Balancing Air Distribution Systems

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Revision 1

Approved by [redacted]

All Stations

11/11/04

Active Divisions/Departments
FEMC

Raytheon Polar Services Company
Facilities Engineering, Maintenance, and Construction (FEMC)
Contract No. OPP 0000373

Table of Contents

Purpose

Procedure to standardize the air balancing of the HVAC systems for construction projects.

Scope/Applicability

The ventilation systems must be balanced for efficient and effective use of the HVAC systems.

Responsibilities

FEMC

Field Engineer/Project Engineer or Designee

- Coordinates the Final Inspection with appropriate parties.
- Oversees/Participates in the Start-up, Test, and Inspection Process to ensure the Specifications and Procedures are followed.

Certified Technician

Performs any testing, start-up, or inspection as dictated to ensure the warranty maintains its integrity; specifications, procedures, and all codes are followed, as required.

NSF

Title II Inspector

Independent Inspector for the NSF, who witnesses the testing, start-up, and conduct his required inspections for the NSF.

Generalized Balancing For Air Distribution Systems

Before Starting, obtain up-to-date plans, drawing and or shop drawings of the complete mechanical system. Compare installed equipment to design and check for completeness of installation. Obtain the manufactures' outlet factors and recommended procedure for testing air outlets

Pre-balance Equipment and System Check

Equipment Check

1. Check fan housings, coils, louvers, etc., to ensure they are clean and free of foreign material.
2. Check filters to ensure that they are clean and in place.
3. Check adjustment of vibration eliminators.
4. Examine drives for proper belt tension and alignment.
5. Check fan and motor lubrication.
6. Check fan overload proctors or heaters for proper size – check motor amperage to guard against overload.
7. Check automatic dampers for proper operation and position.
8. Check fan for proper rotation.

System Check

1. Check for installation of all required balance dampers.
2. Turn off the air handler unit (AHU).
3. Set all system dampers in their open position. This includes all volume dampers, fire dampers, outlet dampers, etc.
4. Turn on the AHU. (Caution: Check fan amperages, in some cases the AHU motor may be overloaded when the system is turned on when all system dampers are opened).
5. Check for air leaks at the fan and the system ductwork.
6. Position all doors and windows to their normal position.
7. Check air temperature to ensure required air temperature delivery.

Air Balancing

Air Handling Equipment Balance

1. Check motor amperage and voltage to ensure motor is not being overloaded. (See form *Vibration Test Data Air Handling Unit (AHU 1)* (EN-MPS-711y) and *Vibration Test Data Air Handling Unit* (AHU 2) (EN-MPS-711z).)
2. Set minimum outdoor air quality using the temperature ratio method.

$$Tm = (\%\ O.A.)(To) + (\%\ R.A.)(Tr)$$

$$\%\ O.A. = 100\ (Tm-Tr) / (To-Tr)$$

$$\%\ R.A. = 100\ (To-Tm) / (To-Tr)$$

Xo = Percent outdoor air
Xr = Percent return air
To = Outside air temperature
Tr = Return air temperature
Tm = Mixed air temperature

3. Determine the volume of the air being delivered by the fan. Adjust the fan speed to increase or decrease the flow if required. If the speed is increased, ensure the motor is not overloaded. Check total flow with the dampers set to their minimum outside air and again for 100 percent outside air; variation should be within 10 percent.
4. Check fan motor speed, operating amperage and voltage. Calculate break horsepower.
5. Take fan static pressure readings and static pressure across the fan system components; i.e., filters, coils, etc.

System Balancing

1. Using the duct velocity traverse method, adjust the volume dampers to deliver the design airflow in each main, zone, and branch duct. (See the following forms: *Air Cooled Condensing Unit* (EN-MPS-711a), *Air Distribution Test Sheet* (EN-MPS-711b), *Air Monitoring Station Data* (EN-MPS-711d), *Air Moving Equipment Test Sheet* (EN-MPS-711e), *Circular Duct Traverse Reading* (EN-MPS-711f), *Duct Leak Test* (EN-MPS-718a), *Duct Traverse Readings* (EN-MPS-711i), *Duct Traverse Readings Zone Totals Report* (EN-MPS-711j), *Electric Coil/Duct Heater Test Report* (EN-MPS-711k), *Exhaust Fan Data Sheet* (EN-MPS-711l), *Fan & Motor Pulley* (EN-MPS-711m), *Induction Units* (EN-MPS-711o), *Oval Duct Traverse Readings* (EN-MPS-711r), *Return Air/Outside Data* (EN-MPS-711s), *Sound Level Report* (EN-MPS-711u), *Terminal Units* (EN-MPS-711w), *Vibration Test Data Air Handling Unit (AHU 1)* (EN-MPS-711y), *Vibration Test Data Air Handling Unit (AHU 2)* (EN-MPS-711z), *Vibration Test Data Centrifugal Fan* (EN-MPS-711aa), *Vibration Test Data Utility Fan* (EN-MPS-711bb), *Vibration Test Vaneaxial Fan* (EN-MPS-711cc).)
2. Adjust the individual supply outlets both for air volume and distribution pattern. Follow the manufactures' recommended procedure, using the proper factor. Use the proportional (ratio) method or other appropriate systematic procedure for outlet balancing. Compare the outlet total flow to the duct traverse previously made; variation should be within 10 percent.
3. Using the same basic procedures for the supply side, balance the return and exhaust systems.
4. Recheck speed, amperage and pressure readings at the fan.
5. Submit Reports. (*Air Handler Test and Balance Report* (EN-MPS-711a and *Test and Balance Report* (EN-MPS-712k).)

References

Air Cooled Condensing Unit (EN-MPS-711a)

Air Distribution Test Sheet (EN-MPS-711b)

Air Handler Test & Balance Report (EN-MPS-711c)

Air Monitoring Station Data (EN-MPS-711d)

Air Moving Equipment Test Sheet (EN-MPS-711e)

Circular Duct Traverse Reading (EN-MPS-711f)

Diffuser and Grill Test Report (EN-MPS-711g)

Duct Leak Test (EN-MPS-718a)

Duct Traverse Readings (EN-MPS-711i)

Duct Traverse Readings Zone Totals Report (EN-MPS-711j)

Electric Coil/Duct Heater Test Report (EN-MPS-711k)

Exhaust Fan Data Sheet (EN-MPS-711l)

Fan & Motor Pulley (EN-MPS-711m)

HVAC Fan Equipment Test Report (EN-MPS-711n)

Induction Units (EN-MPS-711o)

Instrument Calibration Report (EN-MPS-711p)

Oval Duct Traverse Readings (EN-MPS-711r)

Return Air/Outside Data (EN-MPS-711s)

Round Duct Traverse Reading (EN-MPS-711t)

Sound Level Report (EN-MPS-711u)

Square Duct Traverse Reading Report (EN-MPS-711v)

Terminal Units (EN-MPS-711w)

Terminal Unit Test Report (EN-MPS-711x)

Test and Balance Report (EN-MPS-712k)

Vibration Test Data Air Handling Unit (AHU 1) (EN-MPS-711y)

Vibration Test Data Air Handling Unit (AHU 2) (EN-MPS-711z)

Vibration Test Data Centrifugal Fan (EN-MPS-711aa)

Vibration Test Data Utility Fan (EN-MPS-711bb)

Vibration Test Vaneaxial Fan (EN-MPS-711cc)

Records

See the McMurdo, Palmer, and South Pole Stations tab section in *FEMC Records Management Table* (EN-D-226a) on the Master List.