2.10 FLEXIBLE CONNECTIONS

A. Provide flexible duct connections at the inlet and outlet of each belt-driven fan, indoor unit, fan coil unit, air handling unit, etc., and at all other locations indicated. Flexible connections shall be fabricated from a glass fabric coated on both sides with neoprene. Minimum weight shall be 30 oz. per sq. yard.

2.11 DUCT HARDWARE

A. Duct hardware shall be as manufactured by Young Regulator or an approved equal.

2.12 ACCESS DOORS

A. A duct access door shall be provided at each fire damper. Access doors shall be designed for 1.5 times the pressure of the duct in which they are mounted. Access doors shall be of sufficient size to provide access to the dampers for resetting the blades and replacing the links. Access doors in medium and high-pressure ductwork shall be installed downstream of fire dampers and shall be implosion type. Where access is provided through gypsum board walls or ceilings, furnish access door for installation under Division 9. Each door shall match the fire-rating of the wall or ceiling indicated.

2.13 DUCT LINER

A. Duct liner shall be one inch thick, 1 1/2 lb. density (3 lb. density on medium- and high-pressure supply air systems) fibrous glass with one face coated with a black fire retardant compound. The permanent composite fire and smoke hazard rating of the liner shall be stenciled on the liner face and shall be:

1. Maximum flame spread 25
2. Maximum smoke developed 50

2.14 DUCT INSULATION

A. Duct insulation shall be 2" thick, minimum 3/4 lb. density fiberglass with an FSKL 0.00035" thick aluminum foil jacket, reinforced with fiberglass scrim. Thermal conductivity shall be a maximum of K = 0.24 at 75 degrees F. mean temperature.

B. Insulation adhesive shall be Benjamin Foster 85-20. Tape shall be aluminum foil and shall be SMACNA listed and labeled.

C. The composite NFPA 90A and 90B, ASTM E84, UL rating of the installed insulation shall not exceed 25/50.

3.0 EXECUTION

3.01 INSTALLATION

A. Ductwork shall be installed in strict accordance with SMACNA, UL and NFPA standards.

B. Duct liner shall be provided for the following minimum distances or through the first elbow(s) or as otherwise indicated on the drawings, whichever is greater, downstream of each unit indicated below:

3. Terminal unit 5 feet

Duct liner shall also be provided throughout all return air, transfer and plenums.

C. Duct liner shall be cut to provide overlapped and compressed longitudinal corner joints. Liner shall be installed with the coated surface facing the air stream. Duct liner shall be adhered to the ductwork with a 100% coverage of the sheet metal surfaces using a fire retardant adhesive applied by spraying. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured using metal pins welded to the duct and speed washers. All leading edges shall be secured with sheet metal airfoils.

D. All supply air ductwork which is not lined shall be insulated. All outside air ductwork shall be insulated. Insulation shall be cut slightly longer than circumference of duct to insure full thickness at corners. All insulation shall be applied with edges tightly banded. Insulation shall be adhered to duct with fire resistant adhesive. Adhesive shall be applied so that insulation conforms to duct surfaces uniformly and firmly. In addition to the adhesive, the insulation shall be additionally secured to the bottom of all ducts 18" or wider by means of welded pins and speed clips. The protruding end of the pins shall be cut off flush after the speed clips have been applied. The vapor-barrier facing shall be thoroughly sealed with tape where the pins have pierced through. All joints shall be sealed with 2" wide SMACNA tape. Any cuts or tears shall be sealed with SMACNA tape.

E. Flexible ducts utilized in the low-pressure ductwork systems shall be installed without kinks or bends which are less than a centerline radius equal to or greater than twice the diameter of the flexible duct being installed. Also, in the runouts from the medium or high-pressure ductwork to the terminal units, the flexible ducts shall be installed with a variance of no more than 1" per foot of installed length off a straight and level line from the centerline of the sheetmetal ductwork runout or tap to the centerline of the terminal unit inlet. The size of the flexible ductwork connected to each terminal unit shall be the equivalent size of the larger of the following:

1. The inlet size of the terminal unit.
2. The runout size indicated on the drawings.

Should the runout size indicated on the drawings differ from the inlet size of the terminal unit or where the inlet to the terminal unit is rectangular, the transition shall be made with sheetmetal and shall occur at the inlet to the terminal unit.

F. All intersections (crossing) of low-pressure and medium-pressure ductwork shall be made with offsets in the low-pressure ductwork only. The medium pressure ductwork shall be ran straight and level.

END OF SECTION

ABBREVIATIONS

A/C	ABOVE CEILING
AD	ACCESS DOOR
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AUTO	AUTOMATIC
AC	AIR CONDITIONING
AHU	AIR HANDLING UNIT
BAL	BALANCING
BDD	BACKDRAFT DAMPER
B/F	BELOW FLOOR
B/G	BELOW GRADE
B'FLY	BUTTERFLY
BHP	BRAKE HORSEPOWER
BCO	BASE CLEANOUT
CFM	CUBIC FEET PER MINUTE
CBCR	CURVED BLADE CEILING REGISTER
CD	CEILING DIFFUSER
CU	CONDENSING UNIT
CW	COLD WATER (DOMESTIC)
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
CWS	CONDENSER WATER SUPPLY
CWR	CONDENSER WATER RETURN
CON	CONCENTRIC
CO	CLEANOUT
COND	CONDENSATE
db	DRY BULB
DN	DOWN
DR	DRAIN
do	DITTO
dB	DECIBELS
DWG	DRAWING
EA	EACH
EAT	ENTERING AIR TEMPERATURE
ECC	ECCENTRIC
EF	EXHAUST FAN
EOD	EMERGENCY OVERFLOW DRAIN
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
EFF	EFFICIENCY
F	FAHRENHEIT
FCO	FLOOR CLEANOUT
FCU	FAN COIL UNIT
FSD	FIRE/SMOKE DAMPER
FD	FIRE DAMPER OR FLOOR DRAIN
FL DR	FLOOR DRAIN (only)
FLR	FLOOR
FOB	FLAT ON BOTTOM
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET
G	GATE
GA	GAUGE
GPM	GALLONS PER MINUTE
GL	GLOBE
GCO	GRADE CLEANOUT
HD	HUB DRAIN
HP	HORSEPOWER
HTG	HEATING
HW	HOT WATER (DOMESTIC)
HWR	HOT WATER RETURN
HWRR	HOT WATER REVERSE RETURN
HWS	HOT WATER SUPPLY
Hz	HERTZ
ID	INSIDE DIMENSION
IN	INCHES
KW	KILOWATTS
LAT	LEAVING AIR TEMPERATURE
LB	POUNDS
LG	LINEAR GRILLE
LRG	LINEAR RETURN GRILLE
LWR	LOOP WATER RETURN
LWS	LOOP WATER SUPPLY
MIN	MINIMUM
MAX	MAXIMUM
MD	MANUAL DAMPER
MOD	MOTOR OPERATED DAMPER
MFR	MANUFACTURER
NC	NORMALLY CLOSED
NG	NATURAL GAS
NFWH	NON-FREEZE WALL HYDRANT
NO	NORMALLY OPEN
NOM	NOMINAL
OA	OUTSIDE AIR
OD	OUTSIDE DIMENSION
OBD	OPPOSED BLADE DAMPER
PIU	POWERED INDUCTION UNIT
PSI	POUNDS PER SQUARE INCH
RA	RETURN AIR
RAD	RADIUS
RAG	RETURN AIR GRILLE
RED	REDUCER
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
RTU	ROOFTOP UNIT
RAR	RETURN AIR REGISTER
SP	STATIC PRESSURE
SPS	STATIC PRESSURE SENSOR
SA	SUPPLY AIR
SAN	SANITARY
SD	SMOKE DAMPER
SEN	SENSIBLE
SQ	SQUARE
SR	SUPPLY REGISTER
ST	STORM
SS	SPLIT SYSTEM
TEMP	TEMPERATURE
TG	TRANSFER GRILLE
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
V	VENT
VA	VALVE
VTR	VENT THRU ROOF
VAV	VARIABLE AIR VOLUME
wb	WET BULB
WC	WATER COLUMN
WHA	WATER HAMMER ARRESTOR
WT	WEIGHT
W	WASTE

GENERAL NOTES

1. THESE DRAWINGS ARE SCHEMATIC IN NATURE AND ARE NOT INTENDED TO SHOW ALL POSSIBLE CONDITIONS. IT IS INTENDED THAT A COMPLETE TENANT MECHANICAL SYSTEM BE PROVIDED WITH ALL NECESSARY EQUIPMENT, ACCESSORIES, OPTIONS AND CONTROLS, COMPLETELY COORDINATED WITH ALL DISCIPLINES. ALL ITEMS AND LABOR REQUIRED FOR A COMPLETE TENANT MECHANICAL SYSTEM IN ACCORDANCE WITH ALL APPLICABLE CODES, STANDARDS AND THE BASE BUILDING CONTRACT DOCUMENTS SHALL BE FURNISHED WITHOUT INCURRING ADDITIONS TO THE CONTRACT.
2. REFER TO THE ARCHITECTURAL DRAWINGS FOR EXACT PARTITION LAYOUTS, REFLECTED CEILING PLANS, DIMENSIONS, ETC.
3. EXISTING MECHANICAL EQUIPMENT AND DUCTWORK ARE SHOWN BY DASHED LINES. NEW WORK AND RELOCATED WORK ARE SHOWN BY SOLID LINES. EXISTING WORK TO BE REMOVED IS SHOWN CROSSHATCHED. WHEN ANY DUCTWORK OR AIR DISTRIBUTION DEVICE IS REMOVED, THE ASSOCIATED TRUNK DUCT SHALL BE SEALED AIRTIGHT WITH A SHEET METAL PATCH OR CAP.
4. VISIT SITE AND CAREFULLY EXAMINE EXISTING CONDITIONS PRIOR TO SUBMITTING BID. THE EXISTING CONDITIONS SHOWN ARE BASED ON DOCUMENTS PROVIDED BY OTHERS AND HAVE NOT BEEN VERIFIED BY THE ENGINEER. IF EXISTING CONDITIONS DIFFER FROM DRAWINGS IN SUCH A MANNER THAT WILL AFFECT PRICING, (I.E., DUCTWORK, VAV OR PIU ARE NOT IN THE SHOWN LOCATION) CONTRACTOR WILL NOTIFY OWNER SO THAT A RESOLUTION CAN BE MADE PRIOR TO SUBMITTING BIDS. NO ALLOWANCE WILL BE MADE FOR LACK OF KNOWLEDGE OF EXISTING CONDITIONS.
5. REFER TO THE ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF ALL CEILING MOUNTED AIR DISTRIBUTION DEVICES. IF ANY ITEMS ARE NOT SHOWN ON THE REFLECTED CEILING PLANS, PREPARE A DRAWING OF THE PROPOSED LOCATION AND PRESENT IT TO THE ARCHITECT FOR APPROVAL PRIOR TO INSTALLATION.
6. ALL ROUND AND FLEXIBLE DUCTWORK EXTENDING TO DIFFUSERS SHALL BE SIZED FULL SIZE OF DISTRIBUTION DEVICE INLET, AND TAPS TO THE EXISTING LOW-PRESSURE DUCTWORK SHALL BE MADE WITH SPIN-IN FITTINGS HAVING INTEGRAL SCOOPS AND VOLUME DAMPERS. ALL NEW RECTANGULAR DUCTWORK TAPS SHALL BE MADE WITH SPLITTERS OR EXTRACTORS. ALL DUCTWORK SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH SMACNA DUCT STANDARDS.
7. FLEXIBLE DUCTS SHALL BE INSTALLED FREE OF SAGS AND KINKS; SUPPORTED AT NOT MORE THAN 48" O.C.
8. TEST AND BALANCE ALL DIFFUSERS, BOXES, FANS, ETC. TO THE AIRFLOWS AND CONDITIONS INDICATED. ALL EXISTING DIFFUSERS, BOXES, FANS, ETC. WHICH ARE NOT NOTED OTHERWISE SHALL BE BALANCED TO THEIR PRIOR DESIGN AIRFLOWS; REFERENCE THE EXISTING RECORD DRAWING AVAILABLE FROM THE OWNER. TESTING AND BALANCING OF HVAC SYSTEM SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS OF AABC OR NEBB AND SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF A AABC OR NEBB CERTIFIED TEST AND BALANCE ENGINEER. SUBMIT 4 COPIES OF THE REPORT TO THE OWNER.
9. ALL CONTROL WIRING AND TUBING INSTALLED ABOVE THE CEILING SHALL BE LOCATED AS HIGH ABOVE THE CEILING AS POSSIBLE AND SHALL FOLLOW THE DESIGNATED GENERAL ROUTING OF THE DUCTWORK. DO NOT HANG WIRING OR TUBING FROM DUCTWORK; RATHER, SUSPEND FROM THE STRUCTURE.
10. THERMOSTATS SHALL BE LOCATED IN EACH ZONE AS SHOWN. THE EXACT LOCATION ON THE WALL INDICATED SHALL BE AS DIRECTED BY THE ARCHITECT. NEW THERMOSTATS SHALL BE SELECTED TO MATCH EXISTING BASE BUILDING THERMOSTATS AND SHALL BE COMPATIBLE WITH EQUIPMENT SERVED.
11. ADJUST ALL DIFFUSERS IN CORRIDORS OR WITHIN 3 FEET OF A WALL TO PROVIDE 2-WAY OR 3-WAY BLOW AWAY FROM OR PARALLEL TO WALLS. ALL LAY-IN DIFFUSERS SHALL HAVE 4-WAY BLOW UNLESS NOTED OTHERWISE.
12. PORTIONS OF DUCTWORK VISIBLE THROUGH GRILLES AND REGISTERS IN FINISHED AREA SHALL BE PAINTED FLAT BLACK.
13. SHEET METAL SUPPLY DUCTWORK SHALL BE INSULATED WITH 2" THICK FIBERGLASS DUCT INSULATION WITH FOIL VAPOR BARRIER U/L LISTED. EXHAUST DUCTWORK SHALL NOT BE INSULATED UNLESS OTHERWISE NOTED.
14. LOW PRESSURE DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARDS.
15. TEST AND BALANCE ALL AFFECTED ZONES AND PROVIDE REPORT TO OWNER/CUSHMAN.
16. COORDINATE TSTAT LOCATIONS WITH ARCHITECT.
17. BAS GRAPHICS SHOULD BE UPDATED WITH EXISTING AND ALL NEW EQUIPMENT AT THE CONCLUSION OF THE PROJECT.
18. ALL DAMPERS, MECHANICAL EQUIPMENT, SHUTOFF VALVES, WATER SOURCE HEAT HEAT PUMPS, ETC, ARE TO BE MOUNTED IN ACCESIBLE LOCATIONS.

LEGEND

	CEILING DIFFUSER
	CEILING RETURN AIR GRILLE or EXHAUST GRILLE
	SIDE-WALL or DUCT MOUNTED REGISTER
	SLOT DIFFUSER
	MANUAL VOLUME DAMPER
	FIRE DAMPER
T	THERMOSTAT
H	HUMIDISTAT
NS	NIGHT SET-BACK
M	MOTOR OPERATED DAMPER
	EXISTING WORK
	NEW WORK
	WORK TO BE REMOVED
R	FLOOR DRAIN
	HOSE BIBB
	FLOOR CLEAN-OUT
	WALL CLEAN-OUT
	DUCT ACCESS PANEL

VAV SCHEDULE

I.D. TAG	PRIMARY AIR INLET SIZE (IN)	PRIMARY AIR MAXIMUM CFM	PRIMARY AIR MINIMUM CFM	BASIS OF DESIGN	REMARKS
V-0-1	12	1000	165	TITUS	①
V-0-2	10	800	165	TITUS	
V-0-3	10	800	165	TITUS	
V-0-4	8	400	60	TITUS	
V-0-5	10	800	165	TITUS	
V-0-6	6	150	25	TITUS	
V-0-7	12	1000	165	TITUS	②
V-0-8	6	150	25	TITUS	
V-0-9	14	1800	320	TITUS	
V-1-1	12	900	165	TITUS	
V-1-2	12	720	105	TITUS	
V-1-3	8	250	40	TITUS	
V-1-4	8	250	40	TITUS	
V-1-5	12	800	165	TITUS	
V-1-6	12	975	165	TITUS	
V-1-7	8	250	40	TITUS	
V-1-8	8	250	40	TITUS	
V-2-1	8	250	40	TITUS	
V-2-2	8	250	40	TITUS	
V-2-3	8	250	40	TITUS	
V-2-4	8	250	40	TITUS	
V-2-5	8	250	40	TITUS	
V-2-6	8	250	40	TITUS	
V-2-7	8	250	40	TITUS	
V-2-8	8	250	40	TITUS	
V-2-9	8	200	40	TITUS	
V-2-10	6	150	25	TITUS	
V-2-11	10	700	105	TITUS	
V-2-12	10	680	105	TITUS	
V-2-13	10	700	105	TITUS	
V-2-14	12	800	165	TITUS	
V-2-15	8	250	40	TITUS	
V-2-16	8	250	40	TITUS	
V-2-17	8	250	40	TITUS	
V-2-18	10	550	105	TITUS	
V-2-19	8	250	40	TITUS	
V-2-20	8	250	40	TITUS	
V-2-21	8	250	40	TITUS	
V-3-1	8	250	40	TITUS	
V-3-2	8	250	40	TITUS	
V-3-3	8	250	40	TITUS	
V-3-4	8	250	40	TITUS	
V-3-5	8	360	60	TITUS	
V-3-6	8	250	40	TITUS	
V-3-7	8	250	40	TITUS	
V-3-8	8	250	40	TITUS	
V-3-9	8	315	60	TITUS	
V-3-10	8	250	40	TITUS	
V-3-11	10	600	105	TITUS	
V-3-12	8	250	40	TITUS	
V-3-13	8	250	40	TITUS	
V-3-14	8	250	40	TITUS	
V-3-15	8	250	40	TITUS	
V-3-16	8	250	40	TITUS	
V-3-17	8	250	40	TITUS	
V-3-18	8	250	40	TITUS	
V-3-19	8	250	40	TITUS	
V-3-20	8	250	40	TITUS	
V-3-21	8	250	40	TITUS	
V-3-22	8	250	40	TITUS	
V-4-1	8	250	40	TITUS	
V-4-2	8	250	40	TITUS	
V-4-3	8	250	40	TITUS	
V-4-4	8	250	40	TITUS	
V-4-5	14	1650	240	TITUS	③
V-4-6	8	225	40	TITUS	
V-4-7	8	250	40	TITUS	
V-4-8	8	315	60	TITUS	
V-4-9	8	250	40	TITUS	
V-4-10	10	600	105	TITUS	
V-4-11	8	250	40	TITUS	
V-4-12	8	250	40	TITUS	
V-4-13	8	250	40	TITUS	
V-4-14	8	250	40	TITUS	
V-4-15	8	375	60	TITUS	
V-4-16	8	360	60	TITUS	
V-4-17	8	360	60	TITUS	
V-4-18	8	250	40	TITUS	
V-4-19	12	1140	165	TITUS	④
V-4-20	8	250	40	TITUS	
V-4-21	8	250	40	TITUS	

① VAV SHALL BE PROVIDED WITH HOT WATER REHEAT COILS CAPABLE OF PROVIDING A MINIMUM OF 26.5 MBH OF REHEAT CAPACITY. COIL SHALL HAVE 2 ROWS, AND A FLOW RATE OF 2.0 GPM. CONNECT TO EXISTING HOT WATER SUPPLY AND RETURN PIPING NEARBY.

② VAV SHALL BE PROVIDED WITH HOT WATER REHEAT COILS CAPABLE OF PROVIDING A MINIMUM OF 20.1 MBH OF REHEAT CAPACITY. COIL SHALL HAVE 1 ROW, AND A FLOW RATE OF 2.0 GPM. CONNECT TO EXISTING HOT WATER SUPPLY AND RETURN PIPING NEARBY.

③ VAV SHALL BE PROVIDED WITH HOT WATER REHEAT COILS CAPABLE OF PROVIDING A MINIMUM OF 22.7 MBH OF REHEAT CAPACITY. COIL SHALL HAVE 1 ROW, AND A FLOW RATE OF 2.0 GPM. CONNECT TO EXISTING HOT WATER SUPPLY AND RETURN PIPING NEARBY.

④ VAV SHALL BE PROVIDED WITH HOT WATER REHEAT COILS CAPABLE OF PROVIDING A MINIMUM OF 12.2 MBH OF REHEAT CAPACITY. COIL SHALL HAVE 1 ROW, AND A FLOW RATE OF 2.0 GPM. CONNECT TO EXISTING HOT WATER SUPPLY AND RETURN PIPING NEARBY.

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Seal / Signature

STATE OF MAINE · BRAD J. RABINOWITZ · No. 15176 · LICENSED PROFESSIONAL ENGINEER

12/14/17

Project Name

Unum Workplace Transformation - Phase 2 & 3 (HO2 & HO3)

Project Number

59.6481.003

Description

SPECIFICATIONS AND NOTES - HVAC

Scale

M0.003