

# Cert-Aire Technical Services, LTD.

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Date: 5-22-03

To: **Bill Stout**

Client Name: Eastern Sheet Metal, Inc.

Enclosed are the certified test results for the tests conducted on 5/21/03 through 5/22/03 on HVAC metal duct sample #'s ES101 and ES102 in accordance with HVAC Air Duct Leakage Test Manual First Edition 1985.

	Test Instrument	Calibration Date Last	Calibration Date Next Due
✓	Merium Manometer 10" Wg. Model 40HE35WM Serial No.: 100200-B1 Range: 0-10 In.Wg.	5/4/03	5/4/04
✓	Merium Manometer 6" Wg. Model 40HF35WM Serial No.: 100200-B2 Range: 0-6 In.Wg.	5/4/03	5/4/04
✓	Sargent Welch Barometer Model 4519 Serial No.: 87520224 Range: 22-32 In.Hg.	4/28/03	4/28/04
	Oven for Temperature Degradation Serial No.: cert-003 Range: 60-450 deg. F	5/4/03	5/4/04
	McMaster Carr Pressure Guage Serial No.: 0900-10228-CA Range: 0-30 psi	5/4/03	5/4/04
✓	Cert-Aire Psychrometer Wet Bulb Serial No.: cert-001 Range: 30-120 deg. F	5/4/03	5/4/04
	Cert-Aire Psychrometer Dry Bulb Serial No.: cert-002 Range: 30-120 deg. F	5/4/03	5/4/04
	Daytronic DA Temperature Model System 10 Serial No.: cert-004 Range: 0-1200 deg. F	5/4/03	5/4/04
	Daytronic DA MKS Transducer Model system 10 Serial No.: cert-005 Range: 0-10 In. Wg.	5/4/03	5/4/04
	High Temp. Thermometer Model ASTM 2F Serial No.: 1474 Range: 20-580 deg. F	5/4/03	5/4/04

*Prasad Bhatt*

Prasad Bhatt, President

Cert-Aire Technical Services, Ltd.

Test No. > ES101EMU.LA1  
Test Date : 05/21/03  
Client : Eastern Sheetmetal Inc.  
UL File No. : n/a  
Ul Project No. : n/a  
Trade Name : HVAC Metal Duct  
Sample No. > ES101  
Model No. : n/a  
Size : 8" thru 24"  
Reference Area > 0  
Operator/Rating > External Actuator MANUAL  
Flow Direction : Positive Pressure 10" wg.

SMACNA standard > HVAC Air Duct Leakage Test Manual First Edition 1985

Remark1 : See duct setup sketch **APPENDIX B**  
Remark2 : Airflow measured by AMCA nozzles  
Remark3 : Total Duct Surface Area 598.65 sq. ft.  
Remark4 :

Det. No. : 1  
sp : 10  
pd : 2.18  
db=dry bulb : 60  
wb=wet bulb : 50  
db5-nozzles : 60  
dbi-damper : 60  
Barometer : 29.22  
nozzle code : 2 @ 1" dia

Results at Test Conditions:

Inlet Temp. : 60 F  
Air Density : 0.0742  
SP : 10.00  
CFM : 64.8

Results at Standard Conditions:

SPrating : 10.11  
CFMstd : 64.8

Allowable leakage for Class 3 Metal duct 13.4 cfm/100 SFD (Appendix E)  
Allowable Leakage for Class 3 Duct =  $13.4 \times 598.65/100 = 80.2$  cfm  
Tested Duct Setup Leakage is 64.8.

Ducts tested meet SMACNA Class 3 requirement for metal ducts

(signed) Prasad Bhatt  
Prasad Bhatt, President CERTAIRE

Cert-Aire Technical Services, Ltd.

Test No. > ES101EMU.LA2  
Test Date : 05/22/03  
Client : Eastern Sheetmetal Inc.  
UL File No. : n/a  
UL Project No. : n/a  
Trade Name : HVAC Metal Duct  
Sample No. > ES101  
Model No. : n/a  
Size : 8" thru 24"  
Reference Area >  
Operator/Rating > External Actuator MANUAL  
Flow Direction : Negative Pressure 2" wg.

SMACNA standard > HVAC Air Duct Leakage Test Manual First Edition 1985

Remark1 : See duct setup sketch **APPENDIX B**  
Remark2 : Airflow measured by AMCA nozzles  
Remark3 : Total Duct Surface Area 598.65 sq. ft.  
Remark4 :

Det. No. : 1  
sp : -2.00  
pd : 0.925  
db=dry bulb : 60  
wb=wet bulb : 50  
db5-nozzles : 60  
dbi-damper : 60  
Barometer : 29.22  
nozzle code : 1 @ 1" dia

Results at Test Conditions:

Inlet Temp. : 60 F  
Air Density : 0.0742  
SP : 2.00  
CFM : 20.9

Results at Standard Conditions:

SPrating : 2.02  
CFMstd : 20.9

Allowable leakage for Class 3 Metal duct 4.7 cfm/100 SFD (Apendix E)  
Allowable Leakage for Class 3 Duct =  $4.7 \times 598.65/100 = 28.13$  cfm  
Tested Duct Setup Leakage is 20.9

Ducts tested meet SMACNA Class 3 requirement for metal ducts

(signed) Prasad Bhatt  
Prasad Bhatt, President CERTAIRE



# APPENDIX E

## LEAKAGE FACTOR (F) IN CFM/100 S.F. DUCT

PRESSURE W.G.		LEAKAGE CLASS (C <sub>L</sub> )					UNSEALED
P <sup>.65</sup>	P"	CLASS 3	CLASS 6	CLASS 12	CLASS 24	CLASS 48	
.143	.05	.4	.9	1.7	3.4	6.7	
.224	.10	.7	1.3	2.7	5.4	10.7	
.351	.20	1.1	2.1	4.2	8.4	16.8	
.457	.30	1.4	2.7	5.5	11.0	21.9	
.551	.40	1.7	3.3	6.6	13.2	26.4	
.637	.50	1.9	3.8	7.6	15.3	30.6	
.717	.60	2.2	4.3	8.6	17.2	34.4	
.793	.70	2.4	4.8	9.5	19.0	38.1	
.865	.80	2.6	5.2	10.4	20.8	41.5	
.934	.90	2.8	5.6	11.2	22.4	44.8	
1	1	3	6	12	24	48	
1.30	1.5	3.9	7.8	15.6	31.2	62.4	
1.57	2.0	4.7	9.4	18.8	37.7	75.4	
1.81	2.5	5.4	10.9	21.7	43.4	86.8	
2.04	3.0	6.1	12.2	24.5	49.0	98.0	
2.26	3.5	6.7	13.6	27.1	54.2	108.5	
2.46	4.0	7.4	14.8	29.5	59.0	118.1	
2.66	4.5	8.0	16.0				
2.85	5.0	8.6	17.1				
3.03	5.5	9.1	18.2				
3.20	6.0	9.6	19.2				
3.54	7.0	10.6	21.2				
3.86	8.0	11.6	23.2				
4.17	9.0	12.5	25.0				
4.47	10.0	13.4	26.8				
4.75	11.0	14.3	28.5				
5.03	12.0	15.1	30.2				

$$C_L = \frac{F}{P^{.65}}$$

When P = 1

$$C_L = F$$

$$F = C_L(P)^{.65}$$

These factors may also be read from Figure 4-1.  
See Table 4-1 for seal class and pressure class.