

# ELECTRICAL SPECIFICATIONS

## TESTING, ADJUSTING, AND BALANCING FOR HVAC (CONTINUED)

### EXAMINATION

VERIFY THAT SYSTEMS ARE COMPLETE AND OPERABLE BEFORE COMMENCING WORK. ENSURE THE FOLLOWING CONDITIONS:

SYSTEMS ARE STARTED AND OPERATING IN A SAFE AND NORMAL CONDITION.

PROPER THERMAL OVERLOAD PROTECTION IS IN PLACE FOR ELECTRICAL EQUIPMENT.

FILN FILTERS ARE CLEAN AND IN PLACE. IF REQUIRED, INSTALL TEMPORARY MEDIA IN ADDITION TO FINAL FILTERS.

DUCT SYSTEMS ARE CLEAN OF DEBRIS.

ADJUSTMENT TOLERANCES:

EXHAUST SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN FOR SUPPLY SYSTEMS AND PLUS OR MINUS 10 PERCENT OF DESIGN FOR RETURN AND EXHAUST SYSTEMS.

AIR OUTLETS AND INLETS: ADJUST TOTAL TO WITHIN PLUS 10 PERCENT AND MINUS 5 PERCENT OF DESIGN TO SPACE. ADJUST OUTLETS AND INLETS IN SPACE TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN.

RECORDING AND ADJUSTING:

ENSURE RECORDED DATA REPRESENTS ACTUAL MEASURED OR OBSERVED CONDITIONS.

PERMANENTLY MARK SETTINGS OF VALVES, DAMPERS, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS.

AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.

LEAVE SYSTEMS IN PROPER WORKING ORDER, REPLACING BELT GUARDS, CLOSING ACCESS DOORS, CLOSING DOORS TO ELECTRICAL SWITCH BOXES, AND RESTORING THERMOSTATS TO SPECIFIED SETTINGS.

CHECK AND ADJUST SYSTEMS APPROXIMATELY SIX MONTHS AFTER FINAL ACCEPTANCE AND SUBMIT REPORT.

AIR SYSTEM PROCEDURE (RECORD THE FOLLOWING IN THE REPORT):

ADJUST AIR HANDLING AND DISTRIBUTION SYSTEMS TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, AND EXHAUST AIR QUANTITIES.

MAKE AIR QUANTITY MEASUREMENTS IN DUCTS BY PITOT TUBE TRAVERSE OF ENTIRE CROSS SECTIONAL AREA OF DUCT.

MEASURE AIR QUANTITIES AT AIR INLETS AND OUTLETS.

ADJUST DISTRIBUTION SYSTEM TO OBTAIN UNIFORM SPACE TEMPERATURES FREE FROM OBJECTIONABLE DRAFTS AND NOISE.

USE VOLUME CONTROL DEVICES TO REGULATE AIR QUANTITIES ONLY TO EXTENT THAT ADJUSTMENTS DO NOT CREATE OBJECTIONABLE AIR MOTION OR SOUND LEVELS. EFFECT VOLUME CONTROL BY DUCT INTERNAL DEVICES SUCH AS DAMPERS.

VARY TOTAL SYSTEM AIR QUANTITIES BY ADJUSTMENT OF FAN SPEEDS. PROVIDE DRIVE CHANGES OR MOTOR SPEED TAP ADJUSTMENT AS REQUIRED. VARY BRANCH AIR QUANTITIES BY DAMPER REGULATION.

PROVIDE SYSTEM SCHEMATIC (OR TYPE WRITTEN REPORT) WITH REQUIRED AND ACTUAL AIR QUANTITIES RECORDED AT EACH MAKE-UP AIR UNIT, FAN COIL UNIT, AIR HANDLING UNIT, EXHAUST FANS AND OUTLET OR INLET.

MEASURE STATIC AIR PRESSURE CONDITIONS ON AIR SUPPLY UNITS, INCLUDING FILTER AND COIL PRESSURE DROPS, AND TOTAL PRESSURE ACROSS THE FAN. MAKE ALLOWANCES FOR 50 PERCENT LOADING OF FILTERS.

ADJUST OUTSIDE AIR AUTOMATIC DAMPERS, RETURN AIR, AND EXHAUST DAMPERS FOR DESIGN CONDITIONS.

MEASURE TEMPERATURE CONDITIONS ACROSS OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS TO CHECK LEAKAGE.

SUPPLY, RETURN & EXHAUST AIR DUCTWORK: REFER TO DUCT CONSTRUCTION SCHEDULE ON DRAWING ON H-X FOR ADDITIONAL INFORMATION.

### REFERENCE STANDARDS

ASTM A653/A653M - STANDARD SPECIFICATION FOR STEEL SHEET, ZINC-COATED (GALVANIZED) OR ZINC-IRON ALLOY-COATED (GALVANNEALED) BY THE HOT-DIP PROCESS 2019A.

ASTM E84 - STANDARD TEST METHOD FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS 2019B.

NFPA 90A - STANDARD FOR THE INSTALLATION OF AIR-CONDITIONING AND VENTILATING SYSTEMS 2018.

SMACNA (DCS) - HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE 2005 (REVISED 2009).

UL 181 - STANDARD FOR FACTORY-MADE AIR DUCTS AND AIR CONNECTORS CURRENT EDITION, INCLUDING ALL REVISIONS.

DUCT MANUAL: REFERENCE TO THE "DUCT CONSTRUCTION STANDARDS" IN THIS SPECIFICATION IS TO MEAN THE "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE", THIRD EDITION 2005, AS PUBLISHED BY THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INCORPORATED.

### MATERIALS

GALVANIZED STEEL FOR DUCTS: HOT-DIPPED GALVANIZED STEEL SHEET, ASTM A653/A653M FS TYPE B, WITH G60/Z180 COATING.

JOINT SEALERS AND SEALANTS: NON-HARDENING, WATER RESISTANT, MILDEW AND MOLD RESISTANT.

HEAVY MASTIC OR LIQUID USED ALONE OR WITH TAPE, SUITABLE FOR JOINT CONFIGURATION AND COMPATIBLE WITH SUBSTRATES, AND RECOMMENDED BY MANUFACTURER FOR PRESSURE CLASS OF DUCTS.

LOW PRESSURE SYSTEMS: DUCTWORK IS TO COMPLY TO STANDARD RECTANGULAR OR ROUND DUCT CONSTRUCTION WHICH PROVIDES FOR VELOCITIES NOT TO EXCEED 2,500 FPM AND STATIC PRESSURE NOT TO EXCEED 1.0 IN W.G., STD CLASSIFICATION, DENOTING STANDARD CONSTRUCTION CLASSIFICATION.

CONSTRUCTION: DUCTWORK IS TO BE CONSTRUCTED IN ACCORDANCE WITH CHAPTER 2 "RECTANGULAR DUCT CONSTRUCTION" OF THE LATEST EDITION OF THE SMACNA DUCT CONSTRUCTION STANDARDS. STEEL DUCT GAUGE AND REINFORCEMENT OPTIONS ARE TO CONFORM TO TABLE 2-2 ON PAGE 2.16.

### DUCTWORK FABRICATION

INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.

SIZES: DUCT SIZES INDICATED ON THE PLANS ARE CLEAR INSIDE DIMENSIONS, AND DO NOT INCLUDE DUCT LINING (IF DUCT LINING IS REQUIRED).

HANGERS: TO BE CONSTRUCTED IN ACCORDANCE WITH CHAPTER 5 "HANGERS AND SUPPORTS" OF THE DUCT CONSTRUCTION STANDARDS.

SUPPORTS" OF THE DUCT CONSTRUCTION STANDARDS.

ELBOWS - VANED: SQUARE AND RADIUS ELBOWS ARE TO HAVE VANES AND ARE TO BE CONSTRUCTED IN ACCORDANCE WITH FIGURE 4-2 OF THE DUCT CONSTRUCTION STANDARDS (TYPE RE-2 AND TYPE RE-3).

DUCT SEALING: ALL TRANSVERSE JOINTS, LONGITUDINAL SEAMS AND DUCT WALL PENETRATIONS IN SHEETMETAL DUCTWORK ARE TO BE SEALED AIRTIGHT WITH HARDCAST DUCT SEALANT MASTIC AND EMBEDDED FABRIC SYSTEM TO MINIMIZE DUCT LEAKAGE. THE UNI-CAST TWO (2) PART DUCT SEALING SYSTEM MAY ALSO BE USED. TO CONFORM TO THE REQUIREMENTS OF THE INTERNATIONAL ENERGY CONSERVATION CODE, SECTION 503.2.7.1.1, DUCT SEALING IS TO CONFORM TO SEAL CLASS "A" AS INDICATED ON TABLE 1 - 1 ON PAGE 1.11 OF THE DUCT CONSTRUCTION STANDARDS.

FIELD LOCATION AND DIMENSION CHANGES: ROUTINGS INDICATED ON THE DRAWINGS ARE TO BE ADHERED TO IN GENERAL, BUT WHERE REQUIRED BY FIELD CONDITIONS OR COORDINATION MAY BE RELOCATED SLIGHTLY. WHERE FIELD MEASUREMENTS INDICATE THAT CLEARANCES ARE NOT ADEQUATE TO PASS THE DUCTS OF SIZE SHOWN, DUCTS MAY BE RESIZED, PROVIDING CROSS SECTIONAL AREA IS KEPT CONSTANT WHERE MAJOR RELOCATION OR RESIZING IS REQUIRED, IT IS TO BE DONE ONLY WITH THE APPROVAL OF THE ARCHITECT.

CONNECTIONS TO EQUIPMENT: EVEN WHERE DUCTBOARD IS UTILIZED FOR SUPPLY AND RETURN DUCTS, DUCT CONNECTIONS TO MOTOR OPERATED EQUIPMENT (ROOFTOP UNIT, EXHAUST FANS, ETC.) ARE TO BE MADE WITH FLEXIBLE CONNECTIONS AS HERINAFTER SPECIFIED. WHERE DUCT CONNECTION DIMENSIONS ARE NOT INDICATED ON THE PLANS, DUCTS ARE TO BE SIZED TO FIT EQUIPMENT OPENINGS.

FLEXIBLE CONNECTIONS: FLEXIBLE CONNECTIONS ARE TO BE MADE BETWEEN AIR HANDLING EQUIPMENT AND DUCTWORK AS REQUIRED TO PREVENT VIBRATION TRANSMISSIONS, EXCESSIVE MOVEMENT OF LONG DUCTS AND WHEREVER DUCTS CROSS BUILDING EXPANSION JOINTS. FLEXIBLE CONNECTIONS ARE TO BE MADE OF NEOPRENE COATED GLASS FABRIC OR FIRE AND WATER RESISTANT COTTON DUCT HAVING A FINISHED WEIGHT OF APPROXIMATELY 20 OUNCES PER SQUARE YARD EQUAL TO VEN-FAB MANUFACTURE, OR SIMILAR FLEXIBLE FLAME RETARDANT MATERIAL SPECIFICALLY MANUFACTURED FOR THIS APPLICATION. CONNECTIONS (COLLARS) ARE TO BE APPROXIMATELY 4" LONG AND ARE TO BE INSTALLED WITH JUST SUFFICIENT SLACK TO PREVENT TRANSMISSION OF VIBRATION. CIRCULAR COLLARS ARE TO BE SEALED TO FANS AND DUCTS WITH 12 GAGE METALBANDS 1" WIDE. RECTANGULAR COLLARS ARE TO BE SECURED TO DUCTS AND FANS WITH 1" X 1/8" FLAT BARS FASTENED WITH SCREWS OR BOLTS AT 8" INTERVALS OR WITH SLIP JOINTS SIMILAR TO THOSE SPECIFIED FOR DUCT JOINTS, THE FABRIC BEING TIGHTLY CRIMPED INTO THE SLIP JOINT AND THE COMPLETE JOINT BEING FASTENED WITH SHEETMETAL SCREWS AT 8" INTERVALS. COLLARS ARE TO BE PAINTED. METAL FOR FASTENING COLLARS ARE TO BE THE SAME AS SPECIFIED FOR DUCTS AND BRACING. REFER TO FIG. 7-8 OF THE DUCT CONSTRUCTION STANDARDS.

### INSTALLATION

INSTALL, SUPPORT, AND SEAL DUCTS IN ACCORDANCE WITH SMACNA (DCS).

INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

DURING CONSTRUCTION PROVIDE TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.

### SHEETMETAL DUCTWORK

SUPPLY, RETURN & EXHAUST AIR DUCTWORK: REFER TO DUCT CONSTRUCTION SCHEDULE ON DRAWING ON H-X FOR ADDITIONAL INFORMATION.

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THE ARCHITECT.

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### INSTALLATION

INSTALL, SUPPORT, AND SEAL DUCTS IN ACCORDANCE WITH SMACNA (DCS).

INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

DURING CONSTRUCTION PROVIDE TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.

### MOTOR OPERATED DAMPER

MOTOR OPERATED CONTROL DAMPERS AT LOCATIONS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH THIS SPECIFICATION. CONTROL DAMPERS ARE TO MEET THE FOLLOWING MINIMUM PERFORMANCE STANDARDS:

MAXIMUM LEAKAGE OF 3CFM/SF AT 1" W.G. (CLASS 1A)

MAXIMUM PRESSURE DIFFERENTIAL RATING OF 5" W.G.

MAXIMUM VELOCITY RATING OF 3,000 FPM.

PROVIDE AMCA CERTIFIED PERFORMANCE DATA WHERE APPLICABLE.

CONTROL DAMPERS ARE TO MEET THE FOLLOWING MINIMUM CONSTRUCTION STANDARDS.

FRAME AND BLADES ARE TO BE CONSTRUCTED OF 16 GAGE GALVANIZED STEEL.

OPPOSED BLADE ACTION.

TPE BLADE EDGE SEALS MECHANICALLY FASTENED TO EACH BLADE

PLATED STEEL LINKAGES

1/2" PLATED STEEL AXLES WITH SYNTHETIC SLEEVE BEARINGS ROTATING IN POLISHED EXTRUDED HOLES IN THE DAMPER FRAME.

DAMPERS ARE TO BE IN EVERY RESPECT EQUIVALENT TO GREENHECK MODEL VCD-23.

### AIR INLETS AND OUTLETS

SUBMITTALS

PRODUCT DATA: PROVIDE DATA FOR EQUIPMENT REQUIRED FOR THIS PROJECT. REVIEW OUTLETS AND INLETS AS TO SIZE, FINISH, AND TYPE OF MOUNTING PRIOR TO SUBMISSION.

SUBMIT SCHEDULE OF OUTLETS AND INLETS SHOWING TYPE, SIZE, LOCATION, APPLICATION, AND NOISE LEVEL.

PROJECT RECORD DOCUMENTS: RECORD ACTUAL LOCATIONS OF AIR OUTLETS AND INLETS.

PRODUCTS

GRILLES, REGISTERS AND DIFFUSERS

REFER TO SCHEDULE ON DRAWINGS.

PROVIDE IN STANDARD WHITE UNLESS OTHERWISE NOTED.

PROVIDE IN STEEL CONSTRUCTION UNLESS INSTALLED IN WET OR HARSH ENVIRONMENTS AND/OR AS OTHERWISE NOTED.

COORDINATE CEILING STYLE WITH ARCHITECTURAL DRAWINGS PRIOR TO ORDERING.

BRANCH RUN OUT DUCTWORK SERVING DIFFUSER IS TO BE SAME SIZE AS DIFFUSER NECK CONNECTION UNLESS SERVING MORE THAN ONE DIFFUSER OR NOTED OTHERWISE.

PROVIDE DIFFUSERS AND REGISTERS WITH OPPOSED BLADE DAMPERS ADJUSTABLE FROM THE FACE OF THE DEVICE UNLESS SPECIFICALLY NOTED OTHERWISE.

ROOF CURBS

ROOF CURB FOR SINGLE-PLY ROOFING WITH TAPERED INSULATION IS TO BE RPS CORPORATION, MODEL RC-2A HOWEVER, THE HVAC CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXACT ROOF TYPE BEING INSTALLED, AND VERIFYING CURB IS COMPATIBLE WITH ROOF.

CURB IS TO MINIMUM 18" OVERALL HEIGHT.

CURB IS TO BE BOX SECTION DESIGN.

CURB IS TO BE CONSTRUCTED OF 18 GAUGE GALVANIZED STEEL WITH CONTINUOUS WELDED CORNER SLEEVES.

PROVIDE FACTORY INSTALLED WOOD NAILERS.

CURB IS TO BE INTERNALLY INSULATED WITH 1-1/2" THICK, 3 POUND PER CUBIC FOOT DENSITY RIGID FIBERGLASS BOARD.

CURB SEAL: RUBBER SEAL BETWEEN FAN AND ROOF CURB.

DAMPERS:

TYPE: GRAVITY OR MOTORIZED FACTORY DESIGNED TO PREVENTS OUTSIDE AIR FROM ENTERING BACK INTO BUILDING WHEN FAN IS OFF.

BALANCED FOR MINIMAL RESISTANCE TO FLOW.

INSTALLATION

INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

COMPLY WITH SMACNA (ASMM) FOR FLASHING/COUNTER-FLASHING OF ROOF PENETRATIONS AND SUPPORTS FOR ROOF CURBS AND ROOF MOUNTED EQUIPMENT.

CHECK LOCATION OF OUTLETS AND INLETS AND MAKE NECESSARY ADJUSTMENTS IN POSITION TO COMPLY WITH ARCHITECTURAL FEATURES, SYMMETRY, AND LIGHTING ARRANGEMENT.

PROVIDE BALANCING DAMPERS ON DUCT TAKE-OFF TO DIFFUSERS, AND GRILLES AND

REGISTERS, DESPITE WHETHER DAMPERS ARE SPECIFIED AS PART OF THE DIFFUSER, OR GRILLE AND REGISTER ASSEMBLY.

### MANUAL VOLUME CONTROL DAMPERS

FURNISH AND INSTALL MANUAL VOLUME CONTROL (BALANCING) DAMPERS (VDC'S) TO BALANCE THE AIR SYSTEMS, AT LOCATIONS SHOWN ON PLANS OR IN ACCORDANCE WITH THIS SPECIFICATION. VOLUME CONTROL DAMPERS ARE TO MEET THE FOLLOWING MINIMUM CONSTRUCTION STANDARDS:

GALVANIZED 22 GAGE STEEL FRAME WITH 20 GAGE STEEL OPPOSED BLADE DAMPER CONFIGURATION AND 1/2" DIAMETER PLATED STEEL AXLE.

MINIMUM UL 555 DIFFERENTIAL PRESSURE RATING OF 1" WATER GAGE

MINIMUM UL 555 VELOCITY RATING OF 2,000 FPM.

PROVIDE INSULATION STAND-OFF FOR MANUAL ACTUATOR WITH MANUAL QUADRANT AND LOCKABLE HANDLE.

DAMPERS ARE TO BE IN EVERY RESPECT EQUIVALENT TO GREENHECK MODEL MBD (OR MBDR FOR ROUND DUCTS).

INSTALLATION

INSTALL DAMPERS IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.

DAMPERS MUST BE ACCESSIBLE TO ALLOW INSPECTION, ADJUSTMENT, AND REPLACEMENT OF COMPONENTS. THE SHEET METAL CONTRACTOR SHALL FURNISH ANY ACCESS DOORS IN DUCTWORK OR PLENUMS REQUIRED TO PROVIDE THIS ACCESS. THE GENERAL CONTRACTOR SHALL FURNISH ANY ACCESS DOORS REQUIRED IN WALLS, CEILINGS, OR OTHER GENERAL BUILDING CONSTRUCTION.

INSTALL DAMPERS SQUARE AND FREE FROM RACKING.

DO NOT COMPRESS OR STRETCH THE DAMPER FRAME INTO THE DUCT OR OPENING.

HANDLE DAMPERS USING THE FRAME OR SLEEVE. DO NOT LIFT OR MOVE DAMPERS USING BLADES, ACTUATOR OR JACKSHAFT.



ELECTRICAL SPECIFICATIONS

BUILDING REVISIONS

FOR THE

ALLEGANY COUNTY  
LAVALLE BUILDING

37 LANE AVENUE, LAVALLE, MARYLAND, 21502



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541 MAIN STREET  
WINDBER, PA 15963  
(814) 467-6877

### REVISIONS

MARK	BY	DATE

DATE: 12-06-2023

DRAWING NO.

DRAWN BY: J.L.L.

CHECKED BY: B.N.Y.

PROJECT NO. EHEA 23023

E-6

### PROFESSIONAL CERTIFICATION

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 50053, EXPIRATION DATE: 10-13-2024

*Brett N. Yonish*

BRETT NICHOLAS YONISH DATE 12-06-2023