR SMALLER PIPING. SUPPORT PIPING FROM BUILDING STRUCTURE TO MAINTAIN REQUIRED GRADE AND PITCH OF PIPE LINES, PREVENT VIBRATION, SECURE PIPING IN PLACE. SECURE HANGERS TO INSERTS WHERE PRACTICAL. HANGER RODS SHALL HAVE MACHINE THREADS.</div> <div>B. HANGER RODS SHALL BE CONNECTED TO BEAM CLAMP, UL-APPROVED CONCRETE INSERTS OR PHILLIPS OR APPROVED EQUAL EXPANSION SHIELDS. RAMSET OR POWER DRIVEN INSERTS WILL NOT BE ALLOWED.</div> <div>C. HANGER SPACING SHALL MEET REQUIREMENTS OF STATE AND LOCAL CODES.</div> <div>14. SLEEVES AND PENETRATIONS</div> <div>A. PIPE SLEEVES THROUGH FIRE-RATED CONSTRUCTION SHALL BE SCHEDULE 40 STEEL. SLEEVES THROUGH PARTITIONS AND NON-FIRE-RATED CONSTRUCTION SHALL BE 26 GAUGE GALVANIZED STEEL WITH LOCK LONGITUDINAL SEAMS, AS SPECIFIED IN THIS SECTION OF THE SPECIFICATIONS.</div> <div>B. FIRE STOP PENETRATION SEALS IN FIRE-RATED CONSTRUCTION SHALL BE CERAMIC FIBRE, MINERAL FIBRE, OR SILICONE FOAM. PROVIDE MINERAL FIBRE BOARD, MATTING OR PUTTY FOR DAMMING AND FORMING. FINISH SEALS FLUSH TO WALL SURFACE AND FILL GAPS WITH SILICONE ADHESIVE SEALANT CAULKING.</div> <div>C. PACKING FOR SLEEVES THAT DO NOT REQUIRE MAINTENANCE OF FIRE RATING SHALL BE OAKUM, SILICATE FOAM, CERAMIC FIBRE OR MINERAL FIBRE WITH APPROVED SEALANT. PACK OR FOAM TO WITHIN ONE INCH OF BOTH WALL SURFACES. SEAL PENETRATION PACKING WITH APPROVED CAULKING AND PAINTABLE WATERPROOF MASTIC SURFACE FINISH OR SILICONE CAULKING.</div> <div>15. MATERIALS AND WORKMANSHIP</div> <div>A. MAINTAIN MAXIMUM HEADROOM AT ALL TIMES. DO NOT RUN PIPES EXPOSED UNLESS SHOWN EXPOSED ON DRAWINGS. MATERIAL AND EQUIPMENT SHALL BE NEW AND INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDED BEST PRACTICE SO THAT COMPLETED INSTALLATION SHALL OPERATE SAFELY AND EFFICIENTLY.</div> <div>16. CONTINUITY OF SERVICES</div> <div>A. DO NOT INTERRUPT EXISTING SERVICES WITHOUT OWNER'S APPROVAL.</div> <div>17. ACCESS</div> <div>A. PROVIDE PROPER ACCESS TO EQUIPMENT AND VALVES THAT REQUIRE INSPECTION, REPLACEMENT OR REPAIR. ACCESS PANELS SHALL BE A MINIMUM OF 12" X 12".</div> <div>18. TESTING</div> <div>A. TEST AND ADJUST PLUMBING SYSTEMS AS REQUIRED BY ARCHITECT AND AUTHORITIES THAT HAVE JURISDICTION. PERFORM TESTS RECOMMENDED BY MANUFACTURERS OF MATERIALS AND EQUIPMENT.</div> <div>B. TEST PLUMBING SYSTEMS UNDER PRESSURE AND HEADS SPECIFIED IN PLUMBING CODES.</div> <div>C. VAC PIPING SHALL BE PRESSURE TESTED UTILIZING OIL FREE AIR OR NITROGEN UP TO 150 PSI FOR A PERIOD OF 1 HOUR, WITH NO LOSS. A FULL RATE OF RISE/DECAY TEST SHALL BE PERFORMED ON THE VACUUM PIPING.</div> <div>D. CDA & N2O PIPING SHALL BE PRESSURE TESTED UTILIZING SOURCE GAS OR NITROGEN UP TO 150 PSI FOR A PERIOD OF 1 HOUR, WITH NO LOSS. E. ROS PIPING - HYDROSTATICALLY TEST ALL PIPE SYSTEMS WITH DEIONIZED WATER AT 100 PSIG FOR ONE HOUR. DOCUMENT ALL RESULTS. COMPLY WITH 21 CFR, PART 211 (FDA CGMPs) FOR DOCUMENTATION OF SYSTEM INSTALLATION AND TESTING PROCEDURES.</div> <div>19. CLEANING</div> <div>A. CLEAN SYSTEMS THOROUGHLY BEFORE TESTING. FIXTURES, EQUIPMENT, PIPE, VALVES AND FITTINGS SHALL BE FREE OF GREASE, METAL CUTTINGS, DIRT AND OTHER FOREIGN MATERIAL.</div> <div>B. REPAIR STOPPAGE, DISCOLORATION AND DAMAGE TO PARTS OF BUILDING, FINISH AND FURNISHINGS DUE TO FAILURE TO PROPERLY CLEAN PIPING SYSTEM.</div> <div>20. CLEANING OF THERMOPLASTICS</div> <div>A. SYSTEM IS TO BE STERILIZED IN PLACE, LEAK CHECK AND PRESSURE TEST THE SYSTEM WITH AIR OR WATER, PRIOR TO STERILIZATION.</div> <div>B. DISCONNECT ANY UV LIGHTS AND REMOVE ANY SUB-MICRON FILTER CARTRIDGES FROM THEIR HOUSINGS AND INSTALL 5 MICRON FILTER CARTRIDGES.</div> <div>C. CLOSE VALVES ON INLET AND OUTLET AND OPEN BYPASS ON ANY DI BOTTLES TO PREVENT THE STERILIZING SOLUTION FROM ENTERING DI BOTTLES AND CONTACTING THE RESIN, WHILE STILL ALLOWING THE SOLUTION TO CIRCULATE.</div> <div>D. FILL STORAGE TANK TO A DEPTH OF APPROXIMATELY 3 FT. WITH DI WATER. CALCULATE THE TOTAL VOLUME OF WATER IN THE STORAGE TANK AND THE PIPING LOOP. ADD SUFFICIENT HYDROGEN PEROXIDE (H2O2) TO THE WATER IN THE STORAGE TANK TO RESULT IN A SOLUTION STRENGTH OF 10% H2O2).</div> <div>E. WHEN CIRCULATING THE H2O2 SOLUTION, SAMPLE THE WATER AT EACH SINK VALVE, AS FOLLOWS, TO VERIFY THE PRESENCE OF THE H2O2 SOLUTION:</div> <div>F. UTILIZE A NACH CO., INC. PRE-MANUFACTURING TEST KIT MODEL NO. HYP-1 (CAT. NO. 2291-00) OR APPROVED EQUAL. THIS KIT SHALL BE USED TO TEST H202 PRESENCE BY A DROP COUNT (TITRATION) THIOSULFIDE METHOD.</div> <div>G. ADJUST THE PH OF A QUART OF POTASSIUM PERMANGANATE (KMNO4) AND PH 6.5 WITH SULFURIC ACID (H2SO4). A QUART SHOULD BE ADEQUATE FOR TESTING MOST SYSTEMS.</div> <div>H. DRAW APPROXIMATELY ONE-HALF CUP OF WATER FROM EACH SINK VALVE, INDIVIDUALLY, AND ADD A SMALL AMOUNT OF THE TEST SOLUTION (KMNO4) TO THE SAMPLE.</div> <div>I. IF H2O2 IS PRESENT IN THE SAMPLE, IT WILL TURN CLEAR OR BROWN; IF NO H2O2 IS PRESENT, IT WILL REMAIN PURPLE. F. WHEN TESTING VERIFIES THE H202 SOLUTION IS PRESENT AT ALL TEST LOCATIONS, TURN OFF THE DISTRIBUTION PUMP AND OPEN INLET AND OUTLET VALVE AS REQUIRED TO RETAIN THE SOLUTION IN THE LOOP FOR A MINIMUM OF 12 HOURS, WHILE ISOLATING THE TANK FROM THE LOOP.</div> <div>J. DURING THE 12 HOUR RETENTION PERIOD, THE STORAGE TANK CAN BE DRAINED AND CLEANED. THIS IS ACCOMPLISHED BY FIRST DRAINING THE TANK TO BELOW THE MANHOLE. ENTER THE TANK AND USING SUITABLE SPRAYING DEVICE AND PRESSURE, WASH THE TANK WALLS AND DOME WITH THE RESIDUAL H2O2 IN THE TANK. AFTER SPRAYING, DRAIN THE TANK TO A SUITABLE DRAIN AND THEN THOROUGHLY RINSE THE INTERIOR WITH DI WATER ALLOWING IT TO GO TO DRAIN ALSO. VACUUM ANY RESIDUAL DI WATER AND THEN DRY THE TANK. REPLACE THE MANHOLE AND CLOSE THE TANK DRAIN. FILL THE STORAGE TANK WITH DI WATER AND RE-VALVE OR INSTALL A BYPASS TO ALLOW THE BUILDING LOOP RETURN LINE TO DISCHARGE TO DRAIN FOR THE FLUSHING AND DRAINING OF THE LOOP.</div> <div>1. WHILE PERFORMING THE FOLLOWING TANK CLEANING PROCEDURE, FULL BODY PROTECTIVE GEAR INCLUDING BREATHING APPARATUS IS REQUIRED. ALSO, A LIFE LINE MUST BE ATTACHED TO THE PERSON ENTERING THE TANK AND AN ADDITIONAL PERSON SHOULD BE STATIONED OUTSIDE WITHIN SIGHT AND SOUND, IN CASE OF AN EMERGENCY.</div> <div>K. AFTER THE 12 HOUR RETENTION PERIOD, FLUSH THE H2O2 SOLUTION IN THE LOOP TO DRAIN, UTILIZING THE DISTRIBUTION PUMP AND THE DI WATER IN THE STORAGE TANK. FLUSH UNTIL TESTING WITH KMNO4 INDICATES NO RESIDUAL H2O2 IN THE LOOP.</div> <div>L. OPEN INLET AND OUTLET VALVES ON DI BOTTLES AND RECONNECT LOOP RETURN TO THE STORAGE TANK, AND REMOVE AND DISCARD THE 5 MICRON CARTRIDGES FROM THE SUB-MICRON FILTER HOUSING AND INSTALL PROPER SUB-MICRON FILTER CARTRIDGES AND RECONNECT UV LIGHTS. THIS PROCEDURE SHOULD BE REPEATED AT LEAST ANNUALLY OR MORE OFTEN IF CONTAMINATION OCCURS.</div> <div>21. REGULATORS REQUIREMENTS</div> <div>A. STRICTLY COMPLY WITH APPLICABLE CODES, REGULATIONS AND REQUIREMENTS OF AUTHORITY HAVING JURISDICTION.</div> <div>22. DISINFECTION OF WATER SYSTEMS</div> <div>A. WATER PIPING SYSTEMS SHALL BE THOROUGHLY DISINFECTED WITH A SOLUTION CONTAINING NO LESS THAN 50 PARTS PER MILLION OF AVAILABLE CHLORINE. CHLORINATING MATERIALS SHALL BE EITHER LIQUID CHLORINE OR SODIUM HYPO CHLORITE. SOLUTION SHALL BE INTRODUCED INTO THE SYSTEM AND DRAWN TO ALL POINTS IN THE SYSTEM. DISINFECTION SOLUTION SHALL BE ALLOWED TO REMAIN IN SYSTEM FOR 24 HOURS, DURING THIS TIME, VALVES AND FAUCETS SHALL BE OPENED AND CLOSED SEVERAL TIMES. AFTER DISINFECTION, SOLUTION SHALL BE FLUSHED FROM THE SYSTEM WITH CLEAR WATER UNTIL RESIDUAL CHLORINE CONTENT IS NO GREATER THAN 0.2 PARTS PER MILLION.</div>

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Issuance Schedule

Number	Date	Description
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ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

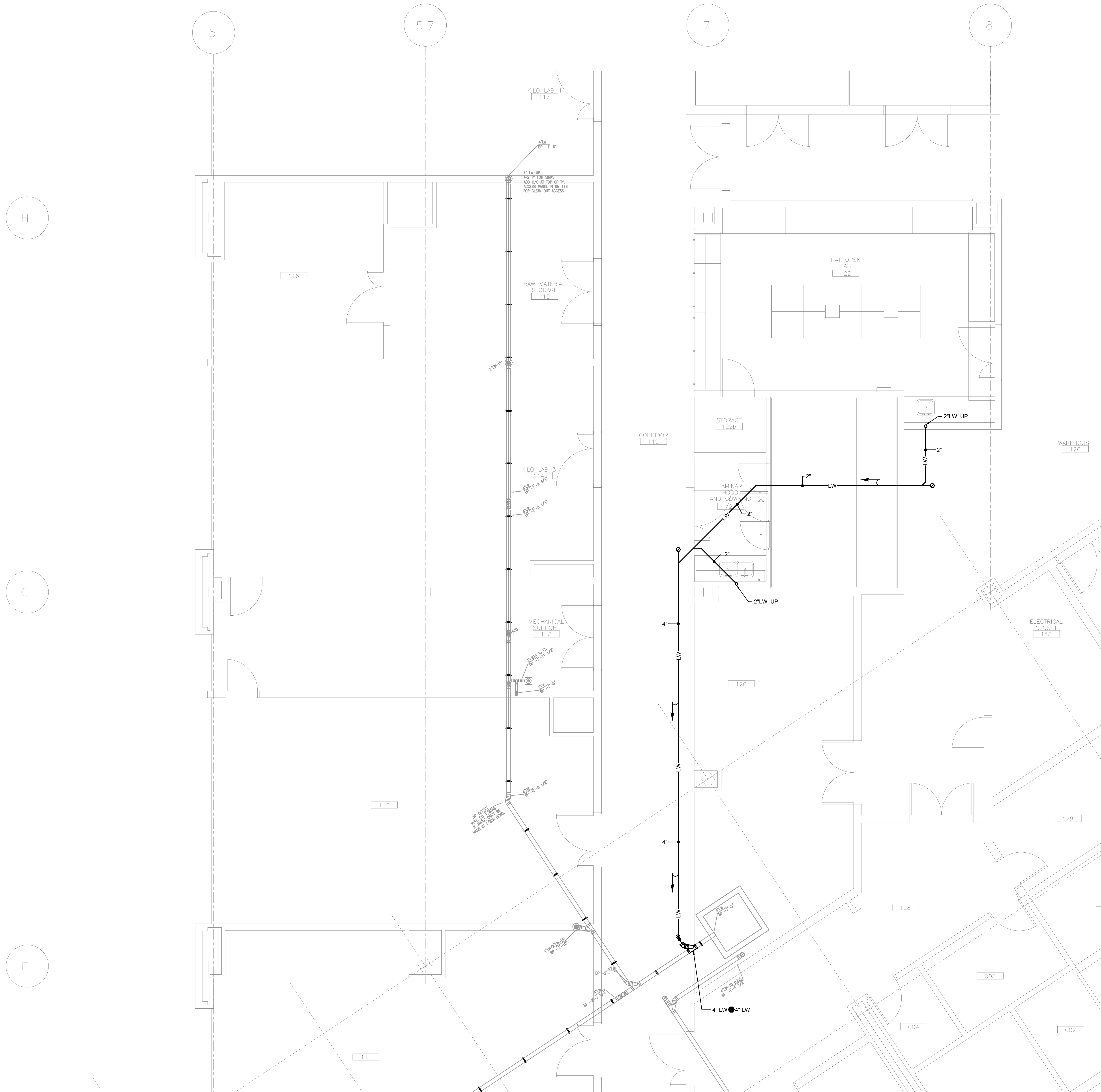
PLUMBING SPECIFICATIONS

Scale: N/A Date Issued: 8/26/16

P0.03

Project Number: 179-07-00

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1 BURIED PIPING PAT LAB - PLUMBING NEW WORK PLAN
SCALE: 1/4"=1'-0"

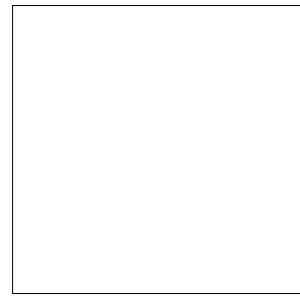
SHEET NOTES

1. THE PC SHALL FIELD VERIFY ALL EXISTING PIPING LOCATIONS, SIZES, INVERTS, DIRECTIONS OF FLOW, MATERIALS, AND SLOPE PRIOR TO INSTALLATION OF ANY NEW PIPING.
2. COORDINATE ALL SAW CUTTING OF SLAB WITH VERTEX FACILITIES PRIOR TO COMMENCEMENT OF WORK. SCHEDULE OFF HOURS WHERE NECESSARY.
3. TRENCHING OF LAB WASTE PIPING SHALL BE AS FAR TO THE SIDE OF THE CORRIDOR AS POSSIBLE TO ALLOW FOR CONTINUOUS USE OF THE SPACE BY LAB USERS.
4. ALTERNATE ROUTING OF LAB WASTE PIPING THRU THE ADJACENT MECHANICAL ROOM SHALL BE INVESTIGATED BY THE PC TO VERIFY VALIDITY OF THIS OPTION. A STRUCTURAL ENGINEER SHALL BE REQUIRED TO DETERMINE IF THE SLAB CAN BE SAW CUT AS CLOSE TO THE VERY HEAVY EQUIPMENT IN THIS SPACE, AND MAINTAIN STRUCTURAL INTEGRITY.

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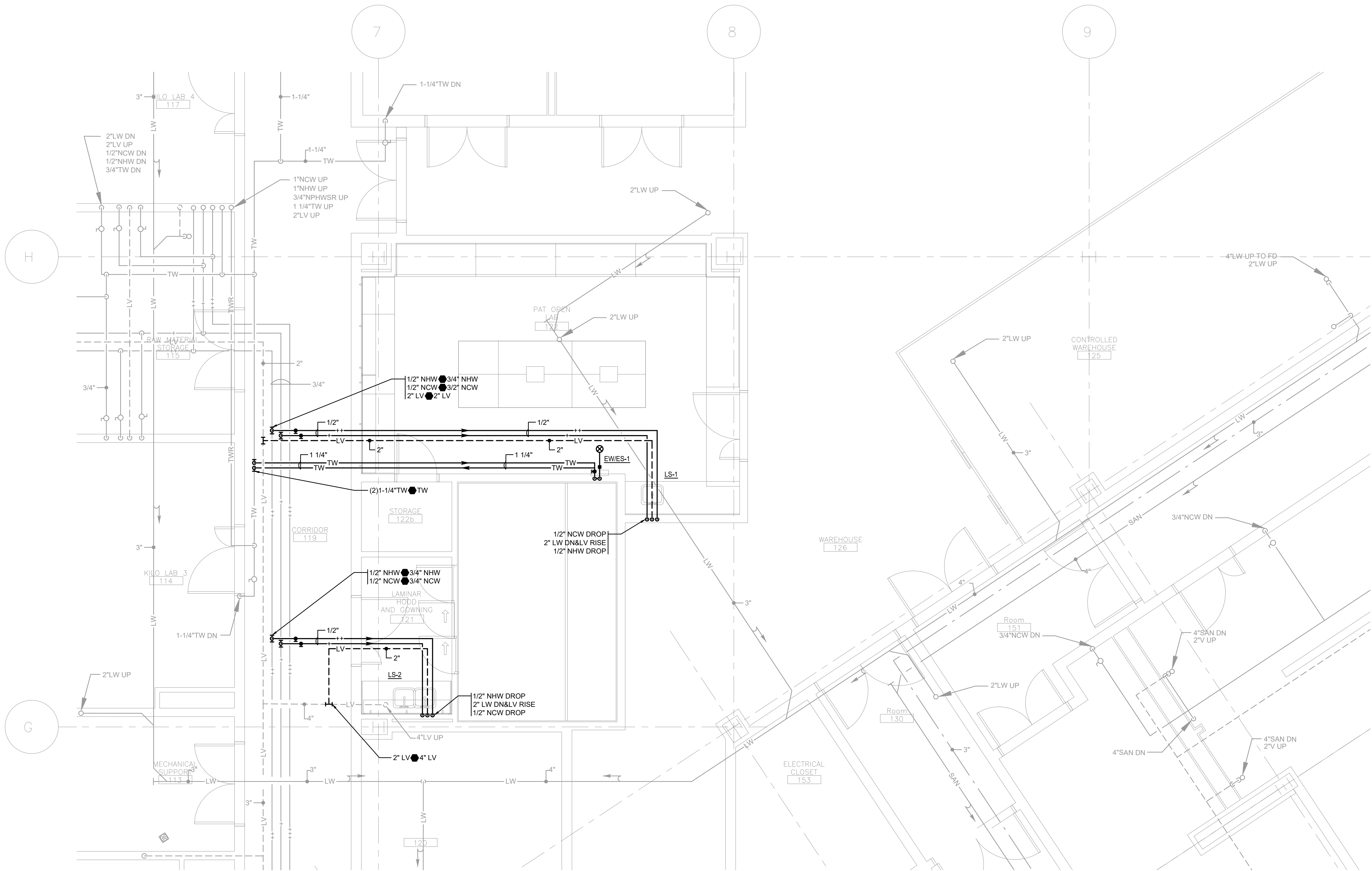
LEVEL 1 PAT LAB

PLUMBING
BURIED PIPING
PLAN

Scale: 1/4"=1'-0" Date Issued: 8/26/16

P1.10

Project Number: 179-07-00



1 LEVEL 1 PAT LAB - PLUMBING NEW WORK PLAN
SCALE: 1/4"=1'-0"

SHEET NOTES

1. THE PC SHALL FIELD VERIFY ALL EXISTING PIPING LOCATION, SIZES, PITCH, DIRECTION OF FLOW, MATERIAL, INVERT, ETC. PRIOR TO INSTALLATION OF ANY NEW PIPING.
2. COORDINATE ALL SAW CUTTING OF SLAB WITH VERTEX FACILITIES PRIOR TO COMMENCEMENT OF WORK. SCHEDULE OFF HOURS WHERE NECESSARY.

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VERTEX PHARMACEUTICALS

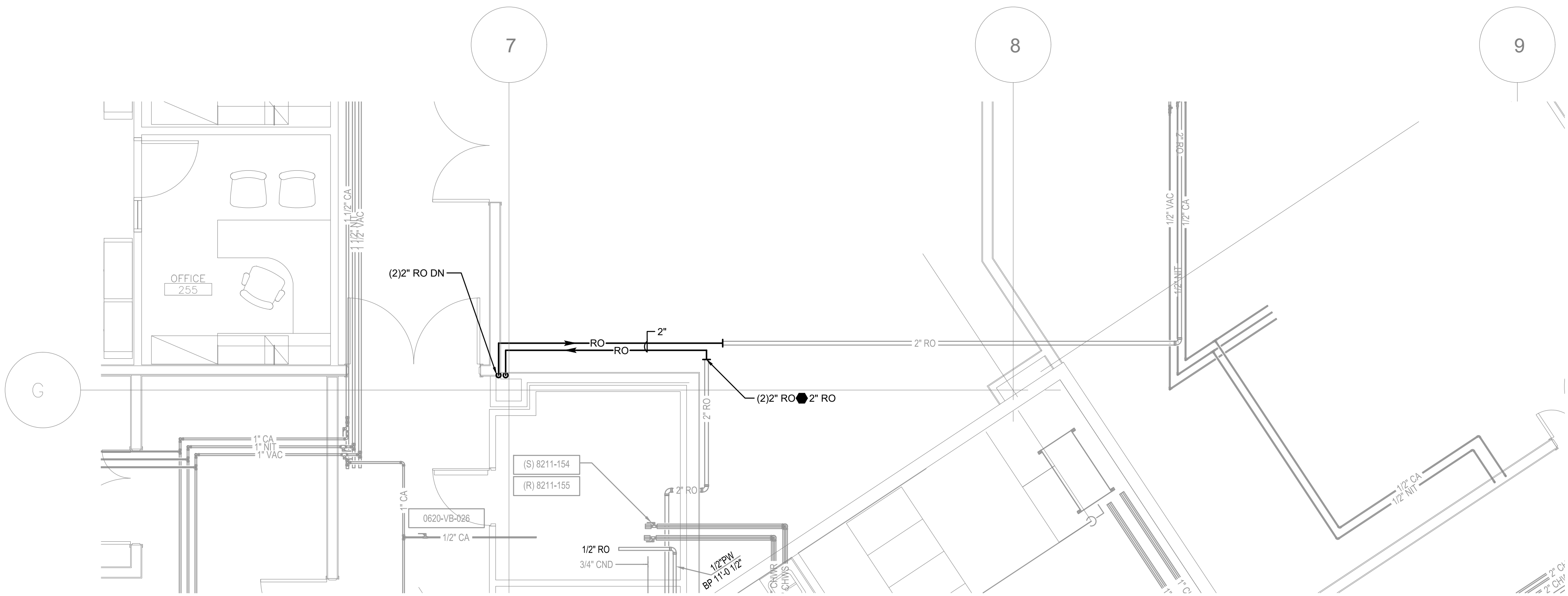
LEVEL 1 PAT LAB

PLUMBING
LEVEL 1
FLOOR PLAN

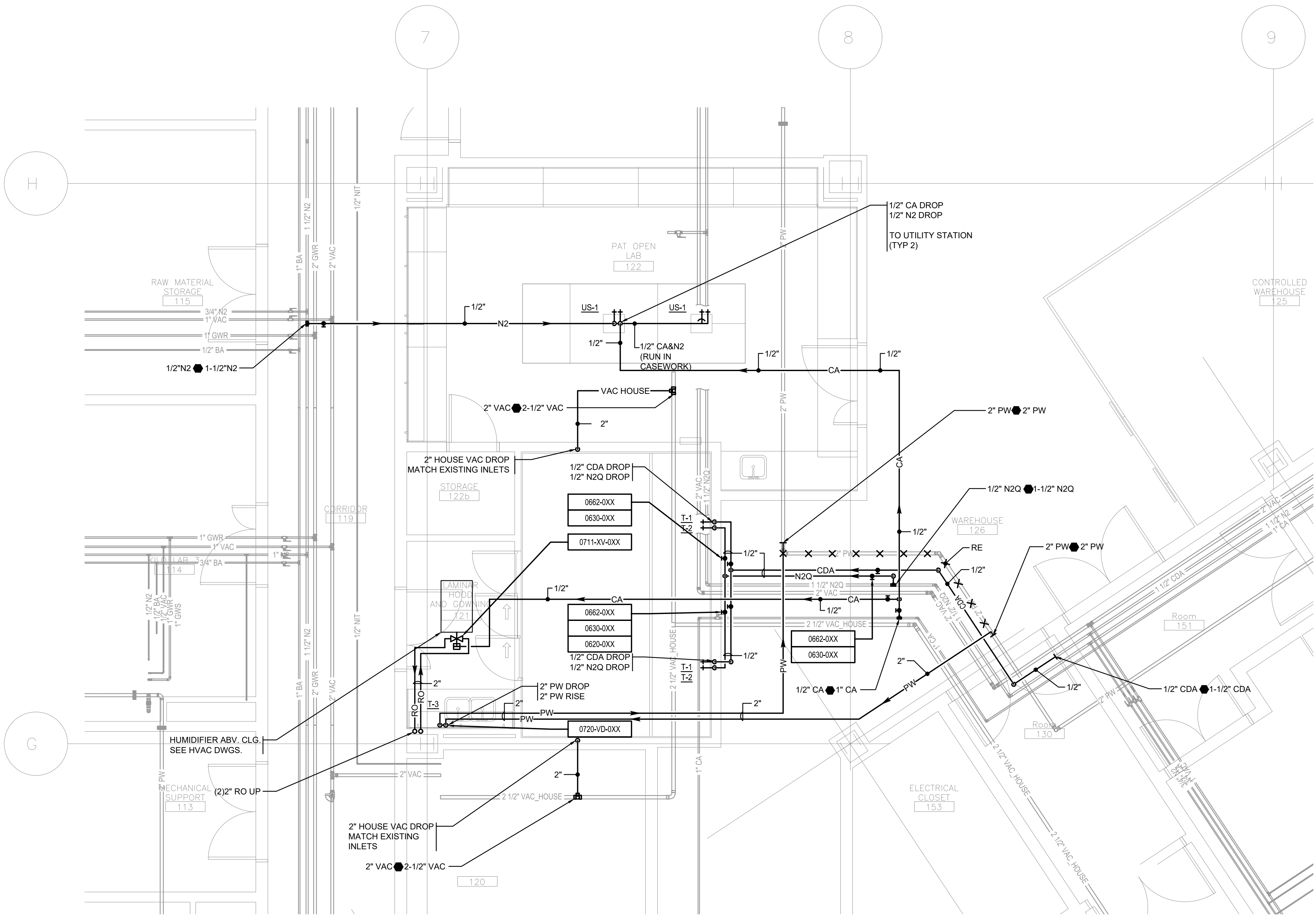
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Project Number: 179-07-00



2 LEVEL 2 PAT LAB - PROCESS PIPING PART PLAN
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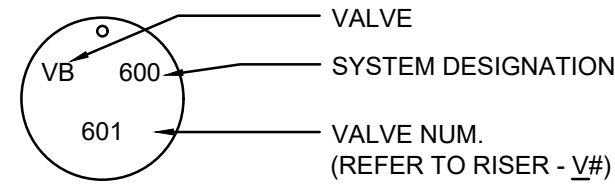


1 LEVEL 1 PAT LAB - PROCESS PIPING PART PLAN
SCALE: 1/4"=1'-0"

SHEET NOTES

1. THE PC SHALL FIELD VERIFY ALL EXISTING PIPING LOCATION, SIZES, PITCH, DIRECTION OF FLOW, MATERIAL, INVERT, ETC. PRIOR TO INSTALLATION OF ANY NEW PIPING.
2. ALL NEW PROCESS PIPING SHALL BE OXYGEN GRADE, BAGGED AND CAPPED PIPING (FOR GASES), AND SHALL BE BRAZED UTILIZING A CONTINUOUS NITROGEN PURGE.
3. TEST ALL NEW GAS OUTLETS FOR SYSTEM PURITY AND CROSS CONNECTION PRIOR TO SETTING BACK IN WORKING ORDER.
4. A FULL STERILIZATION OF THE ENTIRE PURE WATER LOOP SHALL BE PROVIDED UPON COMPLETION OF WORK.
5. ALL NEW VALVE TAGS SHALL MATCH THE EXISTING SYSTEMS AND SHALL NUMBER NUMERICALLY PER THE CURRENT PROTOCOL. NEW TAGS AND NUMBERING SHALL BE FULLY COORDINATED WITH VERTEX FACILITIES.
6. ALL NEW PROCESS SYSTEMS SUBJECT TO VALIDATION SHALL BE VALIDATED BY A THIRD PARTY.

PROCESS SYSTEM LEGEND



PROCESS SYSTEMS	
620	= COMPRESSED AIR
630	= CLEAN DRY AIR SYSTEM
650	= VACUUM SYSTEM
662	= PROCESS NITROGEN SYSTEM
711	= RO WATER SYSTEM
720	= PURIFIED (USP) WATER SYSTEM

P&ID SYMBOLS & ABBREVIATIONS

	CV	CONTROL VALVE
	VB	BALL VALVE
	VC	CHECK VALVE
	PCV	PRESSURE CONTROL VALVE
	FL	FILTER HOUSING
	PI	PRESSURE INDICATOR
	PIT	PRESSURE INDICATING TRANSMITTER
	PS	PRESSURE SWITCH
	DR	DRYER (DESICCANT)

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VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

PLUMBING
PROCESS PIPING
PART PLANS

Scale: 1/4"=1'-0" Date Issued: 8/26/16

P2.11

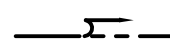
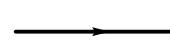
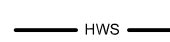
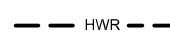
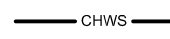
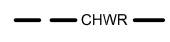
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HVAC DEMOLITION NOTES	
1.	ALL WORK SHALL CONFORM TO THE STATE BUILDING CODES AND ALL OTHER APPLICABLE CODES AND REGULATIONS.
2.	THE DRAWINGS DEPICT ONLY GENERALLY THE EXISTING CONDITIONS. THE CONTRACTOR SHALL MAKE FIELD OBSERVATIONS AND CONFIRM WALL LOCATIONS, DUCTWORK, PIPING AND OTHER UTILITIES ABOVE EXISTING CEILINGS.
3.	ALL CONFLICTS AND ITEMS FOR CLARIFICATIONS SHALL BE BROUGHT TO THE ENGINEER / ARCHITECT'S ATTENTION PRIOR TO WORK IN THE AREA.
4.	THE CONTRACTOR IS RESPONSIBLE TO FOLLOW BUILDING MANAGEMENT RULES WITH REGARDS TO TRASH, ELEVATORS, NOISE, SPRINKLERS AND FIRE ALARM.
5.	THE CONTRACTOR SHALL MAINTAIN IN OPERATION ALL EXISTING UTILITIES DURING CONSTRUCTION
6.	ITEMS IDENTIFIED TO BE SALVAGED SHALL BE STOCKPILED IN AN AREA FOR REMOVAL BY THE OWNER. ALL OTHER ITEMS TO BE REMOVED SHALL BE DISPOSED OF LEGALLY OFF SITE. ALL ITEMS BEING REMOVED AND NOT REUSED SHALL BE DISPOSED OF AS DIRECTED BY THE OWNER.
7.	CAPPING OF ALL SERVICES SHALL BE PERFORMED TO LEAVE EXISTING SERVICES TO OTHER AREAS INTACT AND FUNCTIONAL.
8.	ALL DEMOLITION WORK WILL BE SCHEDULED WITH BUILDING MANAGEMENT AND PERFORMED ONLY FOLLOWING APPROVAL.
9.	THE CONTRACTOR SHALL INFORM BUILDING MANAGEMENT AND RECEIVE SCHEDULE APPROVAL FOR ANY REQUIRED UTILITY SHUTDOWN.
10.	WHERE EQUIPMENT IS SHOWN TO BE REMOVED, THE EQUIPMENT SHALL BE DELIVERED TO BUILDING MANAGEMENT FOR STORAGE OR PROPERLY DISPOSED OF AS DIRECTED BY BUILDING MANAGEMENT.
11.	WHERE EQUIPMENT IS SHOWN OR NOTED AS BEING REMOVED & REPLACED AFTER WALL/CEILING STRUCTURAL OR ARCHITECTURAL WORK IS PERFORMED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER, SAFE STORAGE OF SUCH EQUIPMENT.
12.	ANY DUCTWORK SHOWN TO BE REMOVED SHALL INCLUDE REMOVE OF ALL ASSOCIATED DUCTWORK, FLEXIBLE CONNECTIONS, DIFFUSERS, HANGERS, INSULATION ETC.
13.	ANY PIPING SHOWN TO BE REMOVED WILL BE REMOVED TO THE POINT INDICATED ON THE DRAWINGS OR TO THE ACTIVE MAIN AND VALVED AND CAPPED. PIPING REMOVAL SHALL INCLUDE ALL HANGERS, VALVES, INSULATION, ETC.
14.	EXISTING DUCTWORK SHALL BE CAPPED AND SEALED AIR TIGHT, EXCEPT WHERE UTILIZED FOR NEW BRANCH DUCTWORK.
15.	THERMOSTATS ARE TO BE RELOCATED AS SHOWN ON NEW WORK DRAWINGS.
16.	REMOVE AND CLEAN ALL SUPPLY, RETURN & EXHAUST DIFFUSERS & GRILLES, RE-INSTALL OR SAVE FOR RELOCATION AS SHOWN ON NEW WORK PLAN.
17.	ALL DIFFUSERS TO BE TIED TO UNDERSIDE OF STRUCTURE TO FACILITATE REMOVAL OF EXISTING CEILING AND MAINTAIN DIFFUSER CONNECTION TO DUCTWORK WHERE APPLICABLE. DIFFUSERS SHALL BE REPLACED INTO NEW CEILING GRID AS SHOWN ON NEW WORK DRAWINGS. ADDITIONAL LENGTH OF FLEX MAY BE REQUIRED FOR DIFFUSERS.
18.	CONTRACTOR SHOULD SURVEY EXISTING CONDITIONS AND INFORM ENGINEER OF ANY DEVIATIONS PRIOR TO CONSTRUCTION

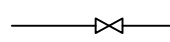
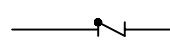
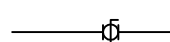
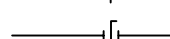

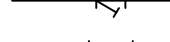
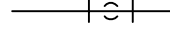
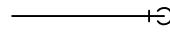
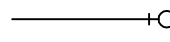
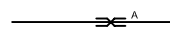
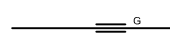
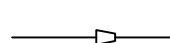
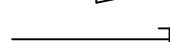

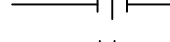
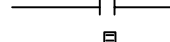
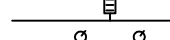
HVAC GENERAL NOTES	
1.	THE HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTRACTOR SHALL VISIT THE SITE TO DETERMINE ALL PRE-EXISTING CONDITIONS AND WORK NECESSARY PRIOR TO SUBMISSION OF BID PRICE.
2.	THE HVAC CONTRACTOR SHALL BE FAMILIAR WITH ALL CONTRACT DOCUMENTS FOR ALL TRADES AND COORDINATE WITH OTHER CONTRACTORS.
3.	DRAWINGS ARE DIAGRAMMATIC ONLY; FINAL ROUTING OF DUCTWORK, PIPING AND EQUIPMENT LOCATIONS SHALL BE DETERMINED IN THE FIELD. PROVIDE ALL ADDITIONAL OFFSETS, ELBOWS, ETC., AT NO ADDITIONAL COST TO THE OWNER.
4.	CONSTRUCT AND INSTALL ALL DUCTWORK IN ACCORDANCE WITH THE LATEST EDITION OF SMACNA STANDARDS.
5.	PROVIDE VOLUME DAMPERS AT ALL LOW PRESSURE SUPPLY, RETURN AND EXHAUST DUCTWORK BRANCH TAKE-OFFS.
6.	MINIMUM SIZE OF HOT WATER SUPPLY, HOT WATER RETURN AND CONDENSATE DRAIN PIPING SHALL BE 3/4" UNLESS OTHERWISE NOTED.
7.	MINIMUM SIZE OF STEAM CONDENSATE RETURN PIPING SHALL BE 1" UNLESS OTHERWISE NOTED.
8.	COORDINATE ALL ELECTRICAL AND PLUMBING REQUIREMENTS WITH THE ELECTRICAL AND PLUMBING CONTRACTORS.
10.	REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR FINAL LOCATIONS OF DIFFUSERS, REGISTERS AND GRILLES.
11.	AUTOMATIC TEMPERATURE CONTROL (ATC) CONTRACTOR: COORDINATE THERMOSTAT LOCATIONS WITH THE ARCHITECTURAL FURNITURE PLANS. INSTALL ALL SENSORS AND FINISHED SPACE CONTROLS INCLUDING THERMOSTATS 48" ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
12.	PROVIDE ALL INCIDENTAL ACCESSORIES NECESSARY TO MAKE THE HVAC WORK COMPLETE AND READY FOR OPERATION.
13.	PROVIDE (FURNISH AND INSTALL) ALL HVAC WORK SHALL BE IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL CODES.
14.	INSTALL ALL HVAC EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
15.	DEMOLITION WORK SHALL BE DONE BY THE HVAC CONTRACTOR. THE HVAC CONTRACTOR SHALL COORDINATE ALL WORK CONCERNING EXISTING EQUIPMENT AND SYSTEMS REMAINING IN THE BUILDING. ALL UNSEEN DUCTS AND PIPES AS A RESULT OF THE DEMOLITION SHALL BE CAPPED, SEALED AND INSULATED.
16.	THE HVAC CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE INTEGRITY, CONDITION AND LOCATION OF EXISTING DUCTWORK AND PIPING WHICH IS TO BE REUSED. IF PIPING AND DUCTWORK CANNOT BE REUSED, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER TO DETERMINE THE EXTENT OF REPLACEMENT.
17.	PROVIDE FIRE DAMPERS AND ACCESS PANELS AT ALL FIRE RATED ASSEMBLIES AND FLOOR PENETRATIONS. REFER TO ARCHITECTURAL DRAWINGS FOR ASSEMBLY LOCATIONS.
18.	PROVIDE FIRE DAMPERS AT ALL TRANSFER DUCTS IN FIRE RATED PARTITIONS.
19.	PROVIDE ISOLATION VALVES IN SUPPLY AND RETURN PIPING ON EACH FLOOR, AND IN BRANCH PIPING SERVING MORE THAN ONE PIECE OF EQUIPMENT.
20.	PROVIDE SHUTOFF VALVES IN THE SUPPLY AND RETURN PIPING TO ALL IN BRANCH PIPING SERVING MORE THAN ONE PIECE OF EQUIPMENT. ARRANGED SUCH THAT EQUIPMENT CAN BE SERVICED WITHOUT CUTTING AND MINIMAL DISRUPTION OF PIPING SERVING THE EQUIPMENT.
21.	FURNISH TO THE GENERAL CONTRACTOR ALL INFORMATION REQUIRED FOR SETTING OF WALL, ROOF AND PARTITION OPENINGS FOR HVAC WORK. THIS INFORMATION SHALL BE FURNISHED IN A TIMELY MANNER SUCH THAT CONSTRUCTION SCHEDULE IS NOT JEOPARDIZED.
22.	INFORM AND COORDINATE WITH THE OWNER ALL NECESSARY INTERRUPTIONS TO EXISTING BUILDING SYSTEMS AND SERVICE THAT MAY AFFECT THE NORMAL OPERATION OF OCCUPIED PORTIONS OF THE BUILDING. THE OWNER SHALL BE INFORMED OF ANY INTERRUPTIONS AT LEAST TWO (2) WEEKS IN ADVANCE.
23.	INFORM THE OWNER WELL IN ADVANCE OF ANY WORK TO BE UNDERTAKEN IN OCCUPIED AREAS OF THE BUILDING ASSOCIATED WITH THIS PROJECT. CONFORM NOISE LIMITS IN THE PORTIONS OF THE BUILDING WHICH REMAIN OCCUPIED DURING CONSTRUCTION.
24.	COORDINATE PHASING REQUIREMENTS FOR THE PROJECT WITH THE GENERAL CONTRACTOR.
25.	FIELD MEASURE THE EXACT SIZES AND VERIFY ALL OPENINGS FOR SHAFTS AND LOUVERS PRIOR TO SUBMISSION OF SHOP DRAWINGS AND INSTALLATION.
27.	MINIMAL CONTROL POWER HAS BEEN IDENTIFIED ON THE DRAWINGS. IF ANY ADDITIONAL POWER IS REQUIRED BASED ON SYSTEMS DESIGN BY THE CONTROLS CONTRACTOR THE AT/CBAS CONTRACTOR SHALL BE RESPONSIBLE TO SUPPLY THAT POWER
30.	THE HVAC CONTRACTOR SHALL COORDINATE THE INSTALLATION OF ALL MECHANICAL EQUIPMENT, DUCTWORK, PIPING, ETC. TO FIT WITHIN THE SPACE ALLOWED BY THE ARCHITECTURAL AND STRUCTURAL CONDITIONS. CUTTING OR OTHERWISE ALTERING ANY STRUCTURAL MEMBERS SHALL NOT BE PERMITTED WITHOUT WRITTEN PERMISSION FROM THE ARCHITECT.
31.	ANY EXISTING WALL, FLOOR, OR CEILING SURFACE THAT IS DISTURBED DURING THE COURSE OF THE HVAC WORK SHALL BE REPAIRED TO MATCH NEW AND/OR EXISTING CONDITIONS.
32.	PROVIDE ACCESS PANELS IN NON-ACCESSIBLE CEILINGS AND IN WALL STRUCTURE OF ADEQUATE SIZE TO ALLOW FOR MAINTENANCE, BALANCING AND COMPLETE REPLACEMENT OF EQUIPMENT WITHOUT DISTURBING PERMANENT CONSTRUCTION. ACCESS PANELS IN CEILINGS AND WALLS SHALL BE PROVIDED WHERE SHOWN ON THE PLANS OR NECESSARY TO ACCESS DAMPERS, VALVES, ETC. COORDINATE EXACT LOCATION & SIZES OF ALL ACCESS PANELS WITH THE ARCHITECT DURING THE SHOP DRAWING PROCESS.
33.	PORTIONS OF DUCTWORK AND PIPE INSULATION VISIBLE THROUGH AIR DISTRIBUTION DEVICES IN FINISHED AREAS SHALL BE PAINTED FLAT BLACK.
34.	ALL PIPE AND DUCT PENETRATIONS OF FIRE AND/OR SMOKE-RATED ASSEMBLIES SHALL BE FIRE-STOPPED AS REQUIRED TO RESTORE THE ASSEMBLY TO ITS ORIGINAL INTEGRITY. FIRE BARRIER PRODUCTS SHALL BE AS MANUFACTURED BY TREMCO, HILTI, 3M OR APPROVED EQUAL.
35.	WHERE ABOVE CEILING VOLUMES ARE UTILIZED AS A RETURN AIR PLENUM, ALL MATERIALS EXPOSED WITHIN THE PLENUMS SHALL BE NON-COMBUSTIBLE OR SHALL HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE-DEVELOPED INDEX OF NOT MORE THAN 50 AS DETERMINED IN ACCORDANCE WITH ASTM E84.
36.	THE HVAC CONTRACTOR SHALL COORDINATE ELECTRICAL CHARACTERISTICS AND REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH ELECTRICAL DRAWINGS PRIOR TO SUBMITTING SHOP DRAWINGS OR ORDERING EQUIPMENT. EQUIPMENT SHALL BE FURNISHED WIRED FOR THE VOLTAGES SHOWN ON THE ELECTRICAL PLANS.
37.	ALL MECHANICAL EQUIPMENT REQUIRING ELECTRICAL POWER SHALL BE INSTALLED WITH DISCONNECT SWITCHES AT EACH PIECE OF EQUIPMENT. COORDINATE SWITCH TYPE WITH EQUIPMENT CHARACTERISTICS, MANUFACTURER'S RECOMMENDATIONS AND THE ELECTRICAL DRAWINGS.
38.	ALL REQUIRED CONTROL WIRING (INCLUDING POWER WIRING REQUIRED FOR CONTROL PANELS, DEVICES, ETC.) NOT SHOWN ON THE ELECTRICAL DRAWINGS SHALL BE INCLUDED AS PART OF THE MECHANICAL WORK.
39.	UNLESS NOTED OTHERWISE, TRANSFORMERS, CONTROLS AND CONTROL WIRING REQUIRED FOR ALL MECHANICAL SYSTEMS SHALL BE FURNISHED WITH THE EQUIPMENT IT SERVES AND INSTALLED BY THE MECHANICAL CONTRACTOR. MOTOR STARTERS FOR HVAC EQUIPMENT SHALL BE FURNISHED WITH THE MOTOR OR APPARATUS WHICH IT OPERATES. MOTOR STARTER INSTALLATION SHALL BE BY THE ELECTRICAL CONTRACTOR.
42.	EACH SUPPLY DIFFUSER/REGISTER RUNOUT SHALL BE PROVIDED WITH A VOLUME DAMPER. REFER TO CEILING DIFFUSER BRANCH TAKE-OFF DETAIL FOR ADDITIONAL INFORMATION.
43.	ALL VOLUME DAMPERS LOCATED ABOVE HARD NON-ACCESSIBLE CEILINGS SHALL BE PROVIDED WITH A YOUNG REGULATOR VOLUME DAMPER FOR REMOTE BALANCING.
44.	RUNOUT SIZES TO DIFFUSERS/REGISTERS SHALL MATCH INLET SIZE NOTED IN THE DIFFUSER REGISTER/GRILLE SCHEDULE OR TAG UNLESS SHOWN OTHERWISE ON FLOOR PLANS.
45.	RUNOUT SIZES TO TERMINAL UNITS SHALL MATCH INLET SIZE UNLESS OTHERWISE NOTED OR SHOWN ON THE FLOOR PLANS.
48.	FLEXIBLE DUCT LENGTH SHALL NOT EXCEED 6'-0" IN LENGTH. FLEXIBLE DUCTWORK SHALL BE INSTALLED AS STRAIGHT AS POSSIBLE AND SHALL BE EQUIPPED AND SUPPORTED WITHOUT FORMING CRIMPS OR OTHER AIR FLOW RESTRICTIONS. PROVIDE SQUARE TO ROUND ADAPTERS OR BOOTS TO CONNECT TO AIR DEVICES NECK WHEN REQUIRED.

HVAC LEGEND

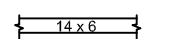
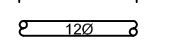


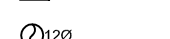
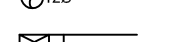
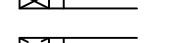
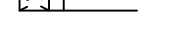
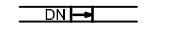
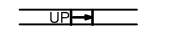
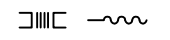

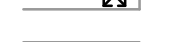
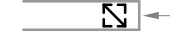




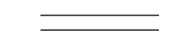


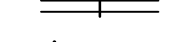

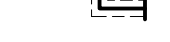

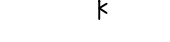








PIPING SYSTEMS

	DIRECTION OF FLOW
	HOT WATER SUPPLY
	HOT WATER RETURN
	CHILLED WATER SUPPLY
	CHILLED WATER RETURN
	CONDENSATION DRAIN









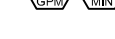

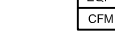


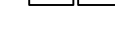



PIPING SPECIALTIES

	GATE VALVE
	CHECK VALVE
	BALL VALVE
	BUTTERFLY VALVE
	STRAINER
	TEE-TURNED DOWN
	ELBOW-TURNED DOWN
	ELBOW-TURNED UP
	PIPE ANCHOR
	PIPE GUIDE
	REDUCER
	PIPE CAP
	UNION
	COMPANION FLANGE
	THERMOMETER
	GAUGES (PRESSURE)
	2-WAY CONTROL VALVE

DUCTWORK SPECIALTIES

	RECTANGULAR DUCT
	ROUND DUCT
	ROUND DUCT - SUPPLY
	ROUND DUCT - RETURN
	ROUND DUCT WITH SIDE
	ROUND DUCT TURNING UP
	ROUND DUCT TURNING DOWN
	DUCT DROP IN RESPECT TO AIR FLOW
	DUCT RISE IN RESPECT TO AIR FLOW
	FLEXIBLE DUCT CONNECTION
	DIFFUSER
	RETURN-AIR EXHAUST OUTLET
	ELECT
	EXTERNAL STATIC PRESSURE
	EXSTING TO RETURN
	ENTERING WATER TEMPERATURE
	FIRE DAMPER
	COMBINATION FIRE DAMPER/SMOKE DAMPER
	FULL LOAD AMPS
	FEET PER MINUTE
	FEET PER HOUR
	FIRE SMOKE DAMPER
	FEET
	GALLONS PER MINUTE
	HEATING COIL
	HORIZONTAL
	HORSEPOWER
	HEATING
	HOT WATER RETURN
	HOT WATER SUPPLY
	HERTZ (CYCLES PER SECOND)
	INCHES
	INTERNAL STATIC PRESSURE
	KILOWATT

MISCELLANEOUS

	THERMOSTAT-EXISTING (TEMPERATURE SENSOR)
	THERMOSTAT-NEW (TEMPERATURE SENSOR)
	CONNECT NEW TO EXISTING
	LIMIT OF REMOVAL
	MOTORIZED EQUIPMENT (MFE)
	UPPER - EQUIPMENT DESIGNATION
	LOWER - MAXIMUM AIR FLOW
	MOTORIZED EQUIPMENT (SP, WS, LD)
	UPPER - EQUIPMENT DESIGNATION
	LOWER - MAXIMUM AIR FLOW
	MOTORIZED EQUIPMENT (PSI, PEV)
	UPPER - EQUIPMENT DESIGNATION
	LOWER - MAXIMUM AIR FLOW
	UPPER - SECTION DESIGNATION
	LOWER - DRAWING NUMBER
	UPPER - DETAIL DESIGNATION
	LOWER - DRAWING NUMBER

HVAC ABBREVIATIONS

A	AMPS	LA	LEAVING AIR TEMPERATURE (OR LATENT)
AD	ACCESS DOOR	LB	LOAD
ADU	AIR HANDLING UNIT	LD	LINEAR DIFFUSER
AM	AMBIENT	LF	LINEAR FOOT (OF FEET)
AP	ACCESS PANEL	LWT	LEAVING WATER TEMPERATURE
APD	AIR PRESSURE DROP	MAX	MAXIMUM
ATC	AUTOMATIC TEMPERATURE CONTROL	MBH	THOUSAND BTU PER HOUR
B-HP	BRAKE HORSEPOWER (OR BAKER HORSEPOWER)	MN	MINIMUM
BTU	BTU PER HOUR	MOP	MAXIMUM OVERCURRENT PROTECTION
CBP	CAPACITY	NC	NORMALLY CLOSED (OR NOISE CRITERIA)
CC	COOLING COIL	NIC	NOT IN CONTRACT
CFM	CUBIC FEET PER MINUTE	NO	NORMALLY OPEN (OR NUMBER)
CG	DEGREE	NOM	NORMAL
DA	DIAMETER	OA	OUTSIDE AIR
EA	EACH 1/2 EXHAUST AIR	OPER	OPERATING
EAT	ENTERING AIR TEMPERATURE	PD	PRESSURE DROP
EFF	EFFICIENCY	PH	PHASE
ELECT	ELECTRICAL	PRESS	PRESSURE
ESP	EXTERNAL STATIC PRESSURE	PSI	POUNDS PER SQUARE INCH
ETR	EXSTING TO RETURN	PSQ	PSI GAGE
EWT	ENTERING WATER TEMPERATURE	QTY	QUANTITY
F	FIRE DAMPER	RA	RETURN AIR
FD	COMBINATION FIRE DAMPER/SMOKE DAMPER	REQD	REQUIRED
FLA	FULL LOAD AMPS	RG	RETURN GRILLE
FM	FEET PER MINUTE	RH	RELATIVE HUMIDITY
FPH	FEET PER HOUR	RLA	RUNNING LOAD AMPS
FPI	FEET PER INCH	RPM	REVOLUTIONS PER MINUTE
FSD	FIRE SMOKE DAMPER	SA	SUPPLY AIR
FT	FEET	SC	SENSEBLE COOLING
CFM	GALLONS PER MINUTE	SEN	SENSEBLE
HC	HEATING COIL	SMD	SMOKE DAMPER
HCR	HORIZONTAL	SD	SMOKE DETECTOR (w SUPPLY DIFFUSER)
HP	HORSEPOWER	SP	STATIC PRESSURE (INCHES WC)
HTG	HEATING	SS	STAINLESS STEEL (OR SPLIT SYSTEM)
HWR	HOT WATER RETURN	ST	STAGES
HWS	HOT WATER SUPPLY	TC	TOTAL COOLING
HZ	HERTZ (CYCLES PER SECOND)	TEMP	TEMPERATURE
IN	INCHES	TO	TO TRANSFER GRILLE
ISP	INTERNAL STATIC PRESSURE	TON	12,000 BTUH COOLING CAPACITY
KW	KILOWATT	TOT	TOTAL
		TSP	TOTAL STATIC PRESSURE
		V	VOLTS w VALVE
		VAV	VARIABLE AIR VOLUME TERMINAL UNIT
		VD	VOLUME DAMPER
		VEL	VELOCITY
		W	WATT
		WT	WET BULB TEMPERATURE (°F)
		WC	WATER COLUMN
		WMS	1/2" x 1/2" GALVANIZED WIRE MESH SCREEN
		WPD	WATER PRESSURE DROP



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Issuance Schedule		
Number	Date	Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

HVAC LEGEND AND
GENERAL NOTES

Scale: NTS Date Issued: 8/26/16

H0.01

Project Number: 179-07-00

DIFFUSER, REGISTER & GRILLE SCHEDULE													
SYMBOL	SIZE	MODEL	FUNCTION	MATERIAL	TYPE	FINISH	DAMPER	OPEN OFFICE		TP	ENCLOSED OFFICE & CONF. ROOM		REMARKS
								CFM RANGE	MAX NC		CFM RANGE	MAX NC	
SD-1	6"x6"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	0 - 120	35	0.105	0 - 100	30	(1)(4)(5)
SD-2	6"x9"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	121 - 185	35	0.106	101 - 160	30	(1)(4)(5)
SD-3	9"x9"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	186 - 280	35	0.068	161 - 225	30	(1)(4)(5)
SD-4	9"x12"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	281 - 375	35	0.106	226 - 320	30	(1)(4)(5)
SD-5	12"x12"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	376 - 500	35	0.060	321 - 400	30	(1)(4)(5)
SD-6	12"x15"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	501 - 625	35	0.068	401 - 530	30	(1)(4)(5)
SD-7	15"x15"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	626 - 775	35	0.101	531 - 665	30	(1)(4)(5)
SD-8	15"x18"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	776 - 935	35	0.073	666 - 800	30	(1)(4)(5)
SD-9	18"x18"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	936 - 1,125	35	0.046	801 - 955	30	(1)(4)(5)
SD-10	18"x21"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	1,126 - 1,310	35	0.076	956 - 1,115	30	(1)(4)(5)
SD-11	21"x21"	SMX	SUPPLY	STEEL	CEILING	PER ARCH	NONE	1,311 - 1,500	35	0.099	1,116 - 1,300	30	(1)(4)(5)
EG-1	24"x24"	PERF	EXHAUST	STEEL	CEILING	PER ARCH	NONE	0 - 1,500	35	0.035	0 - 1,500	30	(2)
EG-2	48"x24"	PERF	EXHAUST	STEEL	CEILING	PER ARCH	NONE	1,501 - 3,500	35	0.043	1,501 - 3,500	30	(2)
LSD-1	48"L x 1 SLOT	TBD3100	SUPPLY	ALUMINUM	CEILING	PER ARCH	NONE	0 - 160	35	0.130	0 - 160	30	(1) 1" SLOT/ 8"Ø INLET. (3)
LSD-2	48"L x 2 SLOT	TBD3100	SUPPLY	ALUMINUM	CEILING	PER ARCH	NONE	161 - 240	35	0.068	161 - 240	30	(2) 1" SLOT/ 10"Ø INLET. (3)
LSD-3	48"L x 3 SLOT	TBD3100	SUPPLY	ALUMINUM	CEILING	PER ARCH	NONE	241 - 350	35	0.071	241 - 350	30	(3) 1" SLOT/ 12"Ø INLET. (3)
LSD-4	48"L x 4 SLOT	TBD3100	SUPPLY	ALUMINUM	CEILING	PER ARCH	NONE	351 - 400	35	0.072	351 - 400	30	(4) 1" SLOT/ 12"Ø INLET. (3)

THE FOLLOWING DIFFUSER CALLOUTS ARE FOR SQUARE CALLOUTS ONLY (SD-1, 3, 5, 7, 9 & 11)

STYLE 40	STYLE 30	STYLE 20	STYLE 22	STYLE 10	STYLE 36	
A	D	E	G	J	T	

THE FOLLOWING DIFFUSER CALLOUTS ARE FOR RECTANGULAR CALLOUTS ONLY (SD-2, 4, 6, 8 & 10)

STYLE 42	STYLE 33	STYLE 20L	STYLE 23	STYLE 24	STYLE 10L	STYLE 10S	STYLE 20S	STYLE 21L	STYLE 21S
B	C	F	H	I	K	L	M	N	O

STYLE 31	STYLE 32	STYLE 34	STYLE 35	STYLE 37	STYLE 41	STYLE 43	STYLE 44	STYLE 45	
P	Q	R	S	U	V	W	X	Y	

- SELECTION BASED ON PRICE
- ① INDUCTION AIR DIFFUSER WITH 24"x24" LAY-IN BORDER.
 - ② RETURN AIR GRILLE (PERFORATED RETURN PANEL - STEEL CONSTRUCTION).
 - ③ WITH ACOUSTICALLY LINED PLENUM.
 - ④ DIFFUSER CONNECTIONS SHALL BE ON THE INSIDE NECK AND SEALED AIR TIGHT.
 - ⑤ PROVIDE A DIFFUSER BOOT. REFER TO DETAILS FOR REQUIREMENTS.

DUCTWORK GENERAL NOTES:

- 1. EACH SUPPLY & RETURN/EXHAUST DIFFUSER RUNOUT SHALL BE PROVIDED WITH A VOLUME DAMPER. REFER TO CEILING DIFFUSER BRANCH TAKE-OFF DETAIL FOR ADDITIONAL INFORMATION.
- 2. RUNOUT SIZES TO LINEAR DIFFUSERS SHALL MATCH INLET SIZE NOTED IN THE DIFFUSER REGISTER AND GRILLE SCHEDULE.
- 3. RUNOUT SIZES TO TERMINAL UNITS (VV, CV, FPT) SHALL MATCH INLET SIZE UNLESS NOTED OTHERWISE ON THE FLOOR PLANS.
- 4. ALL VOLUME DAMPERS LOCATED ABOVE HARD NON-ACCESSIBLE CEILINGS SHALL BE PROVIDED WITH A YOUNG REGULATOR VOLUME DAMPER FOR REMOTE BALANCING.

SUPPLY AIR DIFFUSER RUNOUT SIZE SCHEDULE FOR OPEN OFFICE AREAS	
OPEN OFFICE CFM RANGE	DUCT RUNOUT SIZE TO DIFFUSER
0 - 120	6"Ø
121 - 185	8"Ø
186 - 265	9"Ø
266 - 325	10"Ø
326 - 470	12"Ø
471 - 625	14"Ø
626 - 775	16"Ø

THE ABOVE ALSO APPLIES TO STORAGE ROOMS, KITCHENS, DATA CENTERS, CORRIDORS AND ALL NON-CRITICAL SPACES THAT REQUIRE A MAXIMUM NC LEVEL OF 35.

SUPPLY AIR DIFFUSER RUNOUT SIZE SCHEDULE FOR ENCLOSED OFFICE OR CONFERENCE ROOMS	
ENCLOSED OFFICE CFM RANGE	DUCT RUNOUT SIZE TO DIFFUSER
0 - 100	6"Ø
101 - 160	8"Ø
161 - 225	9"Ø
226 - 280	10"Ø
281 - 400	12"Ø
401 - 530	14"Ø
531 - 665	16"Ø

THE ABOVE ALSO APPLIES TO TRAINING ROOMS, CLASSROOMS, CONFERENCE CENTERS AND ALL SOUND CRITICAL SPACES THAT REQUIRE A MAXIMUM NC LEVEL OF 30.

HEATING COILS (HOT WATER)												HC
SYMBOL	CFM	DUCT SIZE		MAX FACE VELOCITY	AIR SIDE			WATER SIDE		MBH	REMARKS	
		W	H		EAT	LAT	MAX SP	GPM	MAX PD			
HC-1	700	14	12	700	55	75	25	2.3	-	22.9	-	
HC-2	600	12	12	700	55	75	25	2.0	-	19.6	-	

SELECTION BASED ON HEAT CRAFT
CONTRACTOR SHALL VERIFY QUANTITIES ON FLOOR PLANS

ELECTRIC HUMIDIFIERS															H
SYMBOL	SERVES	CAPACITY #/HR	CFM	DUCT SIZE	EAT		LAT		ELECTRICAL			# OF UNITS	ABSORPTION DISTANCE	WATER SOURCE	MODEL
					DB/RH	DB/RH	AMPS	VOLTS	PH	HTZ					
H-1	LAMINAR HOOD & GOWNING 121	24.0	600	13 X 10	52.2° / 3%	55° / 82%	14.4	480	3	60	1	22"	RO WATER	VM-8/ RAPID-SORB ①	

SELECTION BASED ON DRI-STEEM VAPORMIST 316 STAINLESS STEEL. PROVIDE VAPORLOGIC CONTROLLER, BACNET INTERFACE, SCR CONTROL, HIGH LIMIT STAT, AIRFLOW PROVING SWITCH, ROOM SIDE HUMIDSTAT FOR H-1.
① MAINTAIN ROOM CONDITIONS 30% TO 60% RH.

PHOENIX EXHAUST AIR VALVE SCHEDULE												PEV
TAG	SERVICE	AIR FLOW RANGE (CFM)		INLET SIZE	OUTLET SIZE	MAX. NC	MIN. SP (IN. WC)	ACTUATOR POWER		MODEL NUMBER	REMARKS	
		MIN.	MAX.					V	PH	A		
PEV-1	AS SHOWN	30	250	8"	8"	30	0.60	120	1	15	08 M	--
PEV-2	AS SHOWN	60	900	10"	10"	30	0.60	120	1	15	10 M	--
PEV-3	AS SHOWN	165	1,500	12"	12"	30	0.60	120	1	15	12 M	--
PEV-4	AS SHOWN	120	1,900	20" x 10"	20" x 10"	30	0.60	120	1	15	2-10 M	--
PEV-5	AS SHOWN	330	2,900	24" x 12"	24" x 12"	30	0.60	120	1	15	2-12 M	--
PEV-6	AS SHOWN	495	4,300	36" x 12"	36" x 12"	30	0.60	120	1	15	3-12 M	--
PEV-7	AS SHOWN	600	6,000	48" x 12"	48" x 12"	30	0.60	120	1	15	4-12 M	--

- NOTES:
- 1. BASIS OF DESIGN: PHOENIX.
 - 2. PROVIDE EACH FAST ACTING VALVE WITH 100 VA TRANSFORMER FOR ACTUATOR CONTROL.
 - 3. SEE DUCTWORK DRAWINGS FOR ACTUAL CFM REQUIREMENTS.
 - 4. THE ASTERISK IS EITHER "E" FOR GENERAL EXHAUST OR "H" FOR HOOD EXHAUST.

PHOENIX SUPPLY AIR VALVE SCHEDULE											PSV
TAG	SERVICE	AIR FLOW RANGE (CFM)	INLET SIZE	OUTLET SIZE	MAX. NC	MIN. SP	ACTUATOR POWER	MODEL NUMBER		REMARKS	
PSV-1	AS SHOWN	30 350	8"	8"	30	0.30	120	15	08 L	--	
PSV-2	AS SHOWN	50 550	10"	10"	30	0.30	120	15	10 L	--	
PSV-3	AS SHOWN	90 1,050	12"	12"	30	0.30	120	15	12 L	--	
PSV-4	AS SHOWN	180 2,100	24" x 12"	24" x 12"	30	0.30	120	15	2-12 L	--	
PSV-5	AS SHOWN	270 3,150	36" x 12"	36" x 12"	30	0.30	120	15	3-12 L	--	
PSV-6	AS SHOWN	360 4,100	48" x 12"	48" x 12"	30	0.30	120	15	4-12 L	--	

- NOTES:
- 1. BASIS OF DESIGN: PHOENIX.
 - 2. PROVIDE EACH FAST ACTING VALVE WITH 100 VA TRANSFORMER FOR ACTUATOR CONTROL.
 - 3. SEE DUCTWORK DRAWINGS FOR ACTUAL CFM REQUIREMENTS.
 - 4. SEE PIPING DRAWINGS TO DETERMINE WHERE HEATING COILS ARE REQUIRED.
 - 5. WHERE HEATING COILS ARE REQUIRED SEE PIPING DRAWINGS FOR ACTUAL COIL CAPACITY (MBH) AND GPM REQUIREMENTS.
 - 6. HEATING FLUID IS WATER; DESIGN TEMPERATURES EWT=200°F; LWT=170°F.
 - 7. WHERE HEATING COILS ARE REQUIRED PROVIDE 2--ROW COILS.

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Issuance Schedule

Number Date Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

HVAC SCHEDULES

Scale: NTS Date Issued: 8/26/16

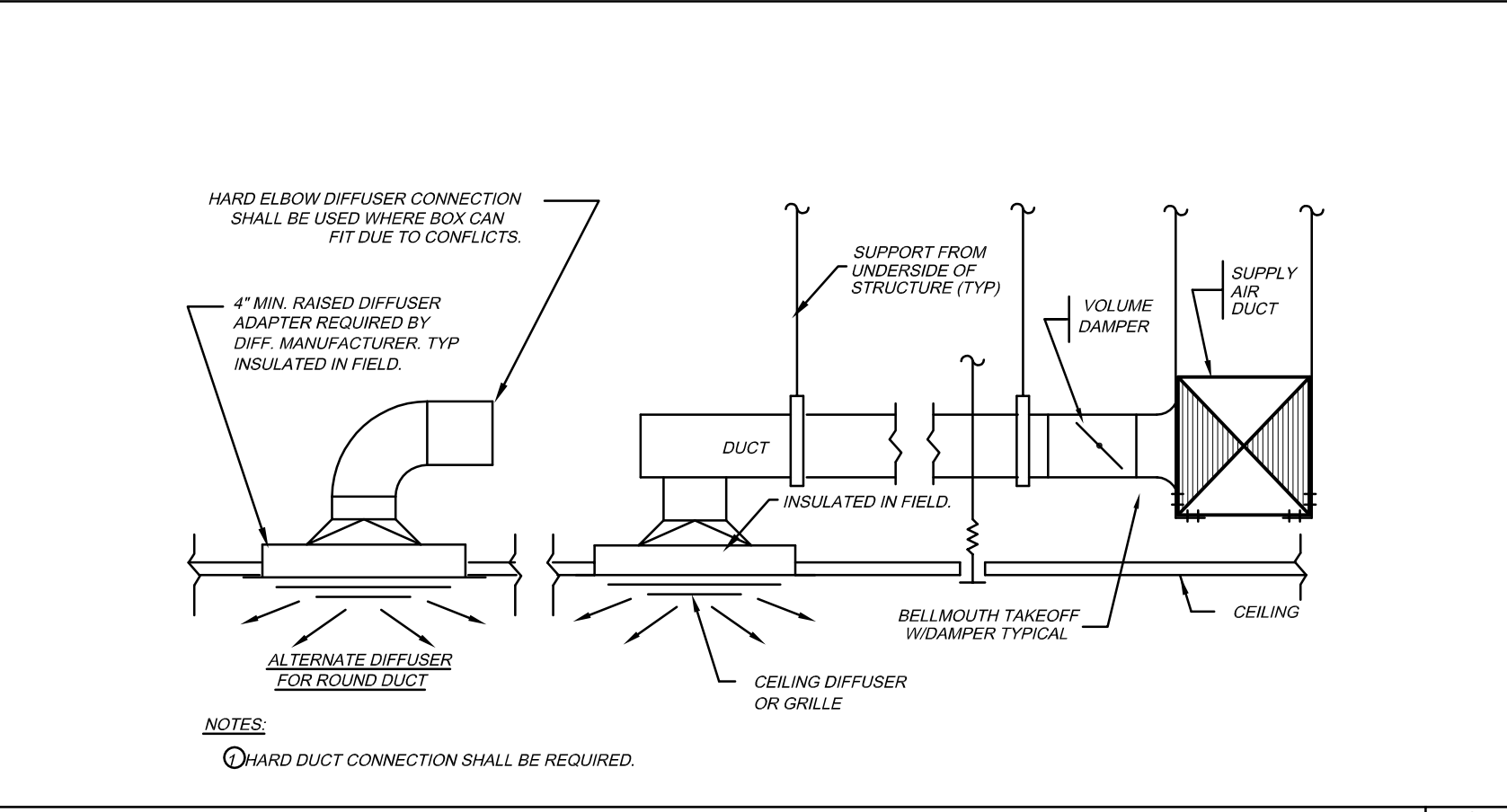
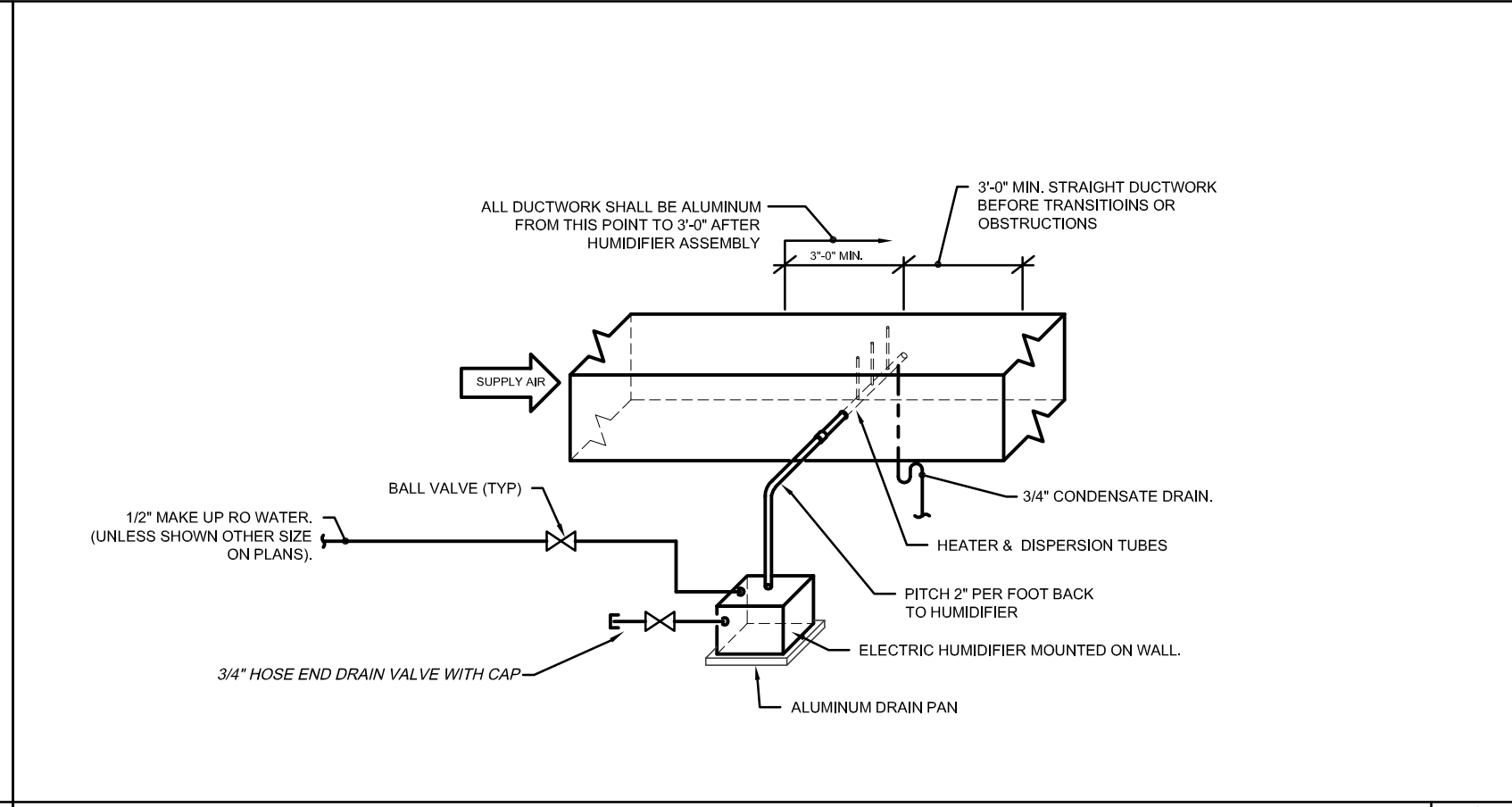
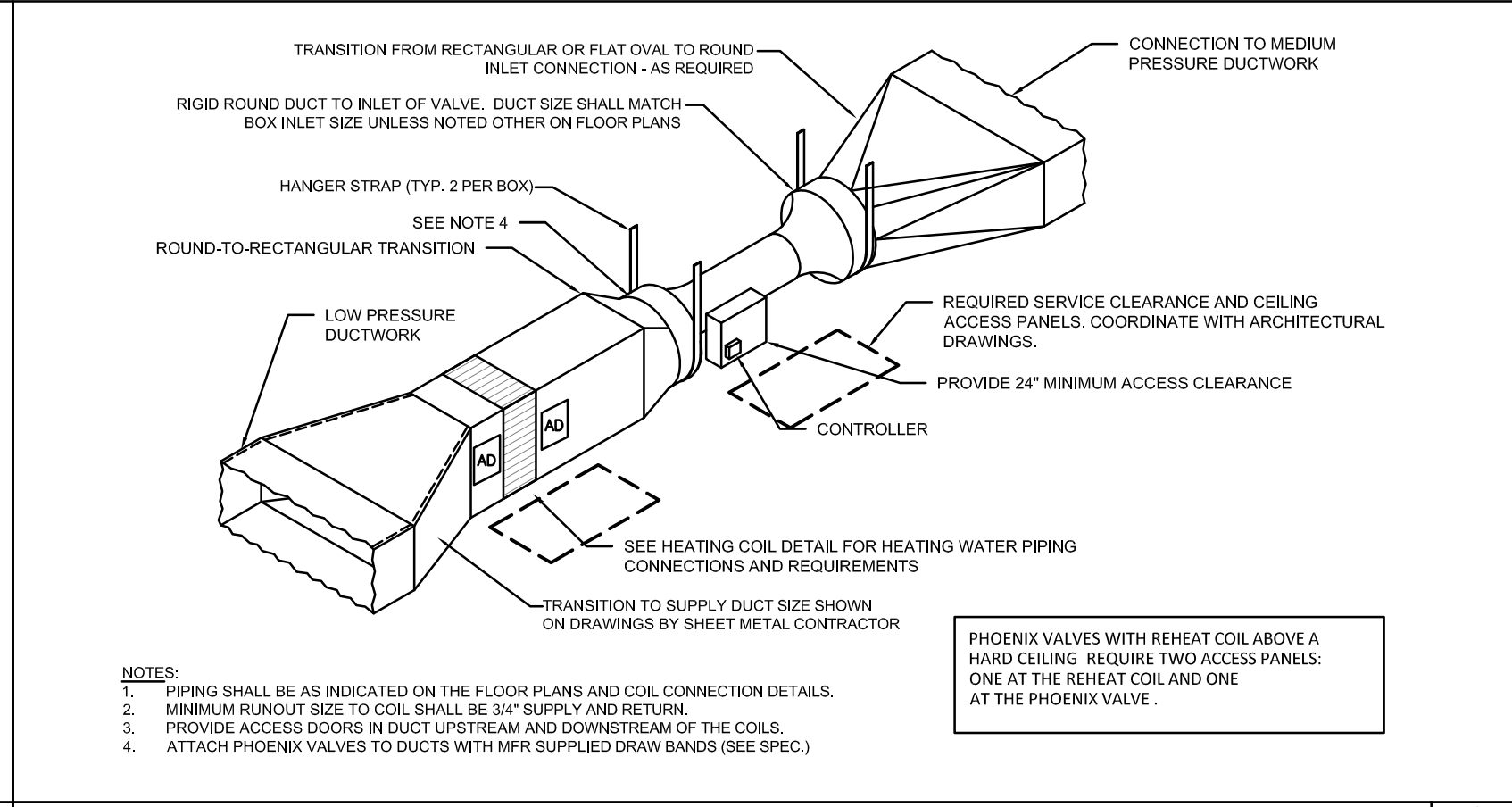
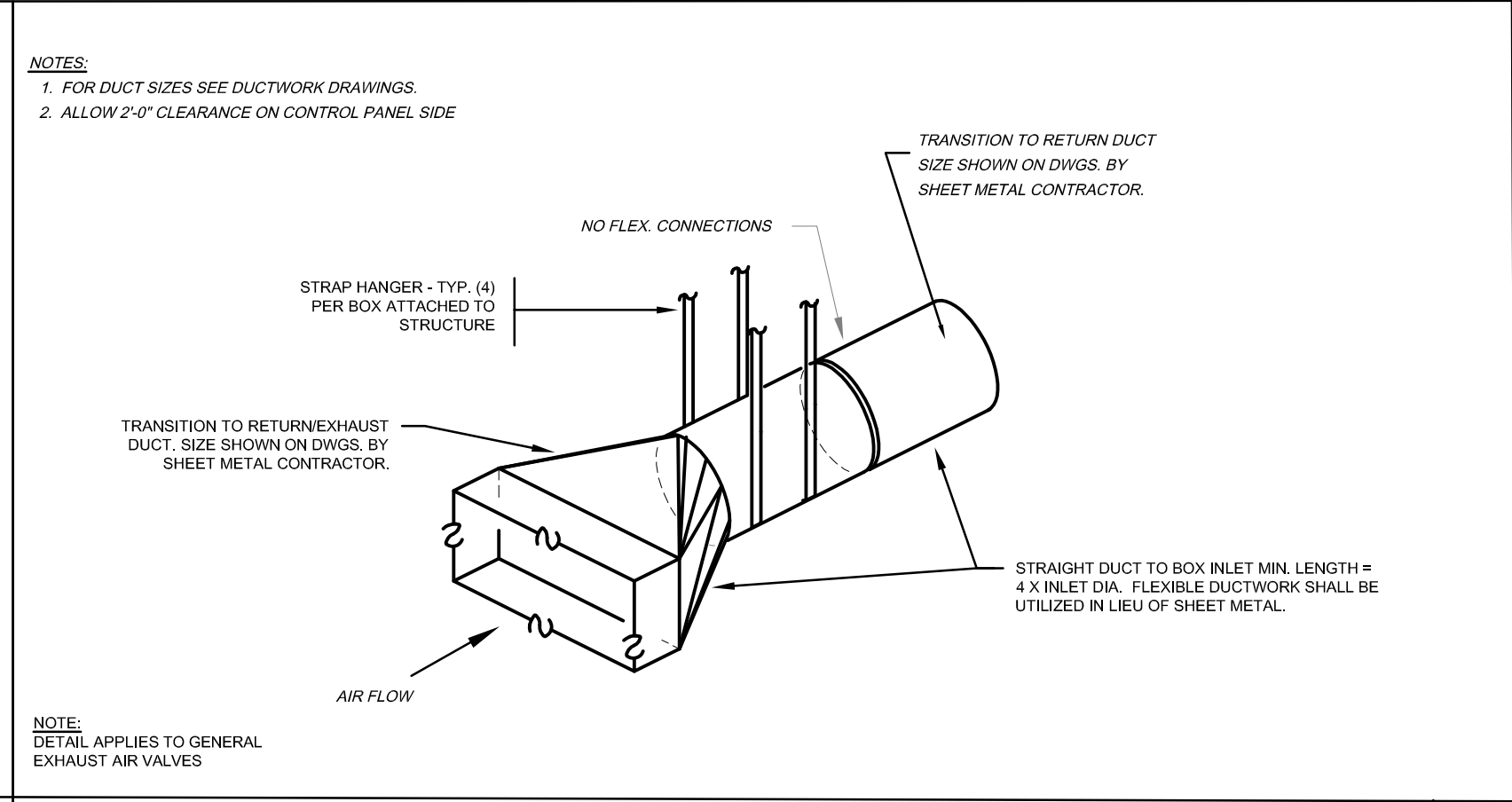
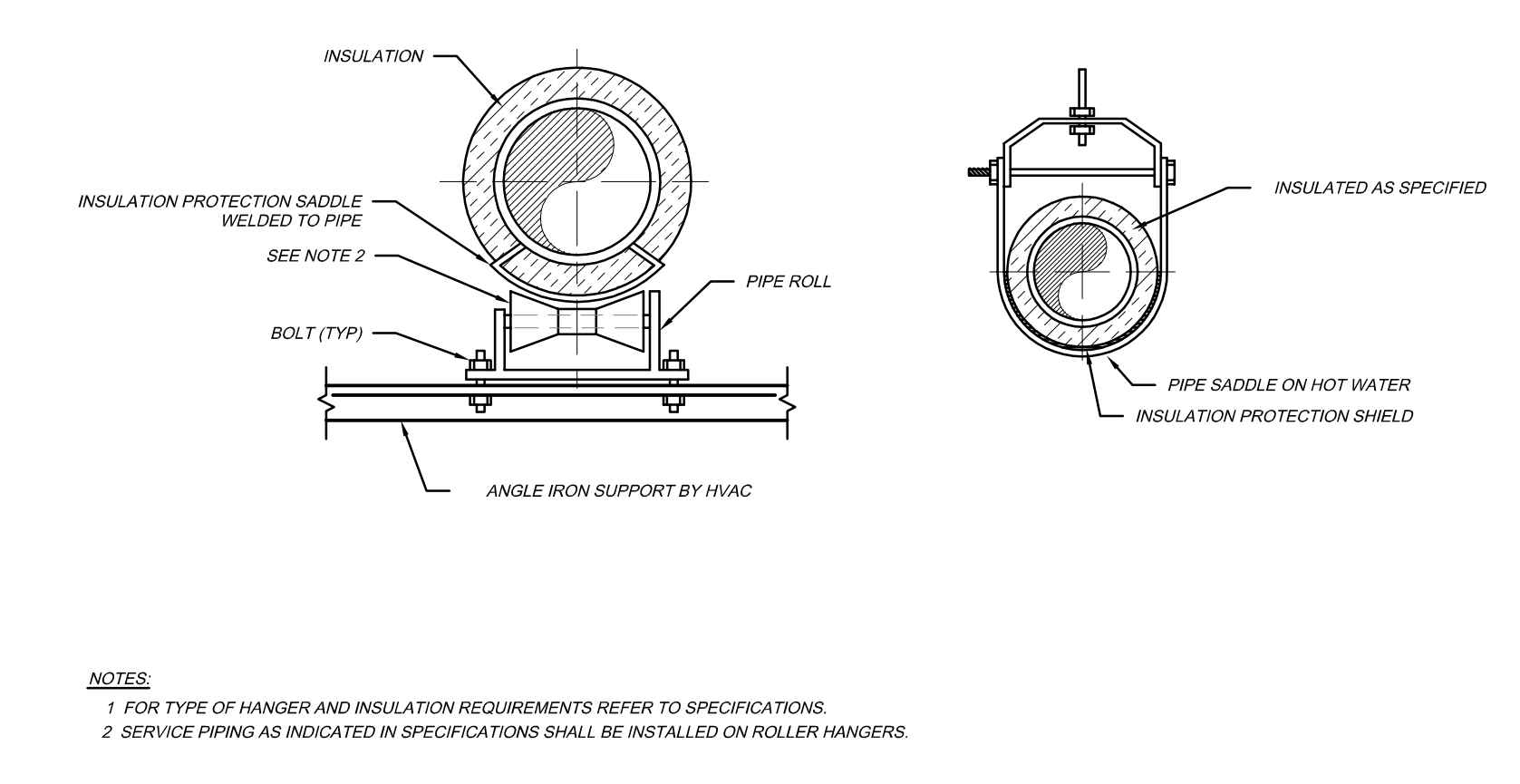
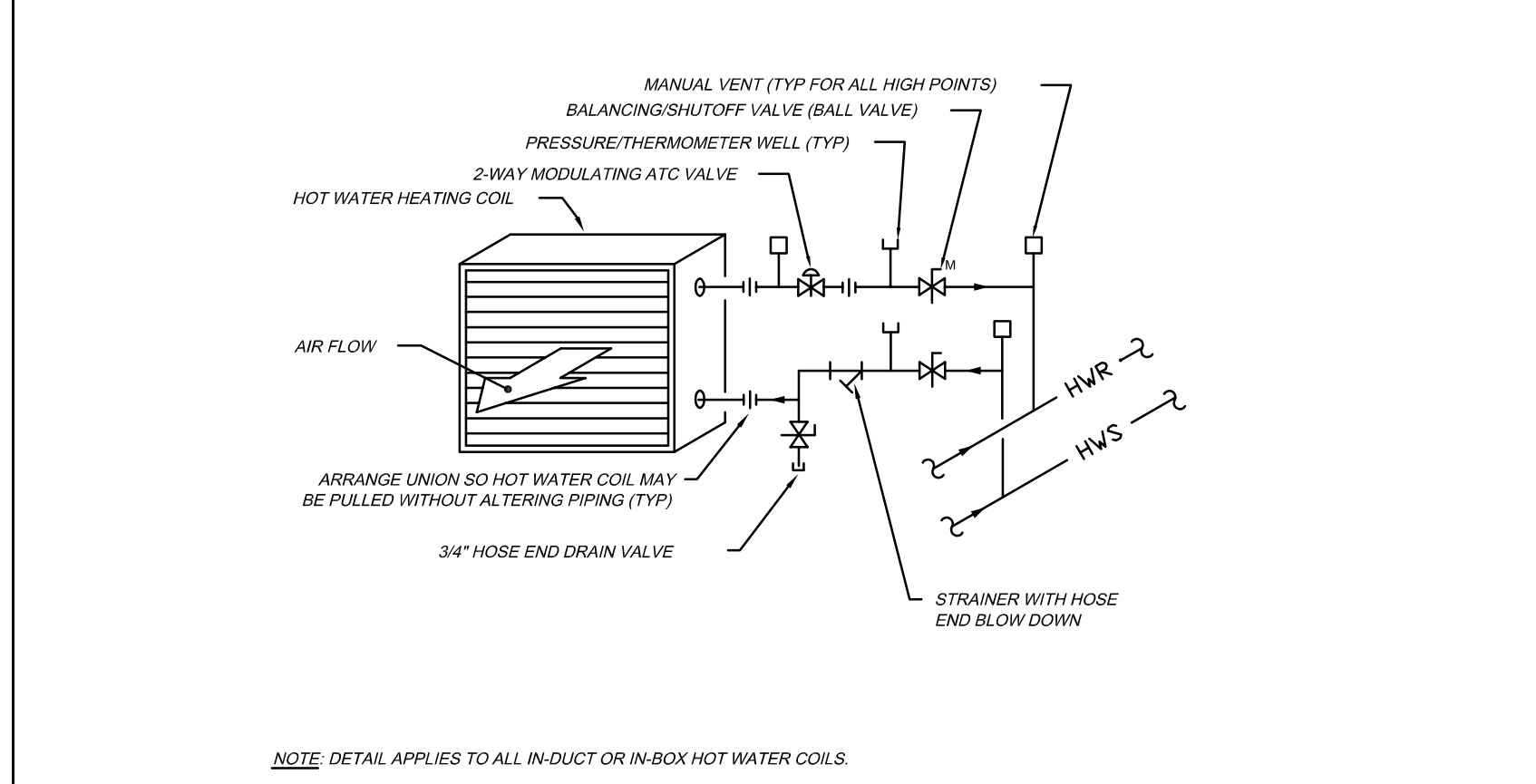
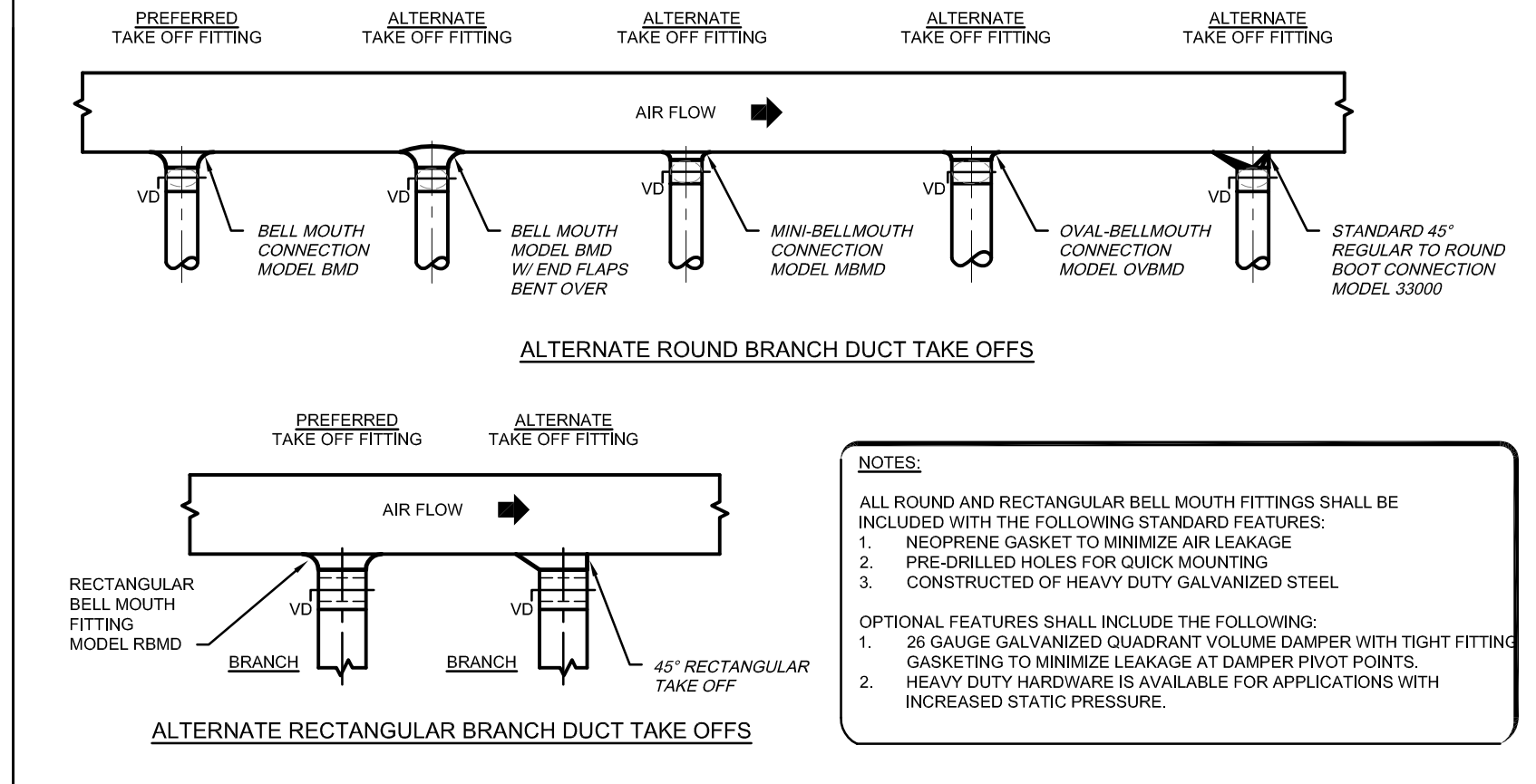
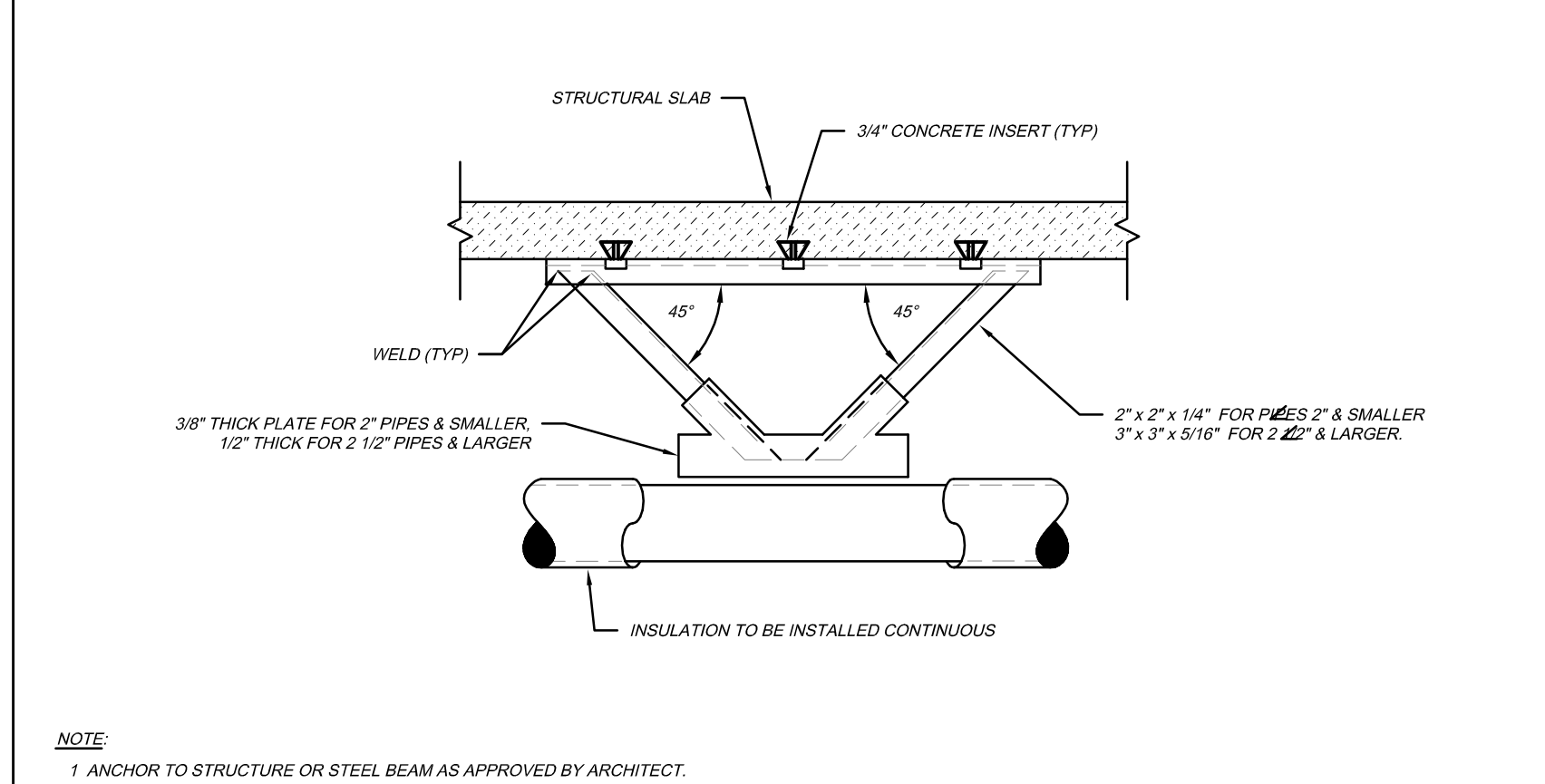
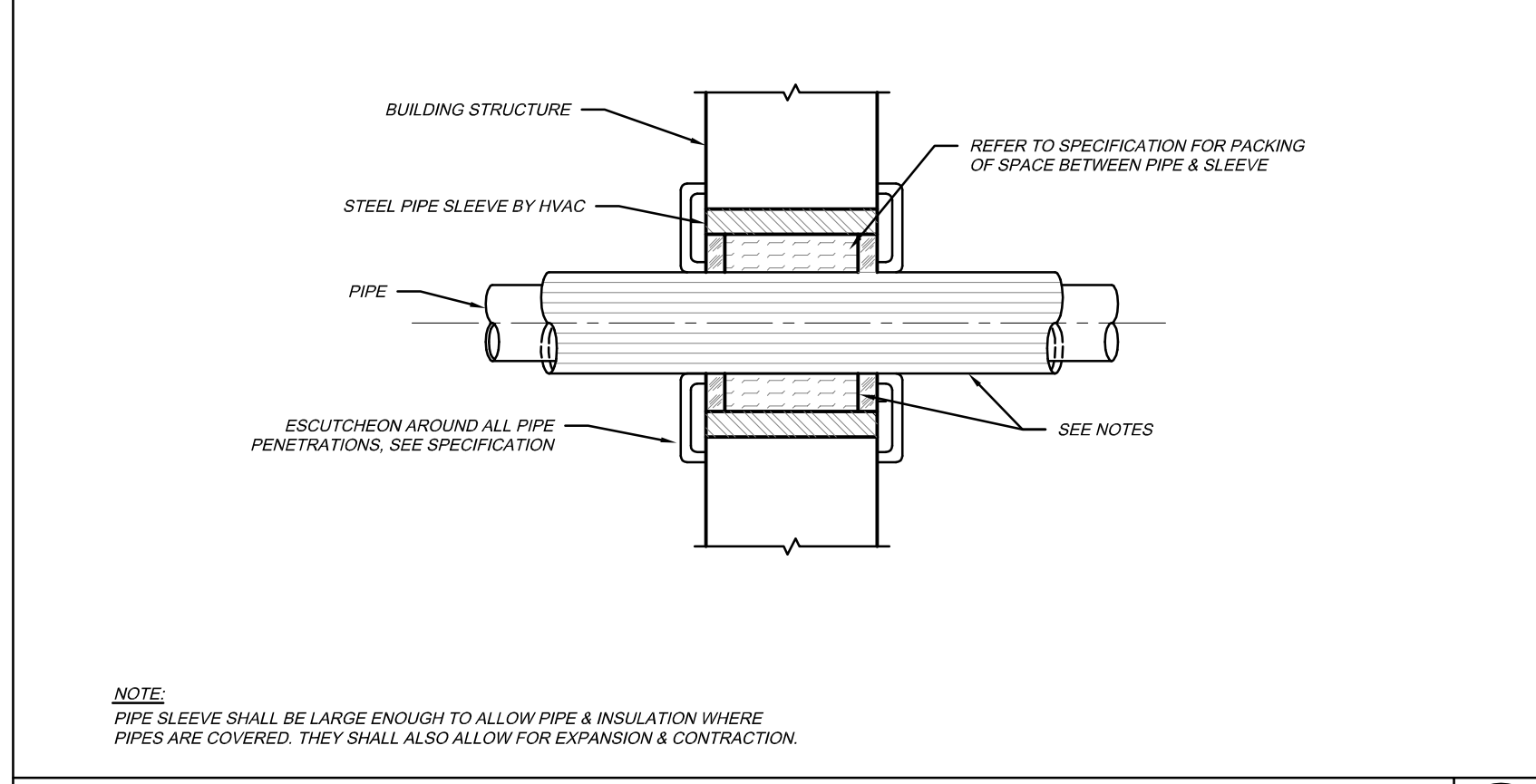
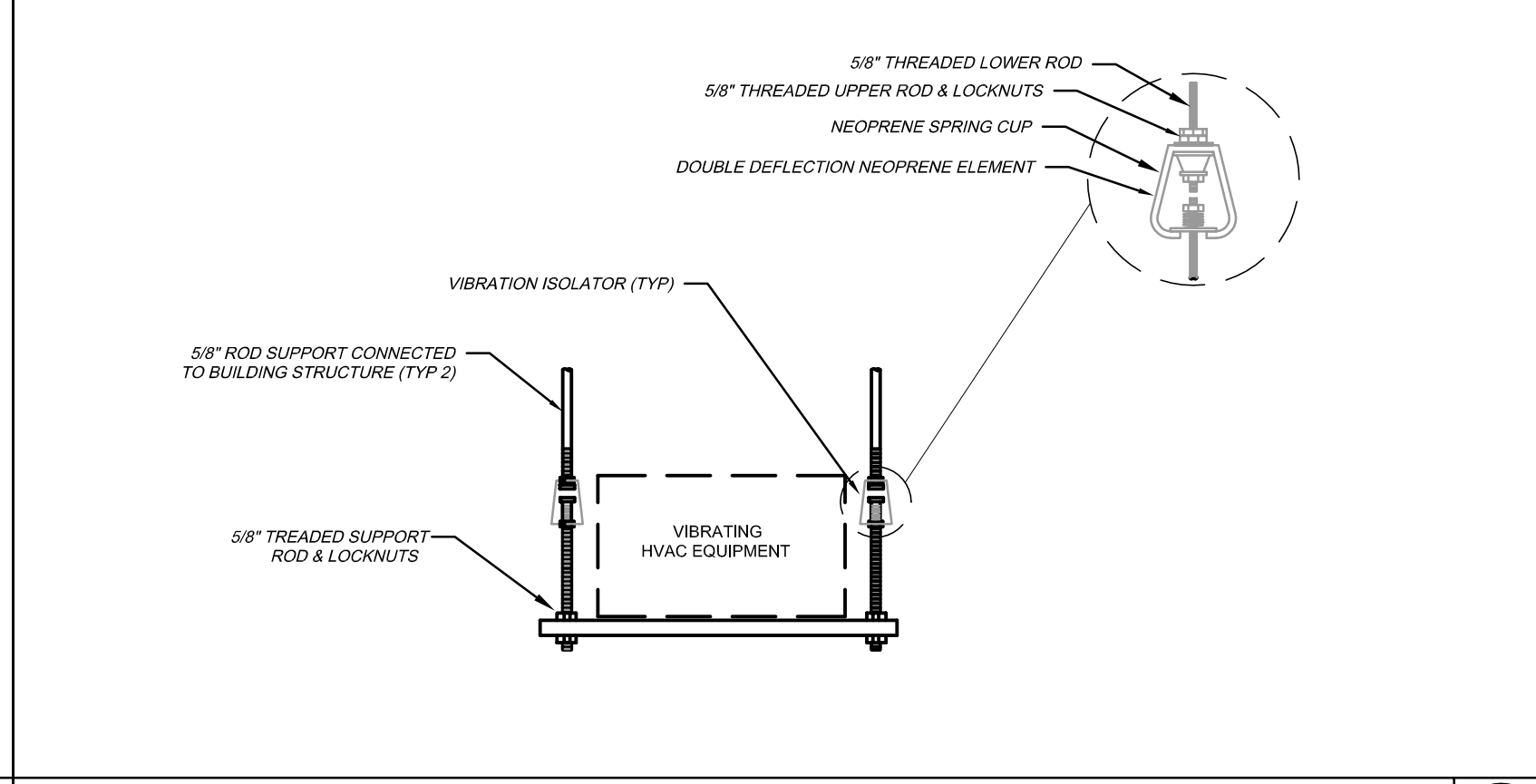
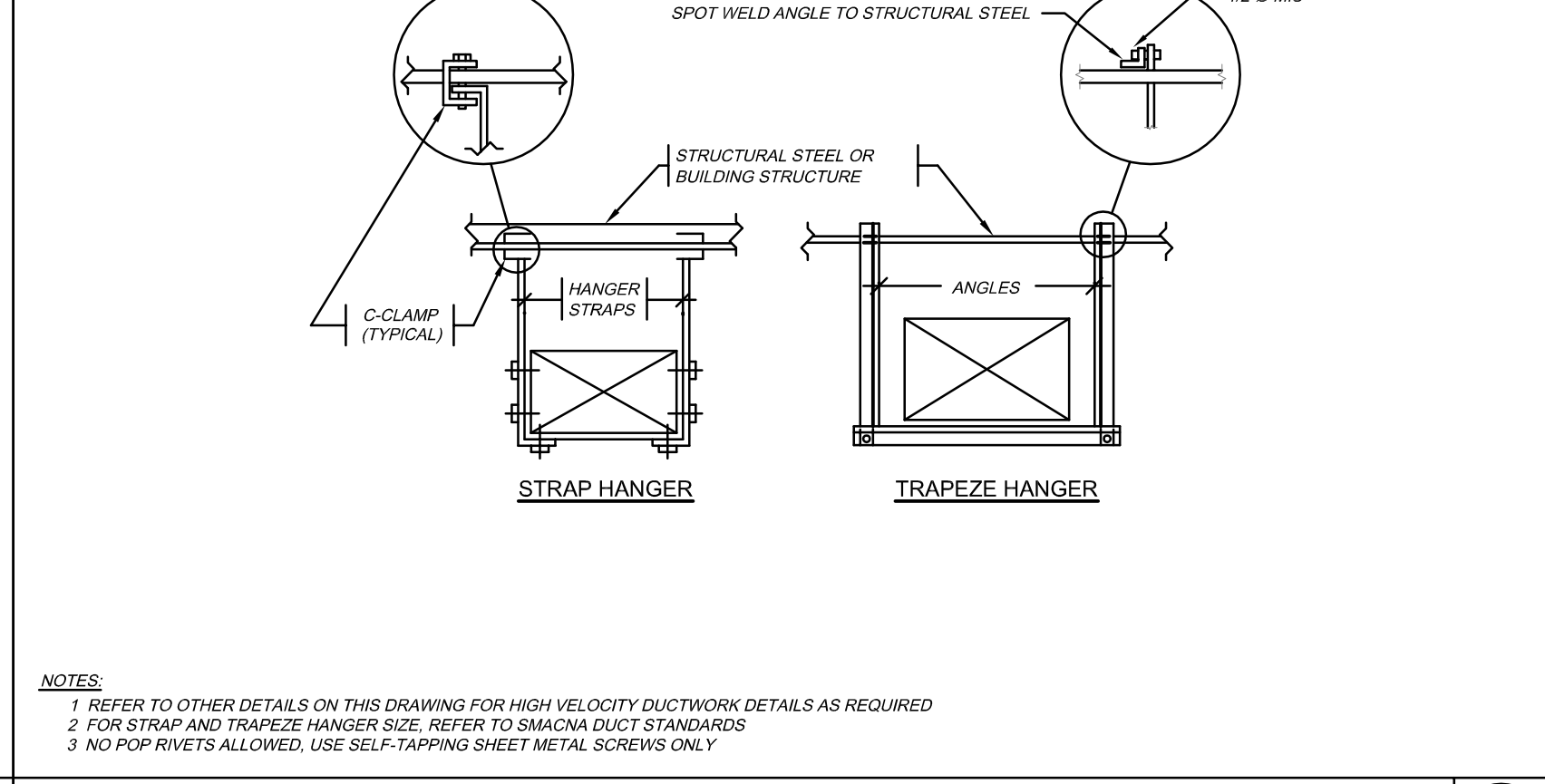
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Project Number: 179-07-00

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 <p>4" MIN. RAISED DIFFUSER ADAPTER REQUIRED BY DIFF. MANUFACTURER. TYP. INSULATED IN FIELD.</p> <p>HARD ELBOW DIFFUSER CONNECTION SHALL BE USED WHERE BOX CAN FIT DUE TO CONFLICTS.</p> <p>ALTERNATE DIFFUSER FOR ROUND DUCT</p> <p>NOTES: 1. HARD DUCT CONNECTION SHALL BE REQUIRED.</p>	NTS	1	 <p>ALL DUCTWORK SHALL BE ALUMINUM FROM THIS POINT TO 3' OF AFTER HUMIDIFIER ASSEMBLY.</p> <p>3" OF MIN. STRAIGHT DUCTWORK BEFORE TRANSITIONS OR OBSTRUCTIONS.</p> <p>1/2" MAKE UP RO WATER (UNLESS SHOWN OTHER SIZE ON PLANS).</p> <p>BALL VALVE (TYP.)</p> <p>3/4" CONDENSATE DRAIN.</p> <p>HEATER & DISPERSION TUBES TO HUMIDIFIER.</p> <p>PITCH 2" PER FOOT BACK TO HUMIDIFIER.</p> <p>ELECTRIC HUMIDIFIER MOUNTED ON WALL.</p> <p>ALUMINUM DRAIN PAN.</p> <p>3/4" HOSE END DRAIN VALVE WITH CAP.</p>	NTS	2	 <p>TRANSITION FROM RECTANGULAR OR FLAT DUCT TO ROUND INLET CONNECTION - AS REQUIRED.</p> <p>ROUND ROUND DUCT TO INLET OF VALVE. DUCT SIZE SHALL MATCH BOX INLET SIZE (UNLESS NOTED OTHER ON FLOOR PLANS).</p> <p>HANGER STRAP (TYP. 2 PER BOX).</p> <p>SEE NOTE 4.</p> <p>LOW PRESSURE DUCTWORK.</p> <p>ROUND-TO-RECTANGULAR TRANSITION.</p> <p>REQUIRED SERVICE CLEARANCE AND CEILING ACCESS PANELS. COORDINATE WITH ARCHITECTURAL DRAWINGS.</p> <p>PROVIDE 24" MINIMUM ACCESS CLEARANCE.</p> <p>CONTROLLER.</p> <p>SEE HEATING COIL DETAIL FOR HEATING WATER PIPING CONNECTIONS AND REQUIREMENTS.</p> <p>TRANSITION TO SUPPLY DUCT SIZE SHOWN ON DRAWINGS BY SHEET METAL CONTRACTOR.</p> <p>PHOENIX VALVES WITH REHEAT COIL ABOVE A HARD CEILING. REQUIRE TWO ACCESS PANELS: ONE AT THE REHEAT COIL AND ONE AT THE PHOENIX VALVE.</p> <p>NOTES: 1. PIPING SHALL BE AS INDICATED ON THE FLOOR PLANS AND COIL CONNECTION DETAILS. 2. MINIMUM RUNOUT SIZE TO COIL SHALL BE 3/4" SUPPLY AND RETURN. 3. PROVIDE ACCESS DOORS IN DUCT UPSTREAM AND DOWNSTREAM OF THE COILS. 4. ATTACH PHOENIX VALVES TO DUCTS WITH MFR SUPPLIED DRAW BINGS (SEE SPEC.)</p>	NTS	3	 <p>TRANSITION TO RETURN EXHAUST DUCT. SIZE SHOWN ON DWGS. BY SHEET METAL CONTRACTOR.</p> <p>NO FLEX CONNECTIONS.</p> <p>STRAP HANGER - TYP. (4) PER BOX ATTACHED TO STRUCTURE.</p> <p>TRANSITION TO RETURN EXHAUST DUCT. SIZE SHOWN ON DWGS. BY SHEET METAL CONTRACTOR.</p> <p>STRAIGHT DUCT TO BOX INLET MIN. LENGTH = 4' X INLET DIA. FLEXIBLE DUCTWORK SHALL BE UTILIZED IN LIEU OF SHEET METAL.</p> <p>AIR FLOW.</p> <p>NOTE: DETAIL APPLIES TO GENERAL EXHAUST AIR VALVES.</p>	NTS	4
 <p>INSULATION.</p> <p>INSULATION PROTECTION SADDLE WELDED TO PIPE.</p> <p>SEE NOTE 2.</p> <p>BOLT (TYP.)</p> <p>PIPE ROLL.</p> <p>PIPE SADDLE ON HOT WATER.</p> <p>INSULATION PROTECTION SHIELD.</p> <p>ANGLE IRON SUPPORT BY HVAC.</p> <p>NOTES: 1. FOR TYPE OF HANGER AND INSULATION REQUIREMENTS REFER TO SPECIFICATIONS. 2. SERVICE PIPING AS INDICATED IN SPECIFICATIONS SHALL BE INSTALLED ON ROLLER HANGERS.</p>	NTS	5	 <p>MANUAL VENT (TYP. FOR ALL HIGH POINTS).</p> <p>BALANCING/SWITCHOFF VALVE (BALL VALVE).</p> <p>PRESSURE/THERMOMETER WELL (TYP.)</p> <p>2-WAY MODULATING ATC VALVE.</p> <p>HOT WATER HEATING COIL.</p> <p>AIR FLOW.</p> <p>ARRANGE UNLESS HOT WATER COIL MAY BE PULLED WITHOUT ALTERING PIPING (TYP.).</p> <p>3/4" HOSE END DRAIN VALVE.</p> <p>STRAINER WITH HOSE END BLOW DOWN.</p> <p>HW# 2.</p> <p>HWS # 2.</p> <p>NOTE: DETAIL APPLIES TO ALL IN-DUCT OR IN-BOX HOT WATER COILS.</p>	NTS	6	 <p>PREFERRED TAKE OFF FITTING.</p> <p>ALTERNATE TAKE OFF FITTING.</p> <p>ALTERNATE TAKE OFF FITTING.</p> <p>ALTERNATE TAKE OFF FITTING.</p> <p>ALTERNATE TAKE OFF FITTING.</p> <p>AIR FLOW.</p> <p>BELL MOUTH CONNECTION MODEL BMD.</p> <p>BELL MOUTH CONNECTION MODEL BMD IN END FLAPS BENT OVER.</p> <p>MINI-BELLMOUTH CONNECTION MODEL MBMD.</p> <p>OVAL-BELLMOUTH CONNECTION MODEL OVBMD.</p> <p>STANDARD 45° REGULAR TO ROUND ROOT CONNECTION MODEL 3000.</p> <p>ALTERNATE ROUND BRANCH DUCT TAKE OFFS.</p> <p>PREFERRED TAKE OFF FITTING.</p> <p>ALTERNATE TAKE OFF FITTING.</p> <p>AIR FLOW.</p> <p>RECTANGULAR BELL MOUTH FITTING MODEL RBMD.</p> <p>BRANCH.</p> <p>BRANCH.</p> <p>45° RECTANGULAR TAKE OFF.</p> <p>ALTERNATE RECTANGULAR BRANCH DUCT TAKE OFFS.</p> <p>NOTES: ALL ROUND AND RECTANGULAR BELL MOUTH FITTINGS SHALL BE INCLUDED WITH THE FOLLOWING STANDARD FEATURES: 1. NEOPRENE GASKET TO MINIMIZE AIR LEAKAGE. 2. PRE-DRILLED HOLES FOR QUICK MOUNTING. 3. CONSTRUCTED OF HEAVY DUTY GALVANIZED STEEL. OPTIONAL FEATURES SHALL INCLUDE THE FOLLOWING: 1. 26 GAUGE GALVANIZED QUADRANT VOLUME DAMPER WITH TIGHT FITTING GASKETING TO MINIMIZE LEAKAGE AT DAMPER PIVOT POINTS. 2. HEAVY DUTY HARDWARE IS AVAILABLE FOR APPLICATIONS WITH INCREASED STATIC PRESSURE.</p>	NTS	7	 <p>STRUCTURAL SLAB.</p> <p>3/4" CONCRETE INSERT (TYP.).</p> <p>WELD (TYP.).</p> <p>45°.</p> <p>45°.</p> <p>2" x 2" x 1/4" FOR PIPES 2" & SMALLER.</p> <p>3" x 3" x 5/16" FOR 2 1/2" & LARGER.</p> <p>3/8" THICK PLATE FOR 2" PIPES & SMALLER.</p> <p>1/2" THICK FOR 2 1/2" PIPES & LARGER.</p> <p>INSULATION TO BE INSTALLED CONTINUOUS.</p> <p>NOTE: 1. ANCHOR TO STRUCTURE OR STEEL BEAM AS APPROVED BY ARCHITECT.</p>	NTS	8
			 <p>BUILDING STRUCTURE.</p> <p>STEEL PIPE SLEEVE BY HVAC.</p> <p>PIPE.</p> <p>ESCUTCHEON AROUND ALL PIPE PENETRATIONS. SEE SPECIFICATION.</p> <p>REFER TO SPECIFICATION FOR PACKING OF SPACE BETWEEN PIPE & SLEEVE.</p> <p>SEE NOTES.</p> <p>NOTE: PIPE SLEEVE SHALL BE LARGE ENOUGH TO ALLOW PIPE & INSULATION WHERE PIPES ARE COVERED. THEY SHALL ALSO ALLOW FOR EXPANSION & CONTRACTION.</p>	NTS	9	 <p>5/8" THREADED LOWER ROD.</p> <p>5/8" THREADED UPPER ROD & LOCKWASHERS.</p> <p>NEOPRENE SPRING CLIP.</p> <p>DOUBLE DEFLECTION NEOPRENE ELEMENT.</p> <p>VIBRATION ISOLATOR (TYP.).</p> <p>5/8" ROD SUPPORT CONNECTED TO BUILDING STRUCTURE (TYP. 2).</p> <p>5/8" TREADED SUPPORT ROD & LOCKWASHERS.</p> <p>VIBRATING HVAC EQUIPMENT.</p>	NTS	10	 <p>SPOT WELD ANGLE TO STRUCTURAL STEEL.</p> <p>1/2" Ø MS.</p> <p>STRUCTURAL STEEL OR BUILDING STRUCTURE.</p> <p>C-CLAMP (TYPICAL).</p> <p>HANGER STRAPS.</p> <p>STRAP HANGER.</p> <p>ANGLES.</p> <p>TRAPEZE HANGER.</p> <p>NOTES: 1. REFER TO OTHER DETAILS ON THIS DRAWING FOR HIGH VELOCITY DUCTWORK DETAILS AS REQUIRED. 2. FOR STRAP AND TRAPEZE HANGER SIZE, REFER TO SMACNA DUCT STANDARDS. 3. NO POP RIVETS ALLOWED. USE SELF-TAPPING SHEET METAL SCREWS ONLY.</p>	NTS	11

Issuance Schedule		
Number	Date	Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS
LEVEL 1 PAT LAB

HVAC DETAILS

Scale: NTS Date Issued: 8/26/16

H0.03

Project Number: 179-07-00

HEATING, VENTILATING AND AIR CONDITIONING SPECIFICATION

I. GENERAL

A. THE WORK COVERED CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO INSTALL, COMPLETE AND READY FOR CONTINUOUS OPERATION, THE HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS, APPARATUS AND EQUIPMENT FOR THE VERTEX ANNEX WAR ROOM RENOVATIONS.

B. SHOP DRAWINGS OF ALL SPECIFIED EQUIPMENT AN APPARATUS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

C. CODES: ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE HVAC SUBCONTRACTS AND LABOR PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE MASSACHUSETTS STATE BUILDING CODES, THE CITY OF BOSTON, NATIONAL FIRE PROTECTION ASSOCIATION, AND INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.

D. PERMITS: ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THE SPECIFICATION, INCLUDING ALL FEES OR EXPENSES INCURRED.

E. INSTRUCTIONS: DURING THE ASSEMBLY AND INSTALLATION OF ALL HVAC SYSTEMS, THE OWNER'S OPERATING PERSONNEL SHALL BE INSTRUCTED REGARDING ITS OPERATION AND MAINTENANCE. A FOUR (4) HOUR INSTRUCTION PERIOD SHALL BE PROVIDED AFTER COMPLETION OF PROJECT. OPERATION AND MAINTENANCE MANUALS SHALL BE REQUIRED.

F. GUARANTEE: ALL MATERIALS AND EQUIPMENT FURNISHED AND INSTALLED SHALL BE GUARANTEED IN WRITING FOR ONE (1) YEAR FROM THE DATE OF ACCEPTANCE OF THE BUILDING BY THE OWNER.

G. RECORD DRAWINGS: THE HVAC SUBCONTRACTOR SHALL MAINTAIN AT THE JOB, AT ALL TIMES, A COMPLETE AND SEPARATE SET OF BLUELINE PRINTS OF THE HVAC DRAWINGS OF HIS TRADE ON WHICH HE SHALL MARK CLEARLY, NEATLY, ACCURATELY AND PROMPTLY AS THE WORK PROGRESSES. MYLAR REPRODUCIBLE "AS-BUILTS" SHALL BE FURNISHED BY THE HVAC SUBCONTRACTOR AT THE JOB COMPLETION.

H. INSPECTION: ALL WORK SHALL BE SUBJECT TO THE INSPECTION OF THE OWNER, THE ARCHITECT AND SUCH OTHER INSPECTORS HAVING JURISDICTION. A PROPERLY EXECUTED CERTIFICATE OF INSPECTION SHALL BE PROVIDED.

I. EXAMINATION OF SITE: THE HVAC SUBCONTRACTOR, BEFORE SUBMITTING PRICES OR BEGINNING WORK, SHALL THOROUGHLY EXAMINE THE SITE AND CONTRACT DOCUMENTS, NO CLAIM FOR EXTRA COMPENSATION WILL BE RECOGNIZED IF DIFFICULTIES WHICH AN EXAMINATION OF SITE CONDITIONS AND CONTRACT DOCUMENTS PRIOR TO EXECUTING CONTRACT WOULD HAVE REVEALED.

J. COORDINATION DRAWINGS: PRIOR TO THE PURCHASING AND FABRICATION OF MATERIALS, EACH SUBCONTRACTOR SHALL PREPARE COORDINATION DRAWINGS FOR ALL AREAS SHOWING THE SIZE AND LOCATION OF HIS/HER EQUIPMENT AND LINES. THE COORDINATION DRAWINGS SHALL BE PRODUCED ON AUTOCAD RELEASE 2000 MINIMUM OR COMPATIBLE SYSTEM. ONE (1) SET OF REPRODUCIBLES (ALL-TRADE COMPOSITE) SHALL BE PROVIDED TO THE ARCHITECT/ENGINEER FOR REVIEW. COORDINATION DRAWINGS SHALL BE 1/8" = 1'-0" SCALE. THE COST OF PREPARING AND REPRODUCING THESE DRAWINGS WILL BE INCLUDED AS PART OF THIS CONTRACT. THE HVAC SUBCONTRACTOR SHALL PREPARE THE INITIAL DRAWINGS AND CIRCULATE THE DRAWINGS TO THE OTHER TRADES (FIRE PROTECTION, PLUMBING AND ELECTRICAL) SO THEY CAN INDICATE THEIR WORK. COORDINATION DRAWINGS SHALL NOT BE CONSTRUED AS REPLACING ANY SHOP DRAWINGS.

K. PROTECTION OF PROPERTY: PROTECT ALL NEW AND EXISTING WORK BEFORE, DURING AND AFTER INSTALLATION.

L. TESTS: THE HVAC SUBCONTRACTOR SHALL PERFORM ALL TESTS AT THE COMPLETION OF THE WORK AND THE RESULTS FURNISHED TO THE OWNER AND ENGINEER IN WRITING.

M. UPON COMPLETION OF ALL WORK, THE HVAC SUBCONTRACTOR SHALL FURNISH, IN DUPLICATE, CERTIFICATES OF INSPECTIONS FROM ALL INSPECTORS AND AUTHORITIES HAVING JURISDICTION, NOTARIZED LETTERS FROM THE MANUFACTURERS STATING THAT AUTHORIZED FACTORY ENGINEERS HAVE INSPECTED AND TESTED THE INSTALLATION OF THEIR RESPECTIVE SYSTEMS AND FOUND SAME TO BE IN PERFECT OPERATING CONDITION.

N. CONTRACT DRAWINGS: THE CONTRACT DRAWINGS ARE DIAGRAMMATIC AND INDICATE ONLY THE GENERAL ARRANGEMENTS OF WORK. IT IS NOT THE INTENT OF THESE DRAWINGS TO SHOW EVERY PIPE, RISE, DROP, ELBOW, ETC. ANY ADDITIONAL WORK NOT SHOWN AND REQUIRED TO INSTALL THE HVAC SYSTEMS SHALL BE INCLUDED AS PART OF THIS CONTRACT.

O. INSTALLATION OF MECHANICAL EQUIPMENT AND/OR SYSTEMS SHALL BE IN ACCORDANCE WITH THE SEISMIC REQUIREMENTS IDENTIFIED IN THE MASSACHUSETTS STATE BUILDING CODE.

II. SCOPE

A. THE WORK OF THIS SECTION CONSISTS OF ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO PROVIDE ALL HVAC WORK, NOT SPECIFICALLY DESCRIBED IN OTHER TRADES COMPLETE, IN PLACE, AS SHOWN ON THE DRAWINGS, SPECIFIED HEREIN AND AS NECESSARY FOR A PROPER INSTALLATION.

B. THE EXTENT OF THE HVAC SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:

1. INSTALLATION OF NEW FPT BOXES, VAV BOXES
2. LOW AND MEDIUM PRESSURE DUCTWORK
3. INSULATION
4. NEW DIFFUSERS
5. DEMOLITION OF EXISTING DUCTWORK AND INSULATION
6. EXTENSION OF EXISTING BASE BUILDING CONTROL SYSTEM TO PICK UP ADDED EQUIPMENT.
7. NEW CONTROLS AS INDICATED ON THE PLANS.
8. ALL OTHER WORK SHOWN OR SPECIFIED.

III. RELATED WORK IN OTHER SECTIONS

A. THE FOLLOWING WORK IS NOT INCLUDED AS WORK IN THIS SECTION AND IS TO BE PERFORMED UNDER OTHER SECTIONS:

1. CUTTING AND PATCHING.
2. TEMPORARY WATER, HEAT AND FIRE PROTECTION.
3. TEMPORARY LIGHT AND POWER.
4. SETTING OF FRAMES FOR REGISTERS AND ACCESS PANELS.
5. PAINTING.
6. FIRE PROTECTION.
7. POWER WIRING TO ALL EQUIPMENT.

IV. IDENTIFICATION OF EQUIPMENT AND MATERIAL

A. LABEL EACH PIECE OF MECHANICAL EQUIPMENT WITH A PLASTIC LAMINATE NAMEPLATE WITH A WHITE BACKGROUND AND WITH THE DESIGNATED EQUIPMENT AND AREA OR SYSTEM SERVED ENGRAVED IN BLACK LETTERS. NAMEPLATES SHALL BE MANUFACTURED BY SETON NAMEPLATE COMPANY, OR APPROVED EQUAL BY DENNISON MANUFACTURING COMPANY OR MARKEM COMPANY.

V. HANGERS AND SUPPORTS

A. THE HVAC SUBCONTRACTOR SHALL BE REQUIRED TO UTILIZE HANGERS APPROPRIATE FOR THE TYPE OF STRUCTURAL SYSTEM IN THE BUILDING. SUPPORTS AND HANGERS SHALL BE INSTALLED IN COMPLIANCE WITH THE SEISMIC REQUIREMENTS OF THE EIGHTH (8TH) EDITION OF THE MASSACHUSETTS STATE BUILDING CODE. REFER TO THE VIBRATION ISOLATION AND SEISMIC RESTRAINT PORTION OF THIS SPECIFICATION FOR ADDITIONAL INFORMATION.

B. ALL HANGERS ASSOCIATED WITH VIBRATING EQUIPMENT SHALL BE VIBRATION ELIMINATOR TYPE. THE FIRST TWO (2) HANGERS FROM THE PIECE OF EQUIPMENT SHALL BE COMBINATION RUBBER-IN-SHEAR SPRINGS WITH 1/2 INCH STATIC DEFLECTION IN THE RUBBER AND 3/4 INCH IN THE SPRING. THE REMAINING HANGERS WITHIN 100 PIPE DIAMETERS OF THE EQUIPMENT SHALL BE DOUBLE DEFLECTION RUBBER-IN-SHEAR WITH 3/8 INCH STATIC DEFLECTION. THESE ELIMINATORS SHALL BE INSTALLED IN THE HANGER RODS, SHALL BE OF A DESIGN THAT THE ADJUSTMENT IS MADE TO PUT THE LOAD ON THE SPRING WITHOUT CHANGING THE INSTALLED HEIGHT AND SHALL BE VIBRATION ELIMINATOR COMPANY, MASON INDUSTRIES, KORFUND OR APPROVED EQUAL.

C. ALL HANGER RODS SHALL BE HUNG FROM INSERTS IN CONCRETE, OR FROM I-BEAM CLAMPS ON STEEL BEAMS, OR FROM COACH SCREW THREADED RODS IN WOOD CONSTRUCTION. CLAMPS SHALL HAVE RETAINING CLIPS AND LOCKWASHER. IF INSERTS HAVE NOT BEEN PROVIDED, HANGERS SHALL BE THROUGH BOLTED OR CINCH OR SLUG-IN EXPANSION BOLTS MAY BE USED WITH THE PERMISSION OF THE ENGINEER.

D. WHERE SUPPORT POINTS ARE REQUIRED BETWEEN AVAILABLE INSERTS OR TO AVOID THE WORK OR ANOTHER TRADE, PROVIDE A SYSTEM OF SPANNING CHANNELS AND ANGLES BETWEEN THESE SUPPORT POINTS AS REQUIRED, WHEN PIPE OR EQUIPMENT IS HUNG OR SUPPORTED, NO PART OF ANY EQUIPMENT FURNISHED BY THIS SUBCONTRACTOR OR ANY PART OF THE BUILDING SHALL BE STRESSED BEYOND ITS NORMAL ALLOWABLE WORKING STRENGTH.

E. ALL STEEL FRAMEWORK AND SUPPORTS PROVIDED UNDER THIS SECTION SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARD SPECIFICATIONS FOR STEEL FOR BRIDGES AND BUILDINGS OF THE AMERICAN SOCIETY FOR TESTING MATERIALS. ALL SHOP FABRICATED FRAMEWORK SHALL HAVE A SHOP COAT OF METAL PRIMER, EXCEPT STEEL IN CONCRETE SHALL NOT BE PAINTED.

VI. SHEETMETAL

A. LOW PRESSURE: FURNISH ALL LOW PRESSURE SHEET METAL DUCTWORK REQUIRED FOR THE VARIOUS SUPPLY, RETURN AND EXHAUST AIR SYSTEMS RATED FOR 2.0" CONSTRUCTION. ALL LOW PRESSURE DUCTWORK AND SHEET METAL PLenums SHALL BE CONSTRUCTED OF GALVANIZED STEEL OF U.S. STANDARD GAUGE TO MEET THE LATEST SMACNA STANDARDS.

B. MEDIUM PRESSURE: ALL MEDIUM PRESSURE DUCTWORK RATED FOR 4.0" CONSTRUCTION SHALL BE GALVANIZED SHEET STEEL, MEETING ASTM STANDARD A-93-58-97. THE GAUGE OF ALL DUCT SHALL BE AS LISTED IN SMACNA STANDARD. FOR RECTANGULAR MEDIUM PRESSURE DUCT THE USE OF "DUCTIMATE" FLANGE TRANSVERSE JOINTS WILL BE ALLOWED. ALL ROUND DUCT THROUGH 36 INCHES IN DIAMETER AND ALL FLAT Oval DUCT THROUGH 48 INCHES WIDE SHALL BE CONSTRUCTED OF SPIRAL LOCK SEAM OR APPROVED EQUAL CONSTRUCTION. ALL ROUND DUCT 37 INCHES IN DIAMETER AND OVER AND ALL FLAT Oval DUCT OVER 48 INCHES WIDE SHALL BE OF WELDED JOINT CONSTRUCTION.

1. ALL ROUND AND Oval CONDUIT FITTINGS SHALL BE EQUAL TO UNITED STATES METAL CORPORATION SPIRAL WOUND FITTINGS FOR USE WITH THE CONDUIT. USE CONICAL TEES AND LATERALS WHERE SHOWN. SPECIAL FITTINGS SHALL BE USED AS SHOWN TO GIVE EVEN AIR FLOW WITH MINIMUM PRESSURE DROP. NINETY DEGREE ELBOWS SHALL BE DIE-FORMED UP TO AND INCLUDING 8 INCH DIAMETER AND FIVE (5) PIECE GORES FOR 9 INCH DIAMETER AND LARGER. FORTY FIVE DEGREE ELBOWS SHALL BE DIE-FORMED UP TO AND INCLUDING 8 INCH DIAMETER AND THREE (3) PIECE GORES FOR 9 INCH DIAMETER AND LARGER.

C. FLEX DUCT: FLEXIBLE DUCT SHALL BE FLEXMASTER TYPE 2 INSULATED DUCT AS MANUFACTURED BY BUCKLEY ASSOCIATES, SHEET METAL WORKERS LOCAL 17. FLEXIBLE DUCT SHALL BE UL LISTED (UL 181 CLASS 1 AIR DUCT) AND CONSTRUCTED IN ACCORDANCE WITH NFPA STANDARDS 90A AND 90B WITH A SMOKE/FLAME SPREAD RATING OF 50/25.

D. FLEX CONNECTIONS: FURNISH FLEXIBLE CONNECTIONS BETWEEN ALL DUCTS AND FAN EXHAUSTS. FLEXIBLE CONNECTIONS SHALL BE VENTGLASS, FERRO CUSTIFAB MASS LOADED FIBERGLASS REINFORCED VINYL FABRIC WITH A WEIGHT OF ONE (1) POUND PER SQUARE FOOT. WIDTH OF CONNECTING MATERIAL SHALL BE NOT LESS THAN 6 INCHES AND MATERIAL SHALL BE INSTALLED TO ALLOW A MINIMUM OF ONE (1) INCH SPACING BETWEEN THE UNIT AND THE DUCT.

E. INTERNAL LINING: PROVIDE OWENS-CORNING, KRAUF OR PITTSBURGH CORNING ACoustICAL DUCT LINING WITH A MINIMUM DENSITY OF 2 POUNDS PER CUBIC FOOT AS SHOWN AND AS SPECIFIED. THE DUCT SIZE SHALL BE THE NET INSIDE DIMENSIONS AFTER LINING IS IN PLACE. LINING IN DUCTS SHALL BE ONE INCH THICK, SIMILAR AND EQUAL TO OWENS-CORNING FIBERGLASS "AEROFLEX" DUCT LINER. LINING SHALL BE ADHERED TO ALL INTERIOR SURFACES OF DUCT WITH BENJAMIN FOSTER 85-15, OR EQUAL ADHESIVE. ALL EXPOSED EDGES OF LINING SHALL BE SEALED.

F. VOLUME DAMPERS: PROVIDE MANUAL VOLUME DAMPERS IN ALL LOW PRESSURE SUPPLY, RETURN AND EXHAUST DUCTS AS SHOWN AND REQUIRED WITH INDICATING AND LOCKING QUADRANTS TO PROPERLY BALANCE THE AIR SUPPLY, RETURN AND EXHAUST SYSTEMS. DAMPERS SHALL BE TWO (2) GAUGES HEAVIER THAN THE DUCTS IN WHICH THEY ARE INSTALLED. DAMPER BLADES SHALL BE RIVETED TO THE SUPPORTING RODS. CAST OR MALLEABLE BRACKETS RIVETED TO THE SIDES OF THE DUCT SHALL BE USED TO SUPPORT THE DAMPER POSITIONED ROD. IN LIEU OF VOLUME DAMPER, CONTRACTOR SHALL PROVIDE BUCKLEY BELLMOUTH TAKEOFFS WITH DAMPERS AT ALL BRANCH DUCT LOCATIONS.

H. ACCESS PANELS: PROVIDE ACCESS PANELS OF THE PROPER SIZE AND AT ALL LOCATIONS IN DUCTWORK NECESSARY TO SERVICE FIRE DAMPERS, SMOKE DAMPERS, FUMABLE DAMPERS, AUTOMATIC DAMPERS, CONTROL DEVICES, FAN BEARINGS AND AS REQUIRED TO SERVICE ALL SYSTEMS.

1. ACCESS PANELS SHALL HAVE FOAM GASKETING, FIXED HINGES AND COMPRESSION TYPE LATCHES AS FURNISHED BY BUCKLEY, VENTLOK, D3 INCHES IN DIAMETER OR APPROVED EQUAL MANUFACTURER. ACCESS DOORS FOR INSULATED DUCTS SHALL BE INSULATED WITH ONE (1) INCH THICK 1-1/2 POUND DENSITY COATED DUCT LINER.

VII. DIFFUSERS/GRILLES

A. SQUARE AND RECTANGULAR CEILING DIFFUSERS

1. PROVIDE PRICE, METAL/AIRE, KRUEGER, OR TUTTLE AND BAILEY DIFFUSERS AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.

2. ALL SQUARE AND RECTANGULAR SUPPLY AIR DIFFUSERS SHALL HAVE DIFFUSING VANES E WITH AIR DEFLECTING DAMPERS FULL SIZE OF THE NECK SIZE SHOWN. ALL DIFFUSER PATTERNS SHALL BE AS SHOWN OR AS REQUIRED TO FIT AIR DISTRIBUTION PATTERN WITH PORTIONS OF THE NECK BLANKED OFF TO GIVE THE PROPER AIR DISTRIBUTION PATTERN AND TO LIMIT THE MAXIMUM NECK VELOCITY TO 550 FPM.

B. RETURN AIR GRILLES

1. PROVIDE PRICE, METAL/AIRE, TITUS, KRUEGER OR TUTTLE AND BAILEY REGISTERS AND GRILLES AS SHOWN.

2. ALL REGISTERS AND GRILLES TO BE MOUNTED IN MASONRY, PLASTERED, OR TILED WALLS AND IN PLASTERED CEILINGS SHALL HAVE ALUMINUM PLASTER FRAMES EQUAL TO MODEL NT MOUNTING FRAME.

C. COATINGS

1. ALL REGISTERS AND GRILLES SHALL BE FINISHED WITH A CROSS LINKED ACRYLIC POWDER COAT. COATING SHALL BE 2.0 - 3.0 MILS DFT AND BE RATED FOR 500 HOUR SALT SPRAY EXPOSURE.

VIII. HOT WATER REHEAT COILS

A. PROVIDE MCQUAY, TRANE, PRECISION COILS, RAE OR CARRIER, ARI CERTIFIED HOT WATER HEATING COILS AS SHOWN ON THE DRAWINGS. THE PRIMARY SURFACE SHALL BE 5/8 INCH O.D. SEAMLESS COPPER TUBES ON 1-1/2 INCH CENTERS. THE SECONDARY SURFACE SHALL CONSIST OF SHALLOW ALUMINUM DIE CAST FIN FINS. THE FIN COLLARS SHALL BE FULL DRAWN TO COMPLETELY COVER THE TUBES FOR MAXIMUM HEAT TRANSFER AND TO PROVIDE ACCURATE CONTROL OF FIN SPACING.

B. CASING SHALL BE CONSTRUCTED OF CONTINUOUS GALVANIZED STEEL WITH REINFORCED MOUNTING FLANGES.

C. COILS SHALL HAVE CONNECTIONS PROVIDED FOR UNIVERSAL RIGHT OR LEFT HAND FLOW APPLICATIONS. COIL CONNECTIONS SHALL BE WROUGHT COPPER 1/2 INCH NPT SUPPLY AND RETURN CONNECTIONS. ALL JOINTS SHALL BE BRAZED WITH COPPER BRAZING ALLOYS.

D. COMPLETE COIL SHALL BE TESTED WITH 315 POUNDS AIR PRESSURE UNDER WARM WATER CONTAINING SPECIAL WETTING AGENT.

E. MAXIMUM COIL FACE VELOCITY SHALL BE 700 FPM. IF DUCT SIZE IS NOTED ON SCHEDULE, IT IS FOR REFERENCE ONLY AND NOT THE COIL SIZE. PROVIDE DUCT TRANSITIONS AS REQUIRED BETWEEN COIL FACE AND DUCT SIZE NOTED.

IX. TEMPERATURE SENSORS

A. TEMPERATURE SENSORS SHALL BE RTDS OR THERMISTORS. SENSOR "TIME CONSTANT" SHALL NOT EXCEED 5 SECONDS FOR A 60% RESPONSE TO A STEP CHANGE IN TEMPERATURE. SENSOR REPEATABILITY SHALL BE 0.1°F OR BETTER.

1. SPACE TEMPERATURE SENSOR ELEMENT SHALL BE ACCURATE WITHIN +0.5°F OVER A RANGE FROM 40°F TO 100°F. SENSORS SHALL BE HOUSED IN MANUFACTURER STANDARD MINATURE TYPE THERMOSTAT COVER AND SHALL INCLUDE SET POINT ADJUSTMENT. THE TEMPERATURE ADJUSTMENT SHALL NOT PROVIDE ACTUAL CONTROL OVER SPACE TEMPERATURE SET POINT WHERE THE ACTUAL SET POINT SHALL BE SET THROUGH THE DDC SYSTEM AND AS SPECIFICALLY CALLED FOR IN THE SEQUENCE OF OPERATION.

2. IF NECESSARY, OUTSIDE AIR TEMPERATURE SENSOR ELEMENTS FOR EACH OF THE CONTROLLERS SHALL BE ACCURATE WITHIN +0.5°F OVER A RANGE FROM -20°F TO 120°F.

3. COLOR TO BE APPROVED BY ARCHITECT.

X. PIPING, VALVES & FITTINGS

A. ALL HOT WATER, CHILLED WATER AND CONDENSATE DRAIN PIPING SHALL BE MUELLER, JOINT OR ANOCONDA TYPE L HARD COPPER TUBING WITH WROUGHT COPPER SOLDER JOINT PRESSURE FITTING WITH 95-5 TIN ANTIMONY SOLDER JOINTS.

B. INSTALL BALANCING VALVES IN THE RETURN FROM EACH HOT WATER HEATING COIL AND CHILLED WATER COOLING COIL. AND AT ALL POINTS AS SHOWN OR REQUIRED TO BALANCE THE SYSTEMS.

C. ALL VALVES SHALL BE STOCKHAM, CRANE, HAMMOND, NIBCO OR APPROVED EQUAL. ALL STOP VALVES IN HOT WATER AND CHILLED WATER SYSTEMS SHALL BE EITHER BALL OR FULL LUG BUTTERFLY.

D. VALVES 2 INCH AND SMALLER SHALL BE BRONZE AND FOR STEEL PIPE SHALL BE SCREWED.

E. VALVES FOR COPPER TUBING 2 INCHES AND SMALLER SHALL BE SIMILAR AND EQUAL TO THE FOLLOWING MANUFACTURERS' FIGURE NUMBERS:

	STOCKHAM	CRANE	HAMMOND	NIBCO
BALL VALVES:	S-2114-FBR-T-S	9322	8211	S-580
GATE VALVES:	B-108	1334	IB-635	S-111
GLOBE VALVES:	B-147	1310	IB-423	S-211Y
CHECK VALVES:	B-310TY	1342	IB-945	S-413Y

F. VALVES FOR STEEL PIPING 2 INCHES AND SMALLER SHALL BE SIMILAR AND EQUAL TO THE FOLLOWING MANUFACTURERS' FIGURE NUMBERS:

	STOCKHAM	CRANE	HAMMOND	NIBCO
BALL VALVES:	S-2114-FBR-T-T	9102-B	8201	T-580-70
GATE VALVES:	B-105	428UB	IB-617	T-124
GLOBE VALVES:	B-22T	71F	IB-413-T	T-235Y
CHECK VALVES:	B-319Y	37	IB-940	T-413-B

G. VALVES FOR STEEL PIPING OR COPPER TUBING 2-1/2 INCHES AND LARGER SHALL BE SIMILAR AND EQUAL TO THE FOLLOWING MANUFACTURERS' FIGURE NUMBERS:

	STOCKHAM	CRANE	HAMMOND	NIBCO
BALL VALVES:	LG-7X2-B53-E	44-X33	6201-X	LD-2000-3/5
GATE VALVES:	G-623	465-1/2	IR-1140	F-617-O
GLOBE VALVES:	G-512	351	IR-116	F-718B
CHECK VALVES:	G-931	373	IR-1124	F-918B

H. CAST IRON FITTINGS SHALL BE USED ON NON-WELDED PIPE AND SHALL BE WELDED TO CRANE, GRINNELL OR APPROVED EQUAL FOR 125 PSIG SERVICE. EXCEPT AS NOTED BELOW, FITTINGS FOR HIGH PRESSURE STEAM PIPING, CONDENSATE RETURN PIPING, BOILER PRESSURE STEAM PIPING AND BOILER FEED WATER PIPING, THE FITTINGS SHALL BE FOR 250 PSIG SERVICE.

I. STRAINERS: PROVIDE MUELLER, SARCO, BARNES & JONES, WARREN WEBSTER OR APPROVED EQUAL STRAINERS BEFORE ALL AUTOMATICALLY OPERATED VALVES AND PUMPS. STRAINER BASKETS SHALL BE STAINLESS STEEL FOR ALL WATER AND ALL STEAM SERVICE. WYE TYPE 125 PSIG STRAINERS SHALL BE USED ON ALL APPLICATIONS, EXCEPT IN ENTRANCE HIGH PRESSURE STEAM LINES, AND AT HIGH PRESSURE DRIPS WHERE WYE TYPE 250 PSI STRAINERS SHALL BE USED.

XI. INSULATION

A. GENERAL: FURNISH ALL MATERIALS NECESSARY FOR THE INSTALLATION OF ALL INSULATION. CRANE, GRINNELL OR APPROVED EQUAL FOR 125 PSIG SERVICE, INCLUDING ALL RELATED EQUIPMENT. ALL INSULATION SHALL BE AS MANUFACTURED BY OWENS-CORNING, MANVILLE, CERTAINTEED, KNAUF OR APPROVED EQUAL.

B. SMOKE RATING: INSULATION WHEN INSTALLED, SHALL HAVE COMPOSITE (INSULATION, JACKET AND ADHESIVE) FIRE AND SMOKE HAZARD RATINGS AS TESTED BY PROCEDURE ASTM-E-84, NFPA 255 AND UL-723, NOT EXCEEDING A FLAME SPREAD OF TWENTY-FIVE (25), FUEL CONTRIBUTION OF FIFTY (50) AND SMOKE DEVELOPED OF FIFTY (50).

C. ACCESSORIES: ACCESSORIES SUCH AS ADHESIVES, MASTICS, CEMENTS AND TAPES SHALL HAVE THE COMPONENT RATINGS AS LISTED ABOVE FOR COMPOSITE INSULATION IN A WET AS WELL AS DRY STATE. ALL THICKNESS AND TYPE OF INSULATION SHALL CONFORM TO THE FOLLOWING:

1. PIPING INSULATION SCHEDULE

FIBER GLASS INSULATION:

(A.) HEATING WATER SUPPLY AND RETURN ALL SIZES - 2 INCH THICKNESS

(B.) CHILLED WATER SUPPLY AND RETURN PIPING ALL SIZES - 1 1/2 INCH THICKNESS

(C.) HUMIDIFIER STEAM PIPING - 3 INCH THICKNESS

ELASTOMERIC FOAM:

(A.) CONDENSATE DRAIN ALL SIZES - 1/2 INCH THICKNESS

2. DUCTWORK INSULATION SCHEDULE:

FLEXIBLE FIBERGLASS:

(A.) SUPPLY AIR DUCTWORK: 1-1/2 INCH FOIL FACE FIBERGLASS. INSULATION NOT TO BE USED IN EXPOSED CEILING AREAS. REFER TO PLANS.

(B.) DUCT LINER: WHERE INDICATED, 1 INCH THICKNESS WITH LINACOUSSTIC PERMACOTE OR MAT FACE FINISH.

XII. LABORATORY AIRFLOW VALVES

A. VALVE BODY MATERIAL FOR FUME HOOD OR OTHER CORROSIVE SERVICE SHALL BE 304SS; 20 GAUGE FOR BODY AND 16 GAUGE FOR BLADES. VALVE SHAFT MATERIAL SHALL BE 316SS. COATED VALVES, IF PROVIDED, WILL BE PROVIDED WITH DRAWBAR CLAMPS FOR CONNECTION TO DUCTWORK TO ALLOW FOR REMOVAL OF THE VENTURI VALVE FOR RECALIBRATION. VALVE BODY MATERIAL FOR NON-CORROSIVE SERVICE SUCH AS FOR SUPPLY AND GENERAL EXHAUST SHALL BE GALVANIZED STEEL OR ALUMINUM; 20 GAUGE (GALVANIZED); 16 GAUGE (ALUMINUM) FOR BODY AND 16 GAUGE FOR BLADES. VALVE SHAFT MATERIAL SHALL BE 316SS.

B. LABORATORY AIRFLOW CONTROL SYSTEM SHALL BE FURNISHED AND INSTALLED TO CONTROL THE AIRFLOW INTO AND OUT OF LABORATORY ROOMS. THE EXHAUST VOLUME OF LAMINAR HOOD AND GOWNING 121 AND THE DOWNFLOW BOOTH SHALL BE CONSTANT FOR CONTINUOUS OPERATION, AS INDICATED ON PLANS. THE PAT OPEN LAB 122 CONTROL UNIT SHALL VARY THE AMOUNT OF AIR INTO THE ROOM TO MAINTAIN TEMPERATURE CONTROL, MINIMUM VENTILATION, AIRFLOW BALANCE, AND LABORATORY PRESSURIZATION IN RELATION TO ADJACENT SPACES (POSITIVE OR NEGATIVE). ALL LABORATORY AIRFLOW CONTROL SYSTEMS DEVICES SHALL BE BY A SINGLE MANUFACTURER.

C. WARRANTY SHALL COMMENCE UPON THE DATE OF THE ACCEPTANCE AND EXTENDED FOR A PERIOD OF THIRTY-SIX (36) MONTHS WHEREUPON ANY DEFECTS IN MATERIALS OR SYSTEM PERFORMANCE SHALL BE REPAIRED BY THE MANUFACTURER AT NO COST TO THE OWNER.

D. DUE TO THE LIFE SAFETY ISSUES OF THIS EQUIPMENT, THE MANUFACTURER SHALL PROVIDE TO THE OWNER DURING AND AFTER THE WARRANTY PERIOD, AT NO ADDITIONAL COST, FIVE (6) YEARS OF PREVENTATIVE MAINTENANCE FOR PRODUCTS THAT INCORPORATE AIRFLOW SENSORS (E.G., PILOT TUBE, FLOW CROSS, AIR BAR, HOT WIRE, VORTEX SHEDDER, ETC.) AND THE FLOW TRANSDUCERS. THE LABORATORY CONTROLS MANUFACTURER SHALL REMOVE THE AIRFLOW SENSORS QUARTERLY DURING THE FIVE YEAR PERIOD TO INSPECT AND CLEAN THEM AS TO PREVENT INACCURACIES DUE TO LONG TERM BUILD-UP FROM CORROSION, LAB TISSUES, WEAR OR STICKY PARTICLES, OR OTHER MATERIALS THAT FOUL THE SENSOR. THE TRANSDUCER SHALL BE CHECKED AND RECALIBRATED TO INSURE LONG TERM ACCURACY.

E. THE LABORATORY AIRFLOW CONTROL SYSTEM SHALL BE FULLY STAND-ALONE FOR EACH INDIVIDUAL LABORATORY. THE SYSTEM SHALL NOT USE OR RELY ON INFORMATION FROM CONTROLLERS IN OTHER LABORATORY AREAS TO CONTROL THE FUNCTIONS WITHIN ITS LABORATORY.

F. THE LABORATORY AIRFLOW CONTROL SYSTEM SHALL EMPLOY INDIVIDUAL FACE VELOCITY CONTROLLERS THAT DIRECTLY MEASURE THE AREA OF THE DOWNFLOW BOOTH SASH OPENING AND PROPORTIONALLY.

G. THE LABORATORY AIRFLOW CONTROL SYSTEM SHALL ALSO MAINTAIN INTERSYSTEM STABILITY WITHIN ONE SECOND OF A CHANGE IN PRESSURE AND/OR FLOW TO ELIMINATE HUNTING, SYSTEM OSCILLATIONS, AND CROSSTALK BETWEEN AIRFLOW CONTROLLERS.

H. THE LAMINAR HOOD AND GOWNING 121 AND THE DOWNFLOW BOOTH AIRFLOW CONTROL SYSTEM SHALL USE VOLUMETRIC OFFSET CONTROL TO MAINTAIN ROOM PRESSURIZATION. THE SYSTEM SHALL MAINTAIN PROPER ROOM PRESSURIZATION POLARITY (NEGATIVE OR POSITIVE) REGARDLESS OF ANY CHANGE IN ROOM/SYSTEM CONDITIONS SUCH AS THE OPENING AND CLOSING OF THE DOWNFLOW BOOTH SASHES OR RAPID CHANGES IN DUCT STATIC PRESSURE. SYSTEMS USING DIFFERENTIAL PRESSURE MEASUREMENT OR VELOCITY MEASUREMENT TO CONTROL ROOM PRESSURIZATION ARE UNACCEPTABLE.

I. THE PAT OPEN LAB 122 AIRFLOW CONTROL SYSTEM SHALL USE VOLUMETRIC OFFSET CONTROL TO MAINTAIN ROOM PRESSURIZATION. THE SYSTEM SHALL RESPOND AND MAINTAIN ROOM PRESSURIZATION (NEGATIVE OR POSITIVE) WITHIN ONE SECOND OF A CHANGE IN ROOM/SYSTEM CONDITIONS.

J. THE LABORATORY AIRFLOW CONTROL SYSTEM SHALL MAINTAIN SPECIFIC AIRFLOW (45% OF SIGNAL WITHIN ONE SECOND OF A CHANGE IN DUCT STATIC PRESSURE) REGARDLESS OF THE MAGNITUDE OF THE PRESSURE CHANGE AIRFLOW CHANGE OR QUANTITY OF AIRFLOW CONTROL DEVICES ON THE MANIFOLD (WITHIN 0.3 TO 3.0" WC).

K. DOWNFLOW BOOTH SASH COMPONENTS

1. A HORIZONTAL SASH SENSOR SHALL BE PROVIDED FOR EACH PAIR OF HORIZONTAL OR OVERLAPPING SASHES THAT ARE LOCATED ON THE DOWNFLOW BOOTH AND OTHER HORIZONTAL, COMBINATION, CALIFORNIA, WALK-IN, OR DISTILLATION TYPE FUME HOODS. SENSORS SHALL BE MAGNETIC BAR TYPE WITH BRIDGE DIODES AND CONTACTS. ALL WIRING SHALL BE PROVIDED WITH A RETRACTABLE CABLE AND HIDDEN FROM VIEW. CONTROL SYSTEMS EMPLOYING SIDE-WALL MOUNTED VELOCITY SENSORS ARE COMPLETELY UNACCEPTABLE.

2. THE AIRFLOW AT THE DOWNFLOW BOOTH SHALL REMAIN CONSTANT. A BYPASS ACROSS THE SASHES SHALL INSURE FLOW THROUGH THE DOWNFLOW BOOTH EVEN WITH THE SASHES TOTALLY CLOSED.

- L. DOWNFLOW BOOTH MONITOR (WITH LED OR NUMERICAL DISPLAY)

1. A DOWNFLOW BOOTH MONITOR SHALL BE PROVIDED TO RECEIVE THE SASH OPENING SIGNALS FROM THE HORIZONTAL SASH SENSORS. THE MONITOR SHALL COMPUTE THE TOTAL OPEN SASH AREA AND THEN OUTPUT AN EXHAUST AIRFLOW CONTROL SIGNAL TO THE APPROPRIATE VOLUME CONTROL DEVICE (VALVE OR DRIVE).

2. AN EMERGENCY EXHAUST CAPABILITY SHALL BE PROVIDED TO OVERRIDE THE SASH SENSOR AND COMMAND MAXIMUM EXHAUST AIRFLOW. A PUSH TO START, PUSH TO STOP, PUSH-BUTTON SWITCH SHALL INITIATE THIS MODE.

3. FUME HOOD MONITOR SHALL INCLUDE AN LED DISPLAY OR NUMERICAL VELOCITY DISPLAY TO INDICATE A RELATIVE MEASURE OF HOOD FACE VELOCITY.

4. A PUSH-BUTTON SWITCH SHALL BE PROVIDED TO MUTE THE AUDIBLE ALARM. THE MUTE MODE IS AUTOMATICALLY RESET WHEN THE ALARM CONDITION CEASES.

M. AIRFLOW CONTROL DEVICE - GENERAL

1. THE AIRFLOW CONTROL DEVICE SHALL BE A VENTURI VALVE EQUAL TO THE PHOENIX CONTROLS ACECELL II MODEL OR EQUAL APPROVED TEAK-AIR CONTROL PRODUCT.

2. THE AIRFLOW CONTROL DEVICE SHALL BE PRESSURE INDEPENDENT OVER ITS SPECIFIED DIFFERENTIAL STATIC PRESSURE OPERATING RANGE. AN INTEGRAL PRESSURE INDEPENDENT ASSEMBLY SHALL RESPOND AND MAINTAIN SPECIFIC AIRFLOW WITHIN ONE SECOND OF A CHANGE IN DUCT STATIC PRESSURE IRRESPECTIVE OF THE MAGNITUDE OF PRESSURE AND/OR FLOW CHANGE OR QUANTITY OF AIRFLOW CONTROLLERS ON A MANIFOLDED SYSTEM.

3. FOR TWO-POSITION OR VAV OPERATION, AN ELECTRIC ACTUATOR SHALL BE FACTORY MOUNTED TO THE VALVE. LOSS OF CONTROL POWER SHALL CAUSE NORMALLY OPEN VALVES TO FAIL TO MAXIMUM POSITION, AND NORMALLY CLOSED VALVES TO FAIL TO MINIMUM POSITION. ELECTRIC ACTUATORS THAT FAIL IN LAST POSITION ARE NOT ACCEPTABLE WHEN USED IN FUME HOOD AND MAKE-UP AIR CONTROL APPLICATIONS.

4. THE CONTROLLER FOR THE AIRFLOW CONTROL DEVICES SHALL BE MICROPROCESSOR BASED AND OPERATE USING A PEER-TO-PEER CONTROL ARCHITECTURE. THE ROOM LEVEL AIRFLOW CONTROL DEVICES SHALL FUNCTION AS A STANDALONE NETWORK.

5. THERE SHALL BE NO RELIANCE ON EXTERNAL OR BUILDING LEVEL CONTROL DEVICES TO PERFORM ROOM LEVEL CONTROL FUNCTIONS. EACH LABORATORY CONTROL SYSTEM SHALL HAVE THE CAPABILITY OF PERFORMING: DOWNFLOW BOOTH CONTROL, PRESSURIZATION CONTROL, TEMPERATURE CONTROL, HUMIDITY CONTROL, AND IMPLEMENT OCCUPANCY AND EMERGENCY MODE CONTROL SCHEMES.

6. THE LABORATORY AIRFLOW CONTROL SYSTEMS SHALL BE INTEGRATED INTO BMS FOR MONITORING ONLY.

7. CONSTANT VOLUME VALVES FOR DOWNFLOW BOOTHS, BIO-SAFETY CABINETS AND/OR SNORKEL EXHAUST SHALL MAINTAIN A CONSTANT VOLUME PRESSURE INDEPENDENT MANUALLY ADJUSTABLE. VOLUME SET POINT, ALL VALVES SHALL BE PROVIDED WITH A PRESSURE SWITCH FOR ALARM STATUS. IT SHALL BE FACTORY CALIBRATED AND SET FOR DESIRED AIRFLOW RATE. IT SHALL ALSO BE CAPABLE OF FIELD ADJUSTMENT FOR FUTURE CHANGES OF DESIRED AIRFLOW RATE. VALVE SHALL NOT BE EQUIPPED WITH ANY PNEUMATIC OR ELECTRONIC CONTROL ACTUATOR REQUIREMENTS.

8. AIRFLOW SENSORS SHALL BE OF A MULTI-POINT AVERAGING TYPE. 304 STAINLESS STEEL FOR ALL SUPPLY AND GENERAL EXHAUST APPLICATIONS. 316L STAINLESS STEEL FOR ALL DOWNFLOW BOOTH, FUME HOOD, CANOPY, SNORKEL, AND BIOSAFETY CABINET APPLICATIONS.

N. EXHAUST AND SUPPLY AIRFLOW CELERIS DIGITAL CONTROLLER

1. THE AIRFLOW CONTROL DEVICE SHALL BE A MICROPROCESSOR-BASED DESIGN AND, SHALL USE CLOSED LOOP CONTROL TO LINEARLY REGULATE AIRFLOW BASED ON A DIGITAL CONTROL SIGNAL. THE DEVICE SHALL GENERATE A DIGITAL FEEDBACK SIGNAL THAT REPRESENTS ITS AIRFLOW.

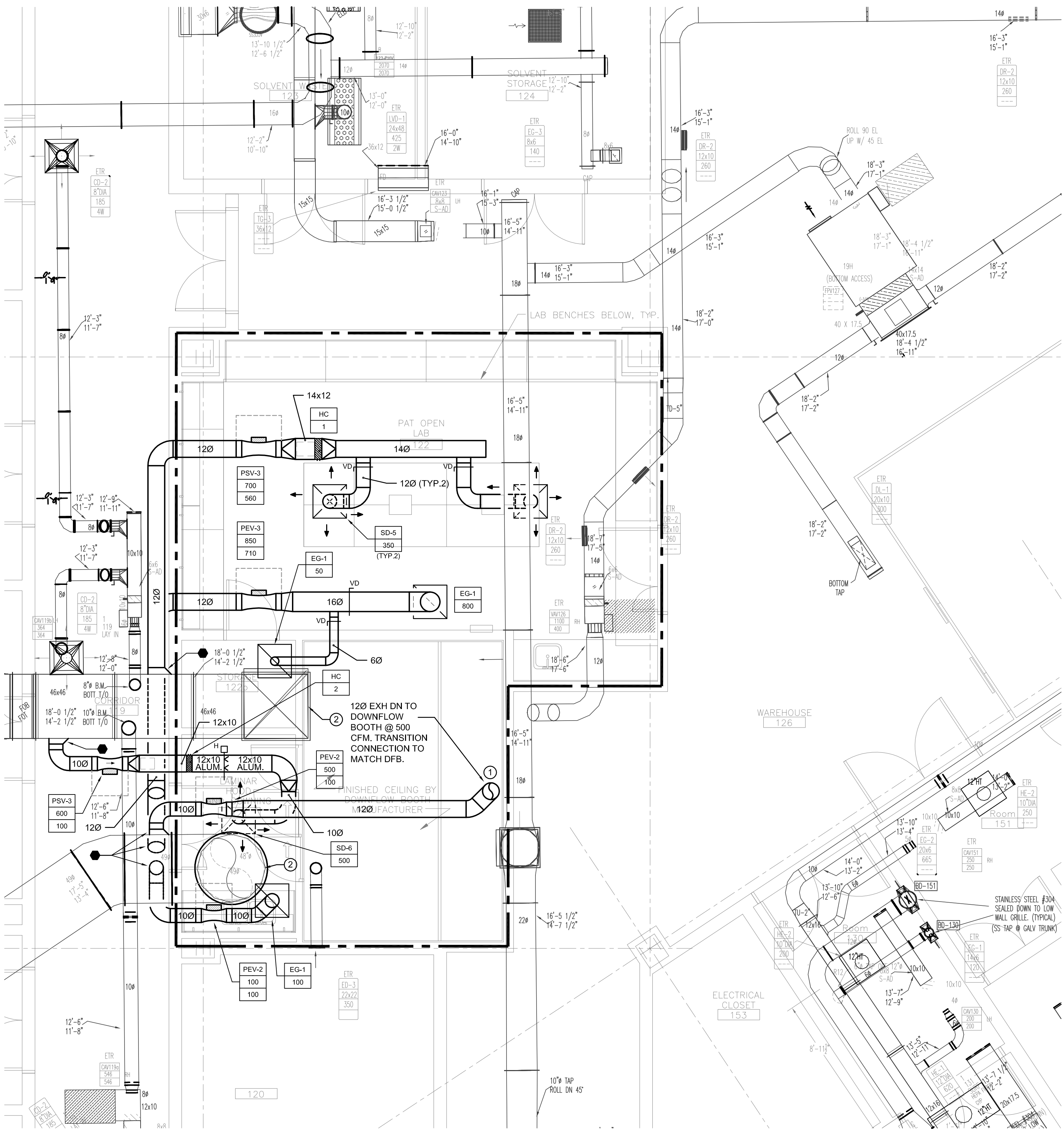
2. THE AIRFLOW CONTROL DEVICE SHALL STORE ITS CONTROL ALGORITHMS IN NON-VOLATILE, RE-WRITABLE MEMORY. THE DEVICE SHALL BE ABLE TO STAND ALONE OR TO BE NETWORKED WITH OTHER ROOM LEVEL DIGITAL AIRFLOW CONTROL DEVICES USING AN INDUSTRY STANDARD PROTOCOL.

3. ROOM-LEVEL CONTROL FUNCTIONS SHALL BE EMBEDDED IN AND CARRIED OUT BY THE AIRFLOW DEVICE CONTROLLER USING A DISTRIBUTED CONTROL ARCHITECTURE. CRITICAL CONTROL FUNCTIONS SHALL BE IMPLEMENTED LOCALLY. NO ROOM LEVEL CONTROLLER SHALL BE REQUIRED.

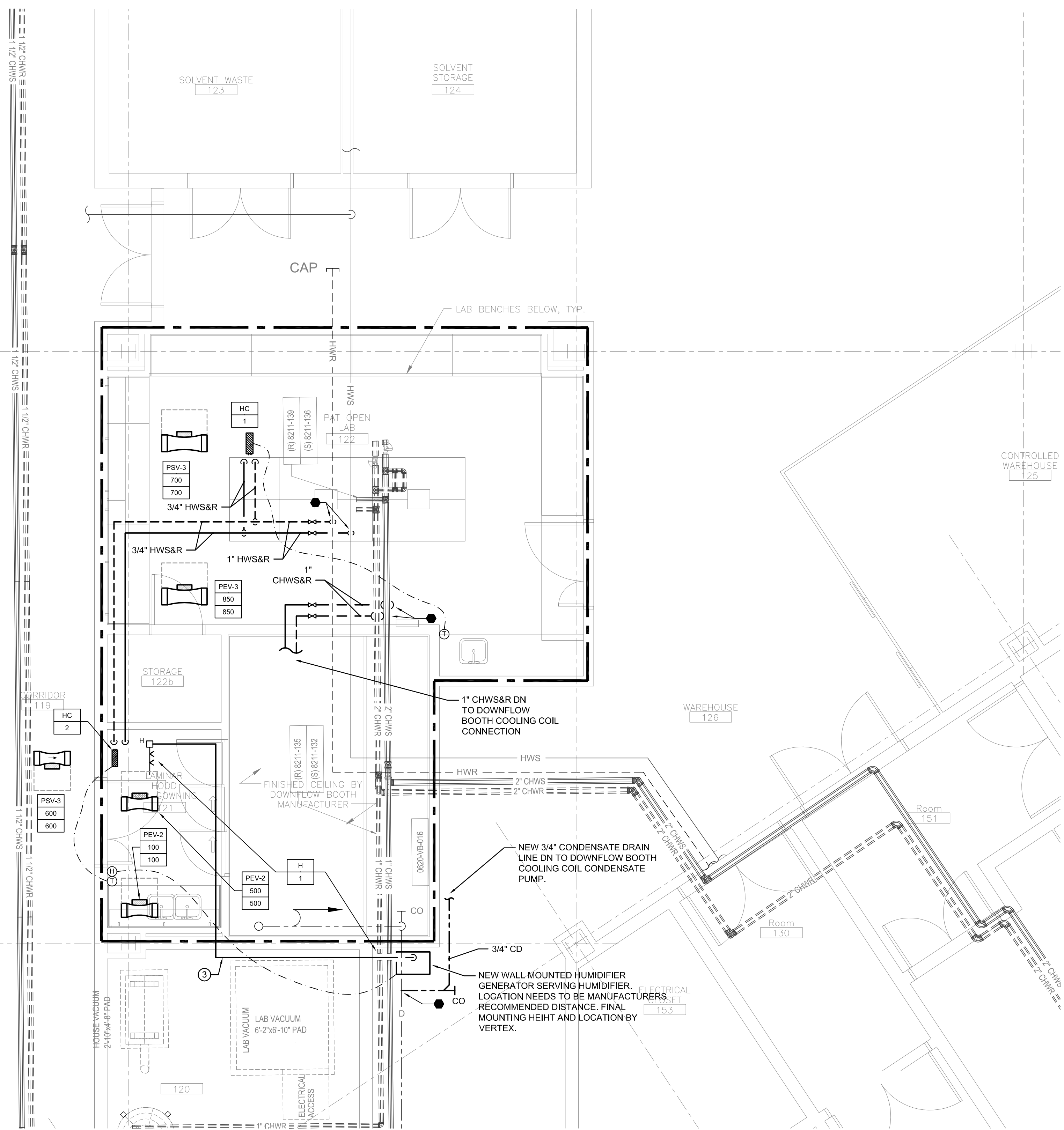
4. THE AIRFLOW CONTROL DEVICE SHALL USE INDUSTRY STANDARD 24 VAC POWER AND PROVIDED WITH REQUIRED STEP DOWN TRANSFORMERS.

5. THE AIRFLOW CONTROL DEVICE SHALL HAVE PROVISIONS TO CONNECT A NOTEBOOK PC COMMISSIONING TOOL AND EVERY NODE ON THE NETWORK SHALL BE ACCESSIBLE FROM ANY POINT IN THE SYSTEM.

6. THE AIRFLOW CONTROL DEVICE SHALL HAVE BUILT-INTEGRAL INPUT/OUTPUT CONNECTIONS ADDRESS DOWNFLOW BOOTH CONTROL, TEMPERATURE CONTROL, HUMIDITY CONTROL, EMERGENCY CONTROL AND NON-NETWORK



1 LEVEL 1 PAT LAB - HVAC DUCTWORK NEW WORK PLAN
SCALE: 1/4"=1'-0"



2 LEVEL 1 PAT LAB - HVAC PIPING NEW WORK PLAN
SCALE: 1/4"=1'-0"

KEYED NOTES

- FINAL BALANCING AIRFLOW VALUE PER DOWNFLOW BOOTH MANUFACTURER SPECIFICATIONS.
- REBALANCE ALL TERMINAL DEVICES AND ROOF EQUIPMENT ASSOCIATED WITH THIS DUCT SYSTEM AS NEEDED TO MEET AIRFLOW VALUES INDICATED IN NEW SCOPE OF WORK.
- SIZE AND INSTALL PIPE PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE STAINLESS STEEL PIPING.

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

HVAC
NEW WORK
PLANS

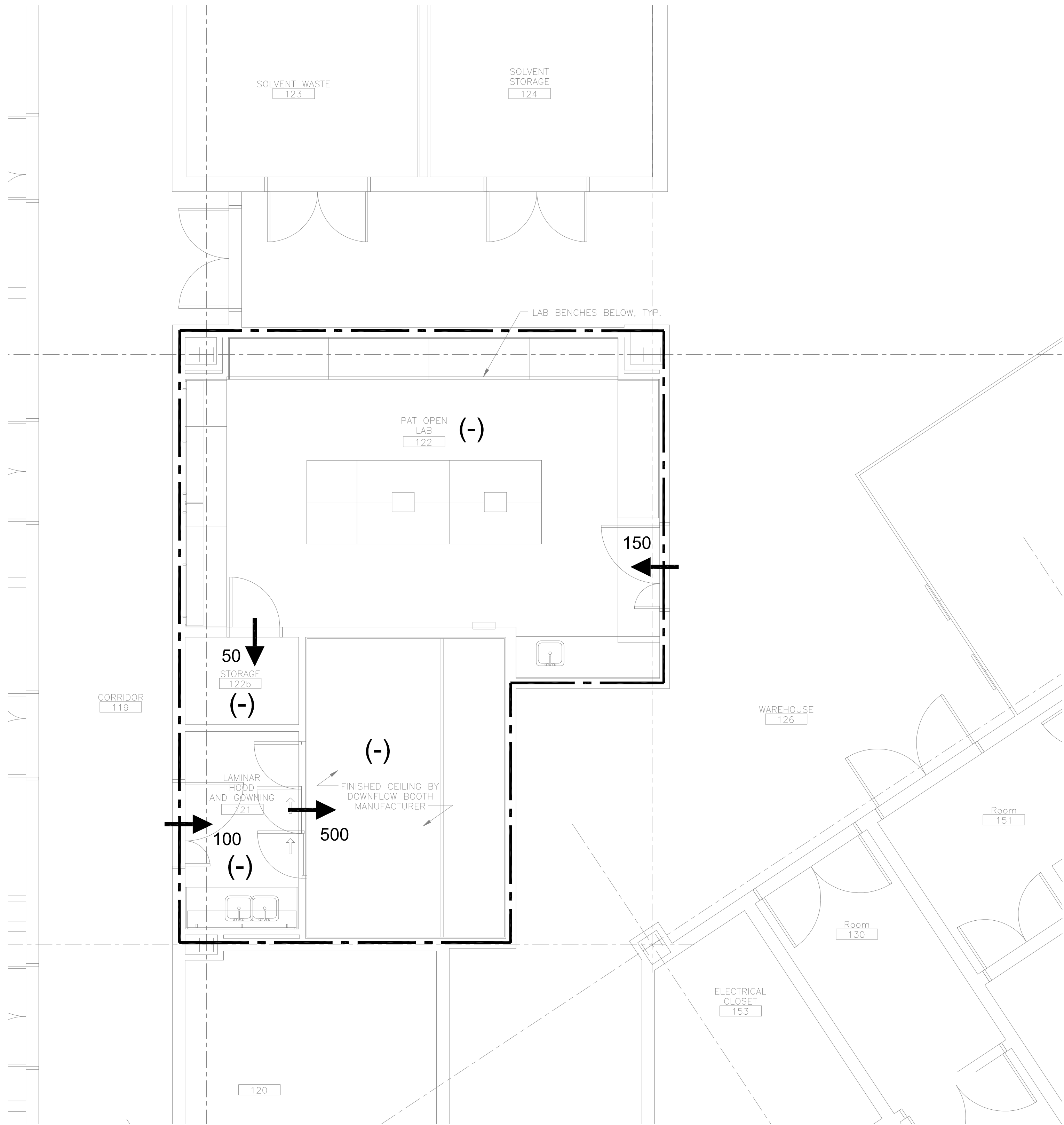
Scale: 1/4"=1'-0" Date Issued: 8/26/16

H1.11

Project Number: 179-07-00

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1 LEVEL 1 PAT LAB - HVAC PRESSURIZATION PLAN
SCALE: 1/4"=1'-0"

Issuance Schedule		
Number	Date	Description

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VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

HVAC
PRESSURIZATION
PLAN

Scale: 1/4"=1'-0" Date Issued: 8/26/16

H1.12

Project Number: 179-07-00

FEEDER SIZE SCHEDULE (COPPER CONDUCTORS)					
FEEDER SYMBOL	CONDUCTORS (3 PHASE, 3 WIRE) WITH GROUND	CONDUIT SIZE	CONDUCTORS (3 PHASE, 4 WIRE) WITH GROUND	CONDUIT SIZE	NOMINAL AMPERE RATING
①	3#6 & 1#10G.	3/4"			60
②	3#6 & 1#8G.	1"	4#6 & 1#10G.	1"	70
③	3#4 & 1#6G.	1 1/4"	4#4 & 1#8G.	1 1/4"	100
④	3#3 & 1#6G.	1 1/2"	4#3 & 1#6G.	1 1/4"	125
⑤	3#1 & 1#6G.	1 1/2"	4#1 & 1#6G.	1 1/2"	150
⑥	3#1/0 & 1#6G.	1 1/2"	4#1/0 & 1#6G.	2"	175
⑦	3#2/0 & 1#6G.	2"	4#2/0 & 1#6G.	2"	200
⑧	3#3/0 & 1#6G.	2 1/2"	4#3/0 & 1#6G.	2"	225
⑨	3#4/0 & 1#4G.	2 1/2"	4#4/0 & 1#4G.	2 1/2"	250
⑩	3-250 kcmil & 1#4G.	3"	4-250 kcmil & 1#4G.	3"	300
⑪	3-350 kcmil & 1#4G.	3"	4-350 kcmil & 1#4G.	3"	350
⑫	3-500 kcmil & 1#3G.	3 1/2"	4-500 kcmil & 1#3G.	4"	400
⑬	2 SETS OF 3-250 kcmil & 1#2G.	2-2 1/2"	2 SETS OF 4-250 kcmil & 1#2G.	2-3"	500
⑭	2 SETS OF 3-350 kcmil & 1#1G.	2-3"	2 SETS OF 4-350 kcmil & 1#1G.	2-3"	600
⑮	2 SETS OF 3-600 kcmil & 1#1/0G.	2-3 1/2"	2 SETS OF 4-600 kcmil & 1#1/0G.	2-4"	800

DRY TYPE TRANSFORMER SCHEDULE							
SIZE	KVA	480V. PRIMARY		208/120V.Y SECONDARY		GROUNDING ELECTRODE CONDUCTOR & COND.	MAIN BONDING JUMPER
		PRI. AMPS	D.C. PROT.	FEEDER	SUPPLY SIDE CONDUCTORS & COND.		
T1	9	11	15A-3P	3#12&1#12G. -1/2"C.	4#10&1#8G. -3/4"C.	1#6-1/2"	#8
T2	15	18	30A-3P	3#10&1#10G. -1/2"C.	4#8&1#6G. -1"C.	1#6-1/2"	#8
T3	30	36	50A-3P	3#8&1#10G. -3/4"C.	4#3&1#6G. -1 1/4"C.	1#6-1/2"	#8
T4	45	54	80A-3P	3#4&1#8G. -1"C.	4#1/0&1#6G. -2"C.	1#6-1/2"	#6
T5	75	90	125A-3P	3#1&1#6G. -1 1/2"C.	4-250kcmil & 1#2G. -3"C.	1#2-1/2"	#2
T6	112.5	136	200A-3P	3#3/0&1#6G. -2"C.	4-500kcmil & 1#1/0G. -4"C.	1#1/0-3/4"	#1/0
T7	150	182	250A-3P	3-250kcmil & 1#4G.-2 1/2"C.	2 SETS OF 4-250kcmil & 1#2G. -3"C.	1#1/0-3/4"	#1/0
T8	225	271	400A-3P	3-500kcmil & 1#3G.-3"C.	2 SETS OF 4-500kcmil & 1#1/0G.-4"C.	1#3/0-3/4"	#3/0
T9	300	361	500A-3P	2 SETS OF 3-250kcmil & 1#2G.-3"C.	3 SETS OF 4-500kcmil & 1#1/0G.-4"C.	1#3/0-3/4"	#4/0
T10	500	602	800A-3P	2 SETS OF 3-500kcmil & 1#1/0G.-3"C.	4 SETS OF 4-600kcmil & 1#1/0G.-4"C.	1#3/0-3/4"	300 kcmil

200% FEEDER SIZE SCHEDULE (COPPER CONDUCTORS)				
FEEDER SYMBOL	CONDUCTORS (3 PHASE, 4 WIRE) WITH GROUND	CONDUIT SIZE	NOMINAL AMPERE RATING	
②a	3#4 & 1#1/0 (NEUTRAL) & 1#1/0G	1 1/4"	60	
④a	3#3 & 1#2/0 (NEUTRAL) & 1#6G	1 1/4"	70	
⑥a	3#1 & 1#4/0 (NEUTRAL) & 1#6G	2"	100	
⑧a	3#2/0 & 2#2/0 (NEUTRAL) & 1#6G	2 1/2"	125	
⑩a	3#3/0 & 2#3/0 (NEUTRAL) & 1#6G	2 1/2"	150	
⑫a	3#4/0 & 2#4/0 (NEUTRAL) & 1#6G	2 1/2"	175	
⑭a	3-250 kcmil & 2-250 kcmil (NEUTRAL) & 1#6G	3"	200	
⑯a	3-300 kcmil & 2-300 kcmil (NEUTRAL) & 1#4G	3"	225	
⑰a	3-350 kcmil & 2-350 kcmil (NEUTRAL) & 1#4G	3 1/2"	250	
⑱a	3-500 kcmil & 2-500 kcmil (NEUTRAL) & 1#4G	4"	300	
⑲a	2 SETS OF 3#4/0 & 2#4/0 (NEUTRAL) & 1#3G	2-2 1/2"	350	
⑳a	2 SETS OF 3-250kcmil & 2-250kcmil (NEUTRAL) & 1#3G	2-3"	400	
㉑a	2 SETS OF 3-400kcmil & 2-400kcmil (NEUTRAL) & 1#2G	2-3 1/2"	500	
㉒a	2 SETS OF 3-500kcmil & 2-500kcmil (NEUTRAL) & 1#1G	2-4"	600	
㉓a	3 SETS OF 3-400kcmil & 2-400kcmil (NEUTRAL) & 1#1/0G	3-3 1/2"	800	

"K" RATED TRANSFORMER SCHEDULE							
SIZE	KVA	480V. PRIMARY		208/120V.Y SECONDARY		GROUNDING ELECTRODE CONDUCTOR & COND.	MAIN BONDING JUMPER
		PRI. AMPS	D.C. PROT.	FEEDER	SUPPLY SIDE CONDUCTORS & COND.		
T2A	15 K-13	18	30A-3P	3#10&1#10G. -1/2"C.	3#6 & 2#6 (NEUTRALS) 1#8G.-1 1/4"C.	1#6-1/2"	#8
T3A	30 K-13	36	50A-3P	3#8&1#10G. -3/4"C.	3#1 & 2#1 (NEUTRALS) 1#6G.-2"	1#6-1/2"	#6
T4A	45 K-13	54	80A-3P	3#4&1#8G. -1"C.	3#3/0 & 2#3/0 (NEUTRALS) 1#4G.-2 1/2"C.	1#6-1/2"	#4
T5A	75 K-13	90	125A-3P	3#1&1#6G. -1 1/2"C.	3-350kcmil & 2-350kcmil (NEUTRALS) 1#2G.-3 1/2"C.	1#2-1/2"	#2
T6A	112.5 K-13	136	200A-3P	3#3/0&1#6G. -2"C.	2 SETS OF 3-250kcmil & 2-250kcmil (NEUTRAL) 1#2G.-3"C.	1#1/0-3/4"	#1/0
T7A	150 K-13	182	250A-3P	3-250kcmil & 1#4G.-2 1/2"C.	2 SETS OF 3-400kcmil & 2-400kcmil (NEUTRAL) 1#1/0G.-3 1/2"C.	1#1/0-3/4"	#2/0
T8A	225 K-13	271	400A-3P	3-500kcmil & 1#3G.-3"C.	3 SETS OF 3-400kcmil & 2-400kcmil (NEUTRAL) 1#1/0G.-3 1/2"C.	1#2/0-3/4"	#3/0
T9A	300 K-13	361	500A-3P	2 SETS OF 3-250kcmil & 1#2G.-3"C.	3 SETS OF 3-600kcmil & 2-600kcmil (NEUTRALS) 1#3/0 G.-4"C.	1#3/0-3/4"	250 kcmil
T10A	500 K-13	602	800A-3P	2 SETS OF 3-500 kcmil & 1#1/0G.-3"C.	5 SETS OF 600 kcmil & 2-600 kcmil (NEUTRALS) 1#1/0 G.-4"C.	1#3/0-3/4"	400 kcmil

NOTE:
1. WHEN ISOLATED GROUND CONDUCTOR IS REQUIRED, PROVIDE AN ISOLATED GROUND CONDUCTOR EQUAL TO EQUIPMENT GROUND.

SPECIAL PURPOSE RECEPTACLE SCHEDULE				
SYMBOL	NEMA	DESCRIPTION	CIRCUIT BREAKER	BRANCH CIRCUIT
①-H	5-20R	20A - 125V, 2P, 3W	20A-1P	2#12 & 1#12G., - 1/2"C.
②-H	5-30R	30A - 125V, 2P, 3W	30A-1P	2#10 & 1#10G., - 1/2"C.
③-H	5-50R	50A - 125V, 2P, 3W	50A-1P	2#6 & 1#10G., - 3/4"C.
④-H	6-20R	20A - 250V, 2P, 3W	20A-2P	2#12 & 1#12G., - 1/2"C.
⑤-H	6-30R	30A - 250V, 2P, 3W	30A-2P	2#10 & 1#10G., - 1/2"C.
⑥-H	6-50R	50A - 250V, 2P, 3W	50A-2P	2#6 & 1#10G., - 3/4"C.
⑦-H	14-20R	20A - 125/250V, 3P, 4W	20A-2P	3#12 & 1#12G., - 1/2"C.
⑧-H	14-30R	30A - 125/250V, 3P, 4W	30A-2P	3#10 & 1#10G., - 1/2"C.
⑨-H	14-50R	50A - 125/250V, 3P, 4W	50A-2P	3#6 & 1#10G., - 3/4"C.
⑩-H	14-60R	60A - 125/250V, 3P, 4W	60A-2P	3#6 & 1#10G., - 3/4"C.
⑪-H	15-20R	20A - 250V, 3Ø 3P, 4W	20A-3P	3#12 & 1#12G., - 1/2"C.
⑫-H	15-30R	30A - 250V, 3Ø 3P, 4W	30A-3P	3#10 & 1#10G., - 1/2"C.
⑬-H	15-50R	50A - 250V, 3Ø 3P, 4W	50A-3P	3#6 & 1#10G., - 3/4"C.
⑭-H	15-60R	60A - 250V, 3Ø 3P, 4W	60A-3P	3#6 & 1#10G., - 3/4"C.
⑮-H	L5-20R	20A - 125V, 2P, 3W, TWIST LOCK	20A-1P	2#12 & 1#12G., - 1/2"C.
⑯-H	L5-30R	30A - 125V, 2P, 3W, TWIST LOCK	30A-1P	2#10 & 1#10G., - 1/2"C.
⑰-H	L6-15R	15A - 250V, 2P, 3W, TWIST LOCK	15A-2P	2#12 & 1#12G., - 1/2"C.
⑱-H	L6-20R	20A - 250V, 2P, 3W, TWIST LOCK	20A-2P	2#12 & 1#12G., - 1/2"C.
⑲-H	L6-30R	30A - 250V, 2P, 3W, TWIST LOCK	30A-2P	2#10 & 1#10G., - 1/2"C.
⑳-H	6-15R	15A - 125V, 2P, 3W	15A-2P	2#12 & 1#12G., - 1/2"C.

LIGHTING FIXTURE SCHEDULE							
TYPE	MTG.	DESCRIPTION	MANUFACTURER AND CATALOG NUMBER	LAMP		VOLT	REMARKS
				NO.	TYPE		
F2	RECESSED	2'X4' STATIC FLUORESCENT TROFFER WITH ANTI-MICROBIAL POWDER COATING	H.E. WILLIAMS 50G-S24-22815S-FA12125-AMW-EB24UNV	2	28WTS/ SPX35	277	MATCH EXISTING
F2E	RECESSED	SAME AS TYPE "F2" EXCEPT WITH EMERGENCY BATTERY PACK	H.E. WILLIAMS 50G-S24-22815S-FA12125-AMW-EB24EM1460VTS/2P-EB24UNV	2	28WTS/ SPX35	277	MATCH EXISTING
L3	RECESSED	6" DIAM. LED DOWNLIGHT FIXTURE	H.E. WILLIAMS LEDP60-2000-40K-SG-ED*AD-277	1	26W LED	277	MATCH EXISTING
L3E	RECESSED	SAME AS TYPE "L3" EXCEPT WITH EMERGENCY BATTERY PACK	H.E. WILLIAMS LEDP60-2000-40K-SG-EM/BSL17C/1-277-ED*AD-277	1	26W LED	277	MATCH EXISTING
⊗	UNIVERSAL	EDGE-LIT LED EXIT SIGN WITH BATTERY PACK	EMERGLITE W-LXN-1-N-R-C-ARROW-C-D	-	LED	277	NUMBER OF FACES AND DIRECTIONAL ARROWS AS REQUIRED. MATCH EXISTING.

NOTES:
1. ALL EMERGENCY BATTERY PACKS SHALL DELIVER 1100 LUMENS MINIMUM.
2. COORDINATE ALL FLANGES WITH CEILING TYPES PROVIDED.

MECHANICAL EQUIPMENT SCHEDULE												
EQUIP. TAG	EQUIPMENT	CHARACTERISTICS	VOLTS	PH.	PANEL	CKT. BRK.	FEEDER	CONNECTION				REMARKS
<div>EH</div>	ELECTRIC HUMIDIFIER	14.4 A	480	3	SEE PLANS	20A-3P	3#12, 1#12G., 1/2".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	WP
<div>PV</div>	PHOENIX VALVE	250 W	120	1	SEE PLANS	20A-1P	2#12, 1#12G., 1/2".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

MECHANICAL EQUIPMENT SCHEDULE NOTES:

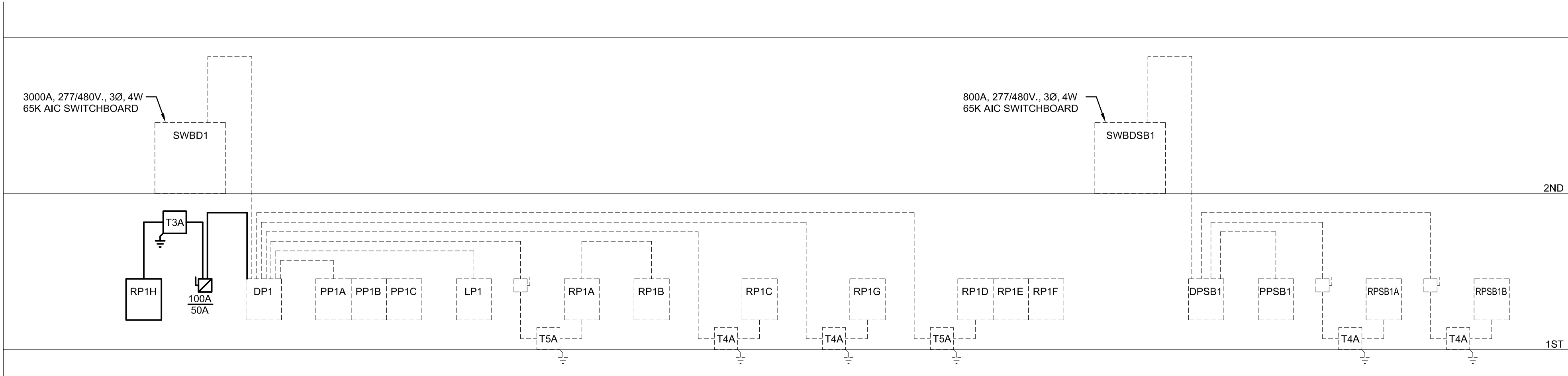
1. STARTERS (FVNR, VFD, RVNR, ETC.) SHALL BE FURNISHED AND INSTALLED BY MECHANICAL CONTRACTORS AND WIRED BY ELECTRICAL CONTRACTOR. FOR EXACT LOCATIONS REFER TO MECHANICAL DRAWINGS.

2. E.C. SHALL COORDINATE FUSE SIZE AND OVERCURRENT PROTECTION FOR ALL MECHANICAL EQUIPMENT WITH MANUFACTURER'S RECOMMENDATIONS.

LABORATORY EQUIPMENT SCHEDULE														
EQUIP. TAG	EQUIPMENT	CHARACTERISTICS	VOLTS	PH.	PANEL	CKT. BRK.	FEEDER	CONNECTION					REMARKS	
								\$	☒	☒	☐	☒		☒
DFB	DOWNFLOW BOOTH	25 A	480	3	DP1-2	30A-3P	3#10, 1#10G., 1/2".					X	X	

PANELBOARD SCHEDULE									
PANEL	VOLTAGE	MAINS	MLO/ MCB	MTG	BRANCH CIRCUIT BREAKERS		SPACES 1 P.	A.I.C. (RMS)	REMARKS
					ACTIVE	SPARE			
EXIST. DP1	277/480V., 3ø, 4W	800A	800A	SURFACE	ADD: (1) 50A-3P; (1) 30A-3P; (1) 20A-3P		—	—	MATCH EXISTING AIC RATING
RP1H	120/208V., 3ø, 4W	100A	100A	SURFACE	(19) 20A-1P		(11) 20A-1P	12	10K

NOTES:
CIRCUIT NUMBERS INDICATED ARE FOR REFERENCE PURPOSES ONLY. ACTUAL CIRCUIT NUMBERS SHALL BE DETERMINED BY SPARE BREAKERS IN EXISTING PANELS MADE AVAILABLE THROUGH DEMOLITION. UTILIZE SPARE BREAKERS AND SPACES AS REQUIRED.



PARTIAL POWER DISTRIBUTION RISER DIAGRAM

N.T.S.
NOTES:
— NEW ELECTRICAL EQUIPMENT.
----- EXISTING ELECTRICAL EQUIPMENT TO REMAIN, UNLESS OTHERWISE NOTED



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Issuance Schedule
Number Date Description

ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS
LEVEL 1 PAT LAB

ELECTRICAL
SCHEDULES
AND DETAILS

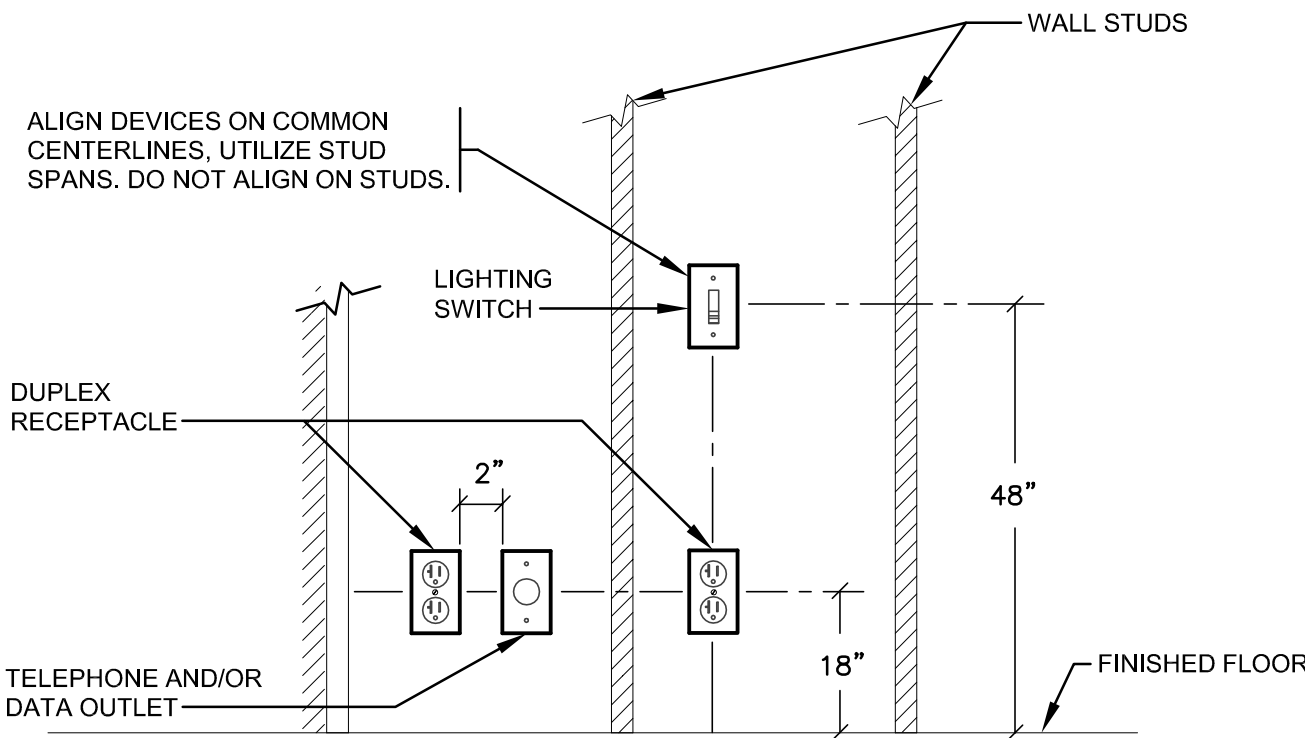
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Project Number: 179-07-00

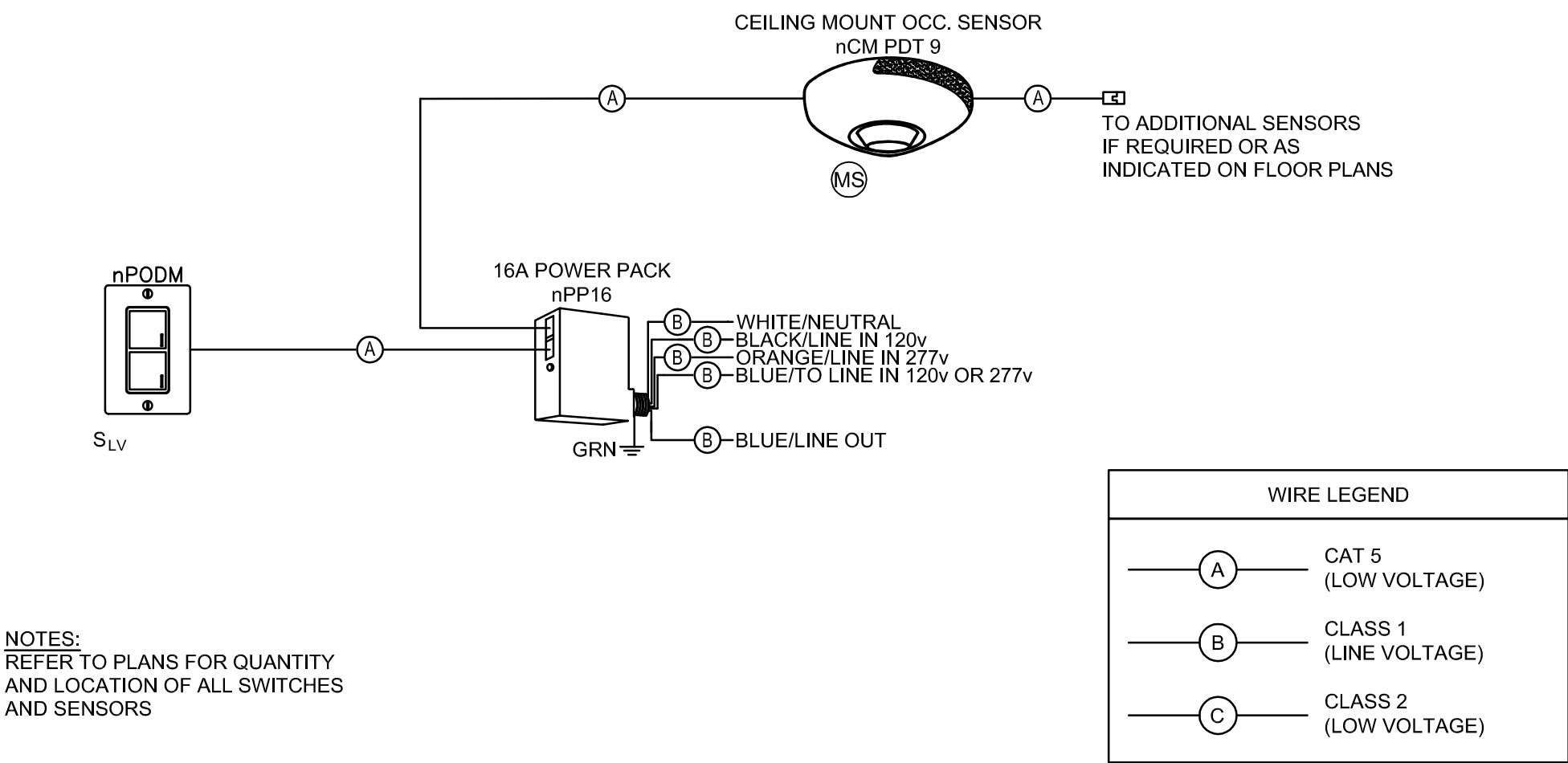
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1 TYPICAL DEVICE MOUNTING DETAIL
SCALE: NTS



NOTES:
1. WHERE POSSIBLE, E.C. SHALL ALIGN DEVICES WITH FIRE ALARM DEVICES.

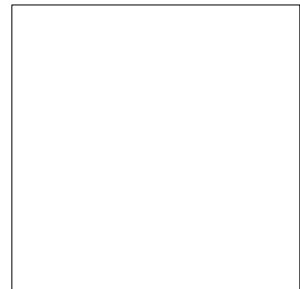
2 LABORATORY (MANUAL ON) WITH
OCCUPANCY SENSOR DETAIL
SCALE: NTS



NOTES:
REFER TO PLANS FOR QUANTITY
AND LOCATION OF ALL SWITCHES
AND SENSORS

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Issuance Schedule		
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VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

ELECTRICAL
SCHEDULES
AND DETAILS

Scale: NONE Date Issued: 8/26/16

E0.03

Project Number: 179-07-00

ELECTRICAL SPECIFICATION

I. GENERAL

- A. THE WORK COVERED CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO INSTALL, COMPLETE AND READY FOR CONTINUOUS OPERATION, THE ELECTRICAL SYSTEMS, APPARATUS AND EQUIPMENT FOR THE VERTEX PAT STACK LAB, 1 HARBOR STREET, BOSTON, MA.
- B. SHOP DRAWINGS OF ALL SPECIFIED FIXTURES, EQUIPMENT AND APPARATUS SHALL BE SUBMITTED TO THE ARCHITECT FOR APPROVAL.
- C. CODES: ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE ELECTRICAL SUB-CONTRACTS AND LABOR PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE MASSACHUSETTS STATE BUILDING AND ELECTRICAL CODES, THE CITY OF BOSTON, NATIONAL FIRE PROTECTION ASSOCIATION AND INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.
- D. PERMITS: ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THE SPECIFICATION INCLUDING ALL FEES OR EXPENSES INCURRED.
- E. INSTRUCTIONS: DURING THE ASSEMBLY AND INSTALLATION OF ALL ELECTRICAL SYSTEMS, THE OWNER'S OPERATING PERSONNEL SHALL BE INSTRUCTED REGARDING ITS OPERATION AND MAINTENANCE. A TWO (2) WEEK INSTRUCTION PERIOD SHALL BE PROVIDED AFTER COMPLETION OF PROJECT. OPERATION AND MAINTENANCE MANUALS SHALL BE REQUIRED.
- F. GUARANTEE: ALL MATERIALS AND EQUIPMENT FURNISHED AND INSTALLED, SHALL BE GUARANTEED IN WRITING FOR ONE (1) YEAR, FROM THE DATE OF ACCEPTANCE OF THE BUILDING BY THE OWNER.
- G. RECORD DRAWINGS: PURCHASE AND MAINTAIN AT THE JOB SITE A COMPLETE AND SEPARATE BLACK LINE SET OF PRINTS OF THE CONTRACT DRAWINGS ON WHICH ACCURATELY INDICATE DAILY PROGRESS BY COLORING MATERIALS AND APPARATUS AS INSTALLED. SCHEDULES SHALL BE MODIFIED TO REFLECT DATA CONSISTENT WITH THAT OF THE INSTALLED EQUIPMENT. CLEARLY SHOW ALL CHANGES TO THE WORK AS A RESULT OF CHANGE ORDERS, INSTRUCTIONS ISSUED BY THE ARCHITECT OR CONDITIONS ENCOUNTERED IN THE FIELD. ACCURATELY INDICATE THE LOCATION, SIZE, TYPE AND ELEVATION OF NEW UTILITIES AND THEIR RELATIONSHIP TO EXISTING UTILITIES. THE MARKED UP AND COLORED IN PRINTS WILL BE USED AS A GUIDE FOR DETERMINING THE PROGRESS OF THE WORK INSTALLED. THEY SHALL BE INSPECTED WEEKLY AND SHALL BE CORRECTED IMMEDIATELY IF FOUND INACCURATE OR INCOMPLETE. REQUISITIONS FOR PAYMENT WILL NOT BE APPROVED UNTIL THE DRAWINGS ARE ACCURATE AND UP-TO-DATE. AT THE COMPLETION OF THE WORK, SUBMIT ONE (1) SET OF MARKED UP PRINTS FOR REVIEW AND COMMENT. AFTER REVIEW AND COMMENT, THESE MARKED UP PRINTS SHALL BE USED IN THE PREPARATION OF THE RECORD DRAWINGS. THE RECORD DRAWINGS SHALL CONSIST OF THESE PRINTS (CORRECTED) PREVIOUSLY INDICATED, AS WELL AS TWO (2) CAD DISKS OF THE FINAL COORDINATION DRAWINGS, CORRECTED ON THE BASIS OF THE ARCHITECT/ENGINEER'S FINAL COMMENTS. OBTAIN AND PAY FOR ONE (1) SET OF REPRODUCIBLES AND CAD DISKS (AUTOCAD RELEASE 2000 MINIMUM OR COMPATIBLE SYSTEM) APPLICABLE TO THIS SECTION. MAKE ALL MODIFICATIONS TO THESE REPRODUCIBLES AS SHOWN ON THE MARKED UP PRINTS. REMOVE ALL SUPERSEDED DATA TO SHOW THE COMPLETED INSTALLATION. THE RECORD DRAWINGS MAY BE MADE FROM THE ORIGINALS OF THE CONTRACT DRAWINGS. ARRANGE WITH THE ARCHITECT TO HAVE THESE REPRODUCIBLES MADE FROM THE ORIGINALS. DELIVER THE COMPLETED REPRODUCIBLE RECORD DRAWINGS AND CAD DISKS PROPERLY TITLED AND DATED TO THE ARCHITECT. THESE RECORD DRAWINGS SHALL BECOME THE PROPERTY OF THE OWNER.
- H. INSPECTION: ALL WORK SHALL BE SUBJECT TO THE INSPECTION OF THE OWNER, THE ARCHITECT AND SUCH OTHER INSPECTORS HAVING JURISDICTION. A PROPERLY EXECUTED CERTIFICATE OF INSPECTION SHALL BE PROVIDED.
- I. TESTS: THE ELECTRICAL SUBCONTRACTOR SHALL PERFORM ALL TESTS AT THE COMPLETION OF THE WORK AND THE RESULTS FURNISHED TO THE OWNER AND ARCHITECT IN WRITING. TESTS SHALL INCLUDE BUT NOT BE LIMITED TO: ALL SYSTEMS TEST FREE OF SHORTS OR GROUNDS, PROPER NEUTRAL CONNECTIONS, GROUND SYSTEM RESISTANCE, SECONDARY VOLTAGES AT MAIN DISTRIBUTION PANEL, POWER PANELS AND LIGHTING PANELS, ALL LIGHTING FIXTURES WITH LAMPS IN PLACE FOR TEN (10) HOURS.
- J. COORDINATION DRAWINGS: PRIOR TO THE PURCHASING AND FABRICATION OF MATERIALS, EACH SUBCONTRACTOR SHALL PREPARE COORDINATION DRAWINGS FOR ALL FLOORS/AREAS SHOWING THE SIZE AND LOCATION OF HIS/HER EQUIPMENT AND LINES. THE COORDINATION DRAWINGS SHALL BE PRODUCED ON AUTOCAD RELEASE 2000 MINIMUM OR COMPATIBLE SYSTEM. A DISC AND ONE (1) SET OF REPRODUCIBLES (ALL-TRADE COMPOSITE) SHALL BE PROVIDED TO THE ARCHITECT/ENGINEER FOR REVIEW. COORDINATION DRAWINGS SHALL BE 3/8" = 1'-0" SCALE. PREPARE AND SUBMIT FOR REVIEW, AT THAT SCALE OR LARGER, PLANS AND SECTIONS. THE COST OF PREPARING AND REPRODUCING THESE DRAWINGS WILL BE INCLUDED AS PART OF THIS CONTRACT. THE HVAC SUBCONTRACTOR SHALL PREPARE THE INITIAL DRAWINGS AND CIRCULATE THE DRAWINGS TO THE OTHER TRADES (FIRE PROTECTION, PLUMBING AND ELECTRICAL) SO THEY CAN INDICATE THEIR WORK. COORDINATION DRAWINGS SHALL NOT BE CONSTRUED AS REPLACING ANY SHOP DRAWINGS. THE PLUMBING SUBCONTRACTOR SHALL BE ADDITIONALLY RESPONSIBLE FOR PREPARING DRAWINGS INDICATING ALL THE BURIED OR UNDERGROUND PLUMBING SYSTEMS, INCLUDE IN THESE DOCUMENTED UNITS, UNDERGROUND COMPONENTS SUCH AS, BUT NOT LIMITED TO, UNDERSLAB DRAINAGE SYSTEMS, FOUNDATION DRAINAGE SYSTEMS, FOOTINGS, FOUNDATION WALLS, PITS, THE BEAMS, ELECTRIC AND TELEPHONE DUCT BANKS.
- K. UPON COMPLETION OF ALL WORK, THE ELECTRICAL SUBCONTRACTOR SHALL FURNISH, IN DUPLICATE, CERTIFICATES OF INSPECTIONS FROM ALL INSPECTORS AND AUTHORITIES, HAVING JURISDICTION, NOTARIZED LETTERS FROM THE MANUFACTURERS, STATING THAT AUTHORIZED FACTORY ENGINEERS HAVE INSPECTED AND TESTED THE INSTALLATION OF THEIR RESPECTIVE SYSTEMS AND FOUND SAME TO BE IN PERFECT OPERATING CONDITION.

II. SCOPE

- A. THE WORK OF THIS SECTION CONSISTS OF ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO PROVIDE ALL ELECTRICAL WORK, NOT SPECIFICALLY DESCRIBED IN OTHER TRADES COMPLETE, IN PLACE, AS SHOWN ON THE DRAWINGS, SPECIFIED HEREIN AND AS NECESSARY FOR A PROPER INSTALLATION.
- B. THE EXTENT OF THE ELECTRICAL SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:
1. INTERIOR SECONDARY NORMAL AND EMERGENCY DISTRIBUTION SYSTEMS INCLUDING ALL SWITCHGEAR, EMERGENCY GENERATOR, DISTRIBUTION PANELBOARDS, INDIVIDUALLY MOUNTED CONTROLS, TRANSFORMERS, DISCONNECT SWITCHES, RACEWAYS, CABLES, WIRING, JUNCTION AND PULL BOXES, TERMINAL CABINETS, WIREWAY AND ALL OTHER COMPONENTS REQUIRED FOR A COMPLETE LIGHTING, POWER AND LOW TENSION SYSTEMS.
 2. ALL LIGHTING SYSTEMS (INDOOR AND OUTDOOR, NORMAL, EMERGENCY AND EXIT) INCLUDING ALL FIXTURES, LAMPS, PLASTER AND TILE FRAMES, SWITCHES, OUTLETS, WIRING RACEWAYS AND ALL OTHER COMPONENTS AND FITTINGS REQUIRED FOR A COMPLETE LIGHTING SYSTEM.
 3. INTERIOR TELEPHONE CONDUIT SYSTEM.
 4. POWER AND ALARM WIRING TO INCLUDE CONNECTIONS FOR HEATING, VENTILATING AND AIR CONDITIONING SYSTEM MOTORS AND EQUIPMENT. ALL STARTERS AND LINE VOLTAGE THERMOSTATS WILL BE FURNISHED TO THE ELECTRICAL CONTRACTOR FOR WIRING, CONNECTIONS AND MOUNTING.
 5. POWER, CONTROL AND ALARM WIRING TO INCLUDE CONNECTIONS FOR THE PLUMBING AND FIRE PROTECTION SYSTEMS. EQUIPMENT SHALL BE WIRED AND CONNECTED BY THE ELECTRICAL CONTRACTOR.
 6. GROUNDING AND BONDING OF ALL ELECTRICAL SYSTEMS AND EQUIPMENT.
 7. GENERAL PURPOSE RECEPTACLES WITH WIRING AND ALL COMPONENTS REQUIRED FOR A COMPLETE SYSTEM.
 8. SPECIAL POWER FOR OWNER'S EQUIPMENT CONNECTIONS.
 9. ALL OTHER SYSTEMS HEREINAFTER SPECIFIED OR INDICATED ON THE CONTRACT DRAWINGS, COMPLETE, LEAVING READY AN ELECTRICAL SYSTEM IN PERFECT OPERATING CONDITION.

III. RELATED WORK

- A. THE FOLLOWING EQUIPMENT ITEMS AND WORK SHALL BE THE RESPONSIBILITY OF OTHERS:
1. TELEPHONE SYSTEM EQUIPMENT AND INSTRUMENTS ARE TO BE FURNISHED AND INSTALLED BY OWNER'S PRIVATE TELEPHONE COMPANY.
 2. ALL AUTOMATIC TEMPERATURE CONTROL SYSTEM COMPONENTS, WIRING AND INTERLOCK WIRING ASSOCIATED WITH THE HEATING, VENTILATING AND AIR CONDITIONING SYSTEM WILL BE FURNISHED, MOUNTED, WIRED AND CONNECTED BY THE HVAC CONTRACTOR.
 3. FINISH PAINTING, EXCEPT FACTORY FINISHED ITEMS.

4. MOUNTING OF ELECTRICAL EQUIPMENT HAVING MECHANICAL CONNECTIONS. REFER TO WORK INVOLVING MECHANICAL TRADES.
5. CONCRETE, MASONRY WORK INCLUDING FINISH PAINTING.
6. INSTALLATION, WIRING AND CONNECTING OF AUTOMATIC TEMPERATURE CONTROLS UNLESS OTHERWISE NOTED OR SPECIFIED.
7. STARTERS AND CONTROL DEVICES FOR HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT UNLESS OTHERWISE NOTED OR SPECIFIED.
8. STARTERS AND CONTROL DEVICES FOR PLUMBING EQUIPMENT.

IV. EXISTING MAIN ELECTRIC SERVICE

- A. ELECTRICAL SERVICE IS EXISTING AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
- B. SECONDARY VOLTAGE CHARACTERISTICS FOR PROJECT ARE 480/277 VOLT, THREE PHASE, 4-WIRE, 60 CYCLE AND 120/208 VOLTS, THREE PHASE, 4-WIRE, 60 CYCLE.

V. NAMEPLATES

- A. NAMEPLATES SHALL BE FURNISHED AND INSTALLED ON EACH DEVICE OF THE MAIN SWITCHBOARD, PANELBOARDS, JUNCTION BOXES, CABINETS FOR SPECIAL PURPOSES, MOTOR DISCONNECT SWITCHES, REMOTE CONTROL STATIONS, STARTERS AND OTHER CONTROLS FURNISHED UNDER THIS CONTRACT, TO DESIGNATE EQUIPMENT CONTROLLED AND FUNCTION.
- B. NAMEPLATES SHALL BE LAMINATED BLACK BAKELITE WITH 1/4 INCH HIGH WHITE RECESSED LETTERS SECURED WITH GALVANIZED SCREWS OR RIVETS.

VI. TEMPORARY POWER AND LIGHT

- A. FURNISH AND INSTALL TEMPORARY LIGHTING AND POWER REQUIRED BY THE TRADES FOR CONSTRUCTION PURPOSES. THE OPERATION AND MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

VII. SEISMIC RESTRAINTS

- A. INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, ACCESSORIES AND COMPONENTS SHALL BE IN ACCORDANCE WITH THE SEISMIC REQUIREMENTS IDENTIFIED IN THE MASSACHUSETTS STATE BUILDING CODE, EIGHTH (8TH) EDITION.

VII. MATERIALS

A. WIRE AND CABLE:

1. ALL CONDUCTORS AND INSTALLED SHALL BE SIZED PER THE MASSACHUSETTS ELECTRICAL CODE.
2. ALL CONDUCTORS SHALL BE 98% CONDUCTIVITY, COPPER WITH 75C/90C DUAL-RATED INSULATION, #12 THROUGH #6 AWG TYPE THHN-THWN; #4 AWG AND LARGER TYPE XHHW, UNLESS OTHERWISE INDICATED. MINIMUM SIZE #12 AWG.
3. ALL WIRING SHALL BE COLOR-CODED.
4. FLEXIBLE METAL CLAD (MC) 90C RATED CABLE WITH GALVANIZED STEEL ARMOR SHALL HAVE THE REQUIRED NUMBER OF PHASE CONDUCTORS, NEUTRAL AND FULL SIZE INSULATED (GREEN) GROUND CONDUCTOR. CONDUCTORS SHALL BE #12 AWG. MINIMUM, TYPE THHN.

B. RACEWAYS AND PULL BOXES:

1. ALL WIRING SHALL BE INSTALLED IN RIGID GALVANIZED STEEL CONDUIT, INTERMEDIATE STEEL CONDUIT, OR ELECTRIC METALLIC TUBING WHICHEVER IS APPLICABLE TO THE MASSACHUSETTS ELECTRIC CODE AND SIZED IN ACCORDANCE WITH SAME.
2. BRANCH CIRCUIT WIRING AND PANELBOARD HOMERUNS SHALL BE IN E.M.T., MINIMUM SIZE 1/2 INCH.
3. METAL CLAD CABLE WITH A FULL SIZE, INSULATED, SEPARATE GROUND WIRE MAY BE USED AS PERMITTED TO THE NEW LOADS SERVED. THE BRANCH CIRCUIT WIRING CONCEALED ABOVE HUNG CEILINGS AND IN STUDDED PARTITIONS.
4. ALL WIRING FOR THE FIRE ALARM SYSTEM SHALL BE INSTALLED IN E.M.T.
5. SETSCREW CONNECTORS SHALL BE GALVANIZED STEEL.
6. WIREWAYS SHALL BE OF THE CODE GAUGE STEEL TYPE WITH HINGED AND SCREW COVERS.
7. PULL BOXES SHALL BE OF THE CODE GAUGE GALVANIZED STEEL WITH SCREW COVERS TO MATCH. PULL BOXES SHALL BE INSTALLED IN ACCORDANCE WITH THE MASSACHUSETTS ELECTRICAL CODE AND/OR JOB CONDITIONS.

C. GROUNDING:

1. GROUNDING SHALL BE IN ACCORDANCE WITH THE MASSACHUSETTS ELECTRICAL CODE.
2. ALL SERVICE TRANSFORMERS, SWITCHBOARD, FIXTURES, DRY TYPE TRANSFORMERS, NEUTRAL CONDUCTORS, METAL CONDUITS, SUPPORTS, PANELBOARDS, MOTOR FRAMES, STARTERS, SAFETY SWITCHES AND ALL OTHER METAL PARTS SHALL BE GROUNDED. A COMPLETE GREEN GROUND WIRE SYSTEM SHALL BE INSTALLED WITH ALL PHASE CONDUCTORS IN ADDITION TO NEUTRAL CONDUCTOR IN ALL FEEDERS AND BRANCH CIRCUITS.

D. EXISTING PANELBOARDS - LIGHTING, POWER

1. THE EXISTING PANELBOARDS ARE SUITABLE FOR 480/277 VOLTS, THREE-PHASE, 4-WIRE AND 208/120 VOLTS, THREE PHASE, 4-WIRE OPERATION AS PREVIOUSLY INSTALLED.
2. WHERE CONNECTIONS ARE MADE IN EXISTING PANELBOARDS, THE PANEL INDEX SHALL BE REVISED TO INDICATE THE NEW LOADS SERVED. ALL EXISTING PANELBOARDS THAT DO NOT HAVE A CIRCUIT DIRECTORY CARD MOUNTED IN A FRAME WITH NONCOMBUSTIBLE PLASTIC COVER SHALL HAVE ONE INSTALLED ON THE INSIDE OF THE DOOR. ALL DIRECTORY CARDS SHALL BE PROPERLY FILLED IN, USING A TYPEWRITER AND INDICATING AREAS AND DEVICES SERVED BY EACH UNIT.
3. NEW CIRCUIT BREAKERS ADDED TO EXISTING PANELBOARDS SHALL BE THE SAME FRAME SIZE AND INTERRUPTING CAPACITY AS EXISTING PANELBOARDS AND CIRCUIT BREAKERS.

E. PANELBOARDS:

1. ALL PANELBOARDS SHALL BE DEAD FRONT, SAFETY TYPE, WITH NEMA 1 ENCLOSURE, EQUIPPED WITH SINGLE OF MULTI-POLE BOLT-ON CIRCUIT BREAKERS. THE PANELBOARDS SHALL BE INSTALLED IN SURFACE MOUNTED OR RECESSED WALL CABINETS.
2. PANELBOARDS SHALL BE SUITABLE FOR 120/208 VOLTS, 3 PHASE, 4-WIRE OPERATION.
3. PANELBOARDS SHALL INCLUDE A SEPARATE GROUND BUS AND TERMINAL STRIP.
4. PANELBOARDS SHALL BE AS MANUFACTURED BY GENERAL ELECTRIC, CUTLER-HAMMER/WESTINGHOUSE, SIEMENS, OR SQUARE D.

F. DISCONNECT SWITCHES:

1. DISCONNECT SWITCHES SHALL BE OF THE FUSED OR UNFUSED TYPE HEAVY DUTY, INTERLOCKING COVER AND SIDE OPERATED, RATED 250 OR 600 VOLTS AS REQUIRED.
2. SWITCHES SHALL BE HORSEPOWER RATED FOR THE VOLTAGE OF THE MOTOR BEING SERVED. ENCLOSURES SHALL BE NEMA 1 INDOORS, NEMA 3R OUTDOORS.
3. SWITCHES SHALL BE GENERAL ELECTRIC, SQUARE D, CUTLER-HAMMER/WESTINGHOUSE OR APPROVED EQUAL.
4. FURNISH AND INSTALL DISCONNECT SWITCHES FOR ALL ITEMS OF HVAC AND PLUMBING EQUIPMENT WHICH ARE NOT SPECIFIED AS BEING EQUIPPED OR FURNISHED WITH MAIN DISCONNECT DEVICES IN THE RESPECTIVE SPECIFICATION OF EACH PIECE OF EQUIPMENT.

G. FUSES:

1. FURNISH AND INSTALL THE FUSES NECESSARY TO COMPLETE THE ELECTRICAL INSTALLATION.
2. UNLESS OTHERWISE NOTED, FUSES SHALL BE GENERAL PURPOSE, ONE TIME, CARTRIDGE TYPE, UL CLASS H.
3. DUAL ELEMENT FUSES, WHERE INDICATED (D.E.) SHALL BE CURRENT LIMITING TIME DELAY, CARTRIDGE TYPE, UL CLASS RK-5, WITH SHORT CIRCUIT INTERRUPTING CAPACITY OF 200,000 AMPERES RMS.
4. ALL SECONDARY SYSTEM FUSES RATED AT 600 VOLT OR LESS SHALL BE UNDERWRITERS LABORATORIES, INCORPORATED, APPROVED, BE CONSTRUCTED IN CONFORMANCE WITH THE APPLICABLE STANDARDS SET FORTH BY NEMA AND ANSI. ALL FUSES 600 VOLT, OR LESS, SHALL BE MANUFACTURED BY BUSSMAN, CHASE SHAWMUT OR GENERAL ELECTRIC.

H. OUTLET, JUNCTION AND PULL BOXES:

1. FURNISH AND INSTALL OUTLET, JUNCTION AND PULL BOXES AS SPECIFIED HEREIN AND WHERE SHOWN ON THE CONTRACT DRAWINGS AND AT ALL OTHER LOCATIONS WHERE THEY ARE REQUIRED TO FACILITATE THE PULLING, SUPPORTING OR CONNECTION OF WIRES AND CABLES.

I. WIRING DEVICES:

1. TOGGLE SWITCHES:
- a. TOGGLE SWITCHES SHALL BE OF THE TOTALLY ENCLOSED AC GENERAL USE FLUSH TUMBLER TYPE OF SUITABLE CAPACITY FOR THE INTENDED LOAD AND SHALL BE "SPECIFICATION GRADE".
- b. TOGGLE SWITCH BODIES SHALL BE OF THE (COLOR BY ARCHITECT) HIGH IMPACT NYLON, QUIET INDICATING TYPE WITH SCREW TYPE TERMINALS.
- c. GENERAL LIGHTING SWITCHES SHALL BE ONE (1) POLE, TWO (2) POLE, THREE (3) WAY OR FOUR (4) WAY AND WITH CHARACTERISTICS OF 20 AMPERE, 120/277 VOLTS AC, RATED AS MANUFACTURED BY CROUSE HINDS, PASS & SEYMOUR OR HUBBELL.
2. RECEPTACLES:
- a. BODIES SHALL BE OF (COLOR BY ARCHITECT) HIGH IMPACT NYLON, UNLESS NOTED OTHERWISE, SUPPORTED BY MOUNTING YOKE HAVING PLASTER EARS AND SHALL BE "SPECIFICATION GRADE". RECEPTACLES SHALL BE SIDE OR BACK WIRED WITH TWO (2) SCREWS PER TERMINAL. ALL RECEPTACLES SHALL BE THE GROUNDING TYPE AND SHALL BE CONNECTED TO METAL MOUNTING YOKE. A TERMINAL SHALL BE PROVIDED FOR GROUND WIRE ON ALL RECEPTACLES.
- b. CONVENIENCE DUPLEX RECEPTACLES SHALL BE 20 AMPERE, 125 VOLTS, 2 POLE, 3-WIRE, U-SLOT GROUNDED TYPE, MANUFACTURED BY CROUSE HINDS, PASS & SEYMOUR OR HUBBELL.
- c. SPECIAL RECEPTACLES, AS SPECIFIED ON DRAWINGS, SHALL HAVE SUITABLE CAPS AND PLATES OR COVERS, MANUFACTURED BY CROUSE HINDS, PASS & SEYMOUR OR HUBBELL.
3. DEVICE PLATES:
- a. ALL DEVICE PLATES FOR TOGGLE SWITCHES, RECEPTACLES, TELEPHONE OUTLETS, PILOT LIGHTS AND MISCELLANEOUS DEVICES SHALL BE STAINLESS STEEL AND MANUFACTURED BY CROUSE HINDS, PASS & SEYMOUR OR HUBBELL.

J. TELEPHONE/DATA SYSTEM:

1. FURNISH AND INSTALL ALL CONDUITS, PULL STRINGS, BOXES, PLYWOOD BACKBOARDS, OUTLETS, FITTINGS AND ALL APPURTENANCES REQUIRED FOR A COMPLETE SYSTEM READY FOR INSTALLATION OF TELEPHONES, EQUIPMENT AND CABLES OF THE TELEPHONE/DATA COMPANY.
2. ALL WALL AND FLOOR OUTLET PLATES SHALL BE FURNISHED BY THE TELEPHONE/DATA COMPANY.
3. THE CONTRACTOR SHALL CONSULT WITH THE REPRESENTATIVE OF THE OWNER'S TELEPHONE/DATA COMPANY AND CONFIRM TO THESE REQUIREMENTS.

K. LIGHTING FIXTURES:

1. LIGHTING FIXTURES SHALL BE OF THE FLUORESCENT OR LED TYPE.
2. THE COST OF FURNISHING AND INSTALLING LAMPS FOR EACH OF THE FIXTURES SHALL BE INCLUDED IN THIS PRICE.
3. ALL FIXTURES SHALL BE U.L. APPROVED.
4. BALLASTS FOR FLUORESCENT FIXTURES SHALL BE HIGH FREQUENCY ELECTRONIC TYPES AND SHALL BE U.L. LISTED, CLASS P, SOUND RATED A, HIGH POWER FACTOR. BALLAST SHALL BE COMPLETELY COMPATIBLE WITH LAMPS FURNISHED WITH FIXTURES.
5. LIGHTING FIXTURES WILL BE COMPLETE WITH STANDARD OR SPECIAL MOUNTING FRAMES, LAMPS, BALLASTS AND OTHER DEVICES AS REQUIRED FOR A FIRST CLASS INSTALLATION.
6. SELECTED LIGHTING FIXTURES AND EXIT SIGNS SHALL BE CONNECTED TO THE EMERGENCY SYSTEM FOR EGRESS.

M. DRY-TYPE TRANSFORMERS K RATED:

1. FURNISH AND INSTALL, INDIVIDUALLY MOUNTED DRY-TYPE TRANSFORMERS OF THE TWO-WINDING TYPE, SELF-COOLED, WITH RATINGS AND VOLTAGES AS INDICATED ON THE DRAWINGS.
2. TRANSFORMERS SHALL BE MANUFACTURED BY WESTINGHOUSE/CUTLER-HAMMER, SQUARE D, GENERAL ELECTRIC, SIEMENS, OR APPROVED EQUAL.
3. TRANSFORMERS SHALL BE DESIGNED, MANUFACTURED, AND TESTED IN ACCORDANCE WITH ALL THE LATEST APPLICABLE ANSI AND NEMA STANDARDS.
4. TRANSFORMERS SHALL BE DESIGNED FOR CONTINUOUS OPERATION AT RATED KVA, FOR 24 HOURS A DAY, 365 DAYS A YEAR OPERATION, WITH NORMAL LIFE EXPECTANCY AS DEFINED IN ANSI C57.96. THE TRANSFORMERS SHALL BE SPECIFICALLY DESIGNED TO SUPPLY CIRCUITS WITH A HARMONIC PROFILE EQUAL TO OR LESS THAN A K-FACTOR OF 13 WITHOUT EXCEEDING 115 DEGREE C TEMPERATURE RISE.
5. TRANSFORMERS SHALL BE INSULATED WITH A UL RECOGNIZED 220°C INSULATION SYSTEM.
6. REQUIRED PERFORMANCE SHALL BE OBTAINED WITHOUT EXCEEDING THE ABOVE INDICATED TEMPERATURE RISE IN A 40°C MAXIMUM AMBIENT.
7. ALL INSULATION MATERIALS SHALL BE FLAME RETARDANT AND SHALL NOT SUPPORT COMBUSTION AS DEFINED IN ASTM STANDARD TEST METHOD D635.
8. TRANSFORMER CORE SHALL BE CONSTRUCTED WITH HIGH GRADE, NON-AGING, GRAIN-ORIENTED SILICON STEEL WITH HIGH MAGNETIC PERMEABILITY, AND LOW HYSTERESIS AND EDDY CURRENT LOSSES. MAXIMUM MAGNETIC FLUX DENSITIES SHALL BE SUBSTANTIALLY BELOW THE SATURATION POINT. THE TRANSFORMER CORE VOLUME SHALL ALLOW EFFICIENT TRANSFORMER OPERATION AT 10% ABOVE THE HIGHEST TAP VOLTAGE. THE CORE LAMINATIONS SHALL BE TIGHTLY CLAMPED AND COMPRESSED.
9. TRANSFORMER COILS SHALL BE WOUND OF ELECTRICAL GRADE ALUMINUM WITH CONTINUOUS WOUND CONSTRUCTION. AN ELECTROSTATIC SHIELD CONSISTING OF A SINGLE TURN OF ALUMINUM SHALL BE PLACED BETWEEN THE PRIMARY AND SECONDARY WINDING AND GROUNDED TO THE TRANSFORMER CORE.
10. NEUTRAL BUS SHALL BE SIZED AND CONFIGURED TO ACCOMMODATE AT LEAST 200% OF THE RATED CURRENT.
11. THE CORE AND COIL ASSEMBLY SHALL BE IMPREGNATED WITH NON-HYDROSCOPIC, THE THERMOSETTING VARNISH AND CURED TO REDUCE HOT SPOTS AND SEAL OUT MOISTURE. THE ASSEMBLY SHALL BE INSTALLED ON VIBRATION-ABSORBING PADS.
12. THE ENCLOSURES SHALL BE MADE OF HEAVY GAUGE STEEL AND SHALL BE FINISHED UTILIZING A CONTINUOUS PROCESS OF DE-GREASING, CLEANING, AND PHOSPHATIZING, FOLLOWED BY ELECTROSTATIC DEPOSITION OF A POLYMER POLYESTER POWDER COATING AND BAKING. THE COATING COLOR SHALL BE ANSI 61 AND SHALL BE UL RECOGNIZED FOR OUTDOOR USE.
13. THE ENCLOSURE CONSTRUCTION SHALL BE VENTILATED, NEMA 2 DRIP-PROOF, WITH LIGHTING HOLES, ALL VENTILATION OPENINGS SHALL BE PROTECTED AGAINST FALLING DIRT.

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Issuance Schedule

Number	Date	Description
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ISSUED FOR CONSTRUCTION

VERTEX PHARMACEUTICALS

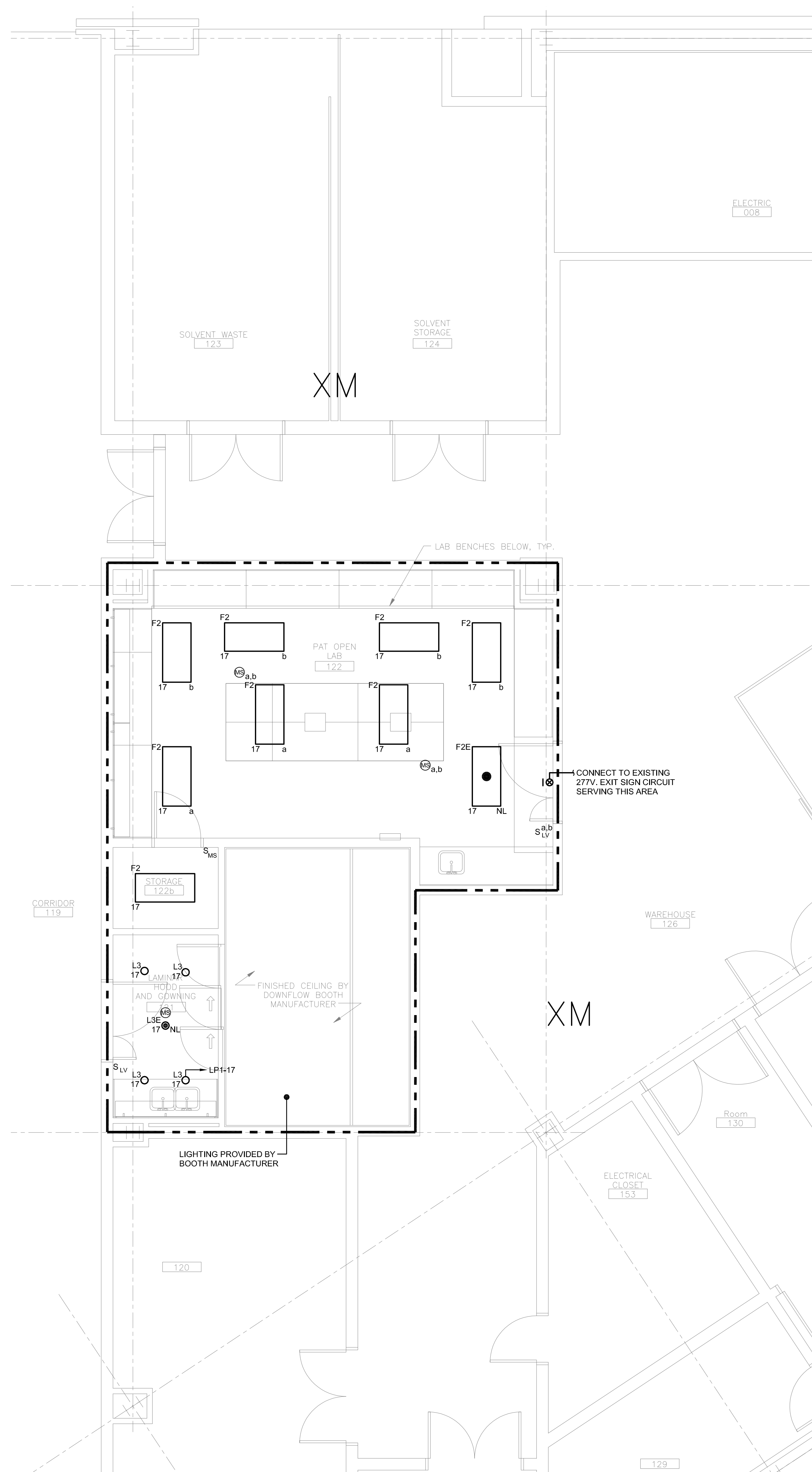
LEVEL 1 PAT LAB

ELECTRICAL SPECIFICATIONS

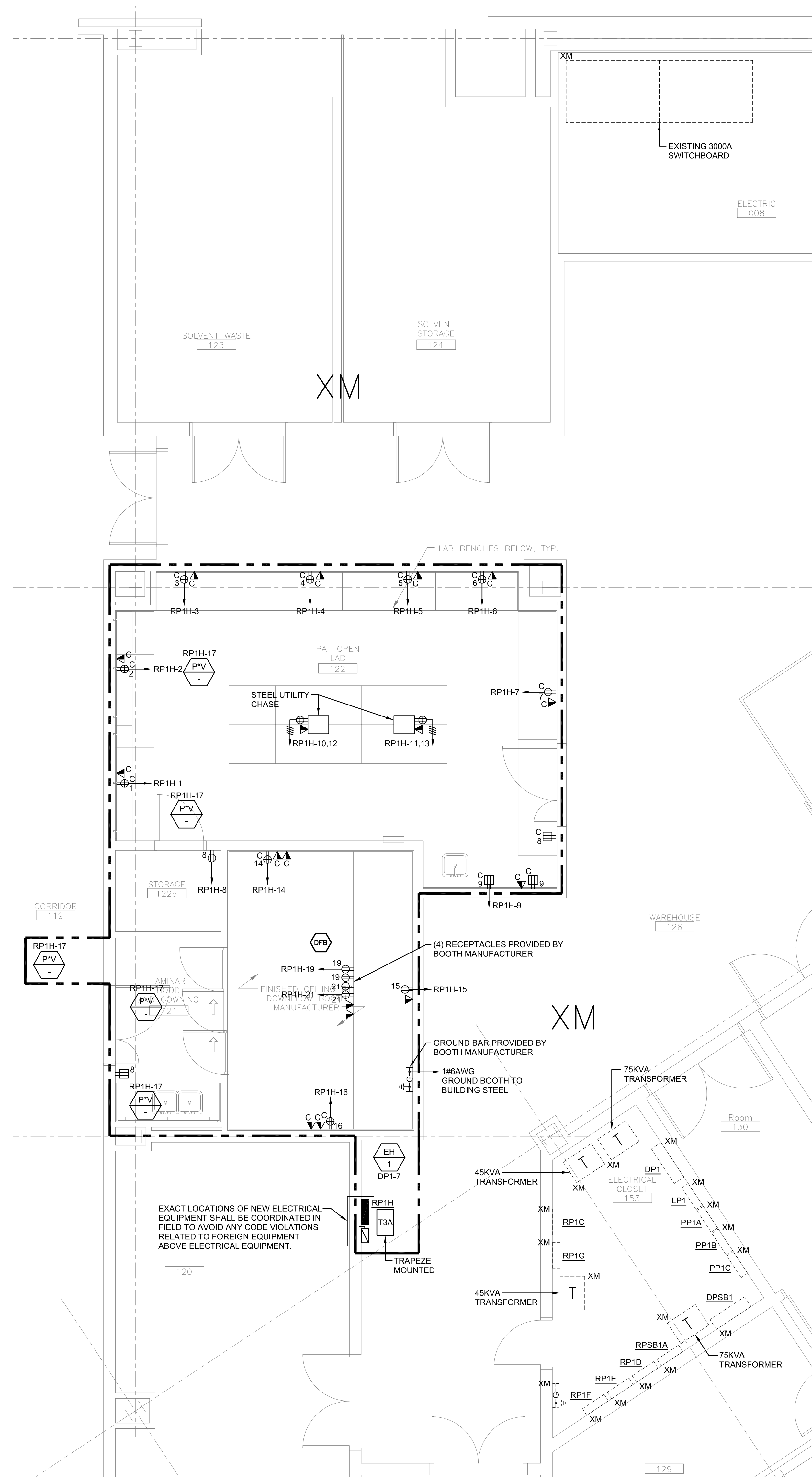
Scale: NONE Date Issued: 8/26/16

E0.04

Project Number: 179-07-00



1 LEVEL 1 PAT LAB - ELECTRICAL LIGHTING NEW WORK PLAN
SCALE: 1/4"=1'-0"



2 LEVEL 1 PAT LAB - ELECTRICAL POWER NEW WORK PLAN
SCALE: 1/4"=1'-0"

SHEET NOTES

1. CIRCUIT NUMBERS INDICATED ARE FOR REFERENCE PURPOSES ONLY. ACTUAL CIRCUIT NUMBERS SHALL BE DETERMINED BY SPARE BREAKERS IN EXISTING PANELS MADE AVAILABLE THROUGH DEMOLITION. UTILIZE SPARE BREAKERS AND SPACES AS REQUIRED.

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Issuance Schedule		
Number	Date	Description

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VERTEX PHARMACEUTICALS

LEVEL 1 PAT LAB

ELECTRICAL NEW WORK PLANS

Scale: 1/4"=1'-0" Date Issued: 8/26/16

E1.11

Project Number: 179-07-00