Z:\-Project Directories\6200-6299\6277 - Republic Wire\-Construction Documents\6277-M3-0-MECHANICAL-DETAILS.dwg-EBS, Plot Date/Time: May 25, 2017-1:52pm - By: kelly.obrien
THESE DRAWINGS AND SPECIFICATIONS ARE NOT AUTHORIZED TO BE USED AS CONTRACT DOCUMENTS. THESE DRAWINGS HAVE BEEN PREPARED TO DEMONSTRATE COMPLIANCE WITH APPLICABLE CODES, AND ARE INTENDED TO PROVIDE THE AUTHORITIES HAVING JURISDICTION WITH INFORMATION TO DETERMINE CODE COMPLIANCE. THE INSTALLING CONTRACTOR IS RESPONSIBLE TO ENSURE THAT MEANS, METHODS, AND MATERIALS USED IN CONSTRUCTION ARE INSTALLED IN ACCORDANCE WITH ANY CONTRACTURAL AGREEMENT THAT MAY EXIST WITH AN OWNER, CONSTRUCTION MANAGER, GENERAL CONTRACTOR, ETC.

## MECHANICAL SPECIFICATIONS

**GENERAL**
REFER TO ARCHITECTURAL DRAWINGS, GENERAL NOTES, INSTRUCTIONS TO BIDDERS, GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS, BASE BUILDING SPECIFICATIONS AND DRAWINGS, SHOP DRAWING MANUALS AND AS-BUILT PLANS, EXCEPT AS NOTED HEREIN, WHICH APPLY IN ALL RESPECTS TO THIS SECTION. THE CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS PRIOR TO BIDDING THE WORK.

**USE OF DRAWINGS AND SPECIFICATIONS**
EBS DRAWINGS AND SPECIFICATIONS ARE INTENDED TO CONVEY DESIGN INTENT ONLY. ALL MEANS AND METHODS, SEQUENCES, TECHNIQUES, AND PROCEDURES OF CONSTRUCTION AS WELL AS ANY ASSOCIATED SAFETY PRECAUTIONS AND PROGRAMS, AND ALL INCIDENTAL AND TEMPORARY DEVICES REQUIRED TO CONSTRUCT THE PROJECT, AND TO PROVIDE A COMPLETE AND FULLY OPERATIONAL MECHANICAL SYSTEM ARE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.

**STANDARDS**
EQUIPMENT AND MATERIALS SHALL CONFORM WITH APPROPRIATE PROVISIONS OF AGA, ARI, ASME, ASTM, CISPI, UL, NEMA, ANSI, SMACNA, ASHRAE, NFPA, NEC, AS APPLICABLE TO EACH INDIVIDUAL UNIT OR ASSEMBLY. ALL EQUIPMENT MUST BEAR UL LABEL.

**LICENSE/ EXPERIENCE**
CONTRACTOR MUST BE LICENSED BY THE STATE TO INSTALL HVAC SYSTEMS/EQUIPMENT. CONTRACTOR MUST ALSO HAVE A MINIMUM OF 5 YEARS EXPERIENCE AND HAVE INSTALLED AT LEAST (5) SUCCESSFUL PROJECT INSTALLATIONS OF SIMILAR SIZE AND SCOPE. REFERENCES MUST BE PROVIDED UPON REQUEST.

**CODES**
ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH ALL APPLICABLE STATE AND LOCAL CODES AND ORDINANCES. THE MECHANICAL CONTRACTOR SHALL SATISFY CODE REQUIREMENTS AS A MINIMUM STANDARD WITHOUT ANY EXTRA COST TO OWNER.

**PERMITS AND FEES**
THE MECHANICAL CONTRACTOR SHALL PROCURE AND PAY FOR ALL PERMITS, FEES, TAXES AND INSPECTIONS NECESSARY TO COMPLETE THE MECHANICAL WORK. FURNISH CERTIFICATE OF APPROVAL FOR WORK FROM INSPECTION AUTHORITY TO OWNER BEFORE FINAL ACCEPTANCE FOR WORK. CERTIFICATE OF FINAL INSPECTION AND APPROVAL SHALL BE SUBMITTED WITH THE CONTRACTOR'S REQUEST FOR PAYMENT. NO FINAL PAYMENT WILL BE APPROVED WITHOUT THIS CERTIFICATE.

**SITE EXAMINATION**
THE MECHANICAL CONTRACTOR SHALL THOROUGHLY EXAMINE ALL AREAS OF WORK WHERE EQUIPMENT, DUCTWORK, AND PIPING WILL BE INSTALLED AND SHALL REPORT ANY CONDITION THAT, IN THEIR OPINION, PREVENTS THE PROPER INSTALLATION OF THE MECHANICAL WORK PRIOR TO BID. CONTRACTOR SHALL ALSO EXAMINE THE DRAWINGS AND SPECIFICATIONS OF OTHER BRANCHES OF WORK MAKING REFERENCE TO THEM FOR DETAILS OF NEW OR EXISTING BUILDING CONDITIONS. NO EXTRAS WILL BE ALLOWED FOR FAILURE TO INCLUDE ALL REQUIRED WORK IN BID. ALL WORK SHALL BE DONE AT TIMES CONVENIENT TO THE OWNER AND ONLY DURING NORMAL WORKING HOURS, UNLESS SPECIFIED OTHERWISE. MECHANICAL CONTRACTOR SHALL TAKE THEIR OWN MEASUREMENTS AND BE RESPONSIBLE FOR THEM.

**CONTRACT DRAWINGS**
THE MECHANICAL DRAWINGS AND SPECIFICATIONS CONVEY DESIGN INTENT ONLY. MEANS AND METHODS, SEQUENCES, TECHNIQUES, AND PROCEDURES OF CONSTRUCTION AS WELL AS ANY ASSOCIATED SAFETY PRECAUTIONS AND PROGRAMS, AND ALL INCIDENTAL AND TEMPORARY DEVICES REQUIRED TO CONSTRUCT THE PROJECT ARE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. COORDINATION DRAWINGS SHOWING SYSTEM AND COMPONENT INSTALLATION LAYOUT, ROUTING, DETAILS, ETC. SHALL BE PRODUCED BY THE MECHANICAL CONTRACTOR AND UNDER THE SUPERVISION OF THE GENERAL CONTRACTOR/CONSTRUCTION MANAGER, OR APPROPRIATE PARTY AS APPLICABLE. ALL SYSTEMS INSTALLED BY EACH SUB-CONTRACTOR SHALL BE COORDINATED WITH ONE ANOTHER AND APPROVED BY GENERAL CONTRACTOR/CONSTRUCTION MANAGER, ETC. PRIOR TO INSTALLATION AND/OR FABRICATION. IF QUESTIONS CONCERNING DESIGN INTENT ARISE DURING COORDINATION, EBS CAN ASSIST WHERE APPROPRIATE. THE ARCHITECTURAL DRAWINGS SHALL TAKE PRECEDENCE OVER ALL OTHER DRAWINGS. DO NOT SCALE DISTANCES OFF THE MECHANICAL DRAWINGS; USE ACTUAL BUILDING DIMENSIONS.

**SHOP DRAWINGS**
SUBMIT TO THE ARCHITECT ELECTRONIC COPIES OF COMPLETE AND CERTIFIED SHOP DRAWINGS, DESCRIPTIVE DATA, PERFORMANCE DATA AND RATINGS, DIAGRAMS AND SPECIFICATIONS ON ALL SPECIFIED EQUIPMENT, INCLUDING ACCESSORIES, AND MATERIALS FOR REVIEW. THE MAKE, MODEL NUMBER, TYPE, FINISH AND ACCESSORIES OF ALL EQUIPMENT AND MATERIALS SHALL BE REVIEWED AND APPROVED BY THE MECHANICAL CONTRACTOR AND GENERAL CONTRACTOR PRIOR TO SUBMITTING TO THE ARCHITECT FOR THEIR REVIEW AND APPROVAL. APPROVAL OF SHOP DRAWINGS DOES NOT RELIEVE THE MECHANICAL CONTRACTOR/VENDOR FROM COMPLIANCE WITH THE REQUIREMENTS OF THE CONTRACT DRAWINGS, SPECIFICATIONS AND APPLICABLE CODES.

SHOP DRAWINGS SHALL BE REQUIRED ON THE FOLLOWING:
HVAC EQUIPMENT
FANS
DIFFUSERS, REGISTERS, GRILLES, DAMPERS, LOUVERS, AND ALL SHEET METAL ACCESSORIES
TEMPERATURE CONTROLS
SHEET METAL COORDINATION DRAWINGS
AIR BALANCE REPORT

**FIRE STOPPING**
PROVIDE FIRE STOPPING AT ALL PENETRATIONS THROUGH RATED SEPARATIONS PER LOCAL CODES AND REGULATIONS AND PER UL RECOMMENDATIONS FOR ASSEMBLIES ENCOUNTERED IN PROJECT. THE FIRE STOPPING MATERIAL SHALL MEET THE INTEGRITY OF THE FIRE RATED WALL, FLOOR, CEILING AND ROOF BEING PENETRATED. REFER TO ARCHITECT'S DRAWINGS FOR WALL, FLOOR, CEILING AND ROOF FIRE RATINGS PRIOR TO BIDDING WORK.

**ACCESS PANELS**
PROVIDE CEILING AND WALL ACCESS PANEL QUANTITIES AND LOCATIONS AS NECESSARY TO THE GENERAL CONTRACTOR PRIOR TO BIDDING. WHERE ACCESS PANELS ARE USED FOR ACCESSING CONCEALED EQUIPMENT THE ACCESS PANEL SHOULD BE SIZED TO ALLOW FOR REMOVAL OF THE EQUIPMENT WITHOUT THE REMOVAL OF PERMANENT BUILDING CONSTRUCTION MATERIALS. THERE SHALL BE NO EXTRAS FOR HAVING TO ADD ACCESS PANELS AFTER BIDS ARE AWARDED.

**CUTTING AND PATCHING**
NEATLY DO ALL CUTTING AS REQUIRED AND PATCH ALL CUT SURFACES TO MATCH BUILDING CONSTRUCTION. THE CONTRACTOR SHALL EMPLOY AND PAY A TRADE TRAINED AND QUALIFIED TO PERFORM THE REQUIRED PATCHING WORK. ALL SURFACES DISTURBED SHALL BE RESTORED WITH LIKE MATERIALS TO THE SATISFACTION OF THE OWNER. ALL PENETRATIONS THROUGH ROOF SHALL BE MADE BY BONDED ROOFER. MECHANICAL CONTRACTOR SHALL PAY ALL FEES REQUIRED.

**FLASHING AND COUNTERFLASHING**
ROOF FLASHING SHALL BE FURNISHED AND INSTALLED BY THE ROOFING CONTRACTOR. ROOF COUNTERFLASHING SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR. COORDINATE WORK WITH ROOFING CONTRACTOR AND PAY ALL FEES.

**WARRANTY**
THE MECHANICAL CONTRACTOR SHALL UNCONDITIONALLY WARRANT ALL WORK TO BE FREE OF DEFECTS IN EQUIPMENT, MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF FINAL ACCEPTANCE BY OWNER. THE MECHANICAL CONTRACTOR WILL REPAIR OR REPLACE ANY DEFECTIVE WORK PROMPTLY AND WITHOUT CHARGE TO THE OWNER. RESTORE ANY OTHER EXISTING WORK DAMAGED IN THE COURSE OF REPAIRING DEFECTIVE EQUIPMENT, MATERIALS AND WORKMANSHIP.

**MECHANICAL WORK**
THE MECHANICAL CONTRACTOR SHALL PROVIDE NEW HVAC EQUIPMENT, FANS, DUCTWORK, PIPING, AIR DEVICES, CONTROLS AS INDICATED ON DRAWINGS AND AS SPECIFIED. STARTUP AND 1ST YEAR PARTS AND LABOR WARRANTY SHALL BE INCLUDED AND MANUFACTURER'S EXTENDED WARRANTIES. EQUIPMENT AND APPLIANCES SHALL BE INSTALLED AS REQUIRED BY THE TERMS OF THEIR APPROVAL, IN ACCORDANCE WITH THE CONDITIONS OF THE LISTING, THE MANUFACTURER'S INSTALLATION INSTRUCTIONS, AND THE APPLICABLE CODE.

**OWNER'S INSTRUCTIONS**
PROVIDE TWO SETS OF COMPLETE OPERATING AND MAINTENANCE INSTRUCTIONS WITH DRAWINGS, TYPEWRITTEN INSTRUCTIONS AND OPERATING SEQUENCES AND DESCRIPTIVE DATA SHEETS. ASSEMBLE EACH SET IN A HARD BOUND COVER. PROVIDE PDF FILES OF ALL DOCUMENTATION.

**FINALE**
PUT ALL EQUIPMENT IN SERVICE AND DEMONSTRATE THAT ALL CONDITIONS OF THE CONTRACT HAVE BEEN FUFILLED. REMOVE ALL TOOLS, DEBRIS, ETC. OCCASIONED BY WORK UNDER THIS CONTRACT. SUBMIT ALL WARRANTIES, TEST REPORTS, OPERATING AND MAINTENANCE MANUALS FOR HVAC SYSTEMS, LOG SHEETS AND CHARTS, AND GUARANTEES AS PREVIOUSLY SPECIFIED. PROVIDE ALL REPORTS, FORMS, ETC. REQUIRED BY INSPECTORS TO THE SATISFACTION OF THE OWNER. PROVIDE AS-BUILT RECORD DRAWINGS (IN AUTOCAD 2007 OR LATER) SHOWING AN ACCURATE ACCOUNT OF THE FINAL INSTALLED SYSTEMS. SYSTEMS INCLUDING BUT NOT LIMITED TO ALL EQUIPMENT AND ASSOCIATED CONTROLS, DUCTWORK/PIPING, AIR DEVICES, ETC.

**SHEETMETAL DUCTWORK**
ALL SIZES OF DUCTS SHOWN ON THE DRAWINGS ARE INTERIOR DUCT DIMENSIONS. ALL DUCTWORK SHALL BE RIGID SHEETMETAL CONSTRUCTED FROM GALVANIZED SHEET STEEL IN ACCORDANCE WITH SMACNA LOW VELOCITY DUCT CONSTRUCTION STANDARDS. ALL EXPOSED DUCTWORK SHALL BE ROUND, SPIRAL, OR RECTANGULAR LOCK-SEAM TYPE, AS SHOWN ON HVAC DRAWINGS. ASSEMBLE AND INSTALL DUCTWORK IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICE FOR ACHIEVING AIR TIGHT (5% LEAKAGE) AND NOISELESS (NO OBJECTIONABLE NOISE) SYSTEMS, CAPABLE OF PERFORMING EACH INDICATED SERVICE. FURNISH ALL REQUIRED DAMPERS, TRANSITIONS, OFFSETS, CONNECTIONS TO AIR DEVICES, AND OTHER ACCESSORIES NECESSARY FOR A COMPLETE OPERATING SYSTEM. FLEXIBLE DUCTWORK SHALL NOT EXCEED 8'-0" LONG.

**ADHESIVES AND SEALANTS**
SEAL ALL LONGITUDINAL AND TRANSVERSE DUCT JOINTS WITH A UL 181A OR 181B NON-HARDENING, NON-MIGRATING MASTIC OR LIQUID ELASTIC SEALANT OF A TYPE RECOMMENDED BY THE MANUFACTURER FOR SEALING JOINTS AND SEAMS IN SHEET METAL DUCTWORK. COVER ALL FIELD JOINTS, JOINTS AROUND SPIN-IN FITTINGS AND FASTENING SCREWS WITH MASTIC. ALL SEALANTS AND GASKETS SHALL HAVE SURFACE-BURNING CHARACTERISTICS WITH A MAXIMUM FLAME-SPREAD INDEX OF 25 AND A MAXIMUM SMOKE-DEVELOPED INDEX OF 50 WHEN TESTED ACCORDING TO UL 723.
EXPOSED DUCTWORK: TRIM DUCT SEALANTS FLUSH WITH METAL. CREATE A SMOOTH AND UNIFORM EXPOSED BEAD. DO NOT USE TWO-PART TAPE SEALING SYSTEM.

**DUCT SUPPORTS**
FURNISH AND INSTALL HOT-DIPPED GALVANIZED STEEL FASTENERS, HANGERS, ANCHORS, RODS, STRAPS, TRIM, AND ANGLES FOR SUPPORT OF DUCTWORK.

**FLEXIBLE CONNECTIONS**
FURNISH AND INSTALL NEOPRENE FLEXIBLE DUCT CONNECTIONS AT THE INLET AND DISCHARGE OF UNITS AND FANS.

**DUCT MANUAL VOLUME DAMPERS**
FURNISH AND INSTALL OPPOSED-BLADE, LEAK-PROOF VOLUME CONTROL DAMPERS WHERE INDICATED ON DRAWINGS AND LOCATIONS IN SUPPLY, RETURN AND EXHAUST DUCTS WHERE BRANCHES ARE TAKEN FROM LARGER DUCTS OR AT EACH INDIVIDUAL DUCT REGISTER IN ORDER TO ACHIEVE SYSTEM AIR BALANCE QUANTITIES. BALANCING DEVICES MUST BE PROVIDED IN ACCORDANCE WITH IMC 603.17. ALL MANUAL VOLUME DAMPERS MUST BE SHOWN ON COORDINATION DRAWINGS WHEN SUBMITTED FOR REVIEW.

**DUCT ACCESS DOORS**
FURNISH AND INSTALL CONVENIENTLY LOCATED DUCT ACCESS DOORS OF AMPLE SIZE AND QUANTITY FOR SERVICING THE DAMPERS.

**DUCT THERMAL INSULATION**
PROVIDE EXTERNAL THERMAL INSULATION WITH AN INTEGRAL VAPOR VARRIER FACING OF SUFFICIENT THICKNESS AND THERMAL RESISTANCE TO MEET LOCAL ENERGY CODE REQUIREMENTS (MINIMUM 1-1/2" THICK, .75 LB. PER CU./FT. DENSITY, WITH FSK JACKET, .002 THICK REINFORCED ALUMINUM FOIL VAPOR BARRIER). DO NOT INSULATE EXPOSED DUCTWORK AND PORTIONS OF DUCTWORK THAT ARE INTERNALLY LINED AS NOTED ON DRAWINGS. DUCTWORK EXPOSED TO THE WEATHER SHALL BE PROTECTED WITH AN APPROVED WEATHERPROOF BARRIER/JACKETING. INSULATION OF ALL DUCTWORK SHALL BE CONTINUOUS THRU ALL WALLS AND FLOORS. THERMAL INSULATION AND SEALERS SHALL COMPLY WITH NFPA FLAME SPREAD OF 25 OR LESS, AND SMOKE DEVELOPED INDEX OF 50 OR LESS.

INSULATION REQUIREMENTS:
SUPPLY AND RETURN AIR DUCT INSULATION IN UNCONDITIONED SPACES WITHIN THE BUILDING.
EXCEPTION: DUCTS WITH INTERIOR AND EXTERIOR TEMPERATURE DIFFERENCE NOT EXCEEDING 15 DEGREES F DOES NOT REQUIRE INSULATION.

ALL SUPPLY AND RETURN DUCTS AND PLENUMS INSTALLED AS PART OF THE HVAC DISTRIBUTION AIR SYSTEM SHALL BE INSULATED IN ACCORDANCE WITH TABLE 6.8.2B BELOW. THIS PROJECT IS LOCATED IN CLIMATE ZONE 4, THEREFORE, THE FOLLOWING R VALUES ARE REQUIRED:

**TABLE 6.8.2B Minimum Duct Insulation R-Value,[a] Combined Heating and Cooling Supply Ducts and Return Ducts**

| Climate Zone | Duct Location: Exterior | Ventilated Attic | Unvented Attic Above Insulated Ceiling | Unvented Attic with Roof Insulation[a] | Unconditioned Space[b] | Indirectly Conditioned Space[c] | Buried |
|---|---|---|---|---|---|---|---|
| **Supply Ducts** | | | | | | | |
| 1 | R-6 | R-6 | R-8 | R-3.5 | R-3.5 | none | R-3.5 |
| 2 | R-6 | R-6 | R-6 | R-3.5 | R-3.5 | none | R-3.5 |
| 3 | R-6 | R-6 | R-6 | R-3.5 | R-3.5 | none | R-3.5 |
| 4 | R-6 | R-6 | R-6 | R-3.5 | R-3.5 | none | R-3.5 |
| 5 | R-6 | R-6 | R-6 | R-1.9 | R-3.5 | none | R-3.5 |
| 6 | R-8 | R-6 | R-6 | R-1.9 | R-3.5 | none | R-3.5 |
| 7 | R-8 | R-6 | R-6 | R-1.9 | R-3.5 | none | R-3.5 |
| 8 | R-8 | R-8 | R-8 | R-1.9 | R-6 | none | R-6 |
| **Return Ducts** | | | | | | | |
| 1 to 8 | R-3.5 | R-3.5 | R-3.5 | none | none | none | none |

[a] Insulation R-values, measured in (h·ft²·°F)/Btu, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as *plenum walls*, wall insulation shall be as required by the most restrictive condition of Section 6.4.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a *mean temperature* of 75°F at the installed thickness.
[b] Includes crawlspaces, both ventilated and nonventilated.
[c] Includes return air *plenums* with or without exposed *roofs* above.

NOTE: UNCONDITIONED OUTSIDE AIR DUCTWORK SHALL HAVE THE SAME INSULATION REQUIREMENTS AS SUPPLY DUCTS EXCEPT UNCONDITIONED OUTSIDE AIR DUCTS SHALL ALSO REQUIRE R-3.5 INSULATION IN INDIRECTLY CONDITIONED SPACES. EXHAUST AIR DUCTWORK BETWEEN ISOLATION DAMPER AND PENETRATION OF BUILDING EXTERIOR OR A MINIMUM OF 5' FROM ALL EXTERIOR PENETRATIONS SHALL HAVE A MINIMUM R-3.5 INSULATION.

**DIFFUSERS, GRILLES AND REGISTERS**
DIFFUSERS, GRILLES AND REGISTERS SHALL BE MANUFACTURED BY TITUS, PRICE, OR ENGINEERED APPROVED EQUAL AND SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR. DIFFUSERS SHALL BE INSTALLED AS INDICATED ON THE DRAWINGS AND SCHEDULES. THE MECHANICAL CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS ITEMS NECESSARY FOR A COMPLETE AND PROPER INSTALLATION IN THE TYPE OF CEILING AND WALLS USED IN THIS PROJECT.

**EXHAUST FAN**
FAN MANUFACTURER SHALL BE BROAN, COOK, GREENHECK, OR ENGINEERED APPROVED EQUAL. REFER TO DRAWINGS AND SCHEDULES FOR UNIT LOCATION, TECHNICAL DATA, AND ANY APPLICABLE ACCESSORIES.

**ROOFTOP UNIT**
OUTDOOR, ROOFTOP MOUNTED, ELECTRICALLY CONTROLLED, HEATING AND COOLING UNIT UTILIZING SCROLL COMPRESSORS FOR COOLING AND NATURAL GAS FOR HEATING. UNIT SHALL HAVE STANDARD MANUFACTURER WARRANTY ON PARTS. INSTALL PER MANUFACTURER'S REQUIREMENTS. REFER TO DRAWINGS AND SCHEDULES FOR UNIT LOCATION, TECHNICAL DATA, AND ACCESSORIES. ROOFTOP MANUFACTURER SHALL BE LENNOX, TEMPMASTER, CARRIER, OR EQUIVALENT.

**TEMPERATURE CONTROLS AND CONTROL WIRING**
THE MECHANICAL CONTRACTOR SHALL PROVIDE ALL CONTROL WIRING NECESSARY FOR THE COMPLETE AND PROPER OPERATING TEMPERATURE CONTROL SYSTEM. PROGRAMMABLE THERMOSTATS SHALL BE PROVIDED WITH EQUIPMENT PACKAGES UNLESS OTHERWISE NOTED.

**TESTING, BALANCING, AND ADJUSTING**
THE INDIVIDUAL PERFORMING THE AIR BALANCING SHALL BE A CERTIFIED TEST AND BALANCER AND A MEMBER OF NEBB OR AABC, USING CALIBRATED EQUIPMENT. THE CERTIFIED AIR BALANCE CONTRACTOR SHALL ACCURATELY BALANCE THE SYSTEMS TO PROVIDE AIR QUANTITIES AS INDICATED ON THE DRAWINGS AND IN THE SCHEDULES/SPECIFICATIONS, OPERATE AUTOMATIC CONTROL SYSTEMS, AND VERIFY SET POINTS DURING BALANCING.

EXHAUST FANS
TOILET ROOM EXHAUST FANS SHALL BE INTERLOCKED WITH LIGHTING CONTROLS.

ROOFTOP UNITS
RTU-3: UNIT SHALL BE CONTROLLED FROM A THERMOSTAT IN THE SPACE.
HEATING MODE - WHEN THE THERMOSTAT CALLS FOR HEATING THE FAN SHALL RUN AND THE GAS FIRED HEAT EXCHANGER SHALL FIRE TO MAINTAIN TEMPERATURE SETPOINT . WHEN THE SETPOINT IS REACHED THE HEATER SHALL SHUT OFF.
COOLING MODE - WHEN THE THERMOSTAT CALLS FOR COOLING THE REFRIGERATION SYSTEM SHALL ENGAGE, THE FAN SHALL RUN, AND THE DX COOLING COIL SHALL COOL THE AIR TO MAINTAIN TEMPERATURE SETPOINT. WHEN THE SETPOINT IS REACHED THE REFRIGERATION SYSTEM SHALL SHUT OFF.
VENTILATION - THE FAN SHALL RUN DURING OCCUPIED MODE TO PROVIDED THE REQUIRED BUILDING VENTILATION/ MAKEUP AIR.
ECONOMIZER MODE - WHEN THE ECONOMIZER IS ENABLED (THE OUTSIDE AIR ENTHALPY IS LOWER THAN THE RETURN AIR ENTHALPY), THE ECONOMIZER BECOMES THE FIRST STAGE OF COOLING. THE ECONOMIZER DAMPER WILL MODULATE TO MAINTAIN SPACE TEMPERATURE.

## DIFFUSER, GRILLE, AND REGISTER SCHEDULE

| CALLOUT | DESCRIPTION | FACE SIZE (IN) | INLET SIZE (IN) | MODEL | NOTES |
|---|---|---|---|---|---|
| CD-1 | 4-WAY DIFFUSER WITH 3 CONES. | 24x24 | 8Ø | TITUS TMS | REMOVABLE CORE FROM FACE OF DIFFUSER. INSULATE BACK OF DIFFUSER. |
| CD-4 | 4-WAY DIFFUSER WITH 3 CONES. | 12x12 | 6Ø | TITUS TMS | REMOVABLE CORE FROM FACE OF DIFFUSER. INSULATE BACK OF DIFFUSER. |
| CD-6 | 24"X24" 4-WAY DIFFUSER WITH 3 CONES. QUICK REMOVAL OF INNER CONE WITH A HEX KEY FOR OPTIONAL DAMPER ADJUSTMENT. | 24x24 | 10Ø | TITUS TMSA | REMOVABLE CORE FROM FACE OF DIFFUSER. INSULATE BACK OF DIFFUSER. |
| EG-3 | ALUMINUM RETURN GRILLE, 35 DEGREE DEFLECTION, 3/4" BLADE SPACING | 12x12 | 10x10 | TITUS 350FS | STANDARD FINISH: #26 WHITE |
| RG-1 | ALUMINUM BORDER, 1/2"X1/2"X1/2", HIGH FREE AREA CORE, MINIMIZED PRESSURE DROP, MRI COMPATIBLE | 24x24 | 24x24 | TITUS 50F | #26 WHITE FINISH, LAY-IN GRILLE WITH OPPOSED BLADE DAMPER |

## Ventilation Schedule

### Zone RTU-3

| | | | |
|---|---|---|---|
| System Primary Airflow: $V_{ps}$ | 3,000 CFM | Zone Air Distribution Effectiveness: $E_z$ | 0.8 |
| Average Outdoor Air Fraction: $X_s$ | 0.12 | Primary Air Fraction to Zone: $E_p$ | 1 |
| Occupant Diversity: $D$ | 1 | Secondary Air Fraction to Zone: $E_r$ | 1 |
| Uncorrected Air Intake: $V_{ou}$ | 360 CFM | Fraction of Supply Air to Zone from Outside Zone: $F_a$ | 1 |
| System Ventilation Efficiency: $E_v$ | 0.698 | Fraction of Supply Air to Zone from Fully Mixed Primary Air: $F_b$ | 1 |
| Outdoor Air Intake: $V_{ot}$ | 516 CFM 0.172 | Fraction of Outdoor Air to Zone from Outside Zone: $F_c$ | 1 |

**Room Information**

| Room | Room Type | People Outdoor Air: Rate (CFM/person) $R_p$ | People $P_z$ | Total (CFM) $R_p*P_z$ | Area Outdoor Air: Rate (CFM/ft²) $R_a$ | Area (ft²) $A_z$ | Total (CFM) $R_a*A_z$ | Breathing Zone Outside Airflow (CFM) $V_{bz}$ | Zone Outdoor Airflow (CFM) $V_{oz}$ | Zone Discharge Airflow (CFM) $V_{dz}$ | Discharge Outdoor Air Fraction $Z_d$ | Zone Ventilation Efficiency $E_{vz}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 OFFICE | Office-Office Space | 5 | 2 | 10 | 0.06 | 376 | 23 | 33 | 41 | 1,250 | 0.0327 | 1.14 |
| 101 TOILET ROOM | Public Spaces-Toilet | 0 | 0 | 0 | 0 | 124 | 0 | 0 | 0 | 108 | 0 | 1.17 |
| 102 OFFICE | Office-Office Space | 5 | 3 | 15 | 0.06 | 471 | 29 | 44 | 55 | 1,230 | 0.0448 | 1.13 |
| **103 CONFERENCE ROOM** | **Offices-Conference Room** | **5** | **34** | **170** | **0.06** | **677** | **41** | **211** | **264** | **413** | **0.639** | **0.533** |

## HEATER SCHEDULE

| TAG | TYPE | AREA SERVED | MANUFACTURER | MODEL | HEAT-MBH | FUEL | HEAT-KW | GAS HEATING: INPUT MBH | OUTPUT MBH | VOLT/PHASE | FLA | MOUNTING | WEIGHT | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H-1 | WALL HEATER | ENTRANCE | BERKO | AWH4507F | 16.4 | ELECTRIC | 4.8 | -- | -- | 277/1 | 17.3 | IN WALL | 25 | 1,2 |
| H-2 | UNIT HEATER | DELIVERY DOCK | MODINE | HDS30 | 24 | GAS | -- | 30 | 24 | 120/1 | 3.7 | HUNG FROM STRUCTURE OR WALL | 55 | 2,3 |

1. SEMI-RECESSED MOUNTING SLEEVE.
2. INTEGRAL THERMOSTAT.
3. SEPARATED COMBUSTION, POWER VENTED.

## MECHANICAL EXHAUST SCHEDULE - 2011 OHIO MECHANICAL CODE

| ROOM NUMBER | ROOMNAME | OCCUPANCY CLASSIFICATION | AREA (ft2) | EXHAUST AIRFLOW RATE (CFM/ft2) | FIXTURES: EXHAUST RATE PER FIXTURE (CFM) | LOWER CONTINUOUS RATE? | HIGHER INTERMITTENT RATE? | QTY. OF FIXTURES | TOTAL EXHAUST AIRFLOW REQ. (CFM) | TOTAL EXHAUST AIRFLOW ACT. (CFM) | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 111 | RESTROOM | TOILET ROOMS - PUBLIC | 75 | 0.00 | 50 | - | - | 2 | 100 | 100 | 1 |
| 118 | RESTROOM | TOILET ROOMS - PUBLIC | 112 | 0.00 | 50 | - | - | 2 | 100 | 100 | 1 |

1. FIXTURE RATE IS BASED ON SPACES THAT DO NOT INVOLVE HEAVY USAGE. (I.E. NOT A THEATER, SCHOOL, OR SPORTS FACILITY).

## FAN SCHEDULE

| TAG | TYPE | AREA SERVED | MANUFACTURER | MODEL | DRIVE | CFM | ESP | WATTS | HP | RPM | VOLT/PHASE | MOUNTING | WEIGHT | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E-1 | EXHAUST | TOILET ROOMS | GREENHECK | SQ-95-G | DIRECT | 300 | 0.25 | - | 1/15 | 1300 | 115/1 | INLINE | 49 | 1 |
| E-2 | EXHAUST | TOILET ROOMS | GREENHECK | CSP-A290 | DIRECT | 250 | 0.15 | - | - | 1050 | 115/1 | INLINE | 23 | 1 |
| E-3 | EXHAUST | TOILET | GREENHECK | SP-B70 | DIRECT | 50 | 0.15 | 16 | - | 675 | 115/1 | CEILING | 9 | 1 |
| E-4 | EXHAUST | SEE PLANS | GREENHECK | RBU-1L36 | BELT | 10,000 | 0.1 | - | 3/4 | 435 | 460/60/3 | ROOF | 254 | 1 |
| E-5 | EXHAUST | REST ROOM | GREENHECK | SP-A110 | DIRECT | 100 | 0.15 | 18 | - | 950 | 115/1 | CEILING | 17 | 1 |

1. FIXTURE RATE IS BASED ON SPACES THAT DO NOT INVOLVE HEAVY USAGE. (I.E. NOT A THEATER, SCHOOL, OR SPORTS FACILITY).

## ROOFTOP UNIT SCHEDULE

| TAG | AREA SERVED | MANUFACTURER | MODEL | WEIGHT | MOUNTING | NOTES | CFM | ESP | OA CFM | BHP | HP | CLG-MBH | CLG-SENS | NOMINAL TONS | EER | HEATING: LOW INPUT MBH | LOW OUTPUT MBH | HIGH INPUT MBH | HIGH OUTPUT MBH | EFFICIENCY % | GAS PRESSURE (IN. WG) | ELECTRIC: VOLT/PHASE | MCA | MOCP | ECONOMIZER: DUAL ENTHALPY | BAROMETRIC RELIEF | POWERED EXHAUST | DUCT SMOKE DETECTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RTU-1 | OFFICE | EXISTING | TO REMAIN | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| RTU-2 | SEE PLANS | ICP | RGS090LECA0AAA | 1028 | ROOF | 1 | 3000 | 0.7 | 470 | 1.79 | 2.9 | 91.7 | 60.1 | 7.5 | 11 | 120 | 98 | 180 | 148 | 82 | 0.7 | 480/3 | 20 | 25 | YES | YES | NO | YES |

1. 14" ROOF CURB.

## OFFICE BUILDING AIR BALANCE SUMMARY

| | RTU-1 | RTU-2 | E-3a | E-3b | E-5 | E-6 | E-7 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| OUTSIDE AIR | 800 | 516 | 0 | 0 | 0 | 0 | 0 | 1316 |
| EXHAUST AIR | 0 | 0 | 50 | 50 | 100 | 100 | 100 | 400 |
| | | | | | | | | 916 POSITIVE |

STATE OF OHIO
SCOTT SEVERT STILKEY
E-77795
REGISTERED
PROFESSIONAL ENGINEER

25 MAY 2017

MSP
McGill Smith Punshon, Inc.
3700 Park 42 Drive Suite 190B
Cincinnati, Ohio 45241-2097
Tel. 513-759-0004 ▪ Fax 513-563-7099
Engineers ▪ Architects ▪ Surveyors
Planners ▪ Landscape Architects

KPO Project Mgr. KPO
Checked by SSS

| Issue/ Revision | Revision Number | Date |
|---|---|---|
| BID / PERMIT | | 05/25/17 |

PR-06164
ENGINEERED BUILDING SYSTEMS INC.
TEAMWORK • COLLABORATION
SHARED SUCCESS
515 Monmouth Street, Suite 204
Newport, KY 41071 (859) 261-0585
MEP Consulting Services, Inc. in OH
Copyright © 2015
THIS DOCUMENT IS THE PRODUCT AND EXCLUSIVE PROPERTY OF ENGINEERED BUILDING SYSTEMS, INC. NEITHER THE DOCUMENT NOR THE INFORMATION IT CONTAINS MAY BE USED FOR OTHER THAN THE SPECIFIC PURPOSE FOR WHICH IT WAS PREPARED WITHOUT WRITTEN CONSENT OF ENGINEERED BUILDING SYSTEMS, INC.

RENOVATIONS AND ADDITIONS
FOR
*Republic Wire*
UNION CENTRE DRIVE
WEST CHESTER, OHIO 45069

Sheet Title
MECHANICAL DETAILS

Project No. 97333.33
Scale AS NOTED
Sheet No. M3.0