

INTERCOMPANY MEMO
JULY 19, 1991

TO: MR. W.I. WALKER

CC: MR. P.W. WOOD
MR. J. WEISMAN
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FROM: MR. L.A. ZEMKE

REFERENCE: CURRENT STATUS OF AIR FLOW BALANCE AND CONDITIONING
CONTROL

Testing of the VAV and CAV boxes that are accessible was conducted during the week of July 15 through July 19. This report is divided into the following sections:

Flow Zone S3 - The west side of the first floor and north end offices, west side of the second floor and center core offices and library.

Flow Zone S2 - The east side of the first floor, the east side and north end of the second floor, and the basement main area.

Flow Zone S1 - The first floor core labs and the resistivity lab.

The enclosed data sheets present the current flow rates measured under full cooling (full open) and full heating (full closed). The rated maximum and minimum are from supplied data from Edwards Engineering and Environmental Technologies dated June 27, 1991. At the current time we have completed the setting of the controllers of the boxes with adjustments to max. and min. settings based on our current usage of areas and the comfort of the areas. Those areas too cool have had the full closed volume reduced as in Dr. Bickelhaupt's office. Those areas that are too warm have had the full open volume increased as far as possible under the current operating set points.

FLOW ZONE S3

The S3 supply fan was set to the following in manual mode:
duct remote static pressure = 1.0" static.

The following data was recorded from various displays:
fan speed = 91 % of full @ 20 amps, 426 volts, flow monitor
reading = 15,200 to 15,500 ACFM downstream of fan.

A total of 19 boxes were tested and adjusted. The following boxes were not adjustable and are not operating properly.

VAV boxes 43 and 45 above the accounting area on the second floor. Box 43 was not adjustable on the low flow side leading to over cooling of the computer room. Box 45 did not operate up to full open required set point thus insufficient cooling in the accounting office area.

VAV box 23 was installed but was blanked off allowing no flow to the solvent room. the control dampers both manual and box were closed.

Total flow was measured with all operating dampers in their full open position and compared to the fan output volume. The leakage of the S3 system is estimated at 1% to 3% for this zone.

After the above adjustment was made the operation of the S3 supply fan improve. With the system in remote (computer) control the S3 fan is dynamically operating between 60% and 90%+ to maintain the duct static pressure set point of 1.0 inches W.G. Prior to adjustment the fan was operating at 80% to 95%+ with a static pressure of .6 to .8 inches W.G. The dynamic operation of the system can be seen by the reduced fan speed when little cooling is requested vrs. higher fan speed during the day as cooling load increases.

FLOW ZONE S2

The S2 supply fan was set to the following in manual mode:
duct remote static pressure = 1.0" static.

The following data was recorded from various displays:
fan speed = 55.3 Hz @ 17 amps, 406 volts, flow monitor
reading = 13,400 to 13,600 ACFM downstream of fan.

A total of 10 boxes were tested and adjusted. The following boxes were not adjustable and are not operating properly.

VAV box 35 above the report area on the second floor. Box 35 does not have the flow sensor installed and is inoperative.

VAV box 30 outside the second floor private conference room did not operate properly and did not respond to setting changes. As such no consistent flow readings were possible. The amount of cooling has been reduced to reduce over cooling.

A total of six boxes were not accessible above the ceiling on both the first and second floor. These were boxes 5, 6, 7, 31, 32, and 33.

The new basement box (unnumbered) was not set while awaiting completion of installation.

Total flow was measured with all operating dampers in their full open position and compared to the fan output volume. A total of 59% of the fan output volume was measured.

Once access is available and the inoperable equipment fixed this system will be checked again. In particular readings will need to be taken to determine the cooling entering the atrium entry to include the flow from the separate unit for this area.

FLOW ZONE S1

At the present time this system is in manual operation to supply sufficient cooling to the resistivity lab to keep it at 70 to 80 degrees F. The system is therefor set as follows:

Fan static pressure = 2.0 inches W.G.@ 57 degrees F.

At this set point maximum air is supplied to the lab at 600 ACFM through the 6 inch box. Reducing the static pressure to 1.5" W.G. decreases the lab flow to 450 ACFM. Replacement with an 8 inch box will allow flow increase to over 1000 ACFM and allow a possible lowering of the duct static pressure.

The hall VAV box 13 has been set to a reduced flow.

A set of readings were taken from the computer display of the six labs that are under active control. The total listed supplied air flow matched the indicated hood and return flows. However the value of flow entering the labs was "equal" to the measured S1 flow without accounting for the flow to the resistivity lab, the hall, and the unmeasured labs 4 and 5 boxes.

At the present time the hoods need to be readjusted by L&G after the hood ducts are sealed. This does not explain the remaining problem of input air flow to the system vrs. total supply to the labs vrs. return from the labs.

The following methodology was used to adjust the VAV boxes. The supply fan was set to provide a static pressure at the downstream sensor of 1.0" static pressure. Data was recorded from the computer display and from the air handler controller in the basement. Both exhaust/return fans were set at computer controlled at 500 ACFM below the supply volume of each air handler. Each VAV box was then found and a draft gauge was placed across the velocity sensor of the box in parallel with the controller. The thermostat for the box was then set to the full cool position to force the damper to the "open" position. The differential pressure was then used with the supplied volume curves to determine the maximum cooling flow. This was compared to the supplied design flow list and adjusted if necessary and possible. The thermostat was then set in the full heat (full "closed") position and adjusted if necessary. The box was then returned to the full cool position to verify flow and left in that position until testing of that zone was completed.

The accuracy of the flow sensors was determined from comparison with duct traverses taken on box 8 in the resistivity lab. The flow was within about 5% of the traverse data at both high and low flow.

The six labs on the S1 zone are under computer control. Their volumes were read from the computer display. No volumes were read from labs 4 and 5.

Based on the above, the building response and the number of complaints recently the following operation will begin Monday for zones S2 and S3 to determine the appropriate air temperature to the boxes. If the air is set too cold all the boxes will close and the system will over cool at the minimum air flow set point. If the temperature is set too high all the boxes will be open without complete cooling.

Static pressure set at 1.0" W.G.

Max. cooling air temp. = 55 degrees F.

S2 from 8:00 AM to 12:00 PM

S3 from 12:00 PM to 4:30 PM

Reduced cooling air temp. = 60 degrees F.

S2 from 12:00 P.M. to 4:30 P.M.

S3 from 7:30 A.M to 12:00 P.M.

computer air temp. set point

All other times, holidays and weekends

Zone S1 will continue at 2.0" s.p. and 57 degrees F.

The above can be discussed at your convenience.

No balance of individual registers has been made. Adjustment will be made on the basis of complaints received.

No balance of the return system outside of the lab core is anticipated.

The remaining problem currently is the lack of cooling to the east first floor offices. This will be monitored as the above time of day plan is implemented and may improve once the S2 system is fully operational.

51

LABS

S2

REPORTS
REPORTS
PROPOSALS
PROPOSALS
W I W
OFFICES
W I W
CONFERENCE
2ND FLOOR ATRIUM
2ND FLOOR
RECEPTION
2ND FLOOR BATH

LUNCH
Room
HUMAN RESOURCES
RECEPTION
EAST 4
OFFICES
1ST CONFERENCE
1ST ATRIUM
1ST RECEPTION
TELEPHONE/
WORKSTATIONS

Static 1.0 Volts 421.

S. 3

[illegible]

Box 41 is
where 46
should be

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2nd Floor

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157

Flam

N.W.
corner

N.W.
WALL.

NE COR
OFFICES

{ Accounting

COMPUTER

2ND CONFERENCE

LIBRARY

J. M. 20

FSK/SR

N.W. CORE
OFFICES

ROY/BOUG R

AVERY AREA

OPEN LAB
AREA

R King

OPEN Chem
12REA

3 Prep
3 Room

OLD BLDG.
HALL