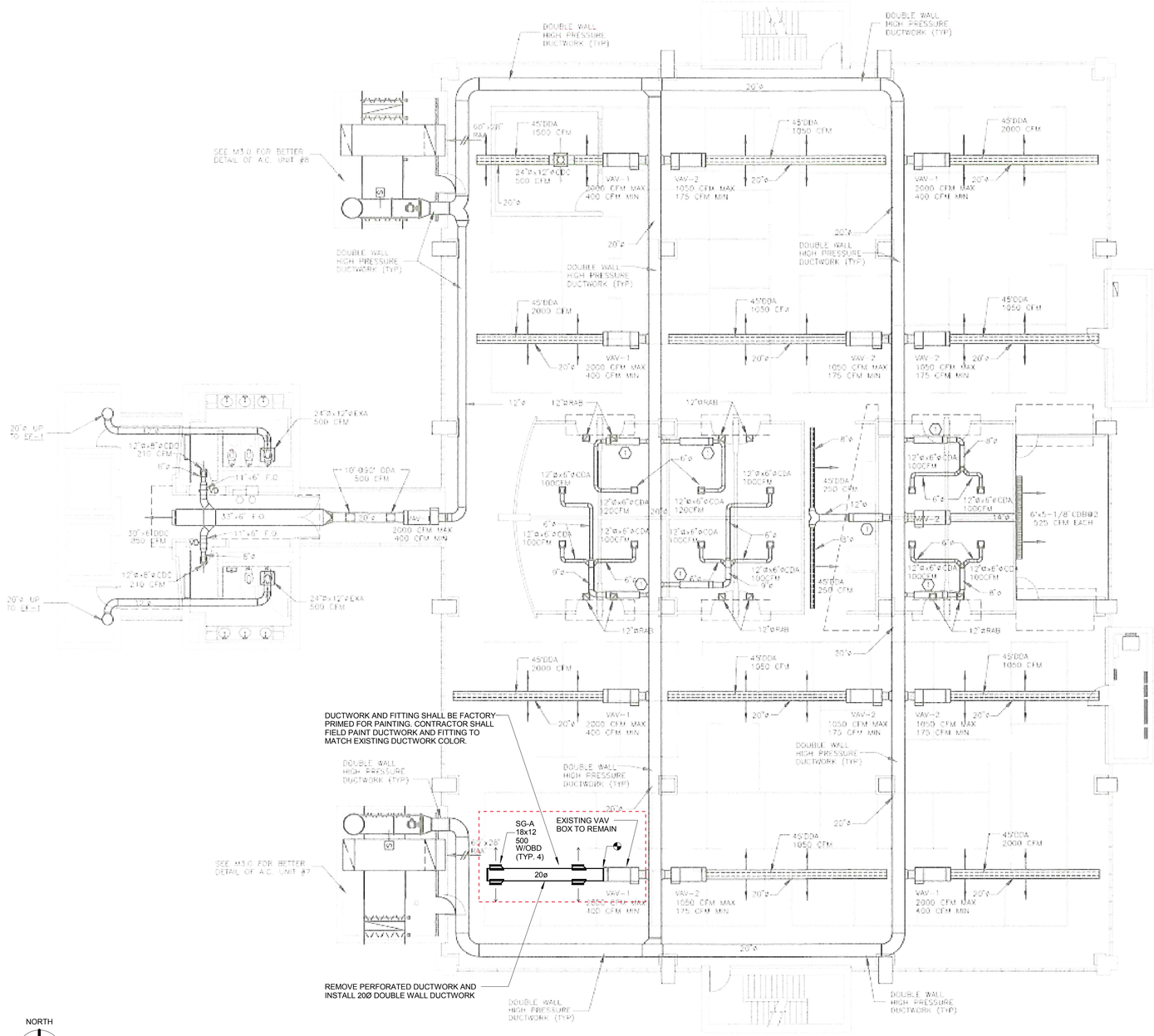


NORTH

A4 ADMIN BUILDING 3RD FLOOR PLAN
1/8" = 1'-0"

DIFFUSERS, REGISTERS, AND GRILLES SCHEDULE

| MARK | MATERIAL OF CONSTRUCTION | DESCRIPTION | BLOW PATTERN | FACTORY FINISH | DESIGN BASIS | REMARKS |
|---|---|---|---|---|---|---|
| SG-A | ALUM | 3/4" SPACING, DOUBLE DEFLECTION | ADJ | WHITE | TITUS 272FL | |

**SECTION 23 0593**
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**
**PART 1 GENERAL**
1.1 SUMMARY
- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.2 QUALIFICATIONS
- A. Testing and balancing shall be performed by an independent certified testing and balancing contractor. The Contractor shall be certified by the AABC (American Association of Balancing Contractors), NEBB (National Environmental Balancing Bureau), or SMARTA (Sheet Metal and Air Conditioning and Roofing Trade Association). The Balancing Contractor shall provide labor, services, and test equipment required to test, adjust, and balance the specified systems. Personnel involved in the execution of the work under the Balancing Contract shall be experienced and trained in the total balancing of mechanical systems, as well as being regular employees of the Balancing Contractor.

1.3 SEQUENCING
- A. Sequence work to commence after completion of systems installation and schedule completion of balancing work before Substantial Completion of Project.
- B. Do not proceed with balancing work until systems scheduled for testing, adjusting, and balancing are clean and free from debris, dirt, and discarded building materials.
- C. Provide report to owner showing results of balancing.

**PART 2**
2.1 PRODUCTS (NOT USED)
**PART 3 EXECUTION**
3.1 OTHER CONTRACTOR RESPONSIBILITIES
- A. The Mechanical and Plumbing Contractors shall cooperate with the balancing agency by:
  1. Including balancing dampers as required by the Drawings and Specifications.
  2. Putting complete system into operation during duration of balancing period.
  3. Providing up-to-date set of Drawings and advising immediately of changes made to the system during construction.
  4. Providing labor and equipment and cost of performing corrections such as dampers, belts, and pulley changes, etc. as required without undue delay.
  5. Providing complete submittal information for mechanical equipment complete with pertinent engineering information.

3.2 INSTALLATION TOLERANCES
- A. Diffusers, Registers and Grilles: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust diffusers, registers and grilles in space to within plus or minus 10 percent of design.

3.3 ADJUSTING
- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostat to specified settings.

3.4 AIR SYSTEM PROCEDURE
- A. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- B. Measure air quantities at air inlets and outlets.
- C. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- D. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

3.5 SCHEDULES
- A. Equipment Requiring Testing, Adjusting, and Balancing
  1. Diffusers, Registers and Grilles
- B. REPORT FORMS
  1. Air Distribution Test Sheet (Diffusers, Registers and Grilles):
     - a. Air terminal number
     - b. Room number/location
     - c. Terminal type
     - d. Terminal size
     - e. Area factor
     - f. Design velocity
     - g. Design air flow
     - h. Test (final) velocity
     - i. Test (final) air flow
     - j. Percent of design air flow

**END OF SECTION**

**SECTION 23 3113**
**METAL DUCTS**
**PART 1 GENERAL**
1.1 SUMMARY
- A. Provide material, devices, labor, and supervision necessary to fabricate and erect ductwork as required by the Drawings and this Section.

1.2 QUALITY ASSURANCE
- A. Codes and Standards:
  1. Ducts, plenums, apparatus casings, metal gauges, reinforcing, methods of supporting and hanging, and other sheet metal work as called for shall meet all functional criteria defined in Section VII, of the SMACNA "HVAC Duct Construction Standards Metal and Flexible" 1985 Edition. This shall be subsequently referred to as the SMACNA Manual. All ductwork must comply with all local, state and federal code requirements.
  2. Comply with applicable requirements of NFPA 91.

1.3 DESCRIPTION
- A. Air ducts shall be constructed as follows:
  - f. General Supply ductwork +2" w-g.

**PART 2 PRODUCTS**
2.1 GENERAL
- A. Shop fabricated sheet metal work shall be constructed of prime quality resquared tight coat galvanized steel, except where other type material is specified. Manufacturer's name and U.S. gauge number shall appear on each sheet.
- B. Duct sealant shall be installed per SMACNA Class A-all transverse joints, longitudinal seams and duct wall penetrations.
- C. Duct Sealant for Low Pressure Duct: UL labeled non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Sealant to be Mastic No. IG601 as manufactured by Hardcast or Engineer approved equivalent product manufactured by Ductmate or United McGill..

2.2 DUCT
- A. Double Walled Round Duct
  1. Where indicated, round ductwork and fittings shall be double walled and internally insulated with internal [perforated] liner. Minimum 1" insulation. Double wall duct shall be primed for painting.
  2. Provide radius type fittings, conical tees and branch take-offs.
  3. Design based on United McGill Acoustic K-27.
  4. Acceptable Manufacturers
     - a. United Sheet Metal Division
     - b. United McGill Corporation
     - c. Semco

2.3 DUCTWORK SUPPORT MATERIALS
- A. Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

**PART 3 EXECUTION**
3.1 INSTALLATION
- A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve airtight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.
- B. Inserts: Install concrete inserts for support of ductwork in coordination with form work, as required to avoid delays in work.
- C. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.
- D. Each duct section shall be rigidly supported from structure. Attach hangers to structure with expansion plugs, concrete inserts, beam clamps or other approved means. Rubber-in-shear isolators shall be installed in hangers for ducts in equipment rooms, to prevent vibration transmission to the structure.
- E. Application of Duct Sealant: All ducts to be properly sealed. Specified duct sealant to be pumped or painted into all joints and seams on all ductwork systems. Sealant shall be allowed to set 48 hours before any air pressure is applied to system.
- F. Double walled round ductwork shall be installed in strict accordance with manufacturer's instructions. All joints shall be sealed. Damaged ductwork shall be replaced.

3.2 ADJUSTING AND CLEANING
- A. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.
- C. Balancing: Refer to Section 23 0593, "Testing, Adjusting and Balancing for HVAC" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent during the balancing process.

**END OF SECTION**

**SECTION 23 3713**
**DIFFUSERS, REGISTERS, AND GRILLES**
**PART 1 GENERAL**
1.1 QUALITY ASSURANCE
- A. Codes and Standards:
  1. ARI Compliance: Test and rate diffusers, registers and grilles in accordance with ARI 650 "Standard for Air Outlets and Inlets".
  2. ASHRAE Compliance: Test and rate diffusers, registers and grilles in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
  3. NFPA Compliance: Install diffusers, registers and grilles in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

**PART 2 PRODUCTS**
2.1 MANUFACTURERS
- A. Products by Titus, Krueger, Carnes, Metal-aire, Nailor, Tuttle-Bailey, or Price

2.2 DOUBLE DEFLECTION SUPPLY
- A. Aluminum supply grilles shall be for the sizes and mounting types as shown on the plans and schedules. The deflection blades shall be available parallel to the long dimension of the grille. All supply grilles shall be constructed with a 1¼-inch wide heavy aluminum border having a minimum thickness of 0.040-0.050 inch. Outer borders shall be assembled and interlocked at the four corners and mechanically staked to form a rigid frame. Screw holes shall be countersunk for a neat appearance.
- B. Blades shall be constructed of heavy duty aluminum and shall be contoured to a specifically designed airfoil cross-section to meet published performance data. Hollow blades are not acceptable. Blades must be solid. Blades shall be spaced ¾-inch apart. Blades shall extend completely through the side frame on each side to ensure stability throughout the complete cfm operating range of the grille. Blades shall be individually adjustable without loosening or rattling and shall be securely held in place with tension wire.
- C. Opposed-blade volume damper shall be constructed of heavy gauge steel or aluminum. Damper must be operable from the face of the grille.
- D. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H. The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film. The paint must pass a 250-hour ASTM D870 Water Immersion Test. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.
- E. The manufacturer shall provide published performance data for the grille. The grille shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

**PART 3 EXECUTION**
3.1 INSTALLATION
- A. General: Install diffusers, registers and grilles in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C. Install wall mounted grilles and registers plumb and level and flush to surface. Locations may be altered slightly, as acceptable to the Architect/Engineer so as to fit portions of the structure.
- D. Provide transitions as required for connections to ductwork, including square to round.
- E. Install diffusers, registers, and grilles level and plumb.
- F. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers.

3.2 ADJUSTING
- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

**END OF SECTION**

## MECHANICAL ENGINEER

LICENSED PROFESSIONAL ENGINEER
BRIAN A STEFFENS 22014
IOWA

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.

Signature — Jul 29 2016 11:44 AM Date

Printed or typed name **Brian A. Steffens**

License Number **22014**

My license renewal date is **12/31/2017**

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DUCT MODIFICATIONS

IOWA DOT
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