ProZone
Intelligent Zoning

Effect of Modulating Zoning on Discharge Air Temperature, Discharge Plenum Pressure and Airflow through the Equipment.

Introduction

A test was performed on an installation to determine the effect of using modulating dampers to change the distribution of heating or cooling to two zones.

Modulating Zoning provides many advantages over traditional zoning that uses dampers that are either open or close.

- Material cost for an installation using modulating dampers is about half the cost of traditional zoning.
- Bypass duct and the bypass damper are eliminated because the dampers never close.
- The DAT sensor is eliminated because Modulating Zoning has minimal effect on discharge temperature.
- The 24VAC transformer and its electrical box are eliminated because modulating dampers use low power, allowing the equipment 24VAC to power the control.

Contractors were concerned that modulating the airflow might adversely affect discharge air temperatures in heating or cooling, increase the duct pressure or change the airflow through the equipment that could affect efficiency. Here's what we found.

- The discharge temperature in cooling and heating was within 2ºF of normal discharge temperatures eliminating the need for a DAT sensor.
- Duct pressure increased from 0.40 to 0.44 inch H2O when airflow to one zone was increased by 30% in cooling. When airflow to one zone was increased by 50%, the pressure increased to 0.46 inch H2O.
- Airflow through the equipment increased from 2276 to 2371 cfm when airflow to one zone was changed by 30% and increased to 2392 cfm when airflow to one zone was increased by 50% and eliminates the need for bypass.

Temperature Differential in Cooling

A test was performed in cooling to measure the temperature differential while the airflow distribution was changed by 50%. The results are shown in Table 1.

Airflow Distribution Zone1/Zone2	Return/Discharge Temperature Differential
100%/100%	18ºF
90%/110%	17ºF
80%/120%	16ºF
70%/130%	19ºF
60%/140%	20ºF
50%/150%	18ºF

Table 1. Discharge temperature change in cooling.

Temperature Differential in Heating

A similar test was performed in heating and the results are shown in Table 2.

Airflow Distribution Zone1/Zone2	Return/Discharge Temperature Differential
100%/100%	48ºF
90%/110%	47ºF
80%/120%	47ºF
70%/130%	46ºF
60%/140%	47ºF
50%/150%	47ºF

Table 2. Discharge temperature change in heating.

Discharge Plenum Pressure in Cooling

The Discharge Plenum pressure was measured using a 0 to 1-inch H2O meter while the airflow distribution was changed by 50%.

Airflow Distribution Zone1/Zone2	Discharge Plenum Pressure
100%/100%	0.40
90%/110%	0.40
80%/120%	0.42
70%/130%	0.44
60%/140%	0.44
50%/150%	0.46

Table 3. Plenum air pressure in cooling.

Discharge Plenum Pressure in Heating

The same test was performed in heating and the results are shown in Table 4.

Airflow Distribution Zone1/Zone2	Discharge Plenum Pressure
100%/100%	0.38
90%/110%	0.38
80%/120%	0.40
70%/130%	0.41
60%/140%	0.42
50%/150%	0.43

Table 4. Plenum air pressure in heating.

Effect of Airflow Adjustment on Zone Airflow and Total Airflow through the Equipment.

The Discharge airflow distribution to Zone1 and Zone2 was changed by 50% and the airflow to each zone was measured.

Airflow Distribution Zone1/Zone2	Zone1 Airflow cfm	Zone2 Airflow cfm	Total Airflow cfm
100%/100%	1170	1106	2276
90%/110%	1104	1182	2286
80%/120%	1009	1362	2371
70%/130%	817	1532	2349
60%/140%	695	1720	2415
50%/150%	608	1784	2392

Table 5. Zone and total airflow through the equipment.

About the Test

The test was run on an installed 5-ton Lennox system. Airflow was measured using an Alnor hood and averaging 5 readings. Temperatures were digitally read. Pressure was read using a 0 to 1.0 inch H20 analog meter.

For information about this test or Modulating Zoning contact:

Mike Beck
949-916-0945
MikeB@eControlsUSA.com

Or visit our website:
www.eControlsUSA.com

eControls

26072 Merit Circle #110 / Laguna Hills, CA 92653
949-916-0945 Fax 949-458-8502 www.eControlsUSA.com