Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690 - 0767

August 21, 1986

Mr. Harold R. Denton
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC. 20555

Subject: Braidwood Station Units 1 & 2
Supplemental Information
for Exceptions to FSAR Appendix A
Regulatory Guides 1.52 and 1.140
NRC Docket Nos. 50-456 and 50-457

Reference: July 2, 1986 A.D. Miosi letter to H.R. Denton

Dear Mr. Denton:

Enclosed is information necessary to complete your review of our request identified in the referenced letter concerning exceptions to FSAR Appendix A Regulatory Guides 1.52 and 1.140. Additional information is being provided to address use of silicone sealant in HVAC ductwork as a permanent sealant and carbon testing.

Carbon Testing

Additional clarification is being provided concerning laboratory carbon testing. The attached Braidwood FSAR pages A1.140-3 and A1.152-4 reflects this clarification. Section 6a(2) of the Braidwood FSAR will now read:

> All carbon furnished prior to 1985 as part of the original specification for atmospheric clean-up filtration units will be tested to the requirements of Table 5-1 of ANSI N509-1976. All replacement carbon or original carbon furnished in 1985 or later will be tested to the requirements of Table 5-1 of ANSI N509-1980 with the exception that the laboratory test for methyl iodine penetration at 30°C, 95% relative humidity will be less than 1%.

B001
1/1

Use of Silicone Sealant

To satisfy the question of ductwork integrity, the following information is provided:

1. Braidwood Station commits to check the Control Room Ventilation system flow monitor indications located on the local control room ventilation system panel on a daily basis.

2. The above mentioned flow instrumentation will be calibrated on an eighteen month calibration frequency. Based on an acceptable review of calibration records, the calibration frequency may be lengthened to normal plant surveillance frequency.

3. Attached is the test and balancing program plan that Braidwood Station is following during construction testing. The details of this program were discussed with Jack Hayes of NRR.

Should you have any questions concerning this information, please contact this office.

One signed original and fifteen copies of this letter and attachment are provided for your review.

Very truly yours,

Anthony Miosi

A. D. Miosi
Nuclear Licensing Administrator

/klj
cc: J. Stevens
2016K

3a - The components of the heaters are manufactured and assembled as per Section 5.5 of ANSI N509-76, similar to the requirements of heaters in safety-related filter systems, but the traceability of the components is not established as it would be in the case of safety-related heaters. Thus, no complete qualification program is done.

5b - Airflow distribution and air-aerosol mixing tests will not be performed on the non-entry type filter units. Airflow distribution tests will be performed on all entry-type filter trains to ensure that the airflow through any individual filter element does not exceed 120% of the element's rated capacity.

5c - Silicone sealants or other temporary patching material will not be used in the non-ESF filter housings. Silicone sealant is used, however, as a permanent sealant for HVAC ductwork.

6a(2) - All carbon furnished prior to 1985 as part of the original specification for atmospheric clean-up filtration units will be tested to the requirements of Table 5-1 of ANSI N509-1976. All replacement carbon or original carbon furnished in 1985 or later will be tested to the requirements of Table 5-1 of ANSI N509-1980. With the exception that the laboratory test for methyl iodine penetration at 30 °C, 95% relative humidity is less than 1%.

6a(3) - Laboratory tests will be performed per the requirements of Table 2 of Regulatory Guide 1.140 with the exception that the temperature will be 30 °C.

5.b Airflow distribution tests will be performed to ensure that the airflow through any individual filter element does not exceed 120% of the element's rated capacity.

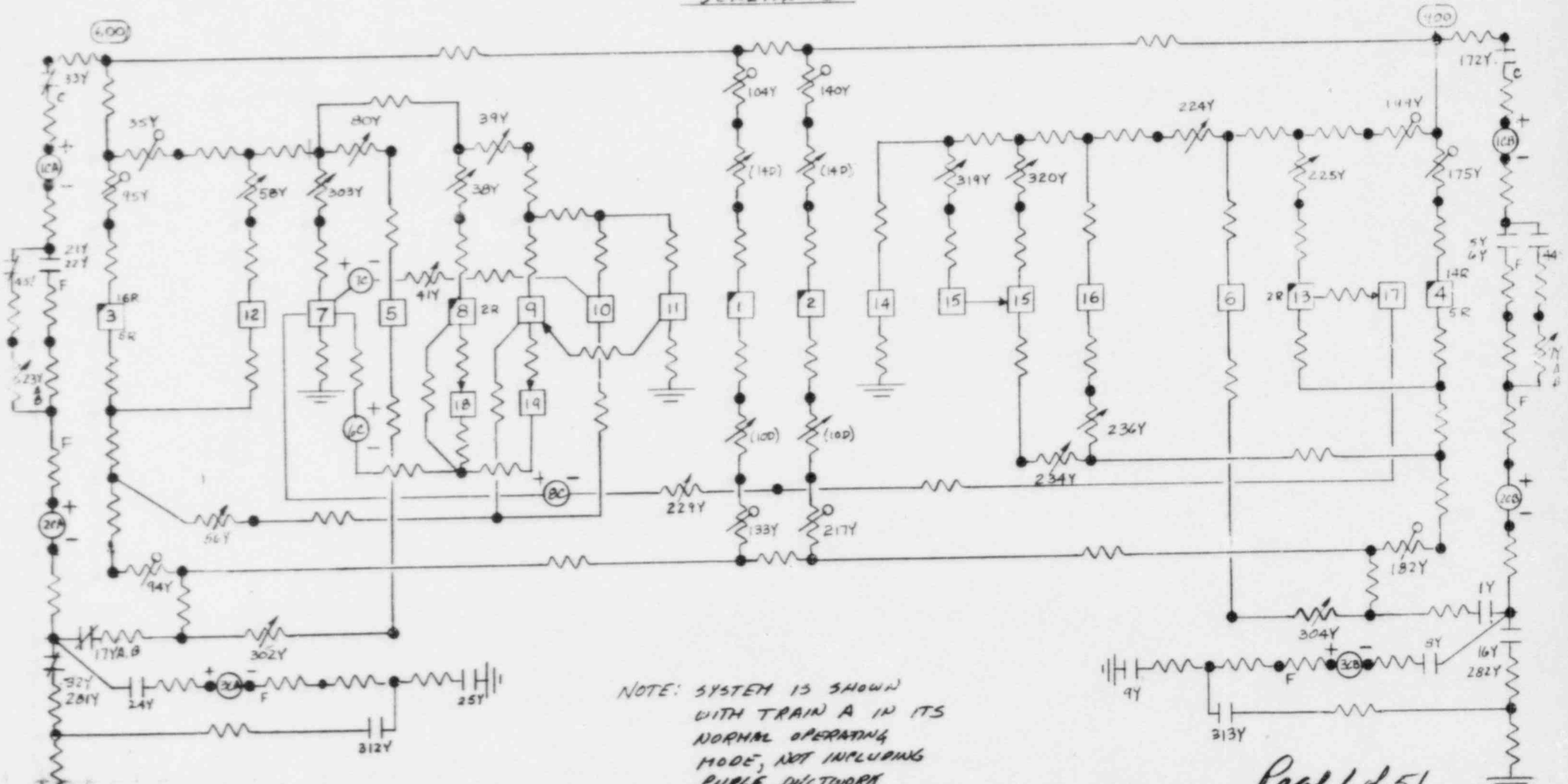
5.c ~~[illegible]~~ Silicone sealant or other temporary patching material will not be used in the ESF filter housings. Silicone sealant is used, however, as a permanent sealant in HVAC ductwork. Further discussions on this subject can be found in Subsections 9.4.1.2 and 12.3.1.7.

Note 1: Exception to this section is no longer required because the Regulatory Guide has been revised to eliminate the criteria to which exception was originally taken.

6.a(2) All carbon furnished prior to 1985 as part of the original specification for atmospheric clean-up filtration units will be tested to the requirements of Table 5-1 of ANSI N509-1976. All replacement carbon or original carbon furnished in 1985 or later will be tested to the requirements of Table 5-1 of ANSI N509-1980, with the exception that the laboratory test for methyl iodine penetration at 30°C, 95% relative humidity is less than 1%.

6.a(3) Laboratory tests will be performed per approved plant Technical Specifications.

COMMONWEALTH EDISON COMPANY
BRAIDWOOD STATION 1 + 2
CONTROL ROOM HVAC
SCHEMATIC



NOTE: SYSTEM IS SHOWN WITH TRAIN A IN ITS NORMAL OPERATING MODE, NOT INCLUDING PURGE DUCTWORK

SUBSYSTEM LIST

Subsystem	Type	Area Served
0A	S,R	Common Supply and Return Headers Train A
0B	S,R	Common Supply and Return Headers Train B
01	S	Make-Up Air Filter Unit - Unit 1
02	S	Supply Unit 1 (Min. O.A.)
03	S	Make-Up Air Filter Unit - Unit 2
04	S	Supply Unit 2 (Min. O.A.)
05	S	Kitchen, Locker, Corridors, Record, Upper Cable Spreading Room, HVAC Equip. Room - Unit 1
06	S	Auxiliary Elec. Equip. Room - Unit 1
07	S	Auxiliary Elec. Equip. Room - Unit 1, Storage, Locker
08	-	N/A
09	-	N/A
10	S	Control Room - Unit 1
11	R	Control Room - Unit 1
12	-	N/A
13	R	Control Room - Unit 2
14	S	Control Room - Unit 2
15	-	N/A
16	-	N/A
17	R	Auxiliary Elec. Equip. Room - Unit 2, Security Control Center, Electronics Shop
18	S	Auxiliary Elec. Equip. Room - Unit 2
19	S	Security Control Center, Electronics Shop

NOTES:

1. Subsystem number is the last two digits of the airflow measuring station except 00.
2. S = Supply
   R = Return
   N/A = Not Applicable
3. Pitot Traverses are identified as S 01 01
   - Supply/Return
   - Subsystem Number
   - Sequential Number

LEGEND

Symbol	Name	Description
	System Resistance	Element Number
F	Filter Resistance	-
C	Coil Resistance	-
	Balancing Damper	Damper Number OWXXY
	Control Damper	Damper Number
	GRD-OBD	GRD Identity Number
	Splitter	-
	Gravity Shutter	Damper Number OWXXY
	Fan	Equip. Number [illegible]CA
	Airflow Measuring Station	Equip. Number [illegible]FE-W0001
	Node	-
	Atmosphere	-
	Room Number	Refer to Room List
X	Room Number w/ Multiple GRD's	Refer to Room List Number of GRD's
	Pitot Traverse No.	S0101
	Pressure Drop Node Number	
	UNDUCTED RESISTANCE	

SARGENT & LUNDY CHICAGO	Client: Commonwealth Edison Company	Prepared by: W.B.Paschal	Date: 8/14/86	Calcs. For: Control Room HITSS Subsystem List - - Legend	Calc. No.
	Project: Braidwood - Units 1 & 2	Reviewed by	Date	Safety-Related / Non-Safety-Related	Rev. 0 Date 8/14/86
	Proj. No. 4683/84-00 Equip. No.	Approved by	Date		Page 2 of

ROOM LIST

Room No.	Area Served	Elevation	Supply Air Design CFM	Acceptance Range	Design Pressure
1	Control Room - Unit 1	451'-0"	10,500	8750 - 11,550	
2	Control Room - Unit 2	451'-0"	10,500	8750 - 11,550	
3	Auxiliary Elect. Equip. Room - Unit 1	451'-0"	10,400	9900 - 11,440	
4	Auxiliary Elect. Equip. Room - Unit 2	451'-0"	10,100	9600 - 11,110	
5	HVAC Equipment Room - Unit 1	451'-0"	1000	870 - 1100	
6	HVAC Equipment Room - Unit 2	451'-0"	1000	870 - 1100	
7	Upper Cable Spreading Room	463'-5"	1300	1150 - 1430	
8	Men's Locker Room	451'-0"	430	380 - 475	
9	Corridor A-413	451'-0"	130	125 - 150	
10	Kitchen	451'-0"	850	760 - 935	
11	Corridor A-402	451'-0"	150	140 - 165	
12	Record Room	451'-0"	300	230 - 330	
13	Storage Room	451'-0"	300	200 - 330	
14	Corridor	451'-0"	140	130 - 155	
15	Security Control Center	451'-0"	1500	1110 - 1650	
16	Electronics Shop	451'-0"	700	630 - 770	
17	Storage Room Toilet	451'-0"	(100)	(MIN 70)	
18	Men's Toilet	451'-0"	(200)	(MIN 200)	
19	Janitor's Closet	451'-0"	(100)	(MIN 80)	

NOTE:

Airflow rates within the above acceptance ranges will be acceptable provided that design pressures with respect to areas not served by the Control Room HVAC system are maintained.

SARGENT & LUNDY ENGINEERS CHICAGO

Client	Commonwealth Edison Company	Prepared by W.B.Paschal	Date 8/14/86
Project	Braidwood - Units 1 & 2	Reviewed by	Date
Proj. No.	4683/84-00	Approved by	Date
Equip. No.			

Calcs. For Control Room HITSS Room List

Safety-Related | Non-Safety-Related

Calc. No.

Rev. 0 Date 8/14/86

Page 3 of

SARGENT & LUNDY
CHICAGO

Client CECO	Prepared by [illegible]	Date 8/18/86	Calcs. For BLANK PAGE
Project BRAIDWOOD - UNITS 1+2	Reviewed by	Date	Safety-Related / Non-Safety-Related
Proj. No. 4683/84 Equip. No.	Approved by	Date	Calc. No. VC Rev. 0 Date 8/19/86 Page 4 of

SUPPLY

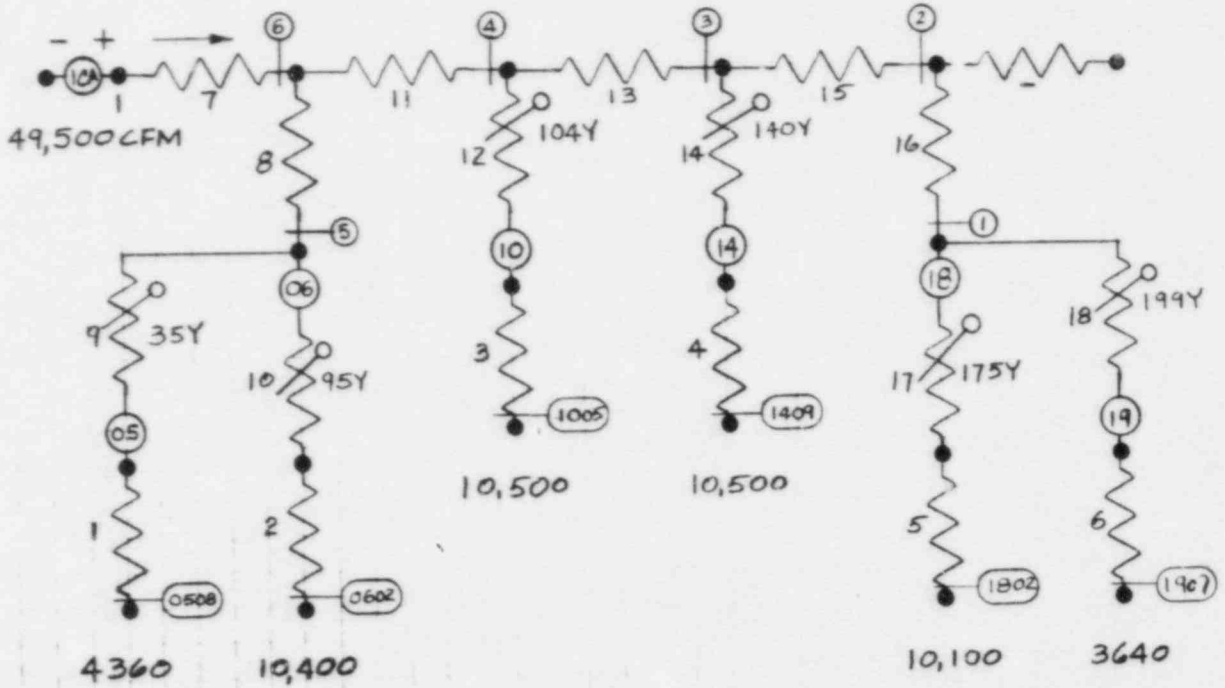
SUBSYSTEM NUMBER	NUMBER OF PITOT TRAVERSES
50A	6
05	8
06	2
10	5
14	9
18	2
19	7
TOTAL	39

RETURN

SUBSYSTEM NUMBER	NUMBER OF PITOT TRAVERSES
R0A	7
07	8
11	12
13	14
16	7
TOTAL	48

SUPPLY	39
RETURN	48
MIN. OA	1
TOTAL	88

SARGENT & LUNDY CHICAGO	Client CECO	Prepared by UAB	Date	Calcs. For CONTROL ROOM HVAC SYSTEM - TRAVERSE SUMMARY	Calc. No. VC
	Project BRAIDWOOD - UNITS 1+2	Reviewed by	Date	Safety-Related / Non-Safety-Related	Rev. 0 Date
	Proj. No. 4683/84 Equip. No.	Approved by	Date		Page 5 of



SUMMARY	
6/6	TRAVERSES
1	INLET
6	OUTLETS
19	NODES
18	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO	Prepared by WBP	Date 8/14/86	Calcs. For CONTROL ROOM HVAC SUPPLY (TRAIN A) - SUBSYSTEM 50A
Project DRAIOWOOD - UNITS 1 & 2	Reviewed by	Date	Safety-Related ☐ Non-Safety-Related ☐
Proj. No. 4683/84 Equip. No.	Approved by	Date	Calc No VC; Rev. 0; Date 8/14/86; Page 6 of

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE		TOTAL PRESSURE DROP		AIR DENSITY		PATH RESISTANCE VALUE		
			REFERENCE	VALUE	REFERENCE	VALUE	REFERENCE	VALUE	CALC.	ADJUST	FINAL
1	O	OFE-VC005	S0508		S0A05-O		S0508				
2	O	OFE-VC006	S0602		S0A05-O		S0602				
3	O	OFE-VC010	S1005		S0A04-O		S1005				
*4	O	OFE-VC014	S1409		S0A03-O		S1409				
5	O	OFE-VC018	S1802		S0A01-O		S1802				
6	O	OFE-VC019	S1907		S0A01-O						
7	S	OVC01CA	—		—		—				
8	I	—	S0A05		S0A06-S0A05		S0A05				
*9	D	OVC035Y	—		—		—				
10	D	OVC095Y	—		—		—				
11	I	—	S0A04		S0A05-S0A04		S0A04				
12	D	OVC104Y	—		—		—				
13	I	—	S0A03		S0A04-S0A03		S0A03				
*14	D	OVC1404	—		—		—				
15	I	—	S0A02		S0A03-S0A02		S0A02				

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
*	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERVAL	—	Q
	O	OUTLET/INLET	ROOM NUMBER	Q
	S/R	INLET/OUTLET	AIR, MEAS. STR. NO.	DEFAULT 0.00031

$$Q = (1.2015 \times 10^{4}) \sqrt{\frac{\tilde{P}}{\rho \tilde{Q}^{2}}}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

Form 00433 Rev 1

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1&2

Prepared by WBP Date 8/12/86

Reviewed by Date

Calc. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 30A

Calc. No. VC

Rev. 0 Date 08/14/86

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
16	I	—	50A01		50A02 50A01		50A01				
17	D	OVC175Y	—		—		—				
18	D	OVC199Y	—		—		—				

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERVAL	—	Q
	O	OUTLET / INLET	ROOM NUMBER	Q
	S/R	INLET / OUTLET	AIR MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{4}) \frac{\tilde{\Delta P}}{\rho \tilde{Q}^{2}}$$

$\tilde{\Delta P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

Form GO432 Rev 1

Client	CECO
Project	BRAIDWOOD UNITS 1 & 2
Prepared by	WBP — Date 8/12/86
Reviewed by	— Date
Approved by	— Date

Calcs. For RESISTANCE DETERMINATION
SUB-SYSTEM NUMBER 50A

Calc. No. VC
Rev. 0 Date 08/16/86
Page A of

DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT²)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE
OVC035Y	9	1						
OVC085Y	10	2						
OVC104Y	12	3						
OVC140Y	14	4						
OVC175Y	17	5						
OVC199Y	18	6						

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

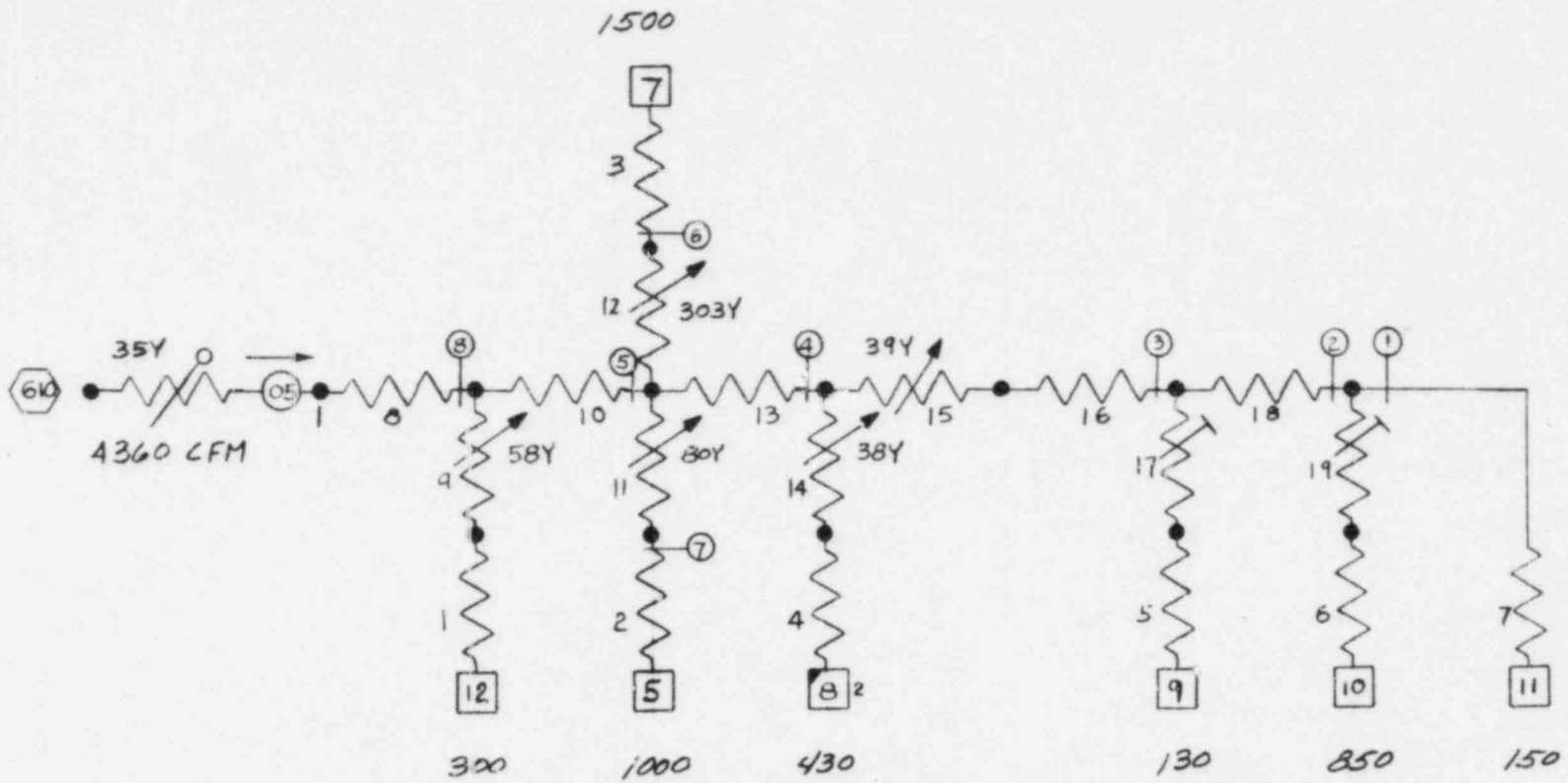
SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1+2
Appl. No. 16.00/04 Equip. No.

Prepared by WBP Date 8/16/82
Reviewed by Date
Approved by Date

Calcs. For BALANCING DAMPER LIST
SUBSYSTEM NUMBER 30A
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 08/16/82
Page 9 of



SUMMARY	
8	TRAVERSES
1	INLET
7	OUTLETS
20	NODES
19	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO	Prepared by WBP/JJP	Date 08/14/86	Calcs. For CONTROL ROOM HVAC SUPPLY - SUBSYSTEM 05
Project BRAIDWOOD	Reviewed by	Date	Safety-Related / Non-Safety-Related
Proj. No. 4683/04 Equip. No.	Approved by	Date	Calc. No. VC; Rev. 0; Date 08/14/86; Page 10 of

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	12	50508-50505		50505-0		50508				
2	O	5	50507		50505-0		50507				
3	O	7	50506		50505-0		50506				
*4	O	8	50504-50503		50504-0		50504				
5	O	9	50503-50502		50503-0		50503				
6	O	10	50502-50501		50502-0		50502				
7	O	11	50511		50502-0		50511				
8	S	OFE-VCOLS	—		—		—				
*9	D	OVC58Y	—		—		—				
10	I	—	50505		50508-50505		50505				
11	D	OVC80Y	—		—		—				
12	D	OVC303Y	—		—		—				
13	I	—	50504		50505-50504		50504				
*14	D	OVC38Y	—		—		—				
15	D	OVC39Y	—		—		—				

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
*	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
*	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET/INLET	ROOM NUMBER	Q
	S/R	INLET/OUTLET	AIR MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{6}) \sqrt{\frac{\tilde{P}}{\rho \tilde{Q}^{2}}}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

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SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1 & 2
Proj. No. 4423/04 Equip. No.

Prepared by WBP Date 8/16/86
Reviewed by Date
Approved by Date

Calcs. For RESISTANCE DETERMINATION
SUB-SYSTEM NUMBER 05
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 08/16/86
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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
16	I	—	50503		50504 - 50503		50503				
17	D	SPLITTER	—		—		—		—	—	0.00001
18	I	—	50502		50503 - 50502		50502				
19	D	SPLITTER	—		—		—		—	—	0.00001

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET / INLET	ROOM NUMBER	Q
	S/R	INLET / OUTLET	AIR MEAS. STN. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^4)\sqrt{\frac{\tilde{\Delta P}}{\rho \tilde{Q}^2}}$$

$\tilde{\Delta P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1 & 2
Proj. No. 5620.84 Equip. No.

Prepared by WBP Date 8/16/86
Reviewed by Date
Approved by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 05
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 08/16/86
Page 12 of

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DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE
OVC58Y	9	1						
OVC80Y	11	2						
OVC303Y	12	3						
OVC38Y	14	4						
OVC39Y	15	16						
SPLITTER	17	5	—	—	—	—	—	—
SPLITTER	19	6	—	—	—	—	—	—

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

BECHTEL & KIMBY

Client CECO

Project GRAIDOOOO UNITS 1+2

Prepared by WBP Date 8/16/84

Reviewed by Date

Approved by Date

Calcs. For BALANCING DAMPER LIST SUBSYSTEM NUMBER 05

Safety-Related | Non-Safety-Related

Calc. No. VC

Rev. 0 Date 08/16/84

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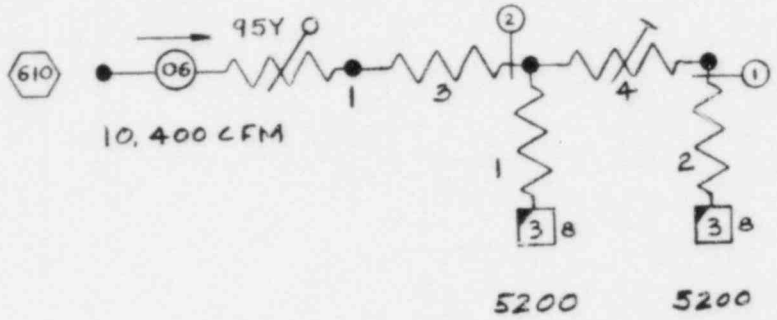

SUMMARY

2	TRAVERSES
1	INLET
2	OUTLETS
5	NODES
4	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO
Project BRAIDWOOD
Proj. No. 4683/84 Equip. No.

Prepared by WBP/JJP Date 08/14/86
Reviewed by Date
Approved by Date

Calcs. For CONTROL ROOM HVAC SUPPLY-SUBSYSTEM 06
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 08/14/86
Page 14 of

PATH NO.	*PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	3	S0602-S0601		S0602-0		S0602				
2	O	3	S0601		S0602-0		S0601				
3	S	OFE-VC006	—		—		—				
4	D	SPLITTER	—		—		—		—	—	0.00001

* PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
I	INTERNAL		R
O	OUTLET/INLET	ROOM NUMBER	R
S/R	INLET/OUTLET	AIR HDLG. SYS. NO.	DEFAULT 0.00001

$$R = (1.2015 \times 10^{6}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNIT 1 & 2R

Proj. No. 4231.04 Equip. No.

Prepared by WBP Date 8/16/86

Reviewed by Date

Approved by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 06

Safety-Related Non-Safety-Related

Calc. No. VC

Rev. 0 Date 08/16/86

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Form GO-432 Rev. 1

DAMPER NUMBER	PATH NUMBER	PATH AFFECT	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE
SPLITTER	4	2	—	—	—	—	—	—

* K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY CHICAGO

Client CECO

Project CRAIG-2000 UNITS 1 & 2

Prepared by WBP Date 8/14/86

Reviewed by Date

Approved by Date

Calcs. For BALANCING DAMPER LIST SUBSYSTEM NUMBER 06

Safety-Related | Non-Safety-Related

Calc. No. VC

Rev 0 Date 08/14/86

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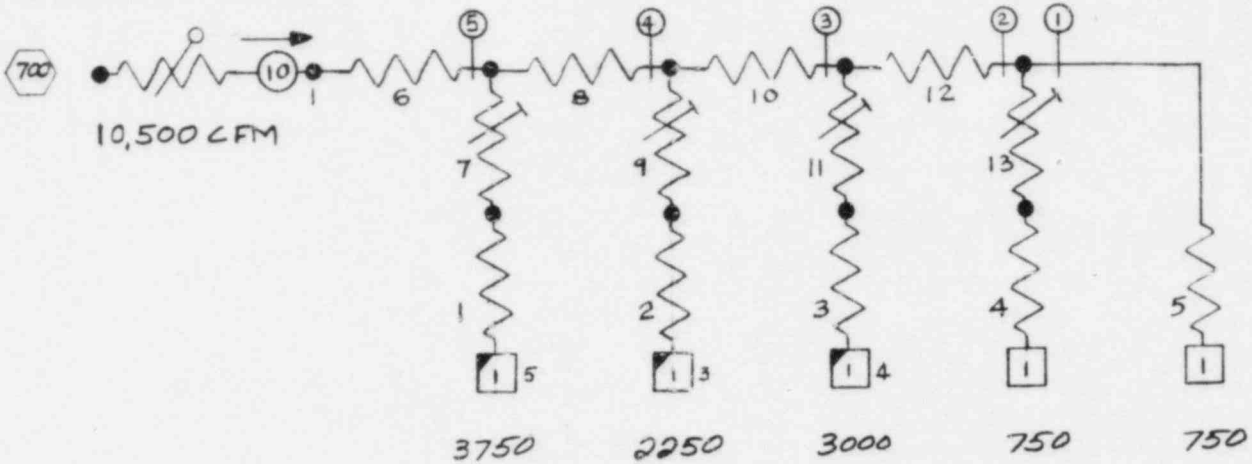

SUMMARY
5 TRAVERSES
1 INLETS
5 OUTLETS
14 NODES
13 PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO		Prepared by WBP/JJP	Date 08/04/86
Project BRAIDWOOD UNITS 1+2		Reviewed by	Date
Proj. No. 4683/84	Equip. No.	Approved by	Date

Calcs. For CONTROL ROOM HVAC SUPPLY - SUBSYSTEM 10

Safety-Related | Non-Safety-Related

Calc. No. VC

Rev. 0 | Date 8/4/86

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PATH NO.	* PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE		TOTAL PRESSURE DROP		AIR DENSITY		PATH RESISTANCE VALUE		
			REFERENCE	VALUE	REFERENCE	VALUE	REFERENCE	VALUE	CALC.	ADJUST	FINAL
1	O	1	S1005-S1004		S1005-O		S1005				
2	O	1	S1004-S1003		S1004-O		S1004				
3	O	1	S1003-S1002		S1003-O		S1003				
*4	O	1	S1002-S1001		S1002-O		S1002				
5	O	1	S1001		S1002-O		S1001				
6	S	OFE-VC010	—		—		—				
7	D	SPLITTER	—		—		—		—	—	0.00001
8	I	—	S1004		S1005-S1004		S1004				
*9	D	SPLITTER	—		—		—		—	—	0.00001
10	I	—	S1003		S1004-S1003		S1003				
*11	D	SPLITTER	—		—		—		—	—	0.00001
12	I	—	S1002		S1003-S1002		S1002				
13	D	SPLITTER	—		—		—		—	—	0.00001
*30											

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
*	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET/INLET	ROOM NUMBER	Q
	S/R	INLET/OUTLET	AIR MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{6}) \sqrt{\frac{\tilde{P}}{\rho \tilde{Q}^{2}}}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY CHICAGO

Client CECO	Prepared by WBP	Date 8/14/86	Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 10
Project BRAIDWOOD UNITS 1 & 2	Reviewed by	Date	Safety-Related / Non-Safety-Related
Proj. No. 12833/104 Equip. No.	Approved by	Date	Calc. No. VC Rev. 0 Date 08/16/86 Page 18 of

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DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE			
SPLITTER	7	1	—	—	—	—	—	—			
"	9	2	—	—	—	—	—	—			
"	11	3	—	—	—	—	—	—			
"	13	4	—	—	—	—	—	—			

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY

Client CECO
Project BRAIDWOOD UNITS 1+2
Proj. No. 4688.84 Recip. No.

Prepared by WBP Date 8/16/84
Reviewed by Date
Approved by Date

Calcs. For BALANCING DAMPER LIST
SUBSYSTEM NUMBER 10
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 08/16/84
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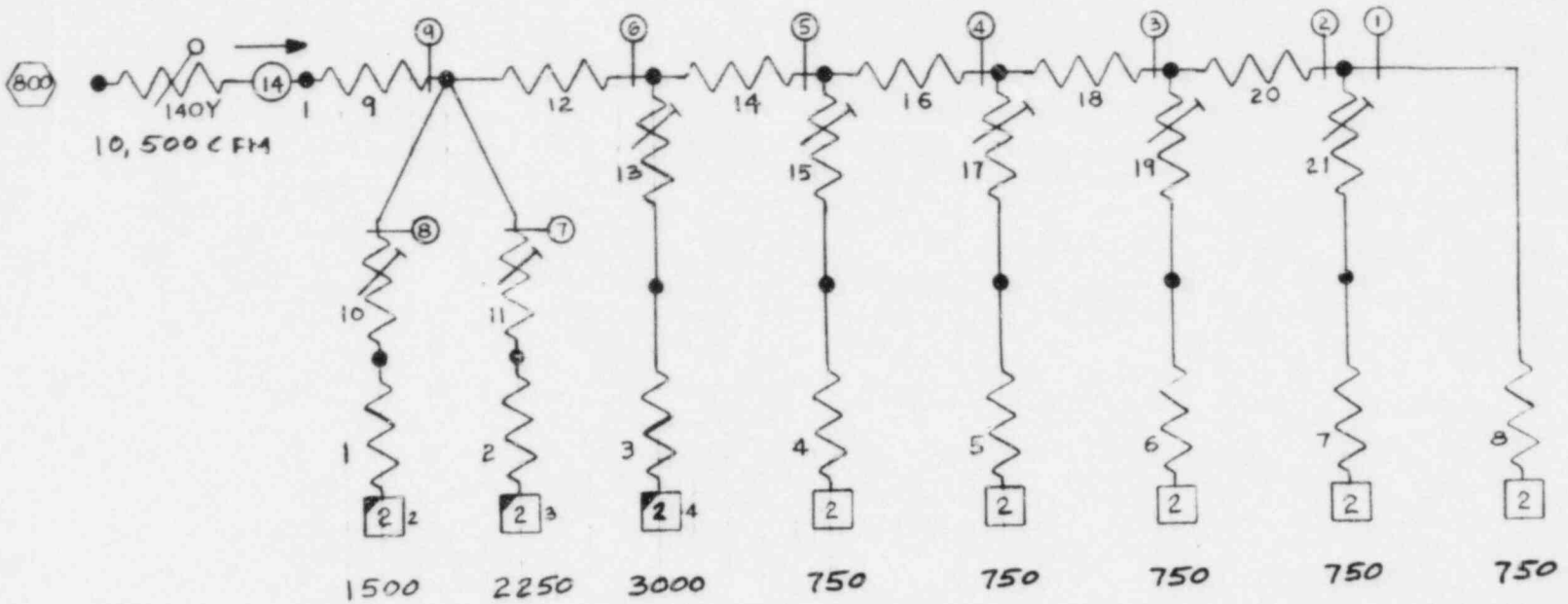

SUMMARY	
9	TRAVERSES
1	INLETS
8	OUTLETS
22	NODES
21	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO		Prepared by WBP/JJP	Date 08/14/86
Project BRAIDWOOD UNITS 1&2		Reviewed by	Date
Proj. No. 4683/84	Equip. No.	Approved by	Date

Calcs. For CONTROL ROOM HVAC SUPPLY - SUBSYSTEM 14

Safety-Related | Non-Safety-Related

Calc. No. VC

Rev. 0 | Date 8/14/86

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	2	S1408		S1409-O		S1408				
2	O	2	S1407		S1409-O		S1407				
3	O	2	S1406-S1405		S1406-O		S1406				
*4	O	2	S1405-S1404		S1405-O		S1405				
5	O	2	S1404-S1403		S1404-O		S1404				
6	O	2	S1403-S1402		S1403-O		S1404				
* 7	O	2	S1402-S1401		S1402-O		S1402				
8	O	2	S1401		S1402-O		S1401				
*9	S	OFF-VC014	—		—		—				
10	D	SPLITTER	—		—		—		—	—	.00001
* 11	D	SPLITTER	—		—		—		—	—	.00001
12	I	—	S1406		S1409-S1406		S1406				
13	D	SPLITTER	—		—		—		—	—	.00001
*14	I	—	S1405		S1406-S1405		S1405				
15	D	SPLITTER	—		—		—		—	—	.00001

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
*	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	R
	O	OUTLET / INLET	ROOM NUMBER	R
	S/R	INLET / OUTLET	AIR HDLG. SYS. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{-4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

Form GO432 Rev 1

SARGENT & LUNDY CHICAGO

Client CECO

Project BRAIDWOOD UNITS 1 & 2

Proj. No. [illegible] Sheet No.

Prepared by [illegible] Date 8/16/86

Reviewed by Date

Approved by Date

Calcs. Fo. RESISTANCE DETERMINATION

SUB-SYSTEM NUMBER 14

Safety-Related | Non-Safety-Related

Calc. No VC

Rev. 0 Date 08/16/86

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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
16	I	—	S1404		S1405 - S1404		S1404				
17	D	SPLITTER	—		—		—		—	—	0.00001
18	I	—	S1403		S1404 - S1403		S1403				
19	D	SPLITTER	—		—		—		—	—	0.00001
20	I	—	S1402		S1403 - S1402		S1402				
21	D	SPLITTER	—		—		—		—	—	0.00001

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET / INLET	ROOM NUMBER	Q
	S/R	INLET / OUTLET	AIR MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{-6}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

SARGENT & LUNDY CHICAGO

Client CECO

Project BRAIDWOOD UNITS 1 & 2

Proj. No. 14821.04 Doc. No.

Prepared by [illegible] Date 8/14/86

Reviewed by Date

Approved by Date

Calcs. For RESISTANCE DETERMINATION

SUB-SYSTEM NUMBER 14

Safety-Related Non-Safety-Related

Calc. No. VC

Rev. 0 Date 08/14/86

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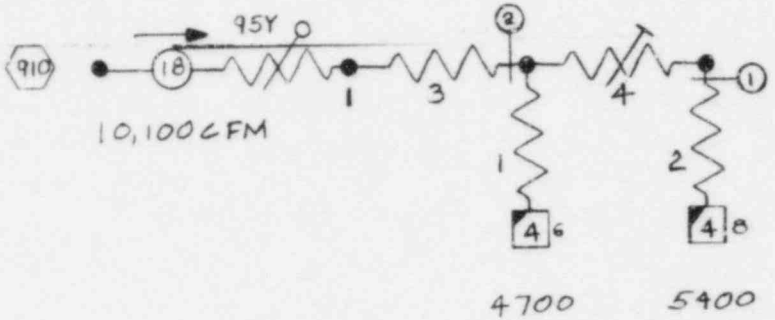
DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE
SPLITTER	10	1	—	—	—	—	—	—
"	11	2	—	—	—	—	—	—
"	13	3	—	—	—	—	—	—
"	15	4	—	—	—	—	—	—
"	17	5	—	—	—	—	—	—
"	19	6	—	—	—	—	—	—
"	21	7	—	—	—	—	—	—

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

BARGETT & LUNDY	Client CECO	Prepared by WBP	Date 08/16/86	Calcs. For BALANCING DAMPER LIST SUBSYSTEM NUMBER 14	Calc. No VC
	Project BRAIDWOOD UNITS 1 & 2	Reviewed by	Date	Safety-Related / Non-Safety-Related	Rev. 0 Date 08/16/86
	Proj. No. 4620/04 Engrg. No.	Approved by	Date		Page 23 of



SUMMARY	
2	TRAVERSES
1	INLET
2	OUTLETS
5	NODES
4	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO		Prepared by WBP/JJP	Date 8/14/86
Project BRAIDWOOD UNITS 1 & 2		Reviewed by	Date
Proj. No. 4683/84	Equip. No.	Approved by	Date

Calcs. For CONTROL ROOM HVAC SUPPLY - SUBSYSTEM 1B

Safety-Related | Non-Safety-Related

Calc. No. VC

Rev. 0 Date 8/14/86

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Form GO 432 Rev 1

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	4	S1802-S1801		S1802-O		S1802				
2	O	4	S1801		S1802-O		S1801				
3	S	OFE-VC01B	—		—		—				
4	D	SPLITTER	—		—		—		—	—	0.00001

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET/INLET	ROOM NUMBER	Q
	S/R	INLET/OUTLET	AIR MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

Form GO-432 Rev. 1

SARGENT & LUNDY

Client: CECO
Project: BRAIDWOOD UNITS 1 & 2
Proj. No. 4321.001 Sheet No.

Prepared by: WFB Date: 08/14/86
Reviewed by: Date:
Approved by: Date:

Calcs. For: RESISTANCE DETERMINATION
SUB-SYSTEM NUMBER 18
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 08/18/86
Page 24 of

DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W (IN)	DIMENSIONS H (IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE			
SPLITTER	4	2	—	—	—	—	—	—			

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY

Client CECO
Project BRAIDWOOD UNITS 1+2
Proj. No. 6488/04 Calc. No.

Prepared by WBB Date 8/16/86
Reviewed by Date
Approved by Date

Calcs. For BALANCING DAMPER LIST
SUBSYSTEM NUMBER 16
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 08/16/86
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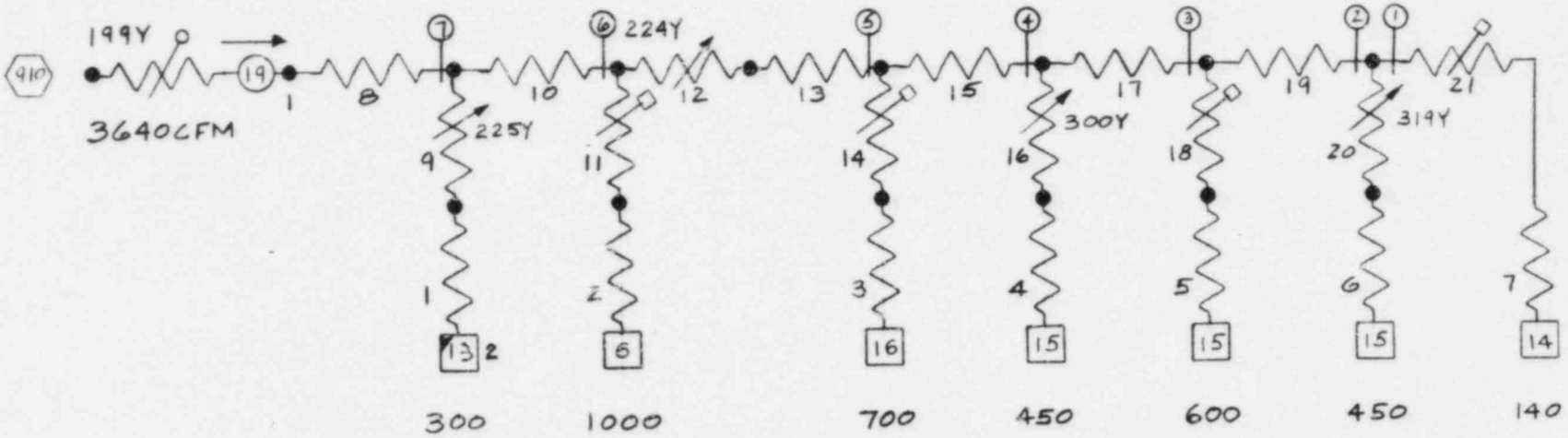

SUMMARY	
7	TRAVERSES
1	INLETS
7	OUTLETS
22	NODES
21	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO		Prepared by WBP/JJP	Date 08/14/86
Project BRAIDWOOD - UNITS 1&2		Reviewed by	Date
Proj. Nr. 4683/84	Equip. No.	Approved by	Date

Calcs. For CONTROL ROOM HVAC SUPPLY SUBSYSTEM 19

Safety-Related | Non-Safety-Related

Calc. No. VC

Rev. 0 | Date 08/14/86

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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	C	13	S1907-S1906		S1907-0		S1907				
2	D	6	S1906-S1905		S1906-0		S1906				
3	D	16	S1905-S1904		S1905-0		S1905				
*4	D	15	S1904-S1903		S1904-0		S1904				
5	D	15	S1903-S1902		S1903-0		S1903				
6	D	15	S1902-S1901		S1902-0		S1902				
7	D	14	S1901		S1902-0		S1901				
8	S	OFE-VC019	—		—		—				
*9	D	OVC225Y	—		—		—				
10	I	—	S1906		S1907-S1906		S1906				
*11	I	OBD	—		—		—				0.00001
12	D	OVC224Y	—		—		—				
13	I	—	S1905		S1906-S1905		S1905				
*14	D	OBD	—		—		—				0.00001
15	I	—	S1904		S1905-S1904		S1904				

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
*	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET/INLET	ROOM NUMBER	Q
	S/R	INLET/OUTLET	AIR MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{6}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOW RATE ACFM

ρ = DENSITY, lb_m/FT^3

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1&2

Prepared by [illegible] Date 08/14/84

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 19

Calc. No. VC

Rev. 0 Date 08/16/84

Form GO-432 Rev 1

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE		TOTAL PRESSURE DROP		AIR DENSITY		PATH RESISTANCE VALUE		
			REFERENCE	VALUE	REFERENCE	VALUE	REFERENCE	VALUE	CALC.	ADJUST	FINAL
16	D	OVC300Y	—		—		—				
17	I	—	S1903		S1904-S1903		S1903				0.00001
18	D	OBD	—		—		—				
19	I	—	S1902		S1903-S1902		S1902				
20	D	OVC31Y	—		—		—				0.00001
21	D	OBD	—		—		—				

* PATH TYPE: C, D, I, O, S/R

PATH NAME: CONTROL DAMPER; BALANCING DAMPER; INTERNAL; OUTLET / INLET; INLET / OUTLET

DESCRIPTION: DAMPER NUMBER; DAMPER NUMBER; —; ROOM NUMBER; AIR. MEAS. STR. NO.

DETERMINATION: DEFAULT 0.00001; DAMPER LIST; Q; Q; DEFAULT 0.00001

$$Q = (1.2015 \times 10^{6}) \frac{\tilde{\Delta P}}{\rho \tilde{Q}^{2}}$$

$\tilde{\Delta P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

Form GQ-432 Rev 1

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1 & 2

Prepared by [illegible] Date 08/12/87

Reviewed by Date

Approved by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 19

Safety-Related Non-Safety-Related

Calc. No. VC

Rev. 0 Date 08/14/87

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DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE
OVC225Y	9	1						
OBD	11	2	—	—	—	—	—	—
OVC224Y	12	13						
OBD	14	3	—	—	—	—	—	—
OVC300Y	16	4						
OBD	18	5	—	—	—	—	—	—
OVC319Y	20	6						
OBD	21	7	—	—	—	—	—	—

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY CHICAGO

Client CECO

Project BRAIDWOOD UNITS 1+2

Prepared by [illegible] Date 08/16/84

Reviewed by Date

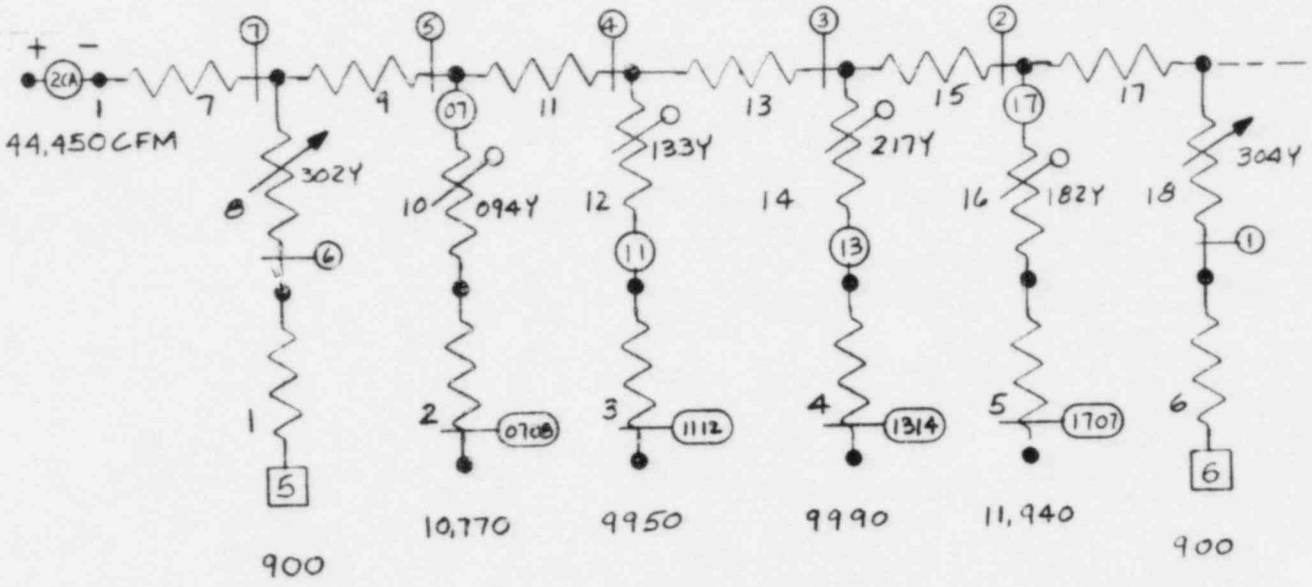
Approved by Date

Calcs. For BALANCING DAMPER LIST SUBSYSTEM NUMBER 19

Safety-Related | Non-Safety-Related

Calc. No. VC

Rev. 0 Date 08/16/84



SUMMARY	
7	TRAINEE
6	INLET
1	OUTLET
19	NODES
18	PATHS

SARGENT & LUNDY CHICAGO

Client CECO
Project BRAIDWOOD - UNITS 1&2
Proj. No. 4683/AH Equip. No.

Prepared by WBP Date 08/17/86
Reviewed by Date
Approved by Date

Calcs. For CONTROL ROOM HVAC RETURN (TRAIN A) - SUBSYSTEM AOA
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 8/17/86
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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	5	ROA06		ROA07-O		ROA06				
2	O	OFE VC007	R0708		ROA05-O		R0708				
3	O	OFE VC011	R0712		ROA04-O		R0712				
4	O	OFE VC013	R1314		ROA03-O		R1314				
5	O	OFE VC017	R1707		ROA02-O		R1707				
6	O	6	ROA01		ROA02-O		ROA01				
7	R	OVC01CA	—		—		—				
8	O	OVC302Y	—		—		—				
9	I	—	ROA05		ROA07-ROA05		ROA05				
10	O	OVC094Y	—		—		—				
11	I	—	ROA04		ROA05-ROA04		ROA04				
12	O	OVC133Y	—		—		—				
13	I	—	ROA03		ROA04 ROA03		ROA03				
14	O	OVC217Y	—		—		—				
15	I	—	ROA02		ROA03-ROA02		ROA02				

* PATH TYPE

* C O I O S/R

PATH NAME	DESCRIPTION	DETERMINATION
CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
INTERNAL	—	R
OUTLET/INLET	ROOM NUMBER	R
INLET/OUTLET	AIR HDLG. STR. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{-4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY CHICAGO

Client CECO

Project BRAIDWOOD UNITS 1 & 2

Prepared by WPB Date 8/17/86

Reviewed by Date

Approved by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER ROA

Safety-Related Non-Safety-Related

Calc. No. VC

Rev. 0 Date 8/17/86

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE		TOTAL PRESSURE DROP		AIR DENSITY		PATH RESISTANCE VALUE		
			REFERENCE	VALUE	REFERENCE	VALUE	REFERENCE	VALUE	CALC.	ADJUST	FINAL
16	D	OVC182Y	—		—		—				
17	I	SPACE	—		—		—				0.00001
18	O	OVC304Y	—		—		—				

* PATH TYPE
- C
- D
- I
- O
- S/R

PATH NAME	DESCRIPTION	DETERMINATION
CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
INTERNAL	—	R
OUTLET/INLET	ROOM NUMBER	R
INLET/OUTLET	AIR MEAS. STR. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{-4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1&2
Sheet No. N-021-Ba

Prepared by WPP Date 8/17/82
Reviewed by Date
Approved by Date

Calcs. For RESISTANCE DETERMINATION
SUB-SYSTEM NUMBER ROA
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 8/17/82
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DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE
OVC302Y	8	1						
OVC094Y	10	2						
OVC133Y	12	3						
OVC217Y	14	4						
OVC182Y	16	5						
OVC304Y	18	6						

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY CHICAGO

Client: CECO

Project: BRAIDWOOD UNITS 1 & 2

Prepared by: [illegible] Date: 6/21/84

Reviewed by: Date:

Approved by: Date:

Calcs. For: BALANCING DAMPER LIST

SUBSYSTEM NUMBER 104

Safety-Related Non-Safety-Related

Calc. No. 10

Rev. 0 Date: 5/[illegible]/84

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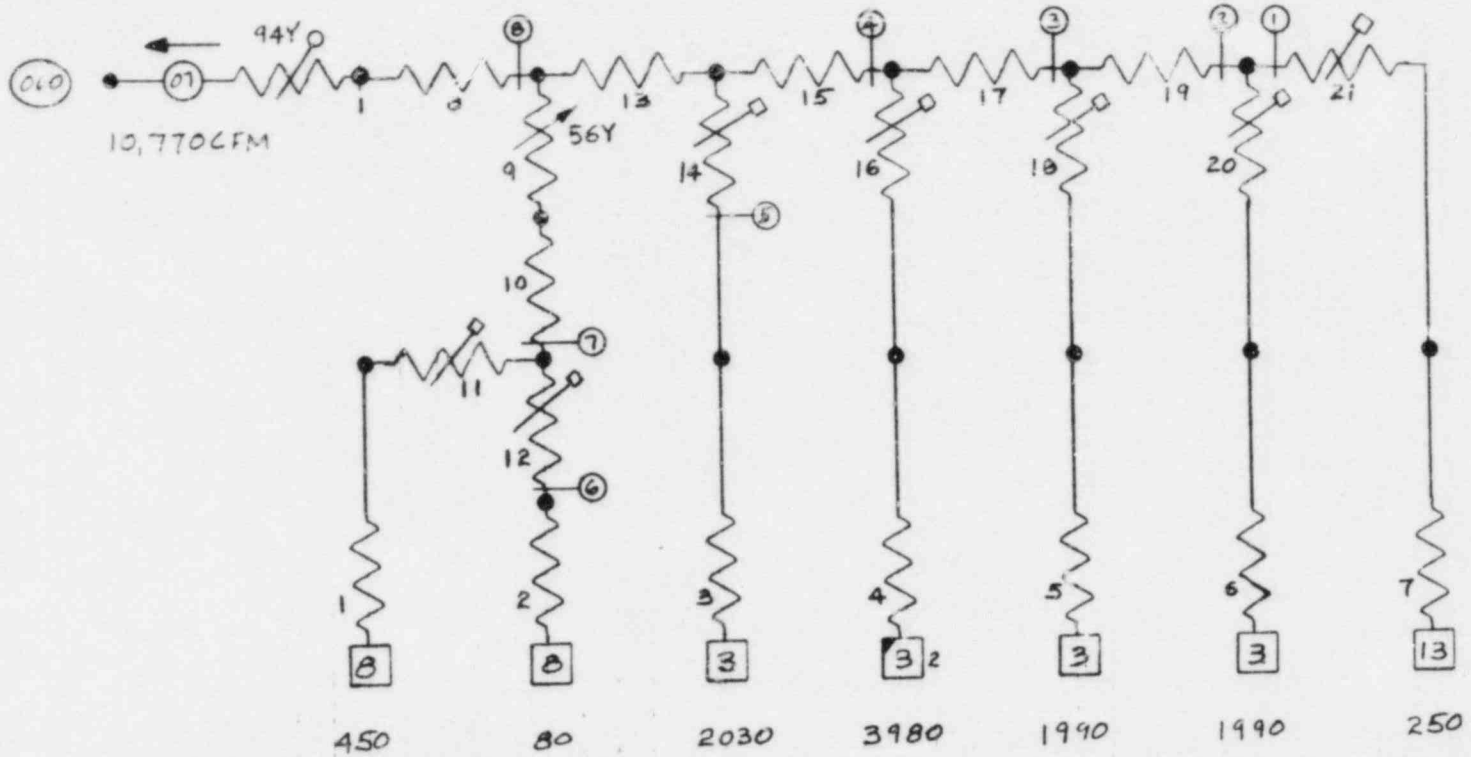

SUMMARY	
8	TRAVERSES
7	INLETS
1	OUTLET
22	NODES
21	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO	Prepared by WBP / JJP	Date 08/16/06	Calcs. For CONTROL ROOM HVAC RETURN - SUBSYSTEM 07
Project BRAIDWOOD - UNITS 1+2	Reviewed by	Date	Safety-Related / Non-Safety-Related
Proj. No. 4683/84 Equip. No.	Approved by	Date	Calc. No. VC
			Rev. 0 Date 08/14/06
			Page 25 of

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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	8	R0707-R0706		R0707-O		R0707				
2	O	8	R0706		R0707-O		R0707				
3	O	3	R0705		R0708-O		R0705				
4	O	3	R0704-R0703		R0704-O		R0704				
5	O	3	R0703-R0702		R0703-O		R0703				
6	O	3	R0702-R0701		R0702-O		R0702				
7	O	13	R0701		R0702-O		R0701				
8	R	OFE-VC007	—		—		—				
9	D	OVC05GY	—		—		—				
10	I	—	R0707		R0708-R0707		R0707				
11	D	OBD	—		—		—		—	—	0.00001
12	D	OBD	—		—		—		—	—	0.00001
13	I	DEFAULT	—		—		—				0.00001
14	D	OBD	—		—		—				
15	I	—	R0704		R0705-R0704		R0704				

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	R
	O	OUTLET/INLET	ROOM NUMBER	R
	S/R	INLET/OUTLET	AIR. MEAS. STA. NO.	DEFAULT 0.00001

$$R = (1.2015 \times 10^{-4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY

CLNR CECO

Project BRAIDWOOD UNITS 1&2

Prepared by [illegible] Date 08/16/86

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 07

Safety Related Non-Safety Related

Calc. No. VC

Rev. 0 Date 08/16/86

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Form GQ 432 Rev 1

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
16	D	OBD	—		—		—		—	—	0.00001
17	I	—	R0703		R0704-R0703		R0703				
18	D	OBD	—		—		—		—	—	0.00001
19	I	—	R0702		R0703-R0702		R0702				
20	D	OBD	—		—		—		—	—	0.00001
21	D	OBD	—		—		—		—	—	0.00001

* PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
I	INTERNAL	—	Q
O	OUTLET / INLET	ROOM NUMBER	Q
S/R	INLET / OUTLET	AIR. MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{4}) \frac{\tilde{\Delta P}}{\rho \tilde{Q}^{2}}$$

$\tilde{\Delta P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

Form QQ 432 Rev. 1

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1 & 2

Prepared by [illegible] Date 08/16/86

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 07

Safety-Related Non-Safety-Related

Calc. No VC

Rev. 0 Date 08/16/86

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DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT²)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE			
OVC056Y	9	10									
OBD	11	1	—	—	—	—	—	—			
"	12	2	—	—	—	—	—	—			
"	14	3	—	—	—	—	—	—			
"	16	4	—	—	—	—	—	—			
"	18	5	—	—	—	—	—	—			
"	20	6	—	—	—	—	—	—			
"	21	7	—	—	—	—	—	—			

K = LOSS COEFF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1+2
Prepared by WAP Date 3/10/86
Reviewed by Date
Approved by Date

Calcs. For BALANCING DAMPER LIST
SUBSYSTEM NUMBER 07
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 09/11/86
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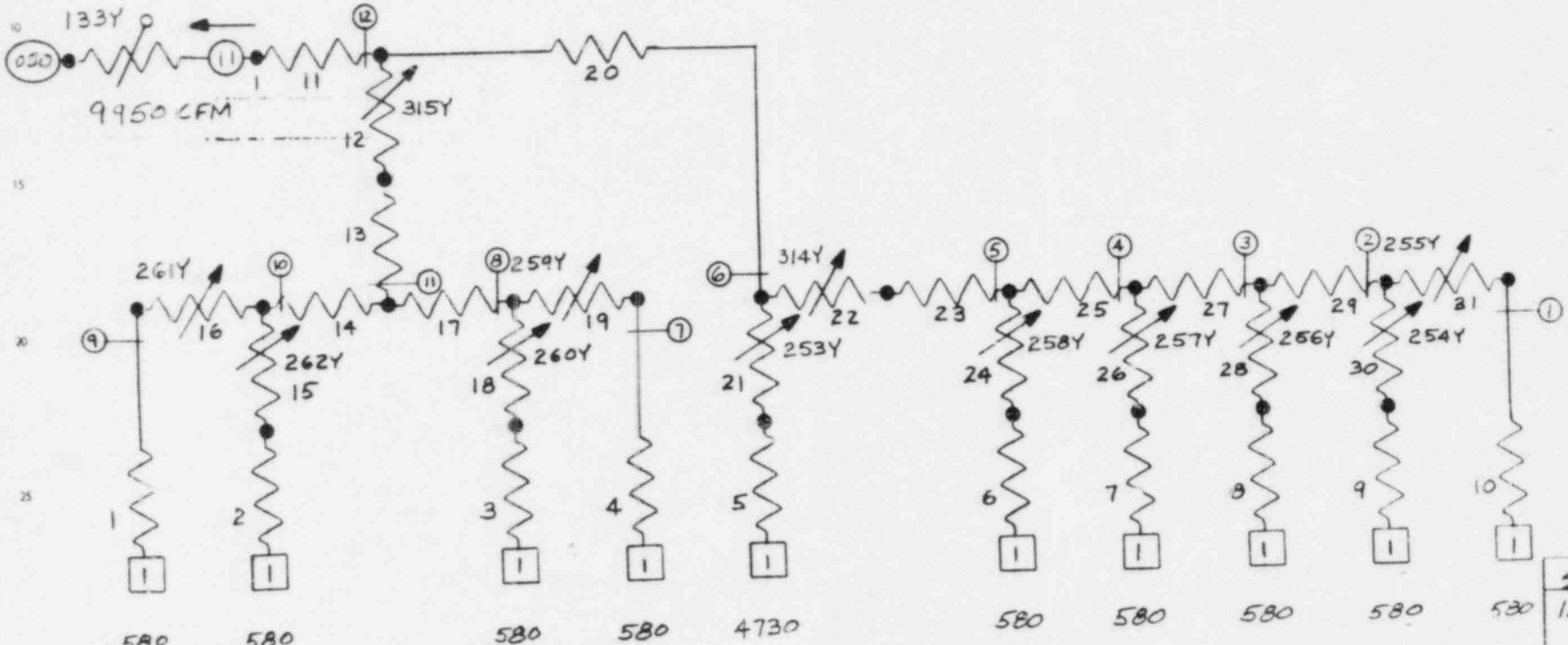

SUMMARY	
12	TRAVERSES
10	INLETS
1	OUTLET
32	NODES
31	PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO
Project BRAIDWOOD - UNITS 1+2
Equip. No.

Prepared by WBP / JJP Date 08/17/86
Reviewed by Date
Approved by Date

Calcs. For CONTROL ROOM HVAC
RETURN - SUBSYSTEM 11
Safety-Related | Non-Safety-Related

Calc. No. VC
Rev 0 Date 8/17/86
Page 39 of

PATH NO.	PATH TYPE*	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	1	R1109		R1110-O		R1109				
2	O	1	R1110-R1109		R1110-O		R1110				
3	O	1	R1108-R1107		R1108-O		R1108				
4	O	1	R1107		R1108-O		R1107				
5	O	1	R1106-R1105		R1106-O		R1106				
6	O	1	R1105-R1104		R1105-O		R1105				
7	O	1	R1104-R1103		R1104-O		R1104				
8	O	1	R1103-R1102		R1103-O		R1103				
9	O	1	R1102-R1101		R1102-O		R1102				
10	O	1	R1101		R1102-O		R1101				
11	R	OFF VCO11	—		—		—				
12	D	OVC315Y	—		—		—				
13	I	—	R1111		R1112-R1111		R1111				
14	I	—	R1110		R1111-R1110		R1110				
15	D	OVC262Y	—		—		—				

* PATH TYPE

	PATH NAME	DESCRIPTION	DETERMINATION
C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
I	INTERNAL	—	Q
O	OUTLET/INLET	ROOM NUMBER	Q
S/R	INLET/OUTLET	AIR. MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{4}) \sqrt{\frac{\tilde{P}}{\rho \tilde{Q}^{2}}}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1&2

Prepared by WPK Date 8/17/86

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION 52B-SYSTEM NUMBER 11

Calc. No. VC

Rev. 0 Date 8/17/86

Page 1/2 of

Form GQ 432 Rev. 1

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
16	D	OVC2614	—		—		—				
17	I	—	R1108		R1111 - R1108		R1108				
18	D	OVC2604	—		—		—				
19	D	OVC2594	—		—		—				
20	I	—	R1106		R1112 - R1106		R1106				
21	D	OVC2534	—		—		—				
22	D	OVC3144	—		—		—				
23	I	—	R1105		R1106 - R1105		R1105				
24	D	OVC2584	—		—		—				
25	I	—	R1104		R1105 - R1104		R1104				
26	D	OVC2574	—		—		—				
27	I	—	R1103		R1104 - R1103		R1103				
28	D	OVC2564	—		—		—				
29	I	—	R1102		R1103 - R1102		R1102				
30	D	OVC2544	—		—		—				

* PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.0000!
D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
I	INTERNAL	—	Q
O	OUTLET / INLET	ROOM NUMBER	Q
S/R	INLET / OUTLET	AIR MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{4}) \frac{\tilde{\Delta P}}{\rho \tilde{Q}^{2}}$$

$\tilde{\Delta P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

Client CECO

Project ROSEWOOD UNITS 1&2

Prepared by WBP Date 8/17/86

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 11

Calc. No. VC

Rev. 0 Date 9/17/86

SARGENT & LUNDY

Form GQ-432 Rev. 1

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
31	D	OUC2554	—		—		—				

* PATH TYPE

C
D
I
O
S/R

PATH NAME	DESCRIPTION	DETERMINATION
CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
INTERNAL	—	Q
OUTLET / INLET	ROOM NUMBER	Q
INLET / OUTLET	AIR HDLG. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{4}) \sqrt{\frac{\Delta P}{\rho \tilde{Q}^{2}}}$$

ΔP = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1&2

Prepared by WBP Date 8/17/82

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 11

Safety-Related Non-Safety-Related

Calc. No. VC

Rev. 0 Date 8/17/82

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DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT²)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE
OVC315Y	12	13						
OVC2624Y	15	2						
OVC2614Y	16	1						
OVC2604Y	18	3						
OVC2554Y	19	4						
OVC2534Y	21	5						
OVC2144Y	22	23						
OVC2584Y	24	6						
OVC2574Y	26	7						
OVC2564Y	28	8						
OVC2544Y	30	9						
OVC2554Y	31	10						

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1+2

Prepared by WBP Date 8/17/84

Reviewed by Date

Approved by Date

Calcs. For BALANCING DAMPER LIST SUBSYSTEM NUMBER 11

Safety-Related Non-Safety-Related

Calc No. VC

Rev. 0 Date 8/17/84

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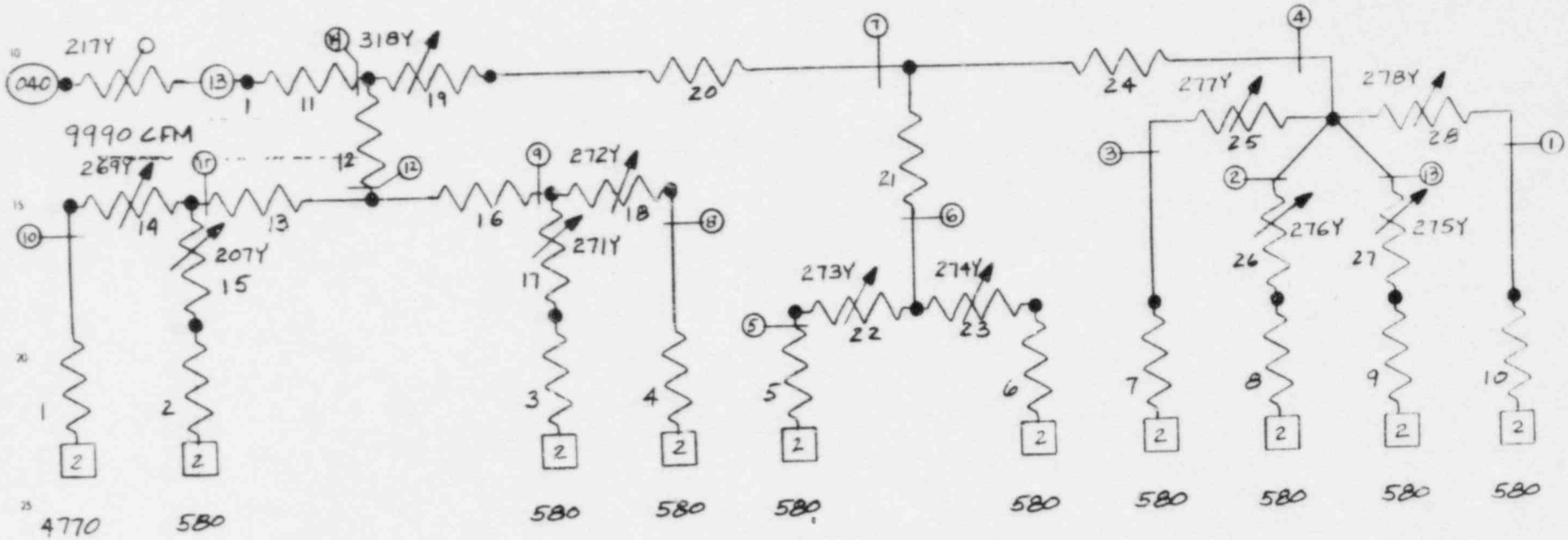

SUMMARY	
1	TRAVERSE
10	INLETS
1	OUTLET
29	NODES
28	PATHS

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD - UNITS 1 & 2

Prepared by WBP/JJP Date 8/17/86

Reviewed by Date

Approved by Date

Calcs. For CONTROL ROOM HVAC RETURN - SUBSYSTEM 13

Safety-Related Non-Safety-Related

Calc. No. VC

Rev. 0 Date 8/17/86

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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
1	O	2	R1310		R1311-O		R1310				
2	O	2	R1311-R1310		R1311-O		R1311				
3	O	2	R1309-R1308		R1309-O		R1309				
4	O	2	R1308		R1309-O		R1308				
5	O	2	R1305		R1306-O		R1305				
6	O	2	R1306-R1305		R1306-O		R1306				
7	O	2	R1303		R1304-O		R1303				
8	O	2	R1302		R1304-O		R1302				
9	O	2	R1313		R1304-O		R1313				
10	O	2	R1301		R1304-O		R1307				
11	R	OFF-VC013	—		—		—				
12	I	—	R1312		R1314-R1312		R1312				
13	I	—	R1311		R1312-R1311		R1311				
14	D	OVC2694	—		—		—				
15	D	OVC2074	—		—		—				

*	PATH TYPE
	C
	D
	I
	O
	S/R

PATH NAME	DESCRIPTION	DETERMINATION
CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
INTERNAL	—	Q
OUTLET / INLET	ROOM NUMBER	Q
INLET / OUTLET	AIR. MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{6}) \frac{\tilde{\Delta P}}{\rho \tilde{Q}^2}$$

$\tilde{\Delta P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1 & 2

Prepared by WBP Date 8/17/86

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 13

Calc. No. VC

Rev. 0 Date 8/17/86

Form GO-4.32 Rev 1

PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
16	I	—	R1309		R1312-R1309		R1309				
17	D	OVC-71Y	—		—		—				
18	D	OVC272Y	—		—		—				
19	D	OVC318Y	—		—		—				
20	I	—	R1307		R1314-R1307		R1307				
21	I	—	R1306		R1307-R1306		R1306				
22	D	OVC273Y	—		—		—				
23	D	OVC274Y	—		—		—				
24	I	—	R1304		R1307-R1304		R1304				
25	D	OVC277Y	—		—		—				
26	D	OVC276Y	—		—		—				
27	D	OVC275Y	—		—		—				
28	D	OVC278Y	—		—		—				
29											

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
35	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET / INLET	ROOM NUMBER	Q
	S/R	INLET / OUTLET	AIR. MEAS. STA. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm / FT^3

SARGENT & LUNDY CHICAGO

Client CECO

Project BRAIDWOOD UNITS 1 & 2

Proj. No. 4683/84 Equip. No.

Prepared by WBP Date 6/17/86

Reviewed by Date

Approved by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 13

Safety-Related Non-Safety-Related

Calc. No. YC

Rev. 0 Date 6/17/86

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Form GO 432 Rev 1

DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT^2)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE			
OVC269Y	14	1									
OVC207Y	15	2									
OVC271Y	17	3									
OVC272Y	18	4									
OVC316Y	19	20									
OVC273Y	22	5									
OVC274Y	23	6									
OVC277Y	25	7									
OVC276Y	26	8									
OVC275Y	27	9									
OVC278Y	28	10									

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1+2
Prepared by WFP Date 1/17/86
Reviewed by Date
Approved by Date

Calcs. For BALANCING DAMPER LIST
SUBSYSTEM NUMBER 13
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 3/17/86
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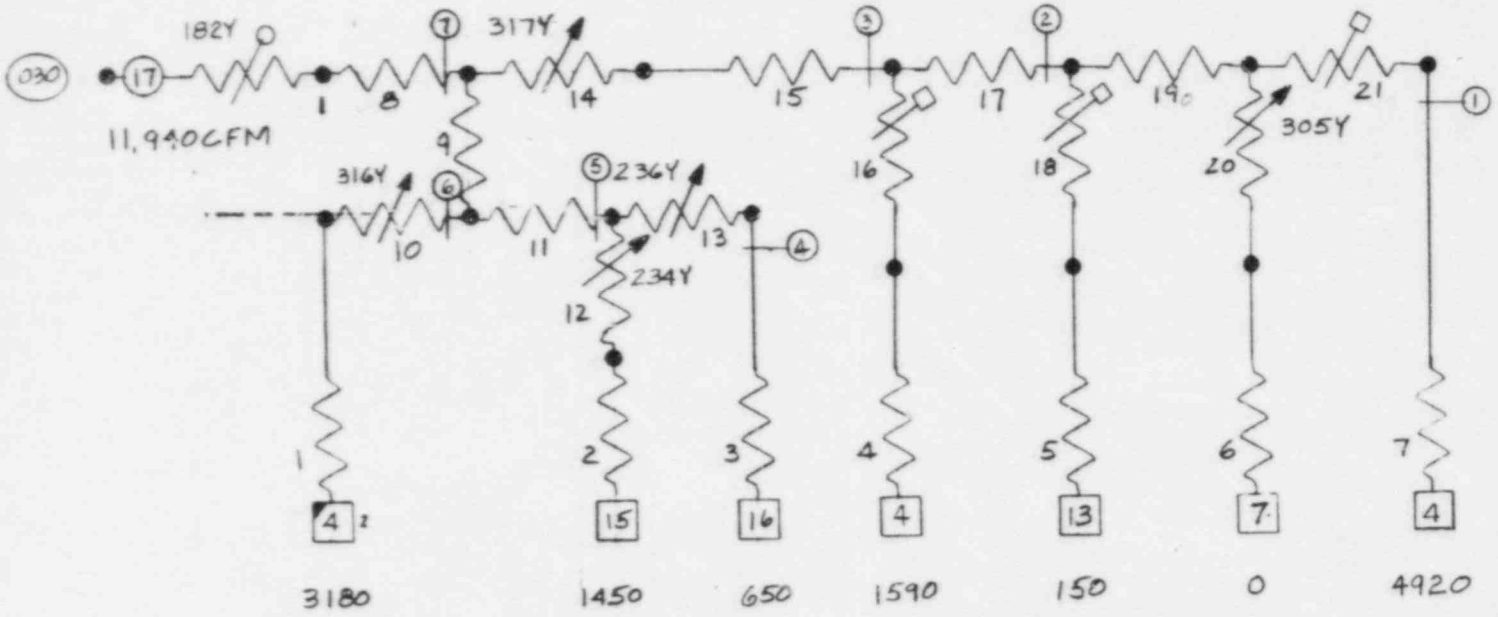

SUMMARY
7 TRAVERSES
7 INLETS
1 OUTLET
22 NODES
21 PATHS

SARGENT & LUNDY ENGINEERS CHICAGO

Client CECO	Prepared by WAP/JJP	Date 8/17/86	Calcs. For CONTROL ROOM HVAC RETURN - SUBSYSTEM 17
Project BRAIDWOOD - UNITS 1 & 2	Reviewed by	Date	Safety-Related / Non-Safety-Related
Proj. No. 4683/87 Equip. No.	Approved by	Date	

Calc. No. VC		
Rev. 0	Date 8/17/86	
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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE		TOTAL PRESSURE DROP		AIR DENSITY		PATH RESISTANCE VALUE		
			REFERENCE	VALUE	REFERENCE	VALUE	REFERENCE	VALUE	CALC.	ADJUST	FINAL
1	O	4	R1706		R1707-O		R1706				
2	O	15	R1705-R1704		R1705-O		R1705				
3	O	16	R1704		R1705-O		R1704				
*4	O	4	R1703-R1702		R1703-O		R1703				
5	O	13	R1702-R1701		R1702-O		R1702				
6	C	SPACE	—		—		—				
7	O	4	R1701		R1702-O		R1701				
8	R	OFF-VCON	—		—		—				0.00001
*9	I	SPACE	—		—		—				
10	D	OVC3N4	—		—		—				
11	I	—	R1705		R1706-R1705		R1705				
12	D	OVC234	—		—		—				
13	D	OVC234	—		—		—				
*14	D	OVC317	—		—		—				
15	I	—	R1703		R1707-R1703		R1703				

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
*	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
*	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER K'ST
	I	INTERNAL	—	Q
	O	OUTLET/INLET	ROOM NUMBER	Q
	S/R	INLET/OUTLET	AIR MEAS. STR. NO.	DEFAULT 0.00001

$$Q = (1.2015 \times 10^{-4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1&2
Proj. No. 6453.1.84 Equip. No.

Prepared by UBP Date 8/17/84
Reviewed by Date
Approved by Date

Calcs. For RESISTANCE DETERMINATION
SUB-SYSTEM NUMBER 17
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 8/17/84
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PATH NO.	PATH TYPE	DESCRIPTION	ACTUAL AIRFLOW RATE REFERENCE	ACTUAL AIRFLOW RATE VALUE	TOTAL PRESSURE DROP REFERENCE	TOTAL PRESSURE DROP VALUE	AIR DENSITY REFERENCE	AIR DENSITY VALUE	PATH RESISTANCE VALUE CALC.	PATH RESISTANCE VALUE ADJUST	PATH RESISTANCE VALUE FINAL
16	D	SPLITTER	—		—		—				0.00001
17	I	—	R1702		R1703-R1702		R1702				
18	D	SPLITTER	—		—		—				0.00001
19	I	SPACE	—		—		—				0.00001
20	D	OVC305Y	—		—		—				
21	D	SPLITTER	—		—		—				0.00001

*	PATH TYPE	PATH NAME	DESCRIPTION	DETERMINATION
	C	CONTROL DAMPER	DAMPER NUMBER	DEFAULT 0.00001
	D	BALANCING DAMPER	DAMPER NUMBER	DAMPER LIST
	I	INTERNAL	—	Q
	O	OUTLET/INLET	ROOM NUMBER	Q
	S/R	INLET/OUTLET	AIR. MEAS. STA. NO.	DEFAULT 0.0001

$$Q = (1.2015 \times 10^{4}) \frac{\tilde{P}}{\rho \tilde{Q}^2}$$

$\tilde{P}$ = INCHES OF WATER COLUMN DIFFERENTIAL

$\tilde{Q}$ = VOLUME FLOWRATE ACFM

ρ = DENSITY, lbm/FT^3

SARGENT & LUNDY

Client CECO

Project BRAIDWOOD UNITS 1&2

Prepared by WBP Date 8/17/82

Reviewed by Date

Calcs. For RESISTANCE DETERMINATION SUB-SYSTEM NUMBER 17

Safety-Related Non-Safety-Related

Calc. No. VC

Rev. 0 Date 8/17/82

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DAMPER NUMBER	PATH NUMBER	PATH AFFECT.	DIMENSIONS W(IN)	DIMENSIONS H(IN)	AREA (FT²)	DAMPER POSITION	LOSS COEFFICIENT	R RESISTANCE			
OVC 3164	10	1									
OVC 2344	12	2									
OVC 2364	13	3									
OVC 3174	14	15									
SPLITTER	16	4									
SPLITTER	18	5									
OVC 3154	20	6									
SPLITTER	81	7									

K = LOSS COEF. = 0.46 FOR WIDE OPEN DAMPER (90°)

$R = \frac{K}{A^2}$

SARGENT & LUNDY CHICAGO

Client CECO
Project BRAIDWOOD UNITS 1+2
Proj. No. 4688/84 Equip. No.

Prepared by WBP Date 8/17/84
Reviewed by Date
Approved by Date

Calcs. For BALANCING DAMPER LIST SUBSYSTEM NUMBER 17
Safety-Related Non-Safety-Related

Calc. No. VC
Rev. 0 Date 8/17/84
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