IN 076 ICTC – ICTC CRAC Unit Replacement

Indiana University Indianapolis
Indianapolis, Indiana
IU 20251317

ADDENDUM NO. 1

HEAPY PROJECT NO. 2025-06093

April 15, 2026

GENERAL

ITEM NO. 1 Issued Pre Bid Meeting Agenda and Information

ITEM NO. 2 Issue building chilled water schematic for reference

ITEM NO. 3 Issue T&B reports for AHUs and three previous CRAC replacement projects for reference

SPECIFICATIONS

ITEM NO. 1 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

A. Paragraph 3.2.B:

1) Paragraph shall read as follows:

a. "B. R Rebalance chilled water flows to the existing CRAC units located in rooms 024 and 019 to design GPMs."

B. Paragraph 3.2.C:

1) Paragraph shall read as follows:

a. "C. Re balance chilled water flows to air handling units CTC-1, CTC-2, and CAB-1 to design GPMs."

DRAWINGS

ITEM NO. 1 Siemens Control Drawings.

A. Added Siemens control drawings.

3850 Priority Way South Dr. Ste 204
Indianapolis, IN 46240
(317) 571-8795 www.heapy.com

Pre-Bid Meeting Agenda And Information

Heapy Project No. 2025-06093

Project: IN076 ICTC – ICTC DATA CENTER CRAC UNIT REPLACEMENT
IU #20251317

Date: April 8, 2026, 1:00 PM

Project Introductions

MEP: Heapy Engineering

Main Contacts
Garrett Mize (PM) — Email gdmize@heapy.com
Ehren Lohrmann (Mechanical) — Email eelohrmann@heapy.com

Indiana University

Ken McKnight — Email kmcknigh@iu.edu
David Toschlog — Email davtosch@iu.edu
Shane Green — Email greensa@iu.edu

Sign In Sheet

All interested parties need to sign in prior to the end of the meeting.

Bidding Documents

Bidding documents are available. Contact Eastern Engineering Distribution Department, 9901 Allisonville Road, Fishers, IN 46038. Phone 317-598-0661, www.iuplanroom.com for deposit and purchase information.

3850 Priority Way South Dr. Ste 204
Indianapolis, IN 46240
(317) 571-8795 www.heapy.com

Bid Date and Procedure

IU 20251317 - Bids will be received until 2:00 PM (local time) on Wednesday, April 29, 2026

Via electronic bid submission on www.iuplanroom.com. Bidders must be registered on the plan room, and signed in to the plan room, in order to submit a bid.

Bids will be electronically opened via Zoom:
https://iu.zoom.us/j/82623978895
Meeting ID: 826 2397 8895
Join By Telephone: 312-626-6799

Sub and Product List

Subs and Products list to be submitted within 48 hours of bid opening

Questions

All questions and comments regarding this project must be directed, in writing to Garrett Mize, gdmize@heapy.com Please submit all questions for the project no later than the end of the day on April 13, 2026, for inclusion in an Addendum

Addenda

Addendum #1 to be issued on April 15, 2026

Addendum can be issued up to 48 hours prior to bid

Scope

Replacement of CRAC Units 11 and 12 in the base bid

Piping, electrical and controls as shown

Rebalance chilled water system

Alternates

No. 1A and 1B:
CRAC unit manufacturers are required to provide unit submittals with the bid along with estimated lead time

No. 2A and 2B:

Replace CRAC Unit 13 as indicated on the drawings and in the specifications. CRAC unit manufacturers are required to provide unit submittals with the bid along with estimated lead time

Schedule

Completion November 20, 2026

Construction Schedule

Detailed construction schedule is required at the beginning of construction to coordinate installation dates and times. Refer to phasing plans

Restrictions / Limitation / Challenges

1. All areas outside the project limits will be occupied during construction
   a. Control air quality (construction dust / debris)
   b. Noise control
   c. Security of projects limits during construction

As-Builts Documentation

Contractor shall keep as-builts documentation up to date. There will be milestone dates established where these documents will be reviewed and if it is determined that they are not up to date payment could be withheld

Additional Site Visits

Contact

David Toschlog Email davtosch@iu.edu

Questions / Comments

-

Walk Through

-

HEAPY

ATTENDANCE SHEET

Project No.: 2025-06093

Date: April 8, 2026

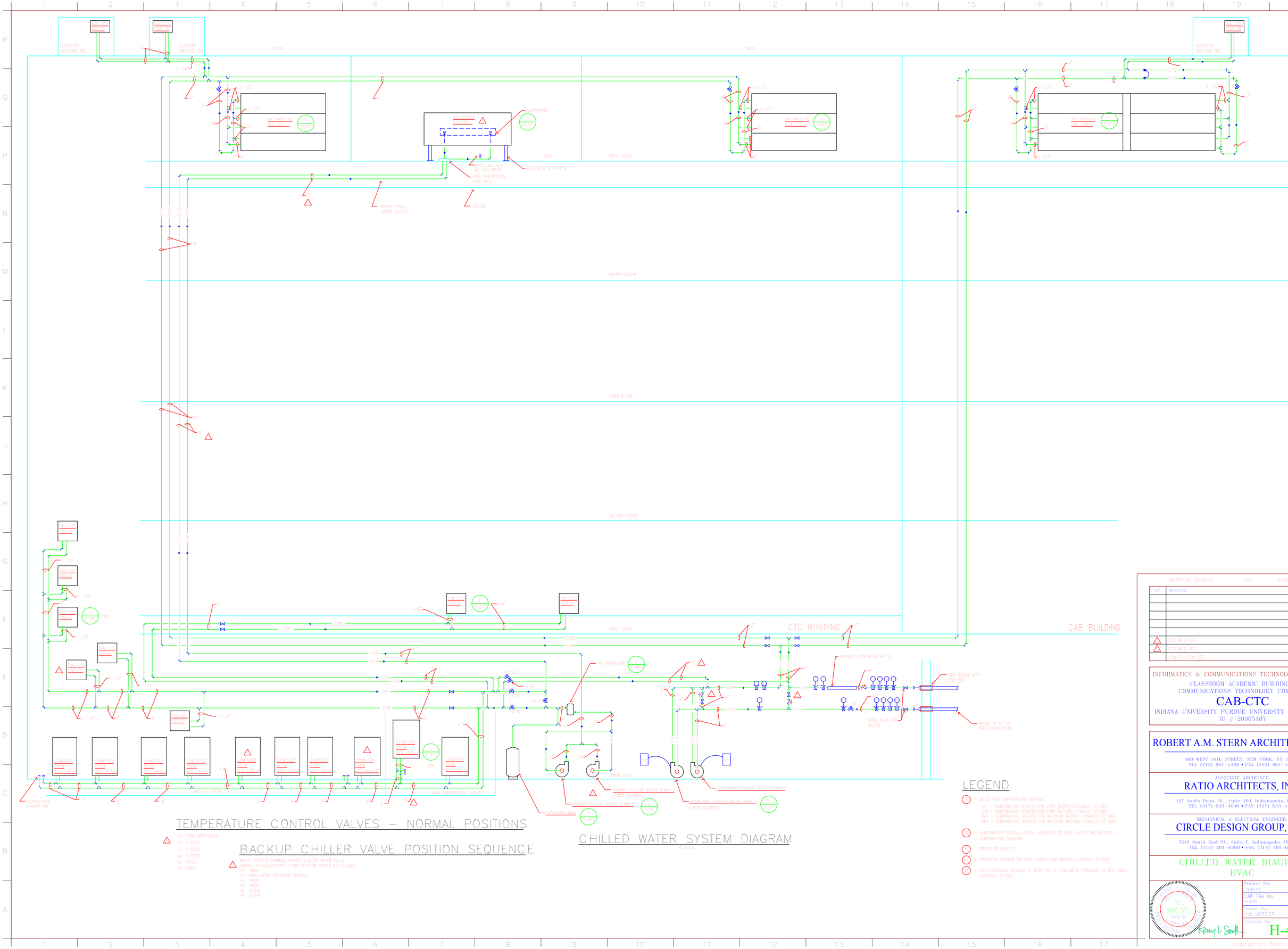
Project: IN076 ICTC DATA CENTER CRAC UNIT REPLACEMENT
IU# 20251317

Purpose: Pre-Bid Meeting

PLEASE PRINT CLEARLY

	Name	Company	E-Mail
1.	BRIAN FENNIG	fuerge	bfennig@fes-co.com
2.	Ross Fazekas	Faco	Ross@FacoLLC.com
3.	Shane Green	CAS- IU	greensa@IU.edu
4.	Tom Hall	Irish	THall@IrishMechanicalServices.com
5.	Aaron Johnson	HMI	ajohnsm@harrell-fish.com
6.	David Toschlog	IU	daxtosch@iu.edu
7.	KEN MCKNIGHT	IU	kmcknigh@iu.edu
8.	Mike Carr	KW Services	MCarr@[redacted].KWservices.com
9.			
10.			

3850 Priority Way South Dr. Ste 204
Indianapolis, IN 46240
(317) 571-8795 www.heapy.com



TEMPERATURE CONTROL VALVES – NORMAL POSITIONS

V1 OPEN MODULATING
V2 CLOSED
V3 CLOSED
V4 CLOSED
V5 OPEN
V6 OPEN

BACKUP CHILLER VALVE POSITION SEQUENCE

△ WHEN CITIZENS THERMAL ENERGY CHILLED WATER FAILS, ENABLE CHILLER,PCHWP=1 AND POSITION VALVES AS FOLLOWS:
V1 OPEN
V2 MODULATING PRESSURE BYPASS
V3 OPEN
V4 OPEN
V5 CLOSE
V6 CLOSE

CHILLED WATER SYSTEM DIAGRAM

NO SCALE

LEGEND

- WELLS FOR TEMPERATURE SENSORS.
  - TLS – TEMPERATURE SENSOR FOR LOOP SUPPLY–CONNECT TO EMS.
  - TLR – TEMPERATURE SENSOR FOR LOOP RETURN–CONNECT TO EMS.
  - TBS – TEMPERATURE SENSOR FOR BUILDING SUPPLY–CONNECT TO EMS.
  - TBR – TEMPERATURE SENSOR FOR BUILDING RETURN–CONNECT TO EMS.
- TG – TEMPERATURE GAUGES. INSTALL ADJACENT TO EMS SUPPLY AND RETURN TEMPERATURE SENSORS.
- PG – PRESSURE GAUGES.
- PS – PRESSURE SENSOR ON LOOP SUPPLY AND RETURN–CONNECT TO EMS.
- PSH – HIGH PRESSURE SENSOR TO STOP VSD IF DISCHARGE PRESSURE IS TOO HIGH–CONNECT TO EMS.

NO.	REVISION	REV. DATE
	RECORD SET "AS-BUILT" MCK 21DEC04 ZMAR05	
△	ADD MC2-004	05-07-03
△	ADD MC2-001	04-09-03
	CONSTRUCTION SET	08-29-02

INFORMATICS & COMMUNICATIONS TECHNOLOGY COMPLEX
CLASSROOM ACADEMIC BUILDING/ COMMUNICATIONS TECHNOLOGY COMPLEX
CAB-CTC
INDIANA UNIVERSITY PURDUE UNIVERSITY INDIANAPOLIS
IU # 20005187

ROBERT A.M. STERN ARCHITECTS, LLP
460 WEST 34th STREET, NEW YORK, NY 10001
TEL (212) 967-5100 • FAX (212) 967-5588

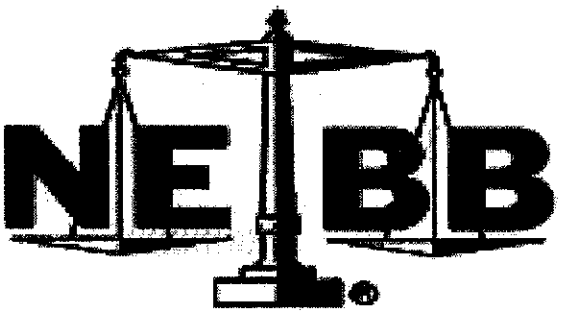
ASSOCIATE ARCHITECT:
RATIO ARCHITECTS, INC.
107 South Penn. St., Suite 100, Indianapolis, IN 46204
TEL (317) 633-4040 • FAX (317) 633-4153

MECHANICAL & ELECTRIAL ENGINEER:
CIRCLE DESIGN GROUP, INC.
5510 South East St., Suite F, Indianapolis, IN 46227
TEL (317) 781-6200 • FAX (317) 781-6201

CHILLED WATER DIAGRAM
HVAC

Project No. 99010	Date 5-30-2002
CAD File No. H405	Scale 1/8"=1'-0"
Drawn By: JIM MERCER	Checked By: KERRY L SMITH
Drawing No.	H-405

No. 880301 STATE OF INDIANA REGISTERED PROFESSIONAL ENGINEER
Kerry L Smith



CERTIFIED TEST, ADJUST, AND BALANCE REPORT

DATE: 10/3/07

PROJECT:

NAME	IUPUI CAB/CTC
ADDRESS	INDIANAPOLIS, INDIANA

ARCHITECT:

NAME	RATIO ARCHITECTS, INC.
ADDRESS	107 SOUTH PENNSYLVANIA INDIANAPOLIS, INDIANA 46204
PHONE	317-633-4153

DESIGN ENGINEER:

NAME	CIRCLE DESIGN GROUP
ADDRESS	5510 SOUTH EAST STREET, SUITE F INDIANAPOLIS, INDIANA 46227
PHONE	

HVAC CONTRACTOR:

NAME	BRIGHT SHEET METAL
ADDRESS	4212 W. 71ST STREET INDIANAPOLIS, INDIANA 46268
PHONE	317-291-7600

NEBB TAB FIRM:

Fulton Air Balance
4212 W. 71st Street
Indianapolis, Indiana 46268
Voice: (317) 291-7600
Fax: (317) 291-7604

TAB CERTIFICATION NUMBER: 2426

CERTIFICATION

PROJECT IUPUI CAB/CTC
ADDRESS INDIANAPOLIS, INDIANA

THE DATA PRESENTED IN THIS REPORT IS AN EXACT RECORD OF SYSTEM PERFORMANCE AND WAS OBTAINED IN ACCORDANCE WITH NEBB STANDARD PROCEDURES. ANY VARIANCE FROM DESIGN QUANTITIES WHICH EXCEED NEBB TOLERANCES ARE NOTED THROUGHOUT THIS REPORT.

THE AIR DISTRIBUTION SYSTEMS HAVE BEEN TESTED & BALANCED AND FINAL ADJUSTMENTS HAVE BEEN MADE IN ACCORDANCE WITH NEBB "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, BALANCING OF ENVIRONMENTAL SYSTEMS" AND PROJECT SPECIFICATIONS.

NEBB TAB FIRM FULTON AIR BALANCE, INC.

REG. NO. 2426 CERTIFIED BY Christopher A. Fulton DATE 10/3/2007

THE HYDRONIC DISTRIBUTION SYSTEMS HAVE BEEN TESTED & BALANCED AND FINAL ADJUSTMENTS HAVEBEEN MADE IN ACCORDANCE WITH NEBB "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, BALANCING OF ENVIRONMENTAL SYSTEMS" AND THE PROJECT SPECIFICATIONS.

NEBB TAB FIRM FULTON AIR BALANCE, INC.

REG. NO. 2426 CERTIFIED BY Christopher A. Fulton DATE 10/3/2007

SUBMITTED & CERTIFIED BY: Christopher A. Fulton

NEBB TAB FIRM FULTON AIR BALANCE, INC.

TAB SUPERVISOR Christopher A. Fulton

REG. NO 2426 SIGNATURE:

DATE 10/3/2007 CERTIFICATION EXPIRATION DATE 12/31/2007

SEAL

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CTC-01

LOCATION Mechanical Room

UNIT DATA	
Make/Model No.	Trane / MCCB080
Type/Size	Drawthru/80
Serial Number	KO3D50381
Arrangement/Class	
Discharge	Horizontal
Make Sheave	(1)
Sheave Diam/Bore	(1)
N. Belts/make/size	(1)
No. Filters/type/size	6/Pleated/20 X 24 X 4
	6/Pleated/20 X 20 X 4
6/Pleated/24 x 20 x 4	6/Pleated/24 X 24 X 4

MOTOR DATA	
Make/Frame	*1
H.P./RPM	*1
Volts/Phase/Hertz	*1
F.L. Amps/S.F.	*1
Make Sheave	*1
Sheave Diam/Bore	*1
Sheave Center Distance	*1
Sheave Oper. Diam.	*1
Filter Final	6/Cartridge/20 X 2 0 X 12
	6/Cartridge/24 X2 0 X 12
6/Cartridge/20 X 24 X 12	6/Cartridge/24 x2 4x 12

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	40,000	40,614
Total S.P.	3.35	2.68
Fan RPM	1063	1078
External S.P.	1.0	1.41
Motor Volts	460	454
Motor Amps	47.5	46.7
Corrected F.L.Amps	NS	46.09
B.H.P.	36.61	38.81
Outside Air	3000	4109
Return Air	37,000	36,505
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	+.40
Suction S.P.	NS	-2.28
Reheat Coil Delta S.P.	0.07	.08
Cooling Coil Delta S.P.	0.74	.60
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	1.54	1.15
Filters Delta S.P.Final		
Duct S. P. Setpont	NS	+.81
Frequency Drive Output	NS	60Hz
Vortex Damp. Position	NS	NA
Out. Air Damp. Position	NS	MINIMUM
Ret. Air Damp. Position	NS	100%
Relief Damp. Position	NS	NA

REMARKS: (1) See following fan sheet.

READINGS BY: KAH

Fulton Air Balance
Certification No. 2426

File Name: p1_iupui-cab/cts_A
Test Date: 5/18/05
10/3/2007

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. SF-CTC-A		FAN NO.		FAN NO.	
Location	AHU-CTC-1		AHU-CC-1			
Service	Supply Fan		Return fan			
Manufacturer	Comefri		Comefri			
Model Number	NS		NS			
Serial Number	2003/23		2003-23			
Type/Class	36" AF / 80G		36" AF / 80			
Motor Make/Style	A. O. Smith / ODP		A.O. SMITH / ODP			
Motor HP/RPM/Frame	40/1780/324T		20/1765/S256T			
Volts/Phase/Hertz	230/460/3-60		230/460/3-60			
F.L. Amps/S.F.	95/47.5/1.15		49/24.5/1.15			
Motor Sheave Make/Model	Browning		Browning			
Motor Sheave Diam./Bore	2B5V94 X B-2 1/8"		2B5V124 X B 2 7/16"			
Fan Sheave Make	Browning		Browning			
Fan Sheave Diam./Bore	2B5V154 X B 2 7/16"		2B5V 124 X B 2 7/16"			
No. Belts/Make/Size	2/Browning/ 5VX 1120		2/Browning/ 5V X 1150			
Sheave Center Distance	35 7/8"		42 3/4"			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	40,000	40,614	37,000	36,505		
Fan RPM	1749	1078	1435	785		
S.P. In/Out	NS	-2.28/+40	NS	-35/-.87		
Total S.P.	3.35	+2.68	0.75	+1.22		
Voltage	460	454	460	478		
Amperage	47.5	46.7	24.5	23.2		
Bhp	36.614	38.81	16.107	19.70		
Hz						

REMARKS:

READINGS BY: KAH

TEST DATE: 5/18/2005

FILE NAME: P2_IUPI_CAB/CTC_A

FULTON AIR BALANCE

Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI-CAB-CTC SYSTEM/UNIT AHU CTC 1

LOCATION/ZONE 5th Floor Mechanical SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.40 Air Temp	SCFM ___	SCFM _____
Size 72x32 Area 16	FPM NS CFM NS	FPM 1455 CFM 23,280

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1311	1084	1426	1427	1370	1249	1572	1601	1365	1613	1708
	2	1592	1554	1580	1348	1397	1368	1195	1493	1379	1223	1569
	3	1401	1385	1540	1368	1525	1403	1583	1299	1415	1315	1326
	4	1333	1313	1277	1436	1594	1574	1351	1517	1669	1568	1291
	5	1331	1350	1180	1284	1613	1476	1511	1650	1730	1557	1387
	6	1422	1138	1394	1240	1463	1394	1423	1752	1719	1562	1710
		12										
		1419										
		1461										
		1678										
		1572										
		1585										
		1869										
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 104,762/72=1455

READINGS BY KAH

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU CTC 1

LOCATION/ZONE 5TH Floor Mechanical

SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. .38 Air Temp	SCFM ___	SCFM _____
Size 68x34 Area 16.05	FPM NS CFM NS	FPM (1080) CFM 17,334

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	617	868	1056	854	563	338	479	0	1137	0	
	2	908	1044	1143	974	1046	710	542	544	746	0	
	3	1098	1048	1289	1560	1166	560	660	593	506	277	
	4	1370	1448	1640	1547	1184	1230	1024	572	592	510	
	5	1465	1607	1761	1706	1665	1413	1376	831	930	930	
	6	2048	2104	2006	1947	1862	1825	1639	1422	1476	1265	
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer. 64,775/60=1080

REMARKS:

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CTC 1

LOCATION/ZONE 5th Floor Mechanical

SERVICE Return

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. .32 Air Temp	SCFM ___	SCFM ____
Size 84x42 Area 24.5	FPM 1510 CFM 37,000	FPM 1490 CFM 36,505

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1128	1719	1719	1256	1454	1321	1378	1305	1488	1412	1426
	2	906	1270	1461	1299	1537	1447	1443	1243	1535	1347	1501
	3	1044	1604	1424	1373	1430	1411	1527	1344	1683	1530	1419
	4	884	1545	1533	1289	1369	1514	1271	1522	1510	1410	1546
	5	1221	1438	1429	1369	1442	1423	1445	1616	1477	1554	1545
	6	1051	1604	1561	1495	1597	1583	1640	1645	1392	1453	1482
	7											
	8	12	13	14								
	9	1601	1499	1418								
	10	1461	1578	1580								
	11	1525	1555	1601								
	12	1625	1649	1670								
	13	1612	1597	1545								
	14	1489	1528	1443								
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

125,160/84=1490

REMARKS:

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM AHU-CTC-1 Supply

OUTLET MANUFACTURER: NA

TEST APPARATUS RVA

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
Chase - 3											
199D	1	X	18 X 38	3.99	(823)	3285	(1608)	6419	(601)	2398	73%
299F	2	X	18 X 42	4.41	(956)	4210	(1633)	7204	(792)	3494	83%
399F	3	X	18 X 54	5.67	(827)	4690	(971)	5503	(825)	4676	100%
499H	4	X	18 X 58	6.09	(718)	4375	(620)	3773	(625)	3806	87%
						16,560		22899		14,374	87%
Chase - 4											
203	5	X	18 X 54	5.67	(817)	4635	(1201)	6805	(605)	3430	74%
399	6	X	18 X 62	6.51	(808)	5260	(851)	5542	(655)	4761	91%
402	7	X	18 X 60	6.3	(713)	4495	(706)	4450	(599)	3776	84%
						14,390		16797		11,467	80%

REMARKS:

READINGS BY: KAH

File Name: p6_iupui_cab-ctc_A

Test Date: 10/21/04

Fulton Air Balance

Certification 2426

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM AHU-CTC-1 / Return

OUTLET MANUFACTURER: NA

TEST APPARATUS RVA

AREA SERVED	OUTLET				DESIGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
O 11	1	P	12X12	.80		345	(192)	(450)		360	104%
199 D	2	P	34X54	10.20		5140	(155)	(521)		5314	103%
Above Ceiling 199D	3	X	12X40	3.33		1340	(326)	(401)		1335	100%
299F	4	P	26X54	7.80		2870	(463)	(372)		2902	101%
Above Ceiling 299F	5	X	10X26	1.81		720	(710)	(420)		760	106%
399 E	6	P	28X58	9.02		3250	(401)	(379)		3419	105%
Above Ceiling 399 E	7	X	10X26	1.81		720	(669)	(393)		711	99%
Above Ceiling 399 E	8	X	10X26	1.81		720	(722)	(408)		738	103%
499F	9	P	40X58	12.89		7430	(842)	(602)		7750	104%
Above Ceiling 499 F	10	X	10X26	1.81		720	(563)	(403)		729	101%
Above Ceiling 499 F	11	X	10X26	1.81		720	(1095)	(415)		751	104%
						23,975				24,779	103%

REMARKS:

READINGS BY: CJB

File Name: p7_iupui_cab-ctc_A

Test Date: 10/21/04

Fulton Air Balance

Certification 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTR

System AHU-CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXIMUM PRELIMINARY VEL	MAXIMUM PRELIMINARY AIRFLOW	MAXIMUM FINAL CFM	HEATING MINIMUM DESIGN	HEATING MINIMUM ACTUAL	
VAV-1-0-1												
019	1	F	10X10	1.0		390	(1)		(1)	200	200	
VAV-1-0-2												
099	1	A	5	1.0		60	35	50	60	30	30	
099U	2	A	5	1.0		65	35	50	65	32	30	
099V	3	A	5	1.0		65	45	55	70	33	35	
004	4	F	6X6	.16	(375)	60	(652)	50	65	30	30	
099	5	D	8	.16		150	150	200	155	75	80	
						400			415	200	205	
VAV-1-0-3												
013	1	D	10	1.0		365	340		365	220	220	
VAV-1-1-1												
109	1	D	10	1.0		355	100	145	360	202	210	(2)
109	2	D	10	1.0		355	170	140	355	203	205	
109	3	D	10	1.0		355	140	135	350	202	200	
109	4	D	10	1.0		355	200	140	355	203	205	
						1420	610	580	1420	810	820	
VAV-1-1-2												
199d	1	D	8	1.0		115	160		115	65	65	

REMARKS: (1) Box set by traverse. See following sheet.

(2 Unit needs to maintain discharge SP @ 1.125" for VAV's to operate).

READINGS BY: KAH

File Name: p23_iupui_cab-ctr_A

Test Date: 05/08/05

Fulton Air Balance

Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI_CAB-CTC

SYSTEM/UNIT AHU-CTC-1

LOCATION/ZONE Lower Level

SERVICE VAV-1-0-1

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.233 Air Temp 68.4°	SCFM ___	SCFM ___
Size 12X10 Area .833	FPM (468) CFM 390	FPM (479) CFM 399

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	457	532	479	459							
	2	519	494	524	569							
	3	462	501	502	462							
	4	444	492	474	394							
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 7665/16 = 479

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXIMUM PRELIMINARY VEL	MAXIMUM PRELIMINARY AIRFLOW	MAXIMUM FINAL CFM	HEATING MINIMUM DESIGN	HEATING MINIMUM ACTUAL	
VAV-1-1-3												
107	1	D	8	1.0		200	195		195	110	110	
VAV-1-1-4												
199U	1	B	8	1.0		70			70	70	70	
VAV-1-1-5												
105	1	D	8	1.0		90	0		85	55	55	
105	2	D	8	1.0		90	185		100	55	55	
						185			185	110	110	
VAV-1-1-6												
103	1	B	10	1.0		250	460	280	250	150	180	
103	2	B	10	1.0		250	0	220	250	150	130	
				1.0		500		500	500	300	310	*
VAV-1-1-7												
199V	1	B	8	1.0		70	20		70	70	70	
FPTU-1-1-8												
113	1	CC	7	1.0		130	380		135	NA	NA	(1)
113	2	CC	7	1.0		125	330		130	NA	NA	
						255			265			

REMARKS: (1) Fan on low speed.

* Box falls out of balance in minimum.

Changes in the flow dynamic within the duct system on a vav box, as it modulates from max to min, make it impossible to maintain precise proportions throughout the full range of the vav terminal. All proportioning is done at max flow.

READINGS BY: KAH, PA

File Name: p10_iupui_cab-ctc_A
Test Date: 2/18/05
12/28/06

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC System AHU-CTC-1

OUTLET MANUFACTURER: Titus TEST APPARATUS: Flowhood

AREA SERVED	OUT LET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXI MUM PRELI MINARY VEL	AIRFLOW	MAXIMUM FINAL CFM	HEATING MINI MUM DESIGN	ACTUAL	
FPTU 1-1-9												
115	1	CC	8	1.0		90	410		90	NA	NA	(2)
115	2	CC	8	1.0		90	325		95	NA	NA	
						180			185			
FPTU 1-1-10												
115	1	CC	8	1.0		90	390		95	NA	NA	(2)
115	2	CC	8	1.0		90	355		90	NA	NA	
						180			185			
FPTU 1-3-15												
115C	1	NA	13X7.75	.70	(869)	608	900	(908)	636	NA	NA	(1)
FPTU - 1-3-16												
115C	1	NA	13X7.75	.70	(869)	608	869	(911)	638	NA	NA	
FPTU 1-2-1												
115C	1	NA	13X7.75	.70	(800)	560		(821)	575	NA	NA	(1)
FPTU 1-2-2												
201C	1	CC	6	1.0		80	320	145	80	NA	NA	(2)
201A	2	CC	6	1.0		80	280	140	80	NA	NA	
201A	3	CC	6	1.0		80	250	135	75	NA	NA	
						240	850		235			

REMARKS: (1) These are first floor units located at column E.1-2
(2) Fan on low speed

READINGS BY: WLK

File Name: p11_iupui_cab-ctc_A
Test Date: 5/03/04
10/3/2007

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC System AHU-CTC-1

OUTLET MANUFACTURER: Titus TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM		
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
FPTU 1-2-3												
201E	1	CC	6	1.0		80	660		80			(1)
201D	2	CC	6	1.0		80	580		80			
						160			160			
FPTU 1-2 - 4												
201F	1	NA	2.375X7.75	.128	(1289)	165	(1305)		167			(1)
FPTU 1-2-5												
203	1	NA	13X7.75	.70	(843)	590	(836)		585			
FPTU - 1-2-6												
205	1	NA	13X7.75	.70	(843)	590	869		588			
FPTU 1-2-7												
200B	1	NA	13X7.75	.70	(857)	600	(871)		610			
FPTU 1-2-8												
205C	1	CC	8	1.0		105	275		110			
205B	2	CC	8	1.0		105	250		110			
205A	3	CC	8	1.0		105	280		110			
						315			330			
FPTU 1-2-9												
207	1	NA	13X7.75	.70	(650)	455	(986)	(659)	461			

REMARKS: (1) Fan on low speed

READINGS BY: KAH

File Name: p12_iupui_cab-ctc_A
Test Date: 4/28/04
10/3/07

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC System AHU-CTC-1

OUTLET MANUFACTURER: Titus TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU 1-2-10											
209	1	NA	13X7.75	.70	(671)	470	(1170)/820	(684)	478		
FPTU -1-2-11											
210	1	CC	8	1.0		100	320		100		
210	2	CC	8	1.0		100	340		105		
						200					
FPTU-1-3-1											
303	1	NA	13X7.75	.70	(1486)	1040	(1243)/870		870		*
FPTU-1-3-2											
305	1	NA				285	(1714)/1200		295		
FPTU-1-3-3											
307C	1	CC	6	1.0		140	270		140		
307B	2	CC	6	1.0		140	250		150		
307A	3	CC	6	1.0		150	240		155		
						430			445		
FPTU-1-3-4											
307D	1	CC	6	1.0		140	340		140		
307E	2	CC	6	1.0		140	340		140		
						280					

REMARKS: * Fan on high speed, full open

READINGS BY: KAH/TEW

File Name: p13_iupui_cab-ctc_A
Test Date: 04/28/04
10/3/07

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FTPU-1-3-5											
309	1	NA				165			163		
F[TU 1-3-6											
313	1	NA				310			320		
FPTU 1-3-7											
311	1	NA				280			297		
FPTU 1-3-8											
302	1	NA	13X7.75	.70	(600)	420	(578)		405		
FPTU 1-3-9											
115B	1	CC	6	1.0		120	165		120		
115C	2	CC	6	1.0		120	190		120		
115D	3	CC	6	1.0		120	180		120		
115E	4	CC	6	1.0		120	200		120		
						480	735		480		
FPTU 1-3-10											
317	1	CC	6	1.0		135	210		130		
317	2	CC	6	1.0		135	240		135		
						270			265		

REMARKS:

READINGS BY: KAH/TEW

File Name: p14_iupui_cab-ctc_A
Test Date: 04/27/04
10/3/07

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU - CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXIMUM PRELIMINARY VEL	AIRFLOW	MAXIMUM FINAL CFM	HEATING MINIMUM DESIGN	ACTUAL	
FPTU-1-3-11												
319	1	CC	6	1.0		120	200		120			
319	2	CC	6	1.0		120	220		120			
						240			240			
FPTU-1-3-12												
321	1	NA				240			235			
FPTU-1-3-13												
323	1	CC	6	1.0		115	360		115	NA		
323	2	CC	6	1.0		115	315		115	NA		
						230						
FPTU-1-3-14												
325	1	CC	6	1.0		120	280		120	NA		
325	2	CC	6	1.0		120	320		120	NA		
						240						
FPTU 1-3-15												
324	1	NA				560	(2)		NA			(1)
FPTU-1-3-16												
324	1	NA				560	(2)		NA			(1)
FPTU-1-3-16												
310	1	CC	6	1.0		150	370		150	NA		
310	2	CC	6	1.0		150	235		150	NA		
REMARKS:						300			300			

(1) Deleted from 3rd floor. Moved to 1st floor

READINGS BY:KAH/TEW

File Name: p15_iupui_cab-ctc_A
Test Date: 04/09/04
10/3/07

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC System AHU-CTC-1

OUTLET MANUFACTURER: Titus TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-1-3-18											
312	1	CC	6	1.0		150	285		155		
312	2	CC	6	1.0		150	315		155		
						300			310		
FPTU-1-4-1											
405	1	CC	6	1.0		120	330		125		
405	2	CC	6	1.0		115	260		115		
						235			240		
FPTU-1-4-2											
407	1	NA	13X7 3/4	.70	1400	980		(1366)	956		
FPTU-1-4-3											
403	1	NA	13X7 3/4	.70	(1129)	790	952	(1122)	785		
FPTU-1-4-4											
499	1	CC	6	1.0		100	190		105		
499	2	CC	6	1.0		100	260		100		
499	3	CC	6	1.0		100	210		105		
						300	660		310		
FPTU 1-4-5											
409A	1	NA				165	878		167		

REMARKS:

READINGS BY: WLK/TEW

File Name: p16_iupui_cab/ctc_A
Test Date: 5/5/04
10/3/07

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM		
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
FPTU-1-4-6												
409C	1	NA	12.875X7.75	.693	(462)	260	(1154)800	(570)	395			(1)
FPTU-1-4-7												
409C	1	NA				340	(1141)791		335			
FPTU-1-4-8												
413	1	CC	6	1.0		100	290		105			
413	2	CC	6	1.0		130	390		130			
						230	680		235			
FPTU-1-4-9												
415	1	CC	6	1.0		130	335		135			
415	2	CC	6	1.0		115	340		115			
						245			250			
FPTU-1-4-10												
417	1	CC	6	1.0		130	355		130			
417	2	CC	6	1.0		115	340		120			
						245			250			
FPTU-1-4-11												
419	1	NA	12.875X7.75	693	(346)	240	(1205)835	(639)	443			(1)
FPTU-1-4-12												
421	1	CC	6	1.0		130	365		135			
421	2	CC	6	1.0		130	270		135			
						260			270			

REMARKS: (1) FAN ON LOW SPEED.

READINGS BY: WLK/TEW

File Name: p17_iupui_cab-ctc_A
Test Date: 4/08/04
10/3/07

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-1-4-13											
423	1	CC	6	1.0		130	320		135		
423	2	CC	6	1.0		130	295		135		
						260			270		
FPTU 1-4-14											
425	1	CC	6	1.0		80	290		80		
425	2	CC	6	1.0		120	330		125		
						200			205		
FPTU-1-4-15											
414K	1	CC	6	1.0		150	325		150		
414K	2	CC	6	1.0		150	300		150		
						300			300		
FPTU-1-4-16											
414I	1	CC	6	1.0		150	290		155		
414I	2	CC	6	1.0		100	290		100		
						250			255		
FPTU-1-4-17											
414H	1	CC	6	1.0		150	300		150		
414H	2	CC	6	1.0		100	315		105		
						250			255		

REMARKS:

READINGS BY: WLK

File Name: p18_iupui_cab-ctc_A
Test Date: 4/08/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-1-5-1											
525	1	D	12	1.0		440	435		445	300	300
VAV-1-5-2											
523	1	D	12	1.0		510	310		515	300	300
VAV-1-5-3											
521	1	D	10	1.0		330	260		315	160	160
VAV-1-5-4											
599H	1	D	6	1.0		125	130		130	69	70
599H	2	D	6	1.0'		150	140		140	82	85
527	3	D	6	1.00		180	165		165	99	100
						455	435		435	250	255
VAV-1-5-5											
519	1	D	6	1.0		190	165		190	100	105
VAV-1-5-6											
511	1	D	6	1.0		150	150		150	75	75
513	2	D	6	1.0		150	130		140	75	70
						300			290	150	145
AV-1-5-7											
515	1	D	10	1.0		350	310		335	210	205

REMARKS:

READINGS BY: KAH

File Name: P19_IUPUI_CAB-CTC_A

Test Date: 02/23/05

Fulton Air Balance

Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-1-5-8											
599	1	N	10	1.0		265	200	210	240	156	150
599	2	N	10	1.0		265	245	240	250	157	150
599	3	N	10	1.0		265	255	240	250	157	160
						795			740	470	460
VAV-1-5-9-											
543	1	D	8	1.0		245	180		245	130	130
VAV-1-5-10											
541	1	N	12	1.0		305	270		280	181	170
541	2	N	12	1.0		305	315		305	181	190
541	3	N	12	1.0		305	305		305	181	190
541	4	N	12	1.0		305	285		290	182	180
						1220	1175		1180	725	730
VAV-1-5-11											
529	1	D	8	1.0		200	185		195	120	120
VAV-1-5-12											
531	1	D	8	1.0		200	180		200	120	120
VAV-1-5-13											
533	1	N	10	1.0		200	100		185	105	100
533	2	N	10	1.0		200	100		185	105	105
						400			370	210	205

REMARKS:

READINGS BY: KAH

File Name: p20_iupui_cab-ctc_A
Test Date: 02/23/05

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CB/CTC System AHU-CTC-1

OUTLET MANUFACTURER: Titus TEST APPARATUS: Flowhood

AREA SERVED	OUTLET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXIMUM PRELIMINARY VEL	AIRFLOW	MAXIMUM FINAL CFM	HEATING MINIMUM DESIGN	ACTUAL	
VAV-1-5-14												
599P	1	D	8	1.0.		220	140		240	130	125	(1)
599P	2	D	8	1.0		220	200		200	130	125	
						440				260	250	
VAV-1-5-15												
535	1	D	10	1.0		270	120		270	185	185	
VAV-1-5-16												
535A	1	D	12	1.0		410	410		410	240	240	
VAV-1-5-17												
539	1	D	12	1.0		495	445		495	310	315	
VAV-1-5-18												
Penthouse	1	F	36X18			1550			1578	870	875	(2)
VAV-1-5-19												
Penthouse	1	F	36X18			1500			1580	840	860	(2)

REMARKS: 2/21/05 Dis. Sp Delta SPT .80 ACT @ .273

(1) System AHU-CTC-1 could not produce enough static to provide design max air flow. Damper was installed and box balanced with available air at 125 each.

(2) Boxes set by traverse. See following sheets.

READINGS BY: KAH/PA

File Name: p21_iupui_cab-ctc_A
Test Date: 6/28/04
12/28/06

Fulton Air Balance
Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI_CAB-CTC SYSTEM/UNIT AHU-CTC-1

LOCATION/ZONE Mechanical Room SERVICE VAV-1-5-18

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.14 Air Temp	SCFM ___	SCFM _____
Size 16x15 Area 1.66	FPM (934) CFM 1,550	FPM (951) CFM 1,578

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1794	1522	1822	1702							
	2	1324	1079	1770	1556							
	3	497	846	918	0							
	4	0	0	391	0							
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 15216/16=951

READINGS BY KAH
Fulton Air Balance
Certification No. 2426

File Name: P22_IUPUI_CAB-CTC_A
Test Date: 5/18/05

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI_CAB-CTC SYSTEM/UNIT AHU-CTC-1

LOCATION/ZONE Mechanical Room SERVICE VAV-1-5-19

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.144 Air Temp	SCFM ___	SCFM _____
Size 16x15 Area 1.66	FPM (934) CFM 1,500	FPM (952) CFM 1,580

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	491	638	1024	1203							
	2	1459	1077	1200	1402							
	3	442	394	1282	1188							
	4	653	752	1097	924							
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 15227/16=952

File Name: P23_IUPUI_CAB-CTC_A
Test Date: 03/01/05

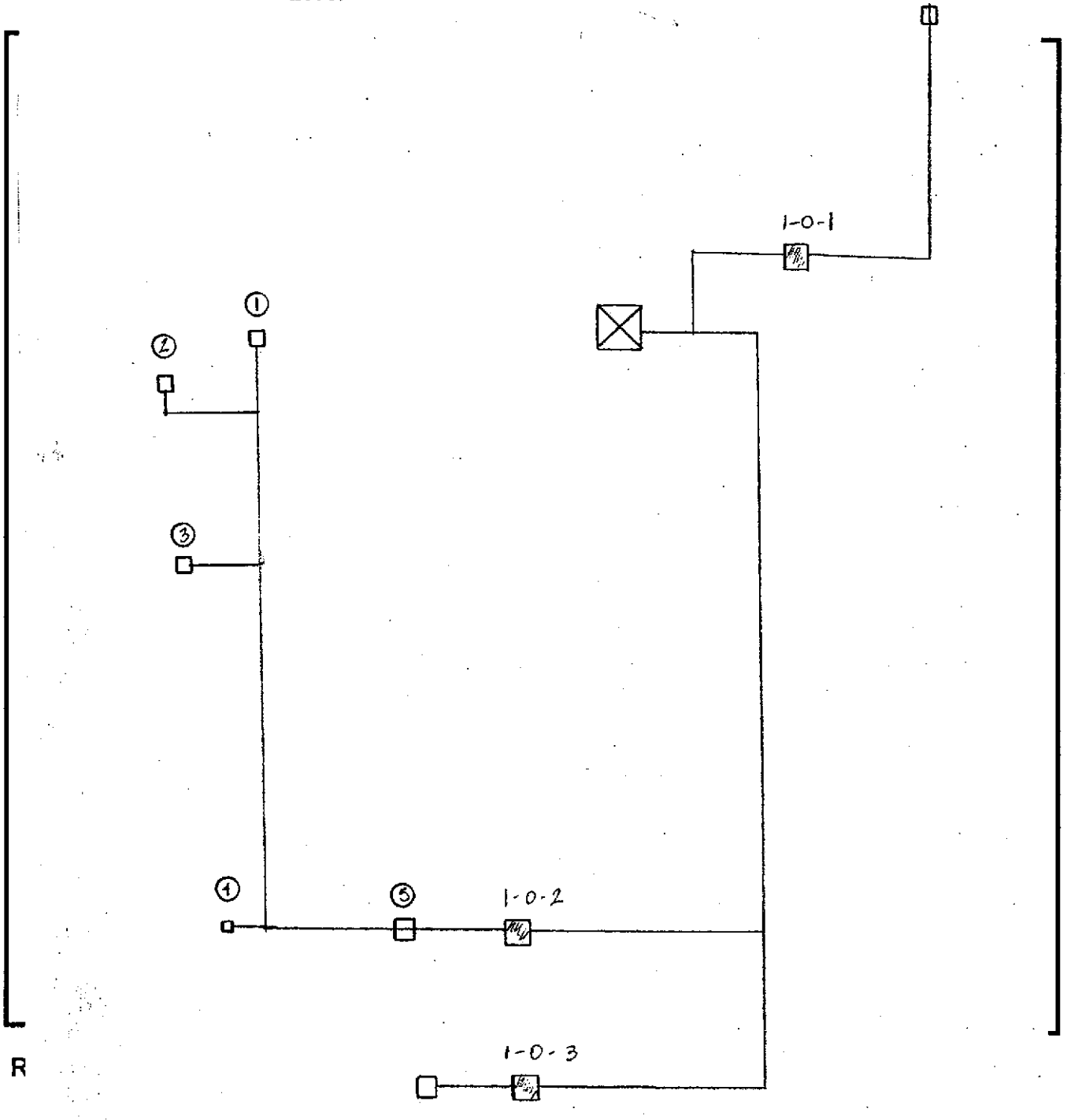
READINGS BY KAH
Fulton Air Balance
Certification No. 2426

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CTC-1

LOCATION Lower Level



R

Fulton Air Balance
Certification No. 2426

FILE NAME: p38_iupui_cab-ctc

TEST DATE:

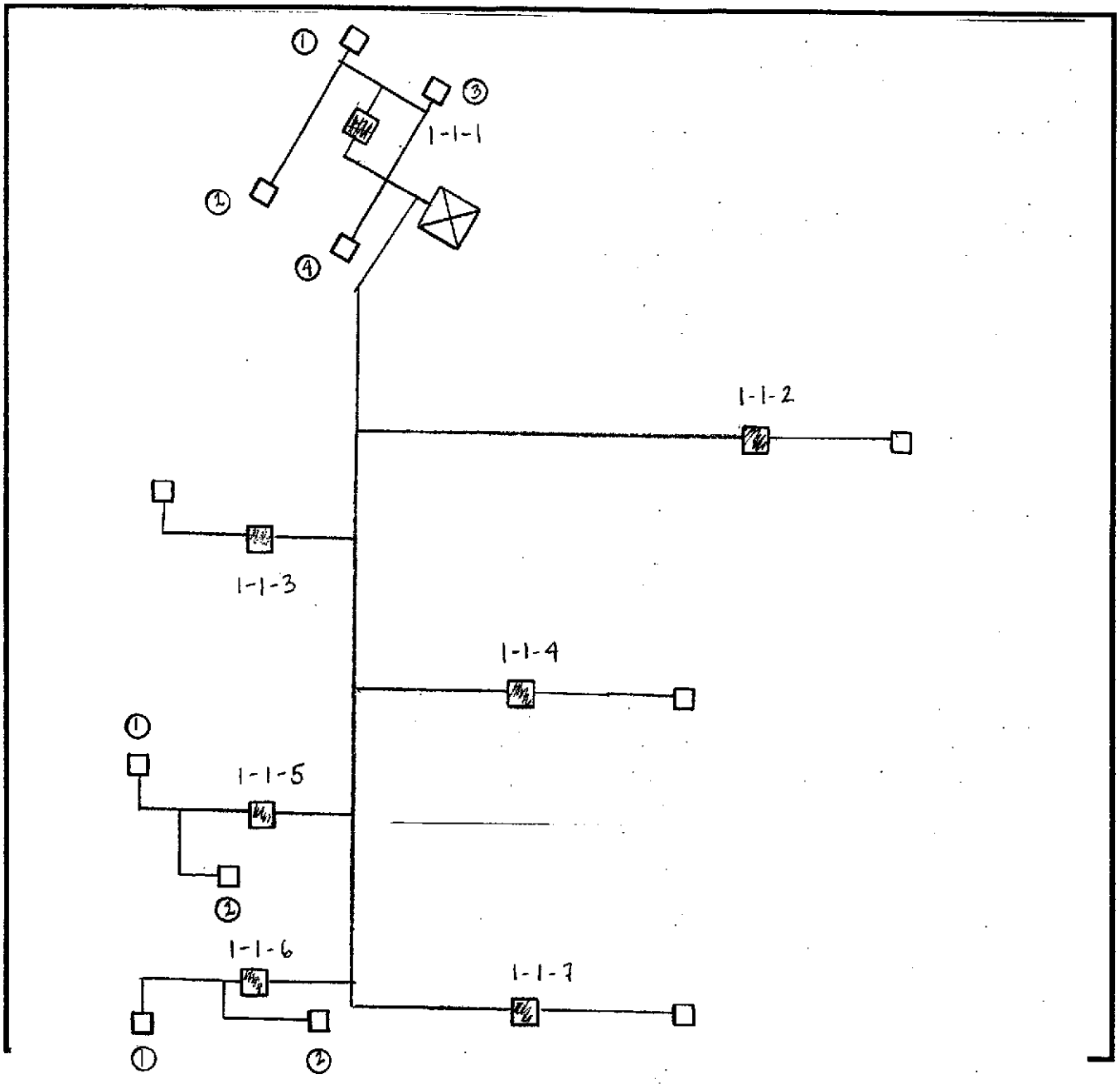
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CTC-1

LOCATION First Floor



Fulton Air Balance
Certification No. 2426

FILE NAME: p39_iupui_cab-ctc

TEST DATE:

READINGS BY:

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB-CTC

SYSTEM/UNIT AHU-CTC-2

LOCATION 5TH FLOOR MECH ROOM

UNIT DATA	
Make/Model No.	TRANE/MCC-80
Type/Size	AHU/80 TON
Serial Number	NS
Arrangement/Class	DWDI/II
Discharge	MULTI
Make Sheave	*1
Sheave Diam/Bore	*1
N. Belts/make/size	*1
No. Filters/type/size	*2

MOTOR DATA	
Make/Frame	*1
H.P./RPM	*1
Volts/Phase/Hertz	*1
F.L. Amps/S.F.	*1
Make Sheave	*1
Sheave Diam/Bore	*1
Sheave Center Distance	*1
Sheave Oper. Diam.	FIXED

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	40000	37,859
Total S.P.	3.5	3.92
Fan RPM	1749	889
External S.P.	1.0	1.83
Motor Volts	460	489/488/489
Motor Amps	47.0	47.0/46.1/46.1
Corrected F.L.Amps	---	44.2
B.H.P.		41.98
Outside Air	3000	9582
Return Air	3700	28277
Relief Air	NS	0

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	1.68
Suction S.P.	NS	-2.24
Reheat Coil Delta S.P.	.10	.07
Cooling Coil Delta S.P.	.79	.53
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	1.25	.61
Duct S.P. Setpoint	.8	.6
Frequency Drive Output	NS	47.1
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	MIN ONLY	MIN ONLY
Ret. Air Damp. Position	0%	0%
Relief Damp. Position	10%	10%

REMARKS:

*1 SEE FAN SHEET

*1 FILTERS

PRE	FINAL
6/DISPO/24X24X4	6/VERICEL/24X24X12
12/DISPO/24X20X4	12/VERICEL/24X20X12
6/DISPO/20X20X4	6/VERICEL/20X20X12

*3 READINGS TAKEN IN MINIMUM O.A.

File Name: CAB-CTC_P1

TEST DATE: 3/22/2007 READINGS BY: P. ASHER

Fulton Air Balance
Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI/CAB-CTC

FAN DATA	FAN NO. SF-CTC-2		FAN NO. RF-CTC-2		FAN NO.	
Location	AHU CTC-2		AHU CTC-2			
Service	SUPPLY		RETURN/RELIEF			
Manufacturer	COMFRI		COMFRI			
Model Number	NS		NS			
Serial Number	2003/23		2003/23			
Type/Class	FAN ATZAF-40-40TISP		FAN ATZAF-36-6TISP			
Motor Make/Style	U.S. MOTORS/NS		MARATHON/NS			
Motor HP/RPM/Frame	40/1779/324T		20/1775/256T			
Volts/Phase/Hertz	230-460/3/60		208-230-460/3/60			
F.L. Amps/S.F.	94-47/1.15		55-55.1-25.5/1.15			
Motor Sheave Make/Model	BROWNING 3B5V54		BROWNING 2B5V56			
Motor Sheave Diam./Bore	5.4X2 1/8		5.6XB1 5/8			
Fan Sheave Make	BROWNING/3B5V86		BROWNING 2B5V124			
Fan Sheave Diam./Bore	8.6XB2 3/16		12.4XB2 7/16			
No. Belts/Make/Size	3/GATES/5VX1060		2/GATES/5VX1150			
Sheave Center Distance	41.5		43.0			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	40000	37859	37000	28277		
Fan RPM	1749	889	1435	541		
S.P. In/Out	NS	-2.24/+1.68	NS	-.34/-.97		
Total S.P.	3.5	3.92	.90	.63		
Voltage	460	488/489/488	460	491/491/494		
Amperage	47.0	47.0/46.1/46.1	25.5	11.1/11.4/11.5		
Bhp	37.2	41.98	16.8	9.68		
Frequency Drive Output	NS	47	NS	40		

REMARKS: READINGS TAKEN AT MINIMUM O.A.

TEST DATE: 3/21/2007 READINGS BY: P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/NORTH RISER SERVICE SUPPLY-1

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.51 Air Temp	SCFM ___	SCFM _____
Size 80X30 Area 16.7	FPM NS CFM NS	FPM 1506 CFM 25,150

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1745	1767	1829	1887	1772	1741	1521	1629	1664	1664	1592
	2	1602	1756	1766	1816	1735	1700	1415	1634	1658	1600	1527
	3	1606	1710	1686	1761	1654	1654	1491	1603	1517	1507	1485
	4	1283	1497	1593	1435	1357	1497	1485	1217	1364	1513	1468
	5	1105	1153	1130	1194	975	1143	1252	1099	1101	1288	1310
	6											
	7	1554	1523									
	8	1537	1516									
	9	1480	1525									
	10	1472	1468									
	11	1356	1306									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: MIN O.A.

File Name: CAB-CTC_P3

TEST DATE 3/20/2007 READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC

SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/SOUTH RISER

SERVICE SUPPLY-2

ALTITUDE Standard

DENSITY Standard

CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. 1.46 Air Temp	SCFM ___	SCFM ____
Size 80X30 Area 16.7	FPM NS CFM NS	FPM 761 CFM 12,709

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	975	896	947	918	786	880	899	920	1017	912	1024
	2	843	952	890	781	781	819	868	848	884	935	911
	3	948	872	863	739	769	791	733	784	656	819	822
	4	754	600	636	605	597	576	583	678	504	712	486
	5	618	471	554	820	518	582	497	529	526	494	470
	6											
	7	1031	1028									
	8	989	932									
	9	786	812									
	10	620	814									
	11	607	580									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: MIN O.A.

File Name: CAB-CTC_P4

TEST DATE 3/20/2007 READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/SOUTH RISER SERVICE RETURN/RELIEF-1

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. -.07 Air Temp	SCFM ___	SCFM ___
Size 80X28 Area 15.6	FPM NS CFM NS	FPM 892 CFM 13,915

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	953	880	888	875	607	834	644	654	672	736	779
	2	1022	1026	1037	860	799	939	715	849	898	858	900
	3	991	1071	1067	1012	982	953	849	906	914	914	931
	4	996	1091	1054	1017	877	937	901	851	740	814	942
	5	995	985	986	916	791	909	820	671	711	773	915
	6											
	7	832	873									
	8	1019	1019									
	9	1023	897									
	10	928	925									
	11	910	832									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: MIN O.A.

File Name: CAB-CTC_P5

TEST DATE 3/20/2007 READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/NORTH RISER SERVICE RETURN/RELIEF-2

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. -.20 Air Temp	SCFM ___	SCFM _____
Size 80X30 Area 16.7	FPM NS CFM NS	FPM 860 CFM 14,362

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1221	1185	1178	1091	997	1091	1226	1215	1069	677	372
	2	1186	1116	1125	1097	1055	1113	1275	1245	920	558	0
	3	1242	1196	1136	1100	1109	1107	1218	1179	1002	723	225
	4	1160	1171	1134	1101	1089	1128	1180	1117	1072	786	425
	5	1203	1140	1078	1100	1046	1099	1110	1093	994	876	406
	6											
	7	162	0									
	8	0	0									
	9	0	0									
	10	0	0									
	11	0	0									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: MIN O.A.

File Name: CAB-CTC_P6

TEST DATE 3/20/2007 READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/NORTH RISER SERVICE SUPPLY 1

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.55 Air Temp	SCFM ___	SCFM _____
Size 80X30 Area 16.7	FPM NS CFM NS	FPM 1609 CFM 26,870

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1832	1908	1934	1997	1864	1849	1550	1665	1752	1735	1713
	2	1840	1848	1900	1868	1853	1812	1693	1747	1700	1730	1643
	3	1673	1810	1843	1856	1739	1733	1563	1747	1654	1639	1599
	4	1666	1471	1652	1567	1513	1540	1274	1572	1389	1553	1577
	5	1245	1220	1324	1281	1182	1275	1259	1224	1247	1313	1444
	6											
	7	1640	1590									
	8	1636	1556									
	9	1591	1602									
	10	1568	1532									
	11	1356	1426									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 100% O.A. VFD AT 47 HZ AND 47 AMPS.

File Name: CAB-CTC_P8

TEST DATE 3/20/2007 READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC

SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/SOUTH RISER

SERVICE SUPPLY 2

ALTITUDE Standard

DENSITY Standard

CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +1.67 Air Temp	SCFM ___	SCFM _____
Size 80X30 Area 16.7	FPM NS CFM NS	FPM 787 CFM 13,143

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	978	994	951	885	878	854	866	902	877	1013	1053
	2	900	945	897	812	807	814	888	895	856	902	1021
	3	798	870	897	807	766	813	738	822	800	805	869
	4	834	584	636	719	684	674	676	701	658	682	752
	5	611	547	631	577	570	558	537	646	573	563	591
	6											
	7	1078	968									
	8	953	1036									
	9	937	878									
	10	630	620									
	11	413	638									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 100% O.A. VFD AT 47 HZ AND 47 AMPS.

File Name: CAB-CTC_P9

TEST DATE 3/20/2007

READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/SOUTH RISER SERVICE RETURN/RELIEF

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT		REQUIRED				ACTUAL			
S.P.	Air Temp	SCFM ___				SCFM _____			
Size 80X28	Area 15.6	FPM	NS	CFM	NS	FPM	728	CFM	11,357

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	801	783	781	570	673	623	533	638	669	712	709
	2	806	876	763	490	713	637	687	735	699	683	800
	3	799	872	885	796	810	712	767	711	741	785	802
	4	862	860	894	767	840	770	655	586	608	814	806
	5	870	796	817	619	665	649	572	547	626	677	716
	6											
	7	729	801									
	8	757	806									
	9	679	799									
	10	662	862									
	11	620	870									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 100% RELIEF. VFD AT 40 HZ.

File Name: CAB-CTC_P10

TEST DATE 3/20/2007 READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/SOUTH RISER SERVICE RETURN/RELIEF

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. -.16 Air Temp	SCFM ___	SCFM _____
Size 80X30 Area 16.7	FPM NS CFM NS	FPM 699 CFM 11,673

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	980	950	919	927	935	889	951	1017	883	597	284
	2	992	997	909	850	876	841	987	1024	797	445	0
	3	944	946	906	905	887	923	994	970	805	482	145
	4	964	940	874	819	873	869	940	898	833	534	267
	5	953	950	941	862	862	854	901	925	923	724	577
	6											
	7	0	0									
	8	0	0									
	9	0	0									
	10	0	0									
	11	216	0									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 100% RELIEF. VFD AT 40 HZ.

File Name: CAB-CTC_P11

TEST DATE 3/20/2007 READINGS BY P. ASHER

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC

SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM

SERVICE RETURN/RELIEF

ALTITUDE Standard

DENSITY Standard

CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. -.26 Air Temp	SCFM ___	SCFM ____
Size 80X28 Area 15.6	FPM NS CFM NS	FPM 1059 CFM 16,520

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1067	1043	1009	835	861	1015	817	824	1029	952	1018
	2	1237	1229	1085	962	1040	1139	916	945	928	1036	1075
	3	1169	1288	1292	1230	1116	1152	1016	1065	993	1071	1136
	4	1260	1345	1265	1195	1042	1223	1024	895	947	972	1056
	5	1212	1117	1232	1080	1007	1214	945	890	771	859	986
	6											
	7	1005	1035									
	8	1166	1083									
	9	1146	1159									
	10	1109	1080									
	11	960	962									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 100% RELIEF. VFD AT 60 HZ AND 19.8 AMPS.

File Name: CAB-CTC_P12

TEST DATE 3/21/2007

READINGS BY P. ASHER

Fulton Air Balance
Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB-CTC SYSTEM/UNIT AHU-CTC-2

LOCATION/ZONE 5TH FL MECH RM/NORTH RISER SERVICE RETURN/RELIEF

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. -.40 Air Temp	SCFM ___	SCFM _____
Size 80X30 Area 16.7	FPM NS CFM NS	FPM 1025 CFM 17,118

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1445	1431	1434	1363	1341	1243	1474	1516	1373	723	389
	2	1405	1393	1384	1284	1286	1333	1533	1415	1199	503	250
	3	1407	1400	1377	1278	1215	1321	1422	1404	1305	970	415
	4	1411	1360	1330	1199	1287	1285	1392	1399	1284	738	447
	5	1376	1275	1346	1246	1261	1256	1290	1388	1302	1178	55
	6											
	7	0	0									
	8	0	0									
	9	0	0									
	10	278	0									
	11	0	0									
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 100% RELIEF. VFD AT 60 HZ AND 19.8 AMPS.

File Name: CAB-CTC_P13

TEST DATE 3/21/2007 READINGS BY P. ASHER

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM AHU-CTC-2

OUTLET MANUFACTURER: NA

TEST APPARATUS RVA

AREA SERVED	OUTLET				DESIGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
SP Damper #-- Chase 1											
1-5 1st floor	1	X	18X42	5.96	(623)	3713	(1187)		(472)	2813	75%
1-4 1st floor	2	X	18X42	5.96	(623)	3713	(1094)		(461)	2748	74%
2-5 2nd floor	3	X	18X44	4.04	(1345)	5435	(1087)		(963)	3891	72%
3-10 3rd floor	4	X	18X66	5.97	(1421)	8482	(1317)		(1137)	6788	80%
4-17 4th floor	5	X	18X32	3.85	(981)	3775	(1016)		(712)	2225	73%
						25118					
Chase 2											
L-1 Lower Level	6	X	18X48	4.43	(1151)	5100	(792)		(921)	4080	80%
1-3 1st floor	7	X	18X32	2.89	(850)	2455	(803)		(687)	1985	81%
2-6 2nd floor	8	X	18X62	5.78	(1049)	6065	(860)		(839)	4849	80%
3-11 3rd floor	9	X	18X72	6.74	(1198)	8071	(724)		(994)	6700	83%
4-16 4th floor	10	X	18X58	5.39	(851)	4586	(664)		(723)	3897	85%
						26277					
					Total	51395				39976	

REMARKS:

READINGS BY: KAH

File Name: p7_iupui_cab-ctc_B

Test Date: 05/18/05

Fulton Air Balance

Certification 2426

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC SYSTEM AHU-CTC-2 (RETURN)

OUTLET MANUFACTURER: NA TEST APPARATUS

AREA SERVED	OUTLET				DESIGN		PRELIMINARY			FINAL	% of DESIGN	
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW		
129A	1	P	26X50	7.25	437	3170	45	326	(280)	2030	64%	
131	2	P	26X50	7.25	437	3170	0	0	(275)	1994	63%	
Above Ceil 129A	3	X	12X52	4.33	404	1750	87	377	(245)	1061	61%	
Above Ceil 131	4	X	12X52	4.33	404	1750	87	377	(251)	1087	62%	
299B	5	P	22X52	6.35	383	2435	284	1803	(258)	1638	67%	
Above Ceil 218	6	X	10X54	3.75	400	1500	296	1110	(241)	904	60%	
Above Ceil 299B	7	X	10X54	X (1)		1500	0	0	0	0	0%	(1)
399D	8	P	20X54	5.98	408	2440	373	2231	(260)	1555	64%	
399D	9	P	20X54	5.98	408	2440	335	2003	(262)	1568	64%	
Above Ceil 399D	10	X	10X30	2.08	433	900	633	1317	(295)	614	68%	
Above Ceil 399D	11	X	10X30	2.08	433	900	633	1317	(300)	624	69%	
Above Ceil 399D	12	X	10X30	2.08	433	900	560	1165	(291)	605	67%	
Above Ceil 399D	13	X	10X30	2.08	433	900	560	1165	(294)	612	68%	
Above Ceil 440N	14	X	10X34	2.36	400	945	725	1711	(248)	585	62%	
Above Ceil 440N	15	X	10X34	2.36	400	945	725	1711	(242)	571	60%	
Above Ceil 440P	16	X	10X34	2.36	400	945	222	524	(242)	571	60%	
Above Ceil 440P	17	X	10X34	2.36	400	945	222	524	(249)	588	62%	
Above Ceil 015	18	X	20X84	11.67	464	5420	9	105	(279)	3256	60%	
	19	Deleted	Deleted	Deleted	Deleted	Deleted	Deleted	Deleted	Deleted	Deleted	Deleted	
123	20	PORX?	16X24	2.67	388	1035	223	595	(265)	708	68%	
123	21	P	16X32	2.78	511	1420	194	539	(271)	753	53%	
Above Ceil 123	22	X	10X48	3.33	390	1300	184	613	(242)	806	62%	
299B	23	P	24X64	8.58	497	4265	239	2051	(313)	2686	63%	
Above Ceil 299B	24	X	10X34	2.36	381	900	274	647	(230)	543	60%	
Above Ceil 299B	25	X	10X34	2.36	381	900	274	647	(236)	557	62%	
399D	26	P	30X72	12.16	499	6071	293	3563	(334)	4122	68%	
Above Ceil 399D	27	X	10X36	2.5	400	1000	472	1180	(260)	650	65%	
Above Ceil 399D	28	X	10X36	2.5	400	1000	472	1180	(271)	678	68%	

REMARKS: (1) Sealed off - Drywall ceiling - no access

Outlet Number 1-17 are Chase Number 1

Outlet Number 18-28 are Chase Number 2

READINGS BY: WLK

File Name: p8_iupui_cab-ctc_B

Test Date: 6/25/04

Fulton Air Balance

Certification 2426

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM AHU-CTC-2 (Return)

OUTLET MANUFACTURER: NA

TEST APPARATUS

AREA SERVED	OUTLET				DESIGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
Chase 2											
499H	29	P	18X52	5.16	501	2585	784	4045	(308)	1589	
Above Ceil 499H	30	X	10X36	2.5	400	1000	719	1798	(265)	663	
Above Ceil 499H	31	X	10X36	2.5	400	1000	719	4798	(251)	628	
						55431					

REMARKS:

Outlet Number 29-31 are Chase Number 2

READINGS BY: WLK

File Name: p9_iupui_cab-ctc_B

Test Date: 6/25/04

Fulton Air Balance

Certification 2426

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS Flowhood

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
FPTU-2-0-4											
038	1	CC	8"Ø	1.0		148	210			155	105%
038	2	CC	8"Ø	1.0		148	280			160	108%
038	3	CC	8"Ø	1.0		148	240			150	101%
						444	730			465	105%
FPTU-2-0-3											
038	1	CC	8"Ø	1.0		148	300			155	105%
038	2	CC	8"Ø	1.0		148	320			155	105%
						296	620			310	105%

REMARKS:

READINGS BY: WLK

File Name: p10_iupui_cab-ctc_B

Test Date: 10/18/04

Fulton Air Balance

Certification 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-2-0-5											
038	1	NA				700			*		
FPTU-2-1-1											
115C	1	CC	6	1.0		80	320		80			(1)
115C	2	CC	6	1.0		80	325		80		
						160			160		
FPTU 2-1-2											
115C	1	CC	6	1.0		80	370		80		
115C	2	CC	6	1.0		80	280		80		
						160			160		
FPTU-2-1-3											
129C	1	CC	6	1.0		80	310		85		
129C	2	CC	6	1.0		80	380		80		
						160			165		
FPTU-2-1-4											
131A	1	CC	8	1.0		120	115	125	125		
131A	2	CC	8	1.0		115	100		120		
						235			245		

REMARKS:

(1) Fan on low speed

* Box deleted. Turned over to owner

READINGS BY: WLK

File Name: p11_iupui_cab-ctc_B
Test Date: 5/5/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM		
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
FPTU-2-1-5												
131B	1	CC	8	1.0		115	400		125			(1)
131B	2	CC	8	1.0		115	370		115			
						230	770		240			
FPTU-2-1-6												
131C	1	CC	8	1.0		120	550		120			(1)
131C	2	CC	8	1.0		115	190		115			
						235			235			
FPTU-2-1-7												
131D	1	NA	13X7 3/4	.70	(471)	330	816	(533)	373			(1)
FPTU-2-1-8												
131	1	CC	8	1.0		125	445		130			(1)
131	2	CC	8	1.0		125	340		130			
						250			260			
FPTU-2-1-9												
131	1	CC	8	1.0		150	375		150			(1)
131	2	CC	8	1.0		150	410		150			
						300			300			
FPTU-2-1-10												
131	1	CC	8	1.0		150	310		150			(1)
131	2	CC	8	1.0		150	420		150			
REMARKS:						300			305			

(1) Fan on low speed

READINGS BY: WLK

File Name: p12_iupui_cab-ctc_B
Test Date: 5/3/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: NA

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-2-1-11											
199A	1	NA	13 X 7 3/4	.70	785	550	904	(782)	547		
FPTU-2-1-12											
199A	1	NA	13 X 7 3/4	.70	785	550	934	(812)	568		
FPTU 2-1-13											
199A	1	NA	18X10	1.25	440	550	935	(446)	558		
FPTU-2-1-14											
199A	1	NA	18X10	1.25	440	550	930	(450)	563		
FPTU-2-1-15											
199A	1	NA	18X10	1.25	440	550	968	(452)	565		
FPTU 2-1-16											
199A	1	NA	18X10	1.25	440	550	980	(452)	565		
FPTU 2-1-17											
199A	1	NA	18X10	1.25	440	550	970	(460)	575		
FPTU 2-1-18											
199A	1	NA	18X10	1.25	440	550	850	(456)	570		
FPTU-2-1-19											
199A	1	NA	18X10	1.25	440	550	913	(458)	573		

READINGS BY: WLK

File Name: p13_iupui_cab-ctc_B
Test Date: 5/6/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus/NA

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-2-1-20											
199A	1	NA	18X10	1.25	(440)	550	961	(450)	563		
FPTU-2-1-21											
121	1	NA	13X7 3/4	.70	(671)	470	896	(703)	492		
FPTU-2-1-22											
121	1	NA	13X7 3/4	.70	(671)	470	893	(698)	489		
FPTU-2-1-23											
121	1	NA	13X7 3/4	.70	(671)	470	899	(686)	480		
FTPU-2-1-24											
125	1	NA	13X7 3/4	.70	(786)	550	991	(781)	547		
FTPU-2-1-25											
125	1	NA	13X7 3/4	.70	(786)	550	976	(772)	540		
FTPU-2-1-26											
127	1	NA	13X7 3/4	.70	(771)	540	923	(756)	529		
FPTU-2-1-27	1	NA	13X7 3/4	.70	(771)	540	890	(775)	543		
FTPU-2-1-28											
127	1	NA	13X7 3/4	.70	(771)	540	893	(780)	546		

READINGS BY: WLK

File Name: p14_iupui_cab-ctc_B
Test Date: 5/4/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus/NA

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXI MUM PRELI MINARY VEL	AIRFLOW	MAXIMUM FINAL CFM	HEATING MINI MUM DESIGN	ACTUAL	
FPTU-2-2-1												
212	1	CC	8	1.0		100	380		100			(1)
212	2	CC	8	1.0		100	360		100			
						200			200			
FPTU-2-2-2												
213	1	NA	13X7.75	.70		470	(1030)/728		(635)/445			
FPTU -2-2-3												
	1	CC	6	1.0		90	340		90			(1)
	2	CC	6	1.0		90	340		90			
						180			180			
FPTU-2-2-4												
217	1	CC	6	1.0		90	345		90			(1)
217	2	CC	6	1.0		90	330		90			
						180			180			
FPTU-2-2-5												
	1	NA	13X7.75	.70	(533)	410	(1128)/788		(692)/484			(1)
FPTU-2-2-6												
	1	NA	13X7.75	.70	(671)	470	(1124)/787	(684)	(689)/478			
FPTU-2-2-2												
	1	NA	13X7.75	.70	(557)	390	(963)/674	(548)	383			

REMARKS: (1) Fan on low speed

READINGS BY: KAH

File Name: p15_iupui_cab-ctc_B
Test Date: 4/13/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS: fLOWHOOD

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-2-2-8											
	1	NA	13X7.75	.70	(557)	390	(1140)/798	580	406		
FPTU-2-2-9											
	1	NA	13X7.75	.70	(786)	550	(1141)/799	805	564		
FPTU-2-2-10											
	1	CC	8	1.0		135	295		140		
	2	CC	8	1.0		135	240		135		
	3	CC	8	1.0		135	240		135		
						405			410		
FPTU-2-2-11											
	1	CC	6	1.0		60	200		60		
	2	CC	6	1.0		60	155		60		
	3	CC	6	1.0		60	150		60		
	4	CC	6	1.0		60	190		60		
						240			240		
FPTU-2-2-12											
	1	CC	8	1.0		130	390		135		
	2	CC	8	1.0		130	340		135		
						260			270		

REMARKS: (1) Fan on low speed

READINGS BY: WLK

File Name: p16_iupui_cab-ctc_B
Test Date: 4/13/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhoood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-2-2-13											
210F	1	CC	6	1.0		115	240		120		
210F	2	CC	6	1.0		115	240		115		
210F	3	CC	6	1.0		115	250		115		
						345			350		
FPTU-2-2-14											
210F	1	CC	6	1.0		115	235		115		
210F	2	CC	6	1.0		115	290		115		
210F	3	CC	6	1.0		115	255		120		
						345			350		
FPTU-2-2-15											
210F	1	CC	6	1.0		115	255		115		
210F	2	CC	6	1.0		115	255		115		
210F	3	CC	6	1.0		115	230		115		
						345			345		
FPTU-2-2-16											
210F	1	CC	6	1.0		115	240		115		
210F	2	CC	6	1.0		115	225		115		
210F	3	CC	6	1.0		115	215		115		
						345			345		
FPTU-2-2-17											
	1	NA	13X7.75	.70	(686)	480	(835)/601	(695)	487		

REMARKS:

READINGS BY: WLK

File Name: p17_iupui_cab-ctc_B
Test Date: 4/13/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhoood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM		
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
FPTU-2-2-18												
	1	NA	13X7.75	.70	(493)	345	(1168)/818	(629)	440			(1)
FPTU-2-3-1												
324C	1	NA				210	904		206			
FPTU-2-3-2												
327	1	CC	6	1.0		120	290		120			
327	2	CC	6	1.0		120	350		125			
						240			245			
FPTU-2-3-3												
324B	1	NA				220	802		223			
FPTU-2-3-5												
331	1	CC	6	1.0		120	225		120			
331	2	CC	6	1.0		120	370		125			
						240			245			
FPTU-2-3-6												
333	1	CC	6	1.0		120	230		125			
333	2	CC	6	1.0		120	210		120			
						240	440		245			

REMARKS: (1) Fan on low speed

READINGS BY: KAH

File Name: p18_iupui_cab-ctc_B
Test Date: 4/12/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhoood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU-2-3-4											
324B	1	CC	6	1.0		100	325		100		
324B	2	CC	6	1.0		100	340		100		
						200			200		

REMARKS:

READINGS BY: KAH

File Name: p19_iupui_cab-ctc_B
Test Date: 4/16/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhoood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM		
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
FPTU-2-3-7												
335	1	CC	6	1.0		120	60		125			(1)
335	2	CC	6	1.0		120	75		125			
						240			250			
FPTU-2-3-8												
341	1	CC	6	1.0		165	245		165			(1)
341	2	CC	6	1.0		165	280		165			
341	3	CC	6	1.0		165	235		160			
						495			490			
FPTU-2-3-9												
343	1	NA	13X7.75	.70	(416)	300	655/(907)	(451)	315			(1)
FPTU-2-3-10												
345	1	NA	13X7.75	.70	(416)	300	660/(914)	(463)	324			(1)
FPTU-2-3-11												
347	1	NA	13X7.75	.70	(582)	420	746/(1033)	(575)	403			(1)
FPTU-2-3-12												
	1	CC	6	1.0		170			170			(1)
	2	CC	6	1.0		170			180			
						340			350			

REMARKS: (1) Fan on low speed

READINGS BY: KAH

File Name: p20_iupui_cab-ctc_B
Test Date: 4/13/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM		
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
FPTU-2-3-13												
	1	CC	6	1.0		170	400		170			(1)
	2	CC	6	1.0		170	440		175			
						340	840		345			
FPTU-2-3-14												
	1	CC	6	1.0		170	400		175			(1)
	2	CC	6	1.0		170	300		175			
						340			350			
FPTU-2-3-15												
	1	CC	6	1.0		100	50		105			(1)
	2	CC	6	1.0		100	50		105			
	3	CC	6	1.0		100	55		100			
	4	CC	6	1.0		80	60		80			
						380			390			
FPTU-2-3-16												
	1	CC	6	1.0		100	200		100			(1)
	2	CC	6	1.0		100	260		100			
	3	CC	6	1.0		80	250		80			
						280	710		280			
FPTU-2-13-17												
	1	CC	6	1.0		100	225		100			(1)
	2	CC	6	1.0		100	230		100			
	3	CC	6	1.0		80	250		80			

REMARKS: (1) Fan on low speed 280 280

READINGS BY: KAH

File Name: p21_iupui_cab-ctc_B
Test Date: 04/09/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM		
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
FPTU-2-3-18												
	1	CC	6	1.0		100	260		100			(1)
	2	CC	6	1.0		100	250		105			
	3	CC	6	1.0		80	265		80			
						280			285			
FPTU-2-3-19												
	1	CC	6	1.0		100	225		100			(1)
	2	CC	6	1.0		100	240		105			
	3	CC	6	1.0		80	250		80			
						280			285			
FPTU-2-3-20												
	1	CC	6	1..0		95	250		95			(1)
	2	CC	6	1.0		95	0		95			
	3	CC	6	1.0		95	240		95			
	4	CC	6	1.0		95	240		100			
						380	750		385			
FPTU-2-3-21												
	1	C	6	1.0		95	180		95			(1)
	2	CC	6	1.0		95	170		100			
	3	CC	6	1.0		95	185		95			
	4	CC	6	1.0		95	230		100			
						380			390			

REMARKS: (1) Fan on low speed

READINGS BY: KAH

File Name: p22_iupui_cab-ctc_B
Test Date: 04/09/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXIMUM PRELIMINARY VEL	MAXIMUM PRELIMINARY AIRFLOW	MAXIMUM FINAL CFM	HEATING MINIMUM DESIGN	HEATING MINIMUM ACTUAL	
FPTU 2-3-22												
299B	1	CC	6	1.0		95	120		100			
299B	2	CC	6	1.0		95	140		95			
299B	3	CC	6	1.0		95	120		95			
299B	4	CC	6	1.0		95	70		95			
						380			395			
FPTU 2-4-1												
427	1	NA	13X7.75	.70	(429)	300	(1026)/718	(539)	377			(1)
FPTU 2-4-2												
429	1	CC	6	1.0		130	330		130			
429	2	CC	6	1.0		130	310		135			
						260			265			
FPTU 2-4-3												
431	1	NA	13X7.75	.70	(429)	300	(1108)/772	(497)	348			(1)
FPTU-2-4-4												
433	1	CC	6	1.0		120	330		125			
433	2	CC	6	1.0		90	310		90			
						210			215			
FPTU 2-4-5												
440A	1	CC	6	1.0		120	320		125			
440A	2	CC	6	1.0		120	305		120			
						260			245			

REMARKS: (1) Fan on low speed

READINGS BY: KAH

File Name: p23_iupui_cab-ctc_B
Test Date: 4/16/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU 2-4-6											
440B	1	CC	6	1.0		120	320		120		
440B	2	CC	6	1.0		110	320		110		
						230			230		
FPTU 2-4-7											
440C	1	NA	13X7.75	.70	(450)	315	(1104)/773	(493)	345		
FPTU 2-4-8											
440D	1	CC	6	1.0		100	325		105		
440D	2	CC	6	1.0		120	360		120		
						220			225		
FPTU 2-4-9											
440E	1	CC	6	1.0		10	310		120		
440E	2	CC	6	1.0		120	330		125		
						240			245		
FPTU 2-4-10											
440F	1	CC	6	1.0		120	320		125		
440F	2	CC	6	1.0		120	335		125		
						240			250		
FPTU 2-4-11											
440G	1	CC	6	1.0		120	380		125		
440G	2	CC	6	1.0		100	320		105		
						220			230		

REMARKS:

READINGS BY: WLK

File Name: p24_iupui_cab-ctc_B
Test Date: 4/08/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU 2-4-12											
440H	1	NA				220	(1025)/710		225		
FPTU 2-4-132											
440J	1	CC	6	1.0		130	295		130		
440J	2	CC	6	1.0		130	345		135		
						260			265		
FTU 2-4-14											
440K	1	CC	6	1.0		130	370		135		
440K	2	CC	6	1.0		130	375		135		
						260			270		
FPTU 2-4-15											
440L	1	CC	6	1.0		130	275		130		
440L	2	CC	6	1.0		130	400		130		
						260	675		260		
FPTU-2-4-16											
440M	1	CC	6	1.0		100	220		100		
440M	2	CC	6	1.0		100	230		105		
440M	3	CC	6	1.0		100	230		105		
440M	4	CC	6	1.0		100	215		95		
						400			405		

REMARKS:

READINGS BY: WLK

File Name: p25_iupui_cab-ctc_B
Test Date: 4/08/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXI MUM PRELI MINARY VEL	AIRFLOW	MAXIMUM FINAL CFM	HEATING MINI MUM DESIGN	ACTUAL	
FPTU 2-4-17												
420E	1	CC	6	1.0		150	280		150			(1)
420E	2	CC	6	1.0		100	430		105			
						250			235			
FPTU 2-4-18												
420F	1	CC	6	1.0		150	310		145			(1)
420F	2	CC	6	1.0		200	275		105			
						350	585		250			
FPTU 2-4-19												
420G	1	CC	6	1.0		125	290		125			(1)
420G	2	CC	6	1.0		100	320		100			
						225	610		225			
FPTU 2-4-20												
420H	1	CC	6	1.0		150	350		155			(1)
420H	2	CC	6	1.0		100	275		105			
						250			260			
FPTU 2-4-21												
420J	1	CC	6	1.0		150	310		150			(1)
420J	2	CC	6	1.0		125	300		130			
						275			280			

REMARKS: (1) Fan on low speed

READINGS BY: WLK

File Name: p26_iupui_cab-ctc_B
Test Date: 4/08/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CTC-2

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
FPTU 2-4-22											
420K	1	CC	6	1.0		140	250		140		
420K	2	CC	6	1.0		140	280		140		
						280			280		
FPTU 2-4-23											
414F	1	CC	6	1.0		150	280		150		
414F	2	CC	6	1.0		100	320		105		
						250			255		
FPTU 2-4-24											
414G	1	CC	6	1.0		125	330		120		
414G	2	CC	6	1.0		100	325		105		
						225			225		
FPTU 2-4-25											
420A	1	NA				170	(118)/830		179		
FPTU 2-4-26											
440R	1	NA				200	(1204)/(843		207		

REMARKS:

READINGS BY: WLK

File Name: p27_iupui_cab-ctc_B
Test Date: 4/08/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION 5TH FLOOR

UNIT DATA	
Make/Model No.	Built Up Unit / Trane
Type/Size	
Serial Number	NS
Arrangement/Class	
Discharge	Horizontal
Make Sheave	(1)
Sheave Diam/Bore	(1)
N. Belts/make/size	(1)
No. Filters/type/size	36/Pleated/24x24x4
	6/Pleated/24x12x4

MOTOR DATA	
Make/Frame	(1)
H.P./RPM	(1)
Volts/Phase/Hertz	(1)
F.L. Amps/S.F.	(1)
Make Sheave	(1)
Sheave Diam/Bore	(1)
Sheave Center Distance	(1)
Sheave Oper. Diam.	(1)
Final Filters	36/AAF/24x24x12
	6/AAF/24x12x12

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	81,000	78,382
Total S.P.	4.0	4.08
Fan RPM	1225	907
External S.P.	1.5	1.1 *
Motor Volts	460	450
Motor Amps	57	53.9
Corrected F.L.Amps	NS	
B.H.P.	38.5	46.2
Outside Air	16,000	16,479
Return Air	65,000	61,903
Relief Air	NS	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	1.55
Suction S.P.	NS	-2.53
Reheat Coil Delta S.P.	NA	NA
Cooling Coil Delta S.P.	0.82	0.50
Preheat Coil Delta S.P.	0.11	.40
Filters Delta S.P.	0.75	1.5
Duct S.P. Setpoint	1.0"	0.8"
Frequency Drive Output	NS	60Hz
Vortex Damp. Position	NS	NA
Out. Air Damp. Position	NS	Minimum
Ret. Air Damp. Position	NS	100%
Relief Damp. Position	NS	Closed

REMARKS: (1) See following fan sheet

* External pressures downstream of sound attenuators.

READINGS BY: KAH

Fulton Air Balance
Certification No. 2426

File Name: p1_iupui_cab-ctc_C
Test Date: 12/28/2005

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. SF-CAB-1		FAN. NO. SF-CAB-2		FAN NO.	
Location	AHU-CAB-3		AHU-CAB-3			
Service	Supply Fan		Supply Fan			
Manufacturer	Cook		Cook			
Model Number	490QMX		490QMX			
Serial Number	NS		NS			
Type/Class	DWDI		DWDI			
Motor Make/Style	Baldor/TEFC		Baldor/TEFC			
Motor HP/RPM/Frame	50/1775/326T		50/1775/326T			
Volts/Phase/Hertz	460/3/60		460/3/60			
F.L. Amps/S.F.	57/1.15		57/1.15			
Motor Sheave Make/Model	Browning		Browning			
Motor Sheave Diam./Bore	6TB64 X Q1 1 5/8		6TB64 X Q1 15/8			
Fan Sheave Make	Browning		Browning			
Fan Sheave Diam./Bore	6B136R X R1 3 7/16		6B136R X R1 3 7/16			
No. Belts/Make/Size	6/Browning/BX128		6/Browning/BX128			
Sheave Center Distance	42 7/8		42 7/8			
Frequency Drive Output	60Hz		60 Hz			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	40,500	(1)	40,500	(1)		
Fan RPM	1225	906	1225	908		
S.P. In/Out	NS	-2.53/+1.55	NS	-2.53/+1.55		
Total S.P.	4.0	4.08	4.0	4.06		
Voltage	460	450	460	449		
Amperage	57	53.9	57	51.8		
Bhp	38.5	46.2	38.5	44.3		
Hz		60		60		

REMARKS: (1) See Air Apparatus Test Report for total of SF-1/SF-2

READINGS BY: KAH

TEST DATE: 5/18/2005

FILE NAME: p2_iupui_cab-ctc_C

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. RF-CAB-1		FAN. NO. RF-CAB-2		FAN NO.	
Location	AHU-CAB-3		AHU-CAB-3			
Service	Return Fan		Return Fan			
Manufacturer	Cook		Cook			
Model Number	445QMX		445QMX			
Serial Number	NS		NS			
Type/Class						
Motor Make/Style	Baldor/TEFC		Baldor/TEFC			
Motor HP/RPM/Frame	20/1765/256T		20			
Volts/Phase/Hertz	460/3/60		460/3/60			
F.L. Amps/S.F.	24/1.15		24/1.15			
Motor Sheave Make/Model	Browning		Browning			
Motor Sheave Diam./Bore	5TB42 X 1 5/8		5TB42 X 1 5/8			
Fan Sheave Make	Maska		Maska			
Fan Sheave Diam./Bore	*					
No. Belts/Make/Size	5/Browning/BX112		5/Browning/BX112			
Sheave Center Distance	43 1/2		43 1/2			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	32,500	(1)	32,500	(1)		
Fan RPM	560	575	560	578		
S.P. In/Out	NS	-.41/-.79	NS	-.41/-.79		
Total S.P.	1.0	1.2	1.0	1.2		
Voltage	460	378	460	377		
Amperage	24	13.8	24	14		
Bhp	8.37	9.45	8.37	9.6		
Hz		49.1 (2)		49.1 (2)		

REMARKS:

(1) See Air Apparatus Test Report for total of SF1/SF2

* Could not access. Plug fan, no access door

(2) Temperature control contractor to limit drive through software.

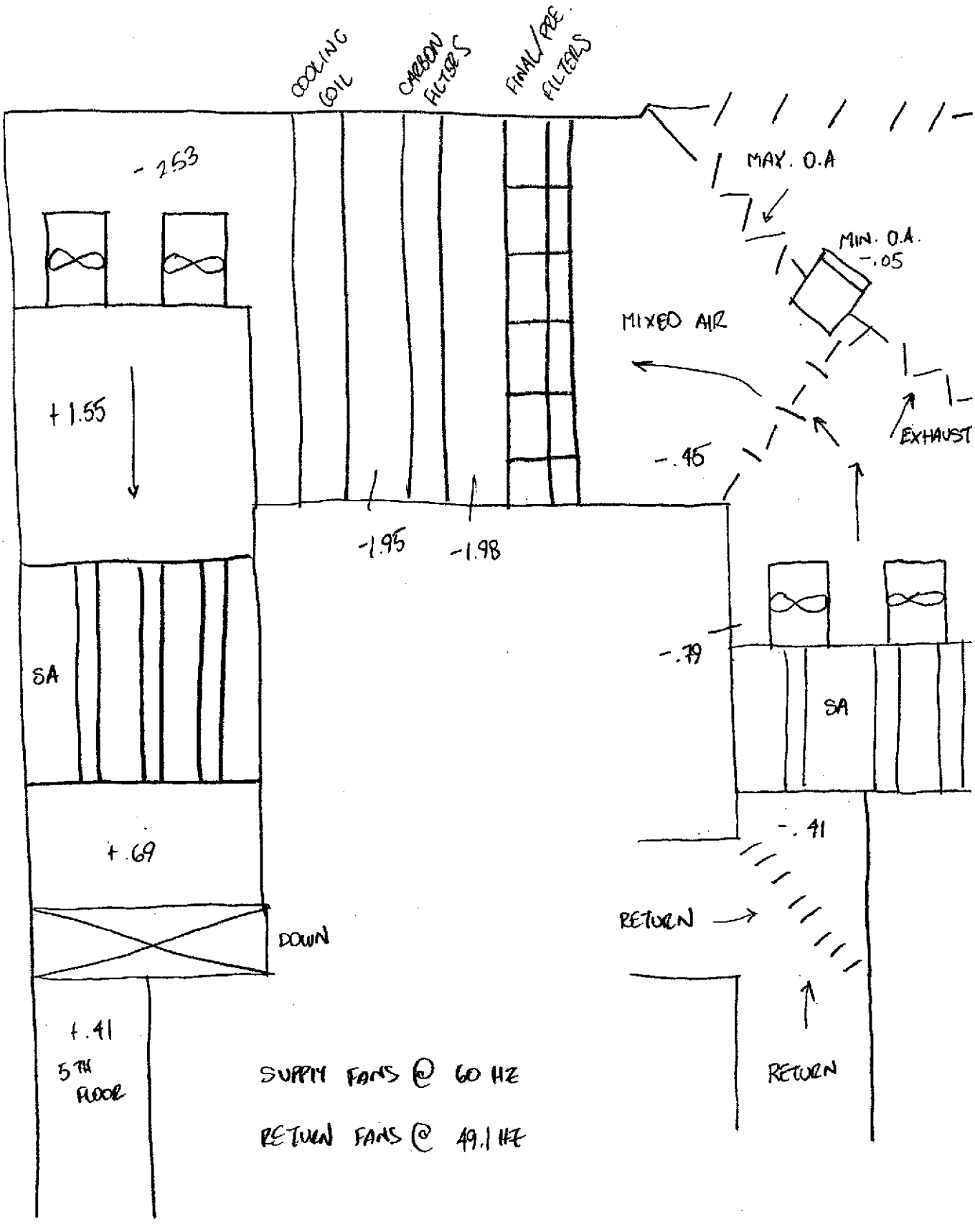
READINGS BY: KAH

TEST DATE: 5/18/2005

FILE NAME: p3_iupui_cab-ctc_C

FULTON AIR BALANCE

Certification No. 2426


COOLING COIL
CARBON FILTERS
FINAL/PRE FILTERS
-.153
MAX. O.A
MIN. O.A. -.05
MIXED AIR
EXHAUST
+1.55
-.45
-1.95
-1.98
SA
-.79
SA
+.69
-.41
DOWN
RETURN
+.41
5TH FLOOR
SUPPLY FANS @ 60 HZ
RETURN FANS @ 49.1 HZ
RETURN

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUICAB/CTC

SYSTEM/UNIT AHU-3-CAB

LOCATION/ZONE 5th Floor Branch

SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.49 Air Temp	SCFM ___	SCFM ____
Size 20x14 Area 1.94	FPM NS CFM NS	FPM 1024 CFM 1,987

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1711	1646	802	0							
	2	1701	1659	646	0							
	3	1757	1573	568	0							
	4	1771	1349	742	442							
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 16383/16=1024

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-3 CAB

LOCATION/ZONE 5th Floor Main

SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.72 Air Temp 75°F	SCFM ___	SCFM ____
Size 96x36 Area 24	FPM NS CFM NS	FPM (1096) CFM 26,304

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	978	1018	890	893	997	986	1017	988	1032	1058	1047
	2	1043	1140	1087	876	1080	920	1062	1093	1052	1201	1238
	3	1135	1058	1100	922	1122	981	1122	1084	1172	1253	1248
	4	1128	1116	1085	967	1116	1042	1072	1112	1134	1234	1261
	5	1128	1166	1181	1109	1023	1037	1048	1162	1085	1157	1250
	6	1024	1119	1027	1068	928	920	853	1052	993	1125	1140
	7											
	8											
	9											
	10	#12										
	11	1096										
	12	1208										
	13	1203										
	14	1042										
	15	1044										
	16	1088										
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 78,912/72= 1096

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-3 CAB

LOCATION/ZONE 4TH Floor & Below

SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.69 Air Temp 75°	SCFM ___	SCFM ____
Size 98x38 Area 25.86	FPM NS CFM NS	FPM (1937) CFM 50,091

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	2139	2522	2584	2575	2480	2402	2564	2494	2523	2408	2411
	2	2202	2305	2453	2481	2547	2415	2548	2456	2440	2406	2338
	3	2211	2306	2362	2294	2362	2147	2115	2165	2197	2238	2141
	4	2239	2179	2217	1987	2103	1825	1738	1852	1777	1830	1863
	5	2055	2017	1956	1839	1511	1618	1419	1356	1144	1382	1441
	6	1754	1634	1429	1228	1036	872	904	967	1076	688	446
	7											
	8											
	9											
	10	#12										
	11	2328										
	12	2356										
	13	2151										
	14	1578										
	15	1064										
	16	340										
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 139,464/72= 1937

NEBB

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUICAB/CTC

SYSTEM/UNIT AHU-3-CAB

LOCATION/ZONE Room 565, 5th Floor

SERVICE Return Chase #2

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. -.23 Air Temp 79°	SCFM ___	SCFM ____
Size 96x32 Area 21.33	FPM NS CFM NS	FPM (1485) CFM 31,675

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1549	1642	1588	1349	1358	1564	1499	1375	1052	983	1074
	2	1707	1769	1785	1773	1531	1561	1639	1606	1335	1049	893
	3	1485	1788	1814	1746	1407	1557	1609	1597	1316	1097	1128
	4	1605	1728	1767	1753	1461	1609	1663	1459	1191	1158	1099
	5	1562	1617	1601	1688	1524	1681	1614	1365	1206	1199	1109
	6	1263	1334	1513	1547	1502	1492	1127	1166	1154	1116	900
	7											
	8											
	9											
	10	#12										
	11	2008										
	12	1987										
	13	1969										
	14	1993										
	15	1944										
	16	2000										
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 106,899/72= 1485

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUICAB/CTC

SYSTEM/UNIT AHU-3-CAB

LOCATION/ZONE Hallway, 5th Floor

SERVICE Return Chase #1

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. -.43 Air Temp 79°	SCFM ___	SCFM _____
Size 72x44 Area 22	FPM ns CFM ns	FPM (1374) CFM 30,228

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	1143	1148	1171	1455	1437	1468	1357	1308	1440	1519	1545
	2	1114	1229	1463	1469	1457	1453	1244	1317	1470	1535	1467
	3	1129	1210	1366	1491	1455	1353	1327	1427	1489	1499	1458
	4	1090	1194	1308	1399	1325	1287	1418	1428	1467	1533	1531
	5	1229	1165	1207	1392	1247	1229	1349	1377	1457	1489	1525
	6	1128	1395	1330	1410	1296	1275	1319	1401	1467	1467	1499
	7											
	8											
	9											
	10	#12										
	11	1397										
	12	1453										
	13	1499										
	14	1475										
	15	1472										
	16	1457										
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS: 98,928/72= 1374

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM AHU-CAB-03 (Return)

OUTLET MANUFACTURER:

TEST APPARATUS RVA

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
009X	1	X	68X26	10.31	(549)	5660	(154)	1585	(414)	4694	83%
009	2	X	68X26	10.31	(352)	3630	(185)	1908	(272)	3084	85%
199N	3	X	98X34	19.43	(511)	9930	(384)	7460	(420)	8977	90%
199L	4	G	76X26	11.39	(413)	4700	(363)	4136	(347)	3797	81%
299S	5	X	98X34	23.14	(495)	11445	(387)	8951	(421)	10716	94%
299T	6	X	48X16	4.24	(470)	1780	(361)	1531	(321)	1497	84%
299T	7	X	48X16	4.24	(420)	1780	(324)	1376	(348)	1624	91%
399S	8	X	80X26	11.99	(575)	6300	(441)	5292	(420)	5540	88%
399T	9	P	74X16	2.21	(1384)	2980	(1267)	2802	(1065)	2591	87%
355	10	X	30X24	4.15	(477)	1980	(387)	1604	(378)	1726	87%
499S	11	X	68X24	9.41	(602)	5660	(642)	6038	(476)	4927	87%
499T	12	X	50X26	7.49	(358)	2680	(311)	2332	(294)	2422	90%
599T	13	E	56X30	9.68	(340)	3295	(397)	3846	(296)	3152	96%
599T	14	E	56X30	9.68	(340)	3295	(410)	3965	(290)	3088	94%
						67,115		52,826		57,335	85%

REMARKS:

READINGS BY: KAH

File Name: p10_iupui_cab-ctc_C

Test Date: 02/03/05

Fulton Air Balance

Certification 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-0-1											
051	1	F	12X8	1.0		265			265	151	150
O51A	2	F	6X6	1.0		50			50	29	30
						315			315	180	180
VAV-3-0-2											
O99K	1	D	6"	1.0		150			150	75	75
VAV-3-0-3											
O58	1	A	6"	1.0		100			100	100	100
VAV-3-0-4											
008	1	D	6"	1.0		100	250	215	105	60	60
008	2	D	6"	1.0		100	90	100	100	60	60
						200	340		210	120	120
VAV-3-0-5											
056	1	A	6"	1.0		100	150		100	60	60
VAV-3-0-6											
054	1	A	6"	1.0		100	160		100	60	60
VAV-3-0-7											
006	1	F	22X6	.83	(422)	350	(508)	(413)	343	210	258/214

REMARKS:

READINGS BY: KAH

File Name: p11_iupui_cab-cts_C
Test Date: 01/07/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-0-8											
052	1	A	6	1.0		100	150		100	60	60
VAV-3-0-9											
077	1	D	10	1.0		270	270		275	160	165
077	2	D	10	1.0		270	310		275	160	160
077	3	D	10	1.0		270	195		265	160	155
077	4	D	10	1.0		270	280		270	160	160
						1080	1055		1085	640	640
VAV-3-0-10											
076	1	D	10	1.0		135	185		135	82	80
076	2	D	10	1.0		130	185		130	78	75
						265	370		265	160	155
VAV-3-0-11											
Corridor	1	D	6	1.0		130	85	120	130	80	80
VAV-3-0-12											
071A	1	A	6	1.0		75			80	58	60
073	2	D	10	1.0		285	300		295	173	170
073	3	D	10	1.0		285	230		255	173	160
073	4	D	10	1.0		285	320		315	173	190
073	5	D	10	1.0		285	330		315	173	185
						1215			1260	750	735

REMARKS:

READINGS BY: KAH

File Name: p12_iupui_cab-cts_C
Test Date: 05/18/05

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-0-13											
062	1	N	6'-0"	1.0		450	450		490	270	280
062	2	N	6'-0"	1.0		450	380		410	270	265
						900			900	540	545
VAV-3-0-14											
074	1	A	6"	1.0		90	90		90	90	90
VAV-3-0-15											
071	1	D	10	1.0		265			270	160	160
071	2	D	10	1.0		265			280	160	165
071	3	D	10	1.0		265			265	160	155
071	4	D	10	1.0		265			250	160	155
						1060			1065	640	625
VAV-3-0-16											
072	1	A	5	1.0		75			75	75	75
VAV-3-0-17											
069	1	D	8	1.0		250	245		245	150	155
069	2	D	8	1.0		250	245		245	150	150
069	3	D	8	1.0		250	240		240	150	150
069	4	D	8	1.0		250	255		255	150	155
						1000	985		985	600	610

REMARKS:

READINGS BY: KAH

File Name: p13_iupui_cab-cts_C
Test Date: 10/07/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-0-18											
067	1	D	6	1.0		150			150	90	90
VAV-3-0-19											
065	1	D	6	1.0		160	110	130	155	97	95
065	2	D	6	1.0		160	120	140	155	98	95
065	3	D	6	1.0		160	200	240	155	97	100
065	4	D	6	1.0		160	120	130	155	98	100
						640	550	640	620	390	390
VAV-3-0-20											
063	1	D	8	1.0		185			180	115	115
VAV-3-0-21											
061	1	D	10	1.0		245	270		250	148	145
061	2	D	10	1.0		245	270		255	148	150
061	3	D	10	1.0		245	350		250	148	145
061	4	D	10	1.0		245	0		250	148	140
061	5	D	10	1.0		245	350		250	148	150
						1225	1240		1255	740	730
VAV-3-0-22											
099Y	1	D	8	1.0		370	200		370	100	100
099Z	2	D	8	1.0		370	210		380	100	105
						740	410		750	200	205

REMARKS:

READINGS BY: KAH

File Name: p14_iupui_cab-cts_C
Test Date: 10/07/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-0-23											
059	1	D	12	1.0		335	320		330	202	205
059	2	D	12	1.0		330	340		325	198	190
059	3	D	12	1.0		335	320		330	202	200
059	4	D	12	1.0		330	340		340	198	195
						1330	1320		1325	800	790
VAV-3-0-24											
055	1	D	8	1.0		210	190		215	125	125
VAV-3-0-25											
062	1	N	6'-0"	1.0		450			470	285	295
062	2	N	6'-0"	1.0		450			430	285	275
						900			900	540	560
VAV-3-0-26											
057	1	D	8	1.0		240	0	200	235	144	145
057	2	D	8	1.0		235	215	290	235	141	140
057	3	D	8	1.0		240	320	300	240	144	145
057	4	D	8	1.0		235	335	300	225	141	140
						950	870		935	570	570
VAV-3-0-27											
Corridor	1	D	8	1.0		200			200	120	120
				1.0							
VAV-3-0-28											
	1	A	6"	1.0		100	65	140	100	65	65

REMARKS:

READINGS BY: KAH

File Name: p15_iupui_cab-cts_C
Test Date: 05/20/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM		
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
VAV-3-1-1												
199	1	N	12"	1.0		315	420		320	190	200	(1)
199	2	N	12"	1.0		315	370		270	190	150	
199	3	N	12"	1.0		315	440		340	190	210	
199	4	N	12"	1.0		315	360		330	190	190	
						1260	1590		1260	760	750	
VAV-3-1-2												
152B	1	D	8"	1.0		170			170	105	110	
VAV-3-1-3												
199	1	N	12"	1.0		420	410		480	253	285	
199	2	N	12"	1.0		420	300		350	253	220	
199	3	N	12"	1.0		420	380		440	254	265	
				1.0		1260	1090		1270	760	770	
VAV-3-1-4												
199N	1	N	36" X 6"	1.0		460				286		(2)
199N	2	N	36" X 6"	1.0		460				286		
199N	3	N	36" X 6"	1.0		470				292		
199N	4	N	36" X 6"	1.0		470				292		
199N	5	N	36" X 6"	1.0		470				292		
						2330				1450		

REMARKS: (1) Grille w/OBD's for balance installed on return. No VD in grille.

(2) Box set by traverse, See Traverse Sheet page 17 of 50

READINGS BY: KAH

File Name: p16_iupui_cab-cts_C

Test Date:

Fulton Air Balance
Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC SYSTEM/UNIT VAV-3-1-4

LOCATION/ZONE CAB ROOM # 199N SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.15 Air Temp	SCFM ___	SCFM _____
Size 30x18 Area 3.75	FPM (621) CFM 2,330	FPM (619) CFM 2,321

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	.06	.04	.03	.02	.01	0					
	2	.07	.06	.04	.02	.01	0					
	3	.07	.07	.03	.02	.01	0					
	4	.07	.07	.03	.01	.01	0					
	5											
	6											
	7	981	801	896	566	401	0					
	8	1060	981	801	566	401	0					
	9	1060	1060	694	566	401	0					
	10	1060	1060	694	401	401	0					
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS		4,161	3,902	3,085	2,099	1,604						

NOTE: Take readings with air blowing toward the observer.

REMARKS: 14,851 / 24 = 619
Minimum SP Delta @ +.05

READINGS BY KAH
Fulton Air Balance
Certification No. 2426

File Name: p17_iupui_cab-ctc_C
Test Date: 10/07/04

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET No.	TYPE	SIZE	AK	MAXIMUM FPM	DESIGN CFM	MAXI MUM PRELI MINARY VEL	AIRFLOW	MAXIMUM FINAL CFM	HEATING MINI MUM DESIGN	ACTUAL	
VAV-3-1-5												
152	1	N	10	1.0		228				136		(1)
152	2	N	10	1.0		228				137		
152	3	N	10	1.0		228				136		
152	4	N	10	1.0		228				137		
152	5	N	10	1.0		228				136		
152	6	N	10	1.0		228				137		
152	7	N	10	1.0		228				136		
152	8	N	10	1.0		228				137		
152	9	N	10	1.0		228				136		
152	10	N	10	1.0		228				137		
152	11	N	10	1.0		228				136		
152	12	N	10	1.0		228				137		
						2740				1640		
VAV-3-1-6												
199M	1	N	48"X6"	1.0		507				314		(1)
199M	2	N	48"X6"	1.0		507				314		
199M	3	N	48"X6"	1.0		507				314		
199M	4	N	48"X6"	1.0		507				314		
199M	5	N	48"X6"	1.0		507				314		
						2535				1570		

REMARKS: (1) Set by traverse. See traverse sheets pages 19 & 20 of 50

READINGS BY: KAH

File Name: [18_iupui_cac-ctc_C

Test Date: 05/18/05

Fulton Air Balance

Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT VAV-3-1-5

LOCATION/ZONE Cab Room

SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.11 Air Temp 56.8°F	SCFM ___	SCFM ___
Size 36x20 Area 5.0	FPM (548)/ (328) CFM 2740/ 1640	FPM CFM 2,835

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	.02	.02	.025	.03	.025	.02					
	2	.02	.02	.025	.03	.025	.02					
	3	.015	.02	.03	.03	.025	.015					
	4	.015	.02	.03	.03	.02	.015					
	5											
	6											
	7	566	566	633	694	633	491					
	8	566	566	633	694	633	491					
	9	491	566	694	694	633	491					
	10	491	566	694	694	566	491					
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS		2,114	2,264	2,021	2,776	2,465	1,964					

NOTE: Take readings with air blowing toward the observer.

REMARKS: 13,064 / 24 = 567
Minimum SP Delta = +.035

READINGS BY KAH
Fulton Air Balance
Certification No. 2426

File Name: p19_iupui_cab-ctc_C
Test Date: 10/06/04

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC SYSTEM/UNIT VAV-3-1-6

LOCATION/ZONE Cab Room #164 SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.16 Air Temp	SCFM ___	SCFM ___
Size 30x22 Area 4.58	FPM (554) CFM 2,535	FPM 520 CFM 2,382

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	.01	.015	.02	.035	.035						
	2	.01	.015	.03	.035	.03						
	3	.015	.02	.03	.035	.03						
	4	.015	.02	.035	.035	.035						
	5											
	6											
	7											
	8	401	491	566	749	749						
	9	401	491	694	749	694						
	10	491	566	694	749	694						
	11	491	566	749	749	749						
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS		1,784	2,114	2,703	2,996	2,886						

NOTE: Take readings with air blowing toward the observer.

REMARKS: 12,481 / 24 = 2542
Minimum SP Delta = +.05

READINGS BY KAH
Fulton Air Balance
Certification No. 2426

File Name: p20_iupui_cab-ctc_C
Test Date: 10/07/04

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-1-7											
164	1	D	10	1.0		345	310		325	707	200
164	2	D	10	1.0		345	360		355	208	215
						690	670		680	415	415
VAV-3-1-8											
162	1	D	12	1.0		435			400	260	240
162	2	D	12	1.0		435			450	260	275
						870			850	520	515
VAV-3-1-9											
199M	1	N	48"X6"	1.0		507				304	(1)
199M	2	N	48"X6"	1.0		507				304	
199M	3	N	48"X6"	1.0		507				304	
199M	4	N	48"X6"	1.0		507				304	
199M	5	N	48"X6"	1.0		507				304	
						2535				1520	
VAV-3-1-10											
160	1	D	10	1.0		285	360		255	170	155
160	2	D	10	1.0		285	415		310	170	185
160	3	D	10	1.0		285	400		290	170	170
160	4	D	10	1.0		285	425		310	170	185
						1140			1165	680	695

REMARKS: (1) Box set by traverse, See Traverse Sheet page 22 of 50

READINGS BY: KAH

File Name: p21_iupui_cab-ctc_C
Test Date: 05/18/05

Fulton Air Balance
Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT VAV-3-1-9

LOCATION/ZONE CAB ROOM #162

SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.145 Air Temp 56°F	SCFM ___	SCFM ___
Size 30x22 Area 4.58	FPM (554) CFM 2,535	FPM 555 CFM 2,542

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	.01	.03	.03	.02	.015	.01					
	2	.01	.035	.035	.02	.015	.01					
	3	.01	.02	.02	.025	.02	.015					
	4	.015	02	.02	.03	.03	.015					
	5											
	6											
	7											
	8	401	694	694	566	491	401					
	9	401	749	749	566	491	401					
	10	401	566	566	633	566	491					
	11	491	566	566	694	694	491					
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS		1,964	2,575	2,575	2,459	2,242	1,784					

NOTE: Take readings with air blowing toward the observer.

REMARKS: 13,329 / 24 = 555
* Minimum SP Delta = +.0425

READINGS BY KAH
Fulton Air Balance
Certification No. 2426

File Name: p22_iupui_cab-ctc_C
Test Date: 10/07/04

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM		
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL	
VAV-3-1-11												
199M	1	N	48"X16"	1.0		507				304		(2)
199M	2	N	48"X16"	1.0		507				304		
199M	3	N	48"X16"	1.0		507				304		
199M	4	N	48"X16"	1.0		507				304		
						2535				1520		
VAV-3-1-12												
167	1	D	10	1.0		375	400		390	224	230	
167	2	D	10	1.0		375	395		385	224	225	
167	3	D	10	1.0		370	390		380	221	225	
167	4	D	10	1.0		370	380		370	221	220	
						1490	1565		1525	890	900	
VAV-3-1-73												
199N	1	D	10	1.0		270			270	135	130	
VAV-3-1-14												
165	1	F	14X6	.43	(570)	245	(628)	(628)	270	150	167	(1)
165	2	F	14X6	0.43	(570)	245	(489)	(482)	207	150	124	
						490			477	300	291	

REMARKS: (1) No balance dampers in grilles

(2) Box set by traverse see Traverse Sheet page 24 of 50

READINGS BY: KAH

File Name: p23_iupui_cab-ctc_C

Test Date: 05/18/05

Fulton Air Balance

Certification No. 2426

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT VAV-3-1-11

LOCATION/ZONE CAB Room #160

SERVICE Supply

ALTITUDE Standard DENSITY Standard CORR.FACTOR 1.0

DUCT	REQUIRED	ACTUAL
S.P. +.15 Air Temp	SCFM ___	SCFM ___
Size 30x22 Area 4.58	FPM (564) CFM 2,535	FPM 589 CFM 2,698

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	.03	.03	.03	.03	.02	.01					
	2	.03	.02	.03	.03	.02	.01					
	3	.03	.03	.02	.03	.01	.01					
	4	.02	.03	.02	.03	.01	.01					
	5											
	6											
	7											
	8	694	694	694	694	566	401					
	9	694	566	694	694	566	401					
	10	694	694	566	694	401	401					
	11	566	694	566	694	401	401					
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS		2,648	2,648	2,520	2,776	1,934	1,604					

NOTE: Take readings with air blowing toward the observer.

REMARKS: 14,130 / 24 = 589
Minimum SP Delta @ +.045

READINGS BY KAH
Fulton Air Balance
Certification No. 2426

File Name: p24_iupui_cab-ctc_C
Test Date: 10/17/04

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHUI-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-1-15											
163	1	D	8"	1.0		220	220		220	131	130
163	2	D	8"	1.0		220	220		220	131	130
163	3	D	8"	1.0		215	220		220	129	130
163	4	D	8"	1.0		215	210		210	129	125
						870			870	520	515
VAV-3-1-16											
159	1	D	8"	1.0		235	280		240	142	145
159	2	D	8"	1.0		235	290		235	142	140
159	3	D	8"	1.0		230	200		210	138	125
159	4	D	8"	1.0		230	210		230	138	135
						930	980		915	560	545
VAV-3-1-17											
199Z	1	D	10"	1.0		260			260	155	155
VAV-3-1-18											
199Y	1	D	10"	1.0		260	375		260	155	155
VAV-3-1-19											
157	1	D	8"	1.0		235	180	210	235	142	140
157	2	D	8"	1.0		235	235	240	240	142	140
157	3	D	8"	1.0		230	280	230	235	138	135
157	4	D	8"	1.0		230	230	230	240	138	140
REMARKS:						930	925	910	950	560	555

READINGS BY: KAH/PA

File Name: p25_iupui_cab-ctc_C
Test Date: 5/18/05 - 12/28/06

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-1-20											
199L	1	D	8	1.0		200			200	120	120
VAV-3-1-21											
155	1	D	8	1.0		235	210		230	142	150
155	2	D	8	1.0		235	230		240	142	150
155	3	D	8	1.0		230	210		210	138	140
155	4	D	8	1.0		230	230		240	138	130
						930			920	560	570
VAV-3-1-22											
151	1	C	5	1.0		60			60	60	60
153	2	F	6X6	1.0		35			35	35	35
						95			95	95	95

REMARKS:

READINGS BY: KAH

File Name: p26_iupui_cab-ctc_C

Test Date: 10/07/04

Fulton Air Balance

Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-2-1											
251	1	F	8X6	1.0		95			90	95	90
253	2	F	6X4	1.0		60			55	60	55
						155			145	155	145
VAV-3-2-2											
299	1	N	8	1.0		120	130		120	70	75
299	2	N	8	1.0		120	120		110	71	70
299	3	N	8	1.0		120	140		110	71	70
299	4	N	8	1.0		115	140		120	68	70
299J	5	N	8	1.0		115	210		120	68	75
						590	740		580	348	360
VAV-3-2-3											
299N	1	N	10	1.0		380			405	223	220
299N	2	N	10	1.0		380			350	224	210
299N	3	N	10	1.0		380			410	223	220
						1140			1165	670	650

REMARKS:

READINGS BY: KAH

File Name: p27_iupui_cab-ctc_C
Test Date: 10/07/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-2-4											
252	1	N	6	1.0		90			95	53	55
252	2	N	6	1.0		90			95	54	55
252	3	N	6	1.0		90			90	53	50
252	4	N	6	1.0		90			85	54	50
252	5	N	6	1.0		90			100	53	55
252	6	N	6	1.0		90			85	54	45
252	7	N	6	1.0		90			90	53	50
252	8	N	6	1.0		90			85	54	50
252	9	N	6	1.0		90			95	53	55
252	10	N	6	1.0		90			85	54	55
252	11	N	6	1.0		90			95	53	45
252	12	N	6	1.0		90			90	54	45
252	13	N	6	1.0		90			95	53	50
252	14	N	6	1.0		90			90	54	45
						1260			1275	750	705
VAV-3-2-5											
199M	1	N		1.0		420			410	253	245
199M	2	N		1.0		420			410	253	250
199M	3	N		1.0		420			400	254	240
						1260			1220	760	735

REMARKS:

READINGS BY: KAH

File Name: p28_iupui_cab-ctc_C
Test Date: 10/09/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-2-6											
274	1	D	10	1.0		290	260		265	172	170
274	2	D	10	1.0		290	270		270	173	170
274	3	D	10	1.0		290	250		270	172	170
274	4	D	10	1.0		290	285		275	173	180
						1160	1065		1080	690	690
VAV-3-2-7											
199M	1	N	48X6	1.0		420			395	251	245
199M	2	N	48X6	1.0		420			420	252	245
199M	3	N	48X6	1.0		420			420	252	255
						1260			1235	755	745
VAV-3-2-8											
270	1	D	14	1.0		495	470		495	296	290
270	2	D	14	1.0		495	480		490	296	290
270	3	D	14	1.0		495	580		485	297	310
270	4	D	14	1.0		495	500		485	297	305
						1980			1955	1185	1195
VAV-3-2-9											
268	1	D	10	1.0		210	140		220	126	125
268	2	D	10	1.0		210	140		200	126	125
268	3	D	10	1.0		210	195		190	126	115
268	4	D	10	1.0		210	240		190	127	115
						840			800	505	480

REMARKS:

READINGS BY: KAH

File Name: p29_iupui_cab-ctc_C
Test Date: 10/07/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-2-10											
199M	1	N	10	1.0		420			400	251	235
199M	2	N	10	1.0		420			380	252	225
199M	3	N	10	1.0		420			400	252	235
						1260			1180	755	785
VAV-3-2-11											
273	1	D	10	1.0		305	320		305	182	180
273	2	D	10	1.0		305	320		300	182	185
273	3	D	10	1.0		300	270		300	181	185
273	4	D	10	1.0		300	200		305	181	180
				1.0		1210			1210	725	730
VAV-3-2-12											
271	1	D	14	1.0		370	420		370	250	250
271	2	D	14	1.0		370	390		365	250	250
271	3	D	14	1.0		370	330		360	250	245
271	4	D	14	1.0		370	330		360	250	240
						1480	1470		1455	1000	985
VAV-3-2-13											
266	1	D	8	1.0		225			225	135	140
VAV-3-2-14											
299S	1	D	8	1.0		250			250	150	150

REMARKS:

READINGS BY: KAH/PA

File Name: p30_iupui_cab-ctc_C
Test Date: 10/04/04 - 12/28/06

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-2-15											
254A	1	D	6	1.0		140			140	100	95
VAV-3-2-16											
267	1	D	10	1.0		335			310	186	180
267	2	D	10	1.0		335			340	186	190
269L	3	A	5	1.0		50			50	28	25
				1.0		720			700	400	395
VAV-3-2-17											
265	1	D	12	1.0		375	335		375	227	230
265	2	D	12	1.0		375	400		365	227	230
265	3	D	12	1.0		370	400		365	223	225
265	4	D	12	1.0		370	360		360	223	225
						1490	1495		1465	900	910
VAV-3-2-18											
257	1	D	10	1.0		235	200	210	230	140	135
257	2	D	10	1.0		235	200	210	230	141	140
257	3	D	10	1.0		235	210	210	230	140	140
257	4	D	10	1.0		235	210	210	230	141	140
257	5	D	10	1.0		235	240	210	230	140	135
257	6	D	10	1.0		235	220	210	230	141	135
257	7	D	10	1.0		235	245	215	235	140	145
257	8	D	10	1.0		235	220	210	230	141	140
259	9	a	5	1.0		60	50	55	60	36	35
						1940	1795	1740	1900	1150	1145

REMARKS:

READINGS BY: KAH

File Name: p31_iupui_cab-ctc_C
Test Date: 05/18/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-2-19											
299Y	1	D	8	1.0		190	180		190	114	115
299Z	2	D	8	1.0		190	210		220	114	120 *
299T	3	D	8	1.0		210	150		170	127	100
						590	540		580	355	335
VAV-3-2-20											
255	1	D	10	1.0		310	295		295	186	190
255	2	D	10	1.0		310	305		310	187	190
255	3	D	10	1.0		310	305		310	186	185
255	4	D	10	1.0		310	295		295	187	180
255	5	D	10	1.0		310	315		315	186	180
255	6	D	10	1.0		310	330		320	187	185
				1.0		1860	1845		1845	1120	1110
				1.0							
VAV-3-2-21											
256	1	D	10	1.0		140	145		145	83	85
256	2	D	10	1.0		140	135		135	84	85
256	3	D	10	1.0		140	140		140	83	80
256	4	D	10	1.0		140	145		145	84	85
						560	565		565	335	335

REMARKS: * No access to diffuser due to drywall ceiling.

READINGS BY: KAH

File Name: p32_iupui_cab-ctc_C
Test Date: 05/18/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER:

TEST APPARATUS:Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-2-22											
254B	1	D	14	1.0		515	540		540	307	325
254B	2	D	14	1.0		515	520		520	308	305
254B	3	D	14	1.0		515	520		520	307	310
254B	4	D	14	1.0		515	540		540	308	315
						2060	2120		2120	1230	1255
VAV-3-2-23											
252	1	N	6	1.0		90	170		90	53	55
252	2	N	6	1.0		90	210		90	54	55
252	3	N	6	1.0		90	205		85	53	50
252	4	N	6	1.0		90	110		95	54	55
252	5	N	6	1.0		90	230		95	53	55
252	6	N	6	1.0		90	140		90	54	55
252	7	N	6	1.0		90	130		85	53	50
						630	1195		630	374	375
VAV-3-2-24											
199M	1	N	8	1.0		115			110	60	60
199M	2	N	8	1.0		115			120	60	60
						230			230	120	120

REMARKS:

READINGS BY: KAH

File Name: p33_iupui_cab-ctc_C
Test Date: 05/18/05

Fulton Air Balance
Certification No. 2426

AIR OUTLET TEST REPORT

. ROJECT IUPUI CAB/CTC

SYSTEM AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS Flowhood

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of	
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN	
VAV-3-2-25												
268	1	D	12"	1.0		440	320	540		410	93%	(1)
268	2	D	12"	1.0		440	200	340		430	98%	
						880				840	95%	
VAV-3-2-26												
273	1	D	10"	1.0		275	370			270	98%	(1)
273	2	D	10"	1.0		275	150			275	100%	
						550				545	99%	

REMARKS: (1) Boxes are cooling only!

READINGS BY: KAH

File Name: p34_iupui_cab-ctc_C

Test Date: 10/07/04

Fulton Air Balance

Certification 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS:Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-3-1											
351	1	F	10X8	.24	(417)	100	(540)	(425)	102	61	60
353	2	F	8X8	.17	(471)	80	(297)	(442)	75	49	46
						180			177	110	106
VAV-3-3-2											
399A	1	D	8	1.0		245			250	150	155
399J	2	D	8	1.0		260			260	150	150
						505			510	300	305
VAV-3-3-3											
354	1	D	8	1.0		190			180	115	115
354	2	D	8	1.0		190			190	115	115
						380			370	230	230
VAV-3-3-4											
399A	1	D	10	1.0		260	240		245	157	145
399A	2	D	10	1.0		260	295		280	158	160
						520			525	315	305
VAV-3-3-5											
393	1	D	10	1.0		200	170		200	120	120
VAV-3-3-6											
352	1	D	8	1.0		190			200	110	110
VAV-3-3-7											
391	1	D	10	1.0		345	390		345	205	210

REMARKS:

READINGS BY: KAH

File Name: p35_iupui_cab-ctc_C
Test Date: 10/07/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-3-8											
384	1	D	8	1.0		200	190		190	120	130
VAV-3-3-9											
389	1	D	10	1.0		165	100	130	165	100	105
VAV-3-3-10											
387	1	D	10	1.0		165	190		170	100	105
VAV-3-3-11											
382	1	D	10	1.0		330	295		330	200	205
VAV-3-3-12											
380	1	D	10	1.0		325	290		325	200	200
VAV-3-3-13											
385	1	D	10	1.0		165	165		165	100	105
VAV-3-3-14											
399R	1	D	8	1.0		180	170		180	100	100
VAV-3-3-15											
383	1	D	10	1.0		165	150		165	100	100
VAV-3-3-16											
381	1	D	10	1.0		165	130		165	100	100

REMARKS:

READINGS BY: KAH

File Name: p36_iupui_cab-ctc_C
Test Date: 05/12/04
6/10/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-3-17											
379	1	D	6	1.0		165	150		170	100	105
VAV-3-3-18											
378	1	A	6	1.0		100	90		105	60	60
VAV-3-3-19											
376	1	F	8	1.0		130			135	130	130
VAV-3-3-20											
377	1	D	6	1.0		165	150		165	100	105
VAV-3-3-21											
375	1	D	6	1.0		165	140		165	100	105
VAV-3-3-22											
373	1	D	6	1.0		165	140		165	100	100
VAV-3-3-23											
371	1	D	10	1.0		165	150		165	100	100
VAV-3-3-24											
370	1	F	8	1.0		105	105		105	65	65
VAV-3-3-25											
369	1	D	10	1.0		165	145		170	100	100

REMARKS:

READINGS BY: KAH

File Name: p37_iupui_cab-ctc_C
Test Date: 05/12/04
6/10/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS:Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-3-26											
367	1	D	10	1.0		200	185		205	100	100
VAV-3-3-27											
399P	1	A	8	1.0		240			240	125	125
399P	2	A	8	1.0		240			240	125	125
						480			480	250	250
VAV-3-3-28											
374	1	F	8	1.0		105	100		105	105	105
VAV-3-3-29											
372	1	F	8	1.0		120	130		125	120	125
VAV-3-3-30											
368	1	F	8	1.0		105	130		105	105	105
VAV-3-3-31											
366	1	F	8	1.0		105	115		100	105	105
VAV-3-3-32											
399K	1	A	6	1.0		60	50		60	60	60

REMARKS:

READINGS BY: KAH

File Name: p38_iupui_cab-ctc_C
Test Date: 05/13/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS:Flowhood

AREA	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-3-33											
365	1	D	10	1.0		225			220	112	110
365	2	D	10	1.0		225			230	113	115
						450			450	225	225
VAV-3-3-34											
364	1	SAG	14X12	1.0		225	255	110	235	113	120
364	2	SAG	14X12	1.0		225	245	105	220	112	110
						450			455	225	230
VAV-3-3-35											
359	1	D	10	1.0		300	260		300	180	180
VAV-3-3-36											
357	1	D	12	1.0		480	330		465	287	275
357	2	D	12	1.0		480	380		465	288	280
357	3	D	12	1.0		480	400		465	287	285
357	4	D	12	1.0		480	450		480	288	290
						1920	1560		1875	1150	1130
VAV-3-3-37											
356	1	A	6	1.0		110	100		110	65	65

REMARKS:

READINGS BY: KAH

File Name: p39_iupui_cab-ctc_C
Test Date: 05/21/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-3-38											
360A	1	D	6	1.0		100				52	*
360	2	D	8	1.0		195				99	
360	3	D	8	1.0		195				99	
						490				250	
VAV-3-3-39											
399T	1	D	8	1.0		180	170		185	100	100
VAV-3-3-40											
355	1	D	12	1.0		495	660		490	287	280
355	2	D	12	1.0		495	530		480	288	275
355	3	D	12	1.0		495	170		500	287	280
355	4	D	12	1.0		495	550		500	288	285
				1.0		1980			1970	1150	1120
VAV-3-3-41											
358	1	D	8	1.0		215	195	220	205	130	130
358	2	D	8	1.0		215	185	190	205	130	125
						430	380	410	410	260	255
VAV-3-3-42											
399Y	1	A	6	1.0		110			110	55	55
399Z	2	A	6	1.0		110			105	55	50
						220			215	110	105

REMARKS: * Room unfinished. Ceiling not complete. Diffusers not installed 03/02/05

READINGS BY: KAH

File Name: p40_iupui_cab-ctc_C
Test Date: 05/21/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-4-1											
451	1	A	5	1.0		80			80	40	40
453	2	A	5	1.0		100			95	50	50
						180			175	90	90
VAV-3-4-2											
499D	1	D	8	1.0		210			205	125	130
VAV-3-4-3											
478	1	D	10	1.0		325	300		325	195	190
VAV-3-4-4											
495	1	D	8	1.0		210	235		205	125	130
VAV-3-4-5											
493	1	D	8	1.0		210	185		215	125	125
VAV-3-4-6											
476	1	D	8	1.0		215	190		215	125	125
VAV-3-4-7											
491	1	D	8	1.0		210	185		215	125	130
VAV-3-4-8											
474	1	D	8	1.0		175	150		175	105	110

REMARKS:

READINGS BY: KAH

File Name: p41_iupui_cab-ctc_C
Test Date: 05/06/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-4-9											
489	1	D	8	1.0		210	185		210	125	125
VAV-3-4-10											
487	1	D	8	1.0		210	175		205	125	125
VAV-3-4-11											
499X	1	D	10	1.0		315	220		220	190	190 *
VAV-3-4-12											
472	1	D	8	1.0		215	230		215	125	125
VAV-3-4-13											
485	1	D	8	1.0		210	185		210	125	125
VAV-3-4-14											
470	1	D	8	1.0		215	215		215	125	125
VAV-3-4-15											
483	1	D	8	1.0		210	190		205	125	125
VAV-3-4-16											
468	1	D	10	1.0		380	340		370	230	230
VAV-3-4-17											
481	1	D	8	1.0		210	190		205	125	125

REMARKS: * Box 4" inlet does not achieve design CFM values. Drawings and schedule have differing values.

READINGS BY: KAH

File Name: p42_iupui_cab-ctc_C
Test Date: 05/06/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-4-18											
479	1	D	8	1.0		210	185		205	125	125
VAV-3-4-19											
464	1	D	8	1.0		200	160		190	120	115
464	2	D	8	1.0		200	170		200	120	120
						400			390	240	235
VAV-3-4-20											
477	1	D	8	1.0		210	190		210	125	130
VAV-3-4-21											
475J	1	D	12	1.0		360	500	410	360	220	220
VAV-3-4-22											
475K	1	D	8	1.0		210	180		205	125	125
VAV-3-4-23											
475N	1	A	6	1.0		80			80	80	80
VAV-3-4-24											
475H	1	D	10	1.0		220	195		210	132	130
475H	2	D	10	1.0		220	200		225	133	140
						440			435	265	270
VAV-3-4-25											
475G	1	D	8	1.0		200	185		200	120	125

REMARKS:

READINGS BY: KAH

File Name: p43_iupui_cab-ctc_C
Test Date: 05/05/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS:Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-4-26											
475F	1	D	8	1.0		210	190		210	125	125
VAV-3-4-27											
475E	1	D	10	1.0		290	250		290	175	175
VAV-3-4-28											
475D	1	D	8	1.0		250	215		250	150	150
VAV-3-4-29											
475C	1	D	8	1.0		250	210		250	150	150
VAV-3-4-30											
475B	1	D	6	1.0		155	110	145	155	100	100
VAV-3-4-31											
475A	1	D	10	1.0		285	240		290	170	170
VAV-3-4-32											
Recycle Area	1	A	5	1.0		80	65		80	80	80
VAV-3-4-33											
497	1	D	12	1.0		420			425	250	250
497	2	D	12	1.0		420			415	250	245
						840			840	500	495

REMARKS:

READINGS BY: KAH

File Name: p44_iupui_cab-ctc_C
Test Date: 05/05/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS:Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-4-34											
499Z	1	A	6	1.0		110			105	65	65
VAV-3-4-35											
473	1	D	6	1.0		135	110		135	85	85
VAV-3-4-36											
471	1	D	6	1.0		135	110		135	85	85
VAV-3-4-37											
499Y	1	A	6	1.0		110			110	65	65
VAV-3-4-38											
469	1	D	6	1.0		135	85		140	85	85
VAV-3-4-39											
462	1	D	10	1.0		330	295		330	200	200
VAV-3-4-40											
467	1	D	6	1.0		135	110		135	85	85
VAV-3-4-41											
465	1	D	6	1.0		135	120		135	85	85
VAV-3-4-42											
460	1	D	10	1.0		330	290		330	200	200

REMARKS:

READINGS BY: KAH

File Name: p45_iupui_cab-ctc_C
Test Date: 05/10/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
SERVED	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-4-43											
463	1	D	6	1.0		135	115		135	85	85
VAV-3-4-44											
458	1	D	10	1.0		265	235		260	160	160
VAV-3-4-45											
499T	1	D	8	1.0		200	185		205	120	120
VAV-3-4-46											
461	1	D	6	1.0		140	110		140	85	85
VAV-3-4-47											
459	1	D	6	1.0		135			135	85	90
VAV-3-4-48											
456	1	D	10	1.0		330	290		330	200	195
VAV-3-4-49											
457	1	D	6	1.0		135	120		135	85	85
VAV-3-4-50											
452	1	D	8	1.0		190			190	115	110
VAV-3-4-51											
455	1	D	6	1.0		135	120		135	85	85

REMARKS:

READINGS BY: KAH

File Name: p46_iupui_cab-ctc_C
Test Date: 05/10/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUTLET				MAXIMUM	DESIGN	MAXIMUM PRELIMINARY		MAXIMUM FINAL	HEATING MINIMUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-5-1											
NS	1	C	7	1.0		140	105		140	83	80
NS	2	F	8X6	1.0		70	125		75	42	45
						210	230		215	125	125
VAV-3-5-2											
599F	1	D	10	1.0		255	250		250	153	150
599F	2	D	10	1.0		255	310		255	153	155
599F	3	D	10	1.0		255	50		250	153	150
599F	4	D	10	1.0		255	50		245	153	145
599F	5	D	10	1.0		255	50		255	153	155
						1275	710		1255	765	755
VAV-3-5-3											
597	1	12	6	1.0		500	440		505	300	300
VAV-3-5-4											
552	1	C	6	1.0		150	120		150	75	75
VAV-3-5-5											
595	1	D	10	1.0		290	310		290	175	175
VAV-3-5-6											
593	1	D	8	1.0		225	190		215	135	135
VAV-3-5-7											
591	1	D	8	1.0		225	200		225	135	135

REMARKS: * Damper not stroking 8/24 Obstruction noted by JCI 10/24

READINGS BY: KAH

File Name: p47_iupui_cab-ctc_C
Test Date: 05/03/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-5-8											
589	1	D	8	1.0		225	200		225	135	135
VAV-3-5-9											
599R	1	D	8	1.0		250	360	280	250	150	150
VAV-3-5-10											
587	1	D	8	1.0		225	195		230	135	135
VAV-3-5-11											
585	1	D	8	1.0		225	195		225	135	135
VAV-3-5-12											
583	1	D	8	1.0		225	210		220	135	135
VAV-3-5-13											
581	1	D	8	1.0		225	190		225	135	135
VAV-3-5-14											
599R	1	D	8	1.0		250	160		250	150	150
VAV-3-5-15											
579	1	D	8	1.0		225	195		230	135	135
VAV-3-5-16											
577	1	D	8	1.0		230	210		235	140	135

REMARKS:

READINGS BY: KAH

File Name: p48_iupui_cab-ctc_C
Test Date: 05/03/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-5-17											
Mech Room	1	D	8	1.0		210			210	126	125
599Z	2	F	6X6	1.0		75			80	45	45
599Y	3	F	6X6	1.0		75			75	45	45
						360			365	210	215
VAV-3-5-18											
571	1	D	8	1.0		180	160		180	110	110
VAV-3-5-19											
569	1	D	8	1.0		180	175		175	110	110
VAV-3-5-20											
567	1	D	8	1.0		180	165		180	110	115
VAV-3-5-21											
580	1	D	8	1.0		265	230		265	160	160
VAV-3-5-22											
565	1	D	8	1.0		180	165		175	110	110
VAV-3-5-23											
563	1	D	8	1.0		180	165		185	110	110
VAV-3-5-24											
560	1	D	10	1.0		290	260		285	175	175

REMARKS:

READINGS BY: KAH

File Name: p49_iupui_cab-ctc_C
Test Date: 05/03/04

Fulton Air Balance
Certification No. 2426

VAV AIR OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC

System AHU-CAB-3

OUTLET MANUFACTURER: Titus

TEST APPARATUS: Flowhood

AREA SERVED	OUT LET				MAXIMUM	DESIGN	MAXI MUM PRELI MINARY		MAXIMUM FINAL	HEATING MINI MUM	
	No.	TYPE	SIZE	AK	FPM	CFM	VEL	AIRFLOW	CFM	DESIGN	ACTUAL
VAV-3-5-25											
561	1	D	8	1.0		180	170		175	110	110
VAV-3-5-26											
558	1	D	10	1.0		365	450		365	220	215
556	2	D	8	1.0		215	215		210	130	130
						580			575	350	345
VAV-3-5-27											
559	1	D	8	1.0		260	235		260	155	155
VAV-3-5-28											
599T	1	D	8	1.0		210	250		205	125	130
VAV-3-5-29											
554	1	D	8	1.0		215	0		210	130	130
VAV-3-5-30											
557	1	D	10	1.0		360	360		360	220	225
VAV-3-5-31											
592	1	D	12	1.0		475	380		465	285	285
VAV-3-5-32											
555	1	D	8	1.0		240	220		245	145	145

REMARKS:

READINGS BY: KAH

File Name: p50_iupui_cab-ctc_C
Test Date: 05/03/04

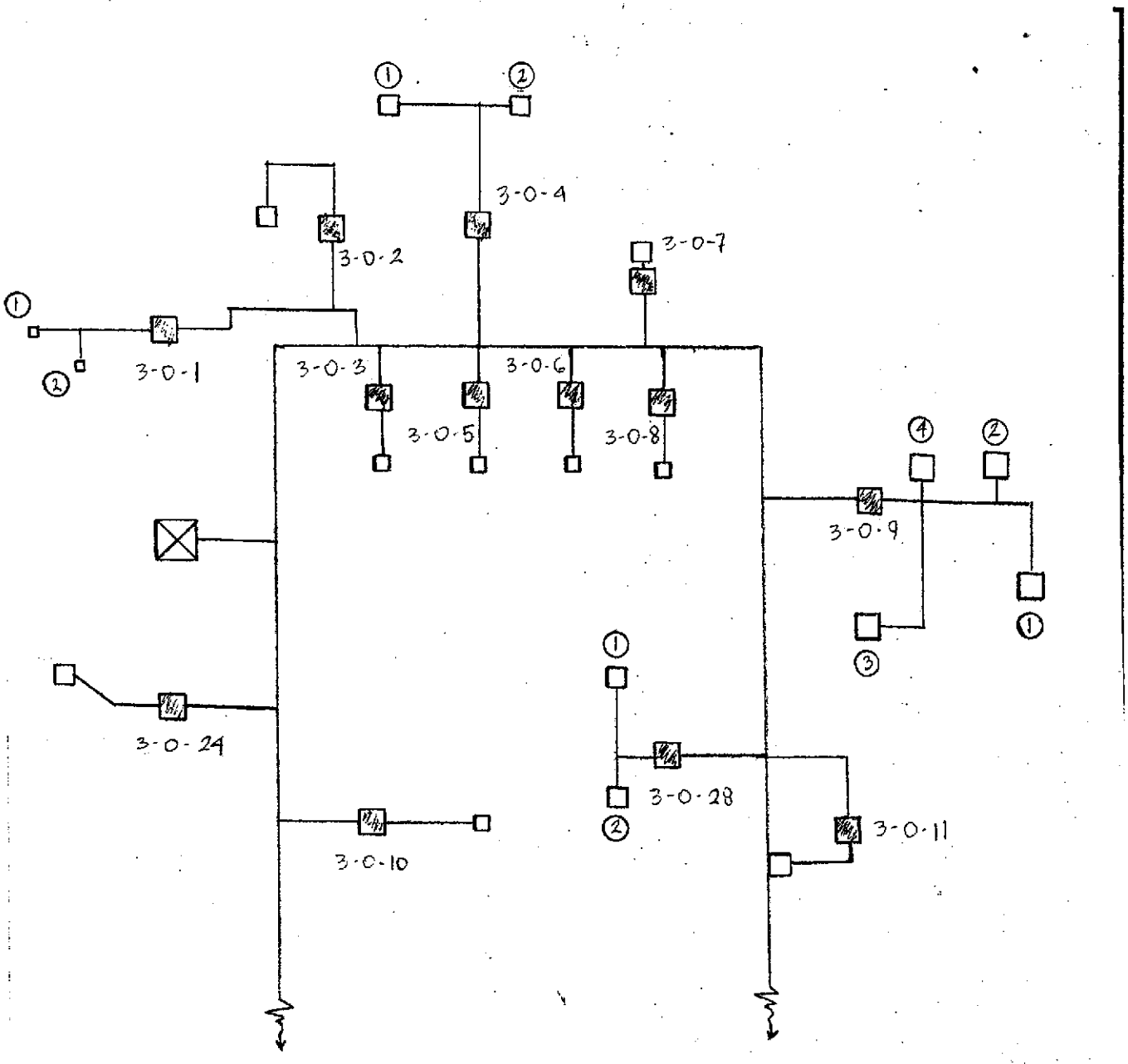
Fulton Air Balance
Certification No. 2426

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Lower Level



Fulton Air Balance
Certification No. 2426

FILE NAME: p40_iupui_cab-ctc

TEST DATE:

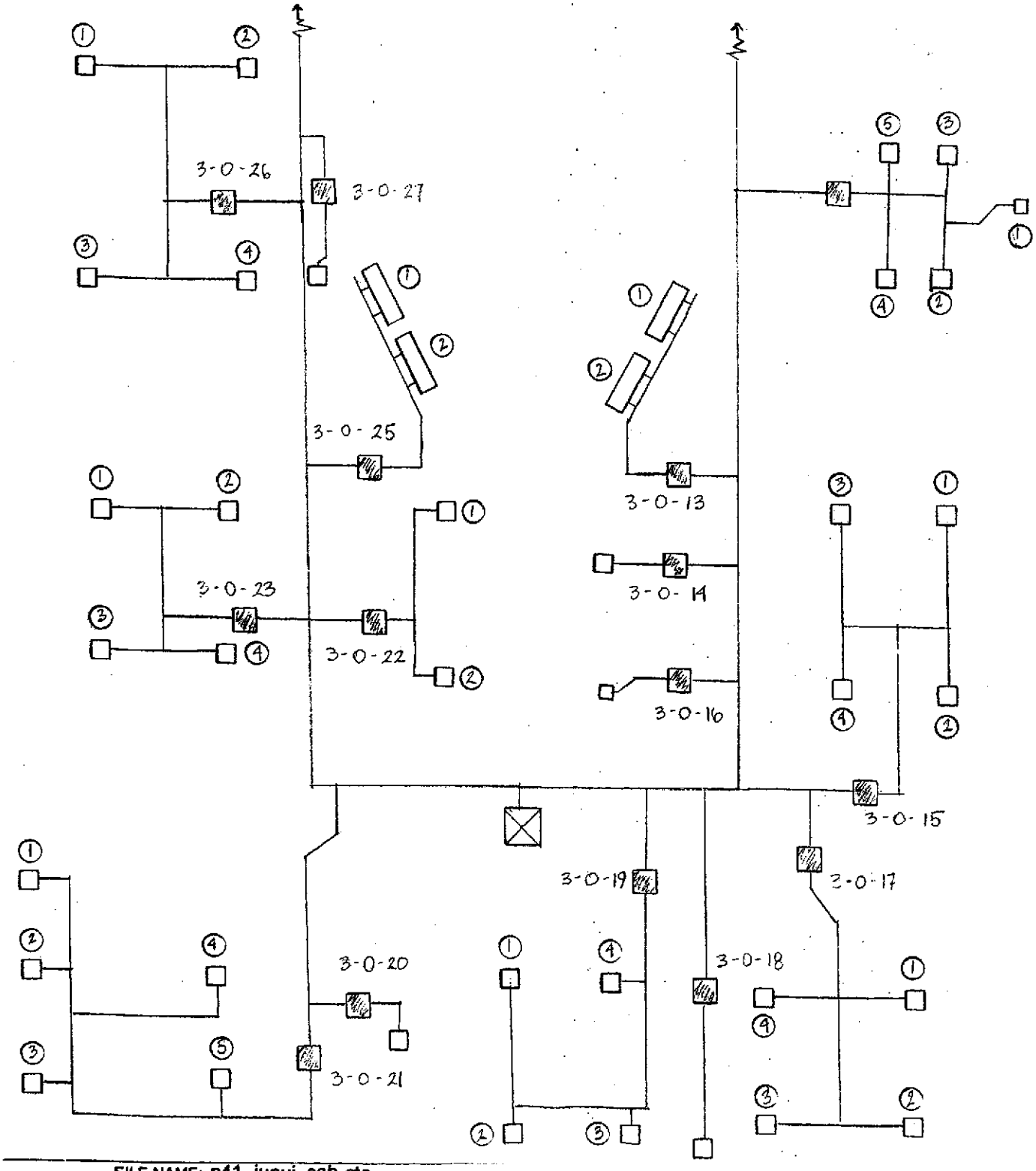
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Lower Level



FILE NAME: p41_iupui_cab-ctc

TEST DATE:

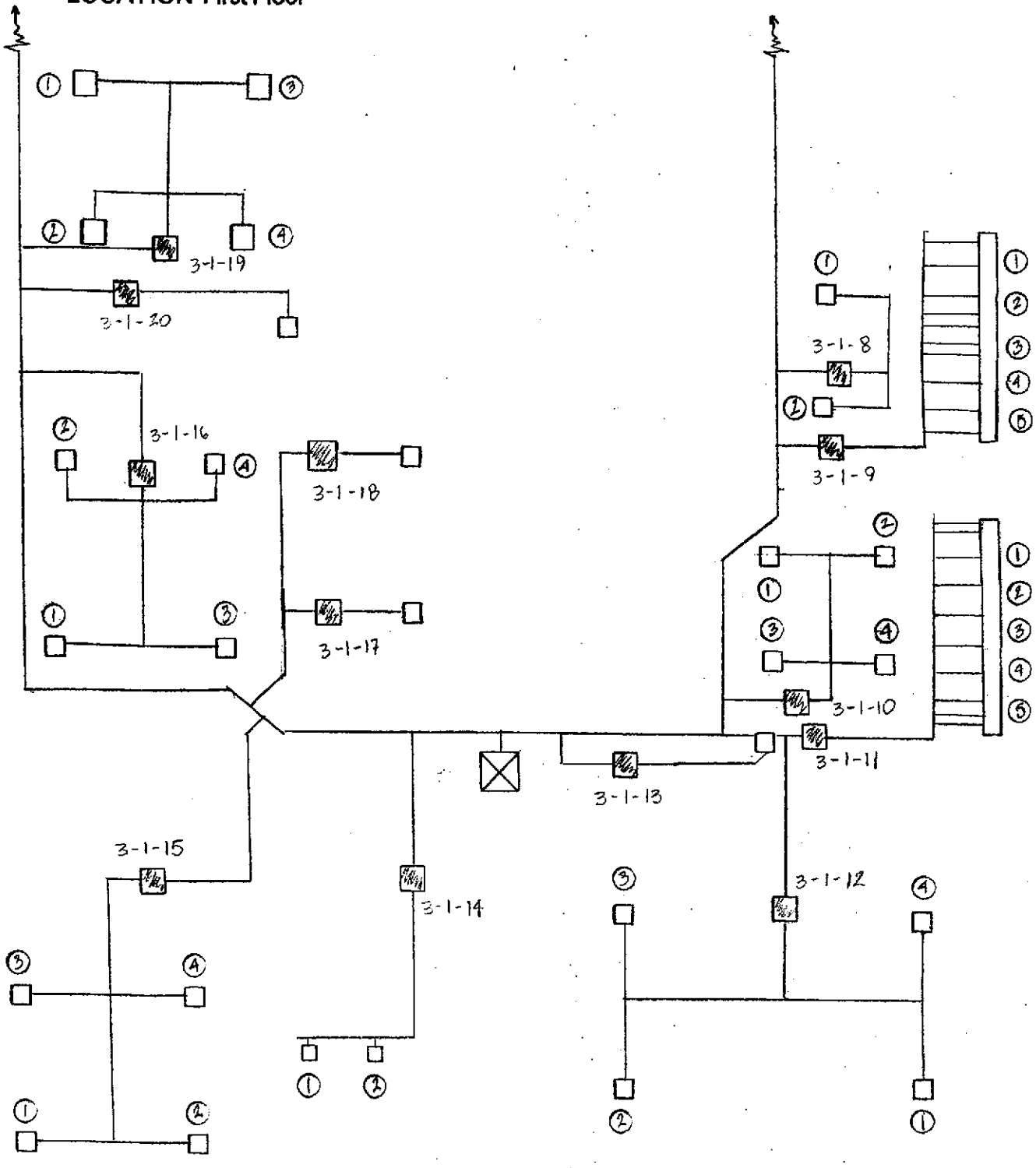
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION First Floor



FILE NAME: p42_iupui_cab-ctc

TEST DATE:

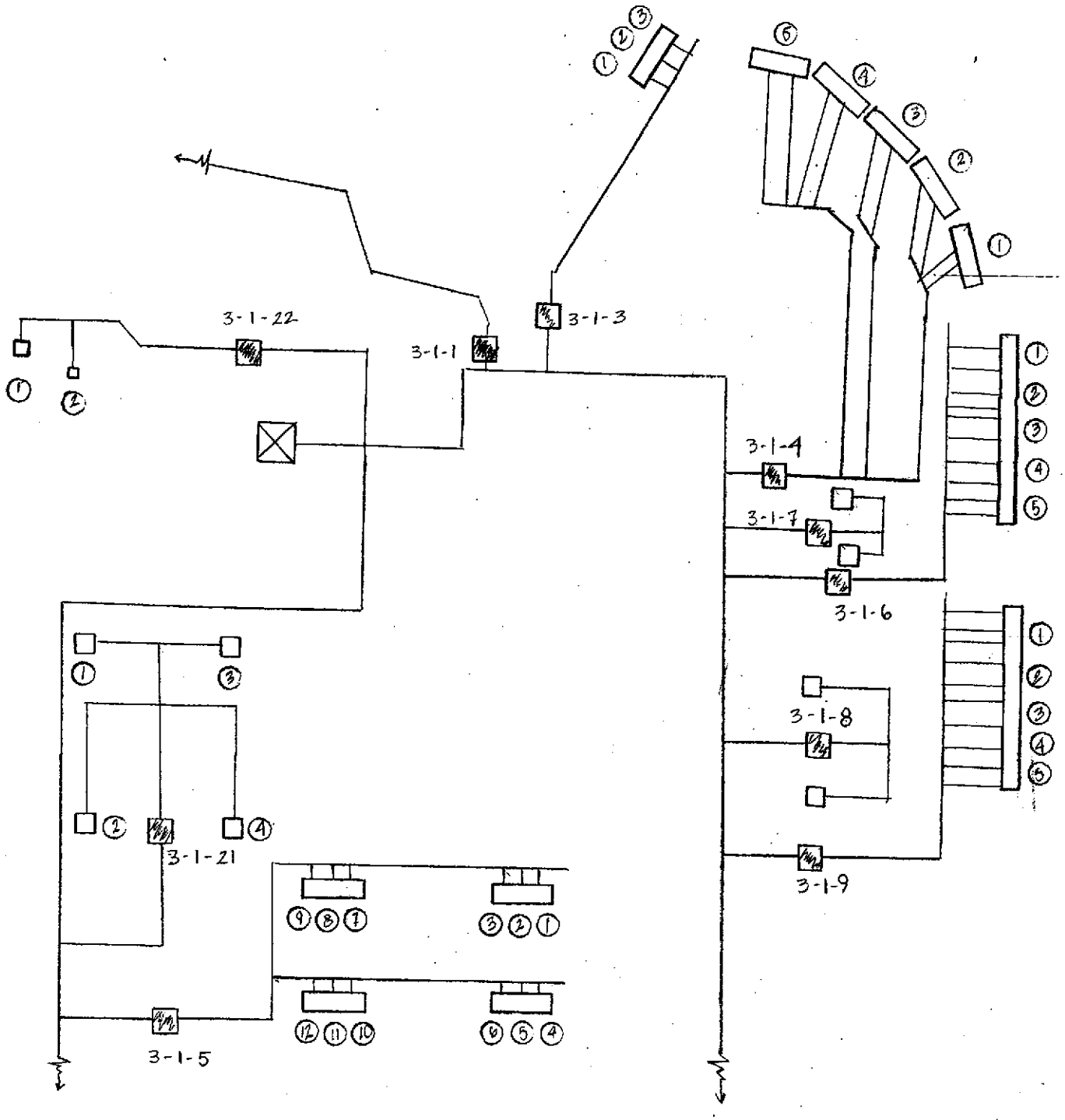
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION First Floor



FILE NAME: p43_iupui_cab-ctc

TEST DATE:

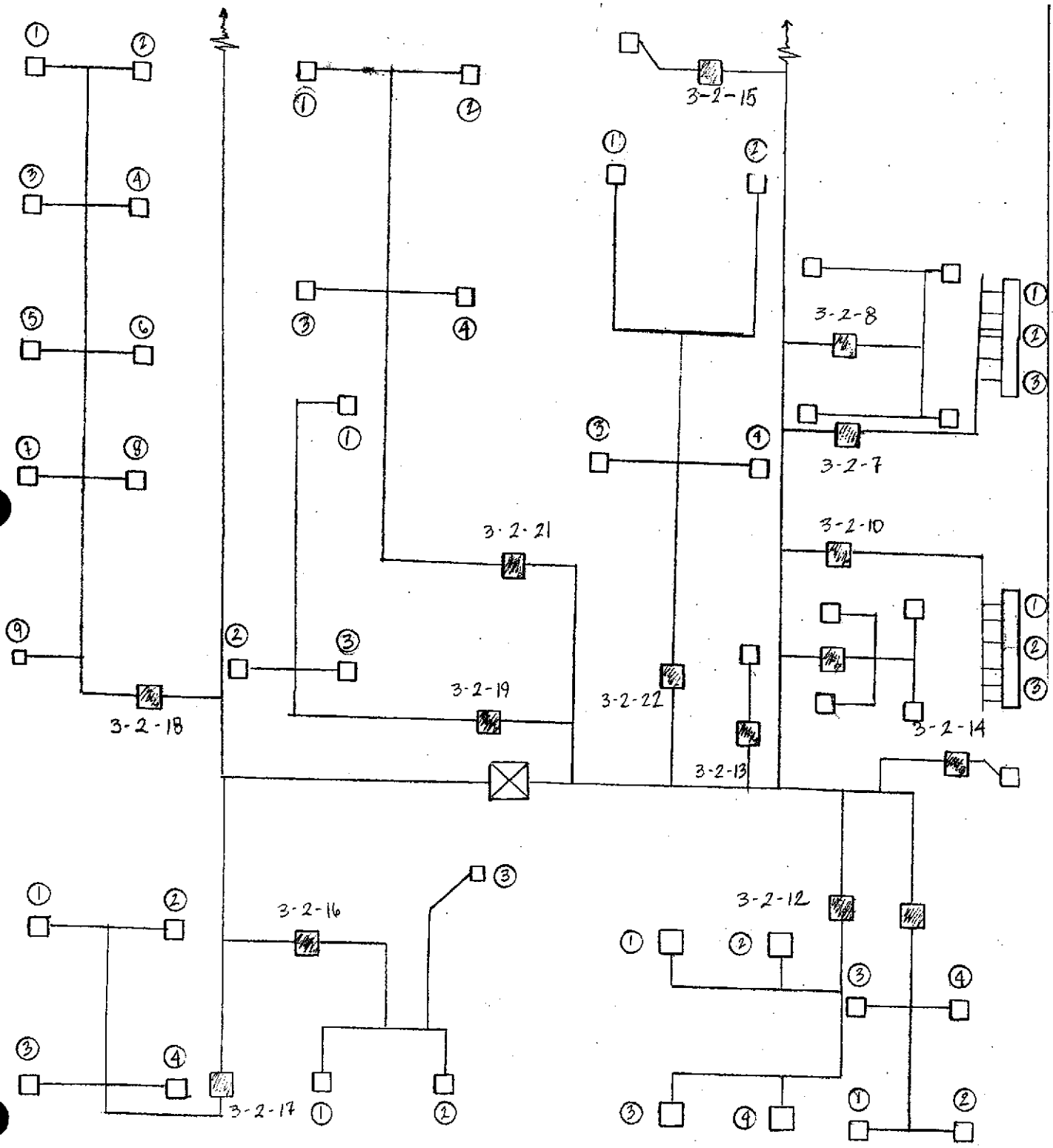
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Second Floor



FILE NAME: p44_iupui_cab-ctc

TEST DATE:

50 of 50

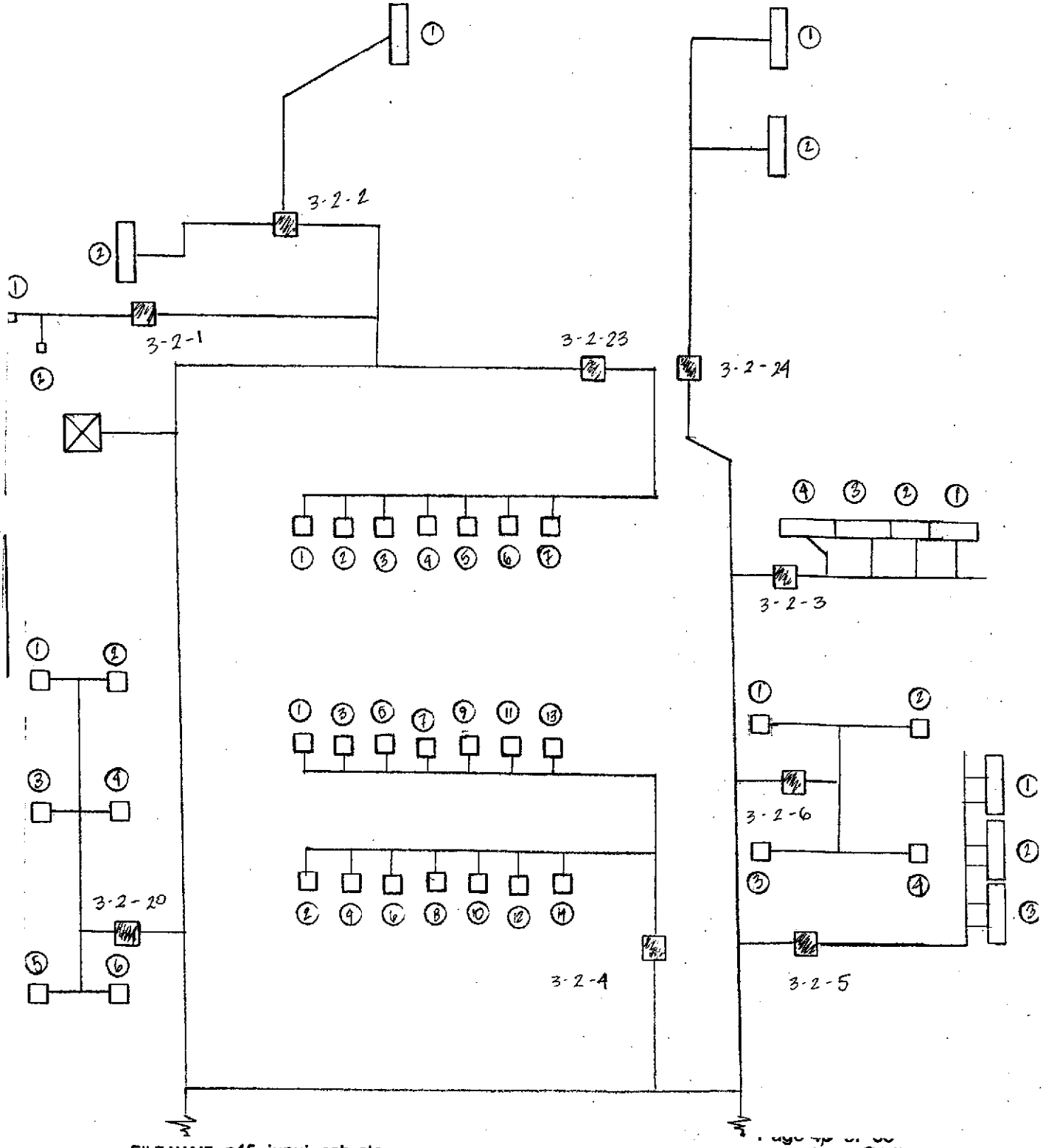
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Second Floor



FILE NAME: p45_iupui_cab-ctc

TEST DATE:

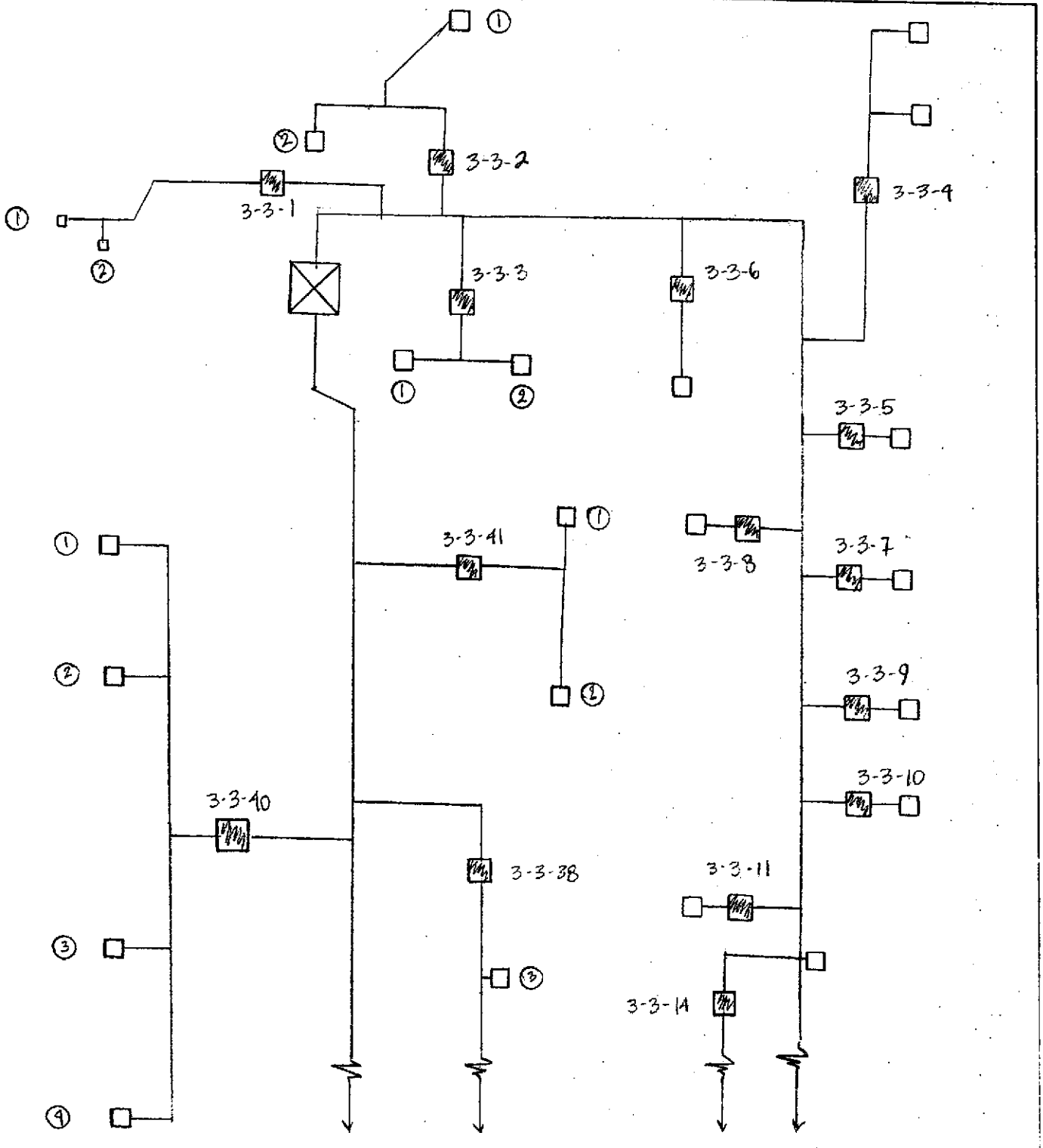
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Third Floor



FILE NAME: p46_iupui_cab-ctc

TEST DATE:

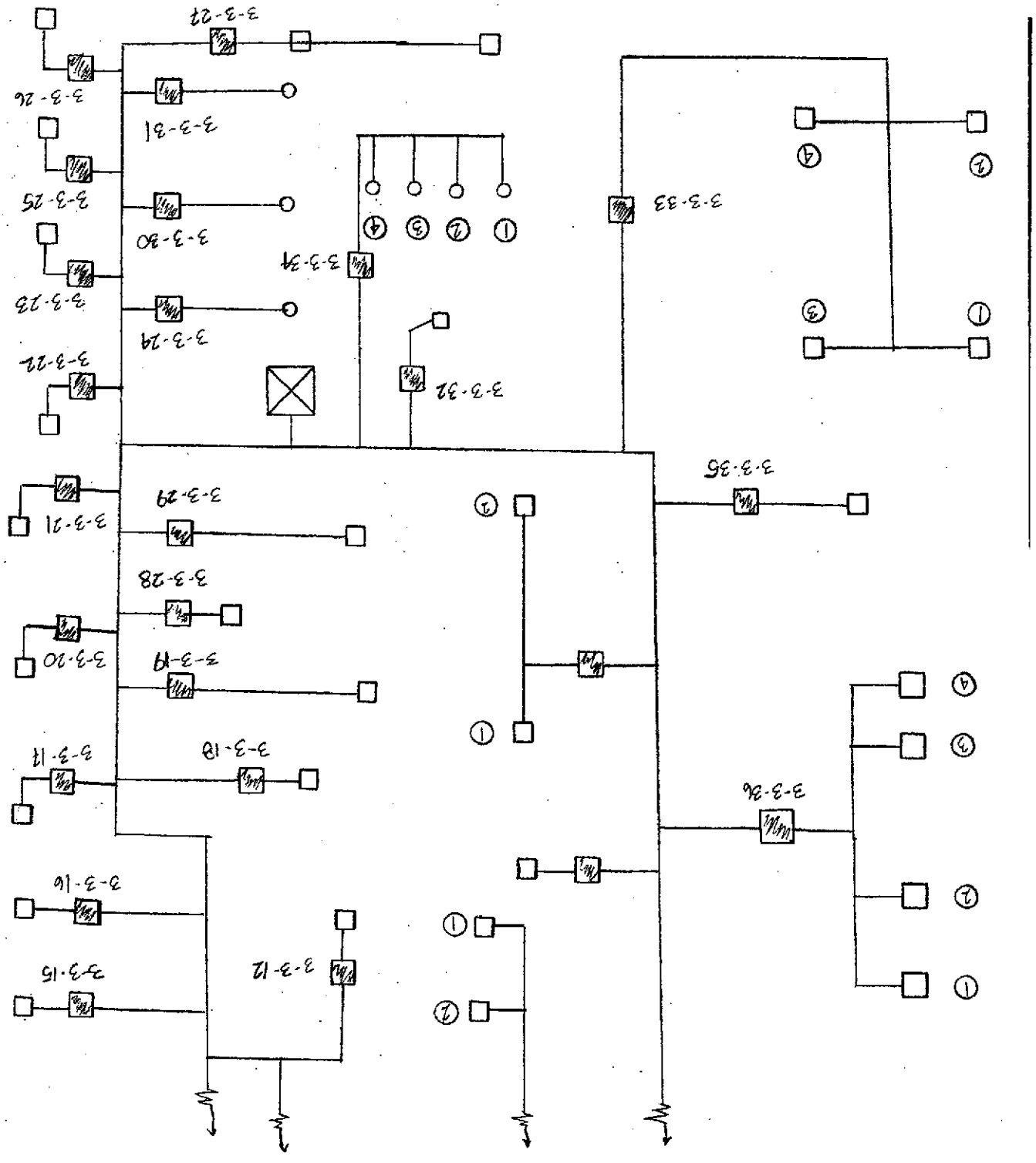
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Third Floor



FILE NAME: p47_iupui_cab-ctc

TEST DATE:

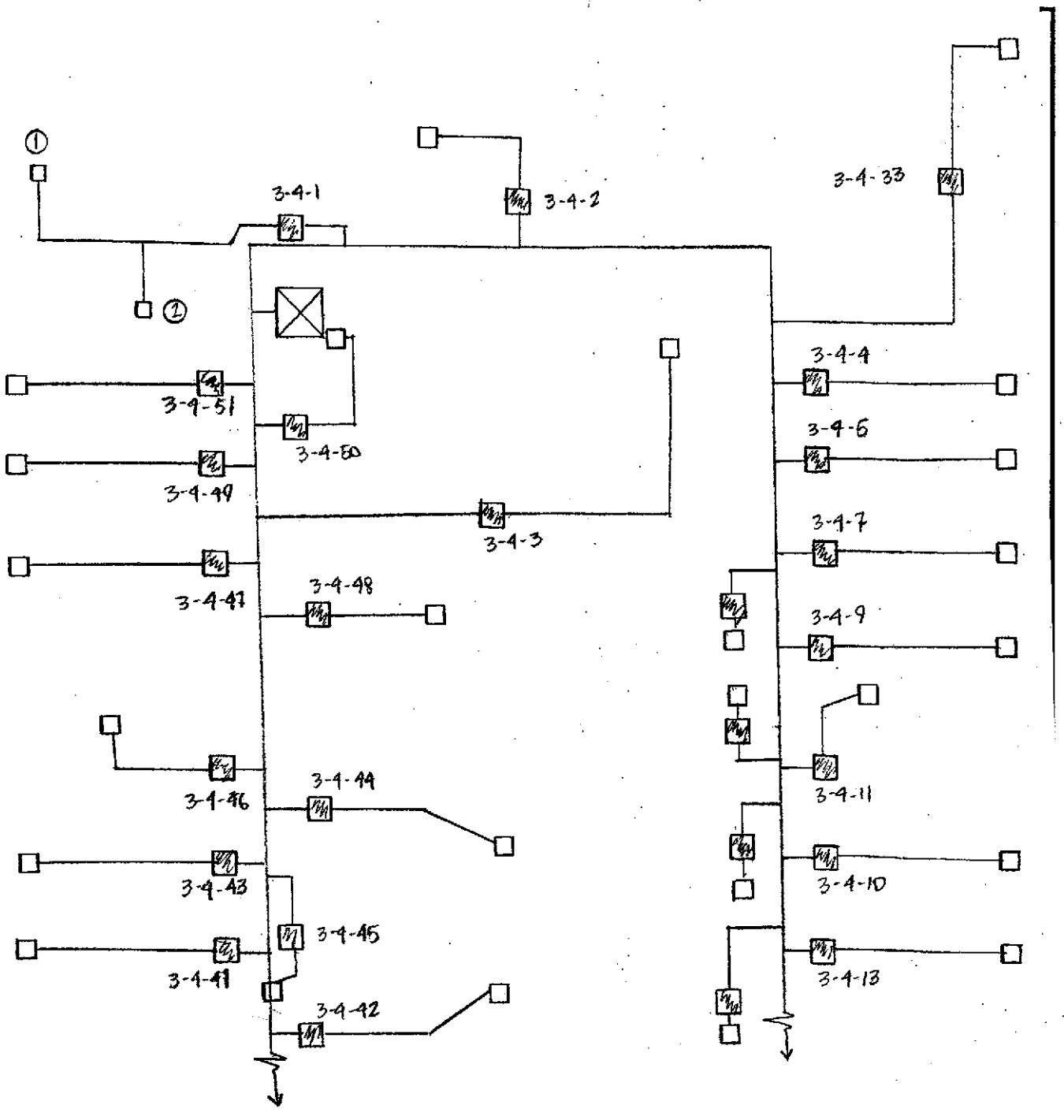
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Fourth Floor



Fulton Air Balance
Certification No. 2426

FILE NAME: p48_iupui_cab-ctc

TEST DATE:

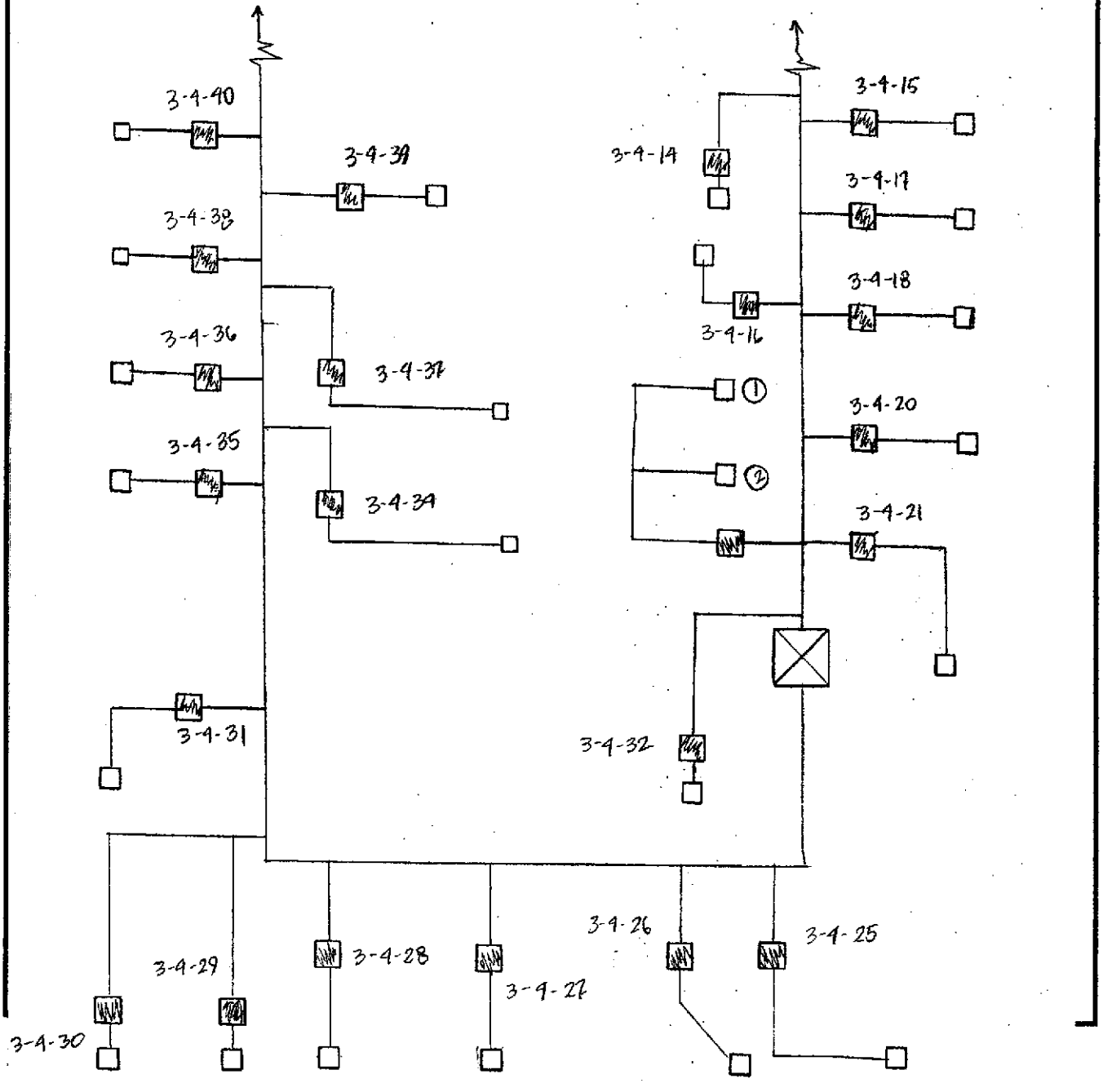
READINGS BY:

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Fourth Floor



Fulton Air Balance
Certification No. 2426

FILE NAME: p49_iupui_cab-ctc

TEST DATE:

READINGS BY:

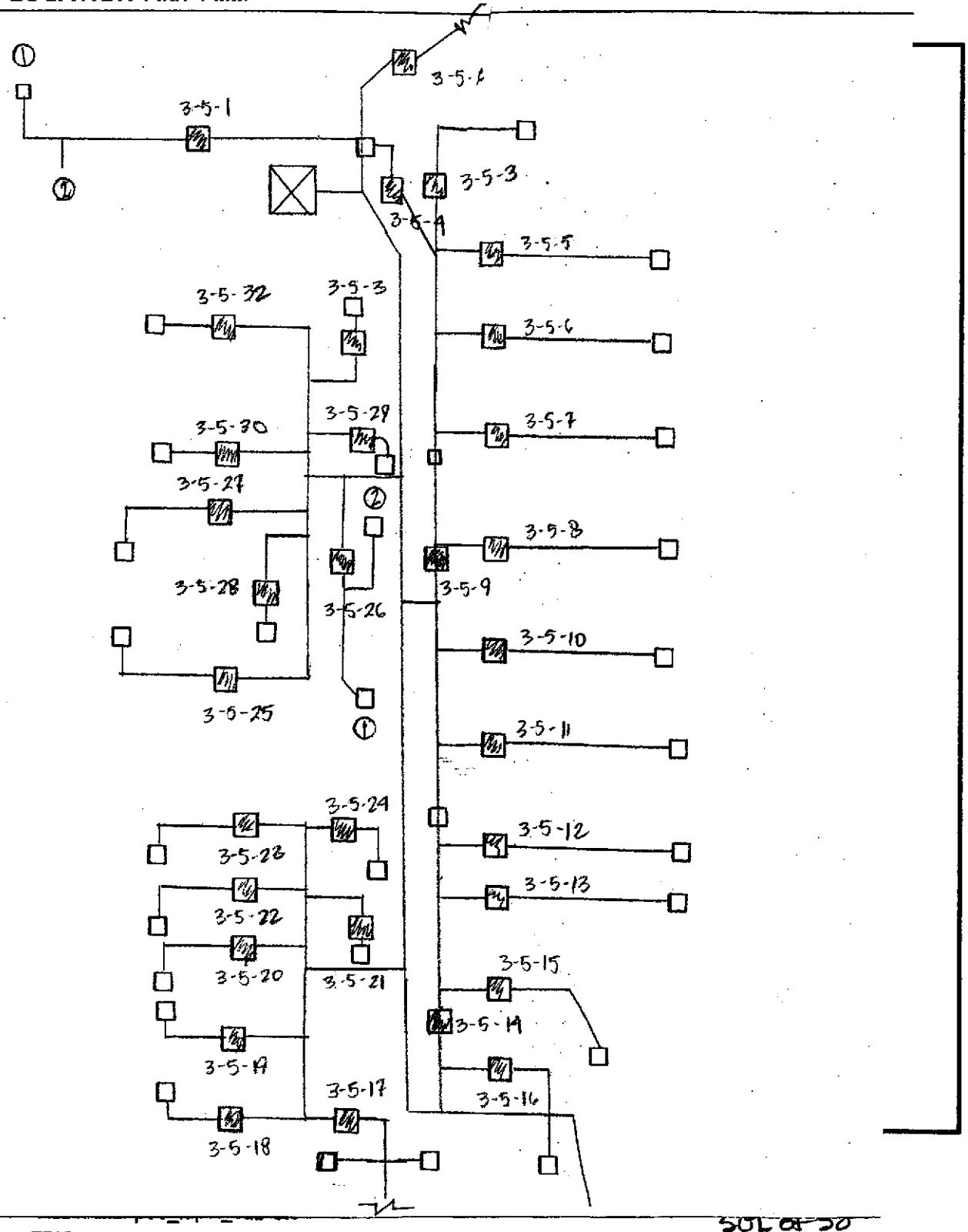
NEBB

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT AHU-CAB-3

LOCATION Fifth Floor



TEST DATE:

READINGS BY:

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. EF-1		FAN NO. EF-2		FAN NO. EF-3	
Location	Roof		Roof		Roof	
Service	CAB-Toilet Rooms		CTC-Toilet Rooms North		CTC-Toilet Rooms South	
Manufacturer	Cook		Cook		Cook	
Model Number	270C9B		225C6B		135SQN-B	
Serial Number	NS		NS		NS	
Type/Class	Roof Exhauster		Roof Exhauster		Roof Exhauster	
Motor Make/Style	US Electric/ODP		Marathon/ODP		Baldor/ODP	
Motor HP/RPM/Frame	2/ 1740 / 145T		3/4 / 1725 / 56		1/3 / 1725 / 56	
Volts/Phase/Hertz	208/3/60		208-230/460/3-60		230/3/60	
F.L. Amps/S.F.	1.4 / 1.15		2.7-2.8 / 1.4 / 1.25		4.2 / 1.15	
Motor Sheave Make/Model	Maska		Maska		Maska	
Motor Sheave Diam./Bore	8400 X 7/8		MVL40 X 5/8"		MVL40 X 5/8"	
Fan Sheave Make	Maska		Browning		Browning	
Fan Sheave Diam./Bore	38AMZ X 1"		AK64 X 1"		AK39 X 3/4"	
No. Belts/Make/Size	2/Daco/AP32		1/Goodyear/A25		1/Checkmate/AP41	
Sheave Center Distance	7 3/4"		6"		15 1/2"	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	5865	4340	3335	3076	1120	1105
Fan RPM	681	731	690	832	1201	1705
S.P. In/Out	NS	NA	NS	NA	NS	NA
Total S.P.	0.81	NA	0.63	NA	0.63	NA
Voltage	200	202	208-230	208	208-230	207
Amperage	6.4	6.5	2.8	3.0	4.2	4.3
Bhp	1.48	2.05	.565	.69	0.232	0.3
Hz		*		*	*	*

REMARKS:

(1) Motor sheave OD = 4 1/8
(2) Fan sheave OD - 8 1/8
*Fan out of amps!

READINGS BY: KAH

TEST DATE: 5/18/2005

FILE NAME: p1_iupui_cab-ctc_D

FULTON AIR BALANCE
Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. EF-CTC		FAN NO.		FAN NO.	
Location	Lightwell					
Service	Lightwell					
Manufacturer	Cook					
Model Number	150CPFB					
Serial Number	NS					
Type/Class	SWSI					
Motor Make/Style	Marathon/ODP					
Motor HP/RPM/Frame	3/4 / 1725 / 56					
Volts/Phase/Hertz	208/3/60					
F.L. Amps/S.F.	2.7-2.8 / 1.25					
Motor Sheave Make/Model	Browning					
Motor Sheave Diam./Bore	1VL34 X 5/8"					
Fan Sheave Make	Browning					
Fan Sheave Diam./Bore	AK68H X 052L X 1"					
No. Belts/Make/Size	1/Dayco/AP37					
Sheave Center Distance	12 3/4"					
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	2000	2170				
Fan RPM	585	588				
S.P. In/Out	NS	NA				
Total S.P.	0.65	NA				
Voltage	208	206				
Amperage	2.8	2.2				
Bhp	0.396	0.58				
Hz						

REMARKS:

READINGS BY: KAH

TEST DATE: 5/18/2005

FILE NAME: p2_iupui_cb-ctc_D

FULTON AIR BALANCE

Certification No. 2426

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM EF-1

OUTLET MANUFACTURER: Titus

TEST APPARATUS Flowhood

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
EF-1											
052	1	H	12X10	1.0		255				180	71%
099Y	2	H	12X8	1.0		175				120	69%
099Y	3	H	12X8	1.0		175				130	74%
099Y	4	H	12X8	1.0		175				130	74%
099Z	5	H	12X8	1.0		175				125	71%
099Z	6	H	12X8	1.0		175				135	77%
099Z	7	H	12X8	1.0		175				125	71%
067	8	H	10X10	1.0		230				175	76%
156	9	H	8X6	1.0		80				60	75%
199Y	10	H	12X8	1.0		200				145	73%
199Y	11	H	12X8	1.0		200				160	80%
199Y	12	H	12X8	1.0		200				145	73%
199Y	13	H	12X8	1.0		200				155	78%
199Z	14	H	12X8	1.0		200				145	73%
199Z	15	H	12X8	1.0		200				140	70%
199Z	16	H	12X8	1.0		200				155	78%
199Z	17	H	12X8	1.0		200				150	75%
299Y	18	H	12X8	1.0		165				120	73%
299Y	19	H	12X8	1.0		165				120	73%
299Y	20	H	12X8	1.0		165				115	70%
299Z	21	H	12X8	1.0		165				115	70%
299Z	22	H	12X8	1.0		165				115	70%
299Z	23	H	12X8	1.0		165				120	73%
261	24	H	8X6	1.0		80				65	81%
399Y	25	H	12X6	1.0		160				125	78%
399Y	26	H	12X6	1.0		160				115	72%
399Z	27	H	12X6	1.0		160				125	78%

REMARKS:

READINGS BY: GH/RMS

File Name: p3_iupui_cab-ctc_D

Test Date: 05/18/05

Fulton Air Balance

Certification 2426

NEBB

AIR OUTLET TEST REPORT

ROJECT IUPUI CAB/CTC

SYSTEM EF'S

OUTLET MANUFACTURER: Titus

TEST APPARATUS Flowhood

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
EF-1											
399Z	28	H	12X6	1.0		160				140	88%
363	29	H	8X6	1.0		80				70	88%
499Y	30	H	12X6	1.0		155				120	77%
499Y	31	H	12X6	1.0		155				120	77%
499Z	32	H	12X6	1.0		155				120	77%
499Z	33	H	12X6	1.0		155				115	74%
499R	34	H	6X6	1.0		60				50	83%
576	35	H	6X6	1.0		80				70	88%
599Z	36	H	12X6	1.0		165				130	79%
599Y	37	H	12X6	1.0		165				125	76%
						5721				4340	76%
EF-2											
099U	1	H	12X6	1.0		150	65	100	120	125	83%
099V	2	H	12X6	1.0		150	65	100	120	125	83%
002	3	H	12X6	1.0		120	85	120	100	105	88%
102	4	H	6X6	1.0		60	35	25	50	55	92%
199U	5	H	12X8	1.0		205	100	110	160	165	80%
199U	6	H	12X8	1.0		205	50	75	155	160	78%
100	7	H	12X6	.43	(326)	140	(359)/154	(481)/207	(269)/116	(281) 121	
119	8	H	6X6	1.0		80	35	35	65	70	88%
119V	9	H	12X8	1.0		205	100	110	160	170	83%
199V	10	H	12X8	1.0		205	110	135	160	170	83%
299U	11	H	12X8	1.0		160	130	155	140	145	91%
299V	12	H	12X8	1.0		165	130	160	145	150	91%
202	13	H	6X6	1.0		80	45	45	70	75	94%
						1925					

REMARKS:

READINGS BY: GH/RMS

File Name: p4_iupui_cab-ctc_D

Test Date: 12/29/05

Fulton Air Balance

Certification 2426

AIR OUTLET TEST REPORT

. ROJECT IUPUI CAB/CTC

SYSTEM EF'S

OUTLET MANUFACTURER: Titus

TEST APPARATUS Flowhood/RVA

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of	
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN	
204	14	H	8X4	1.0		80	(309)/59	(356)/68	(356)/68	70	88%	
399U	15	H	12X8	.19	(421)	165	100	125	135	140	85%	
399V	16	H	12X8	1.0		165	130	150	140	145	88%	
306	17	H	6X6	1.0		80	50	65	70	75	94%	
304	18	H	8X4	.19	(421)	80	(319)/60	(457)/87	(374)/71	75	94%	
411	19	H	6X6	1.0		60	45	50	60	65	108%	
408	20	H	8X6	1.0		80	100	110	65	70	88%	
499U	21	H	12X8	1.0		190	120	130	160	170	89%	
499V	22	H	12X8	1.0		190	160	190	160	170	89%	
404	23	H	6X6	.21	(333)	70	(499)/105	(612)/129	(326)/62	65	93%	
505W	24	H	6X6	.21		80	75	95	65	70	88%	
503M	25	H	6X6	.21		80	120	135	70	75	94%	
EF-2	26		8X8			NS	205	250	250	250	(1)	
										3076		
EF-3												
037	1	H	8X8	1.0		130	35	55	75	90	69%	(2)
Kitchen NT	2	H	6X6	1.0		50	5	35	35	40	80%	
129D	3	H	8X6	1.0		95	20	50	65	75	79%	(2)
129E	4	H	8X6	1.0		95	0	50	65	75	79%	(2)
131E	5	H	8X6	1.0		100	0	30	50	60	60%	
299W	6	H	10X6	1.0		120	60	80	90	105	88%	
299X	7	H	8X6	1.0		80	65	80	60	70	88%	
Kitchen NT	8	H	6X6	1.0		50	55	80	45	50	100%	(1)
399X	9	H	10X6	1.0		120	50	60	90	105	88%	
399w	10	H	6X6	1.0		80	75	90	60	70	88%	
Kitchen NT	11	H	6X6	1.0		50	65	80	50	60	120%	(1)
499W	12	H	12X6	1.0		140	130	150	100	115	82%	
499X	13	H	8X6	1.0		100	10	35	70	80	80%	
Kitchen NT	14	H	6X6	1.0		50	100	125	60	70	140%	(1)
129E BR	15	H	6X6	1.0		50	10	45	35	40	80%	
						1310	680	1045		1105	84%	

REMARKS:

(1) OBD 100% shut

(2) OBD 100% open

READINGS BY: KAH

File Name: p5_iupui_cab-ctc_D

Test Date: 12/29/05

Fulton Air Balance

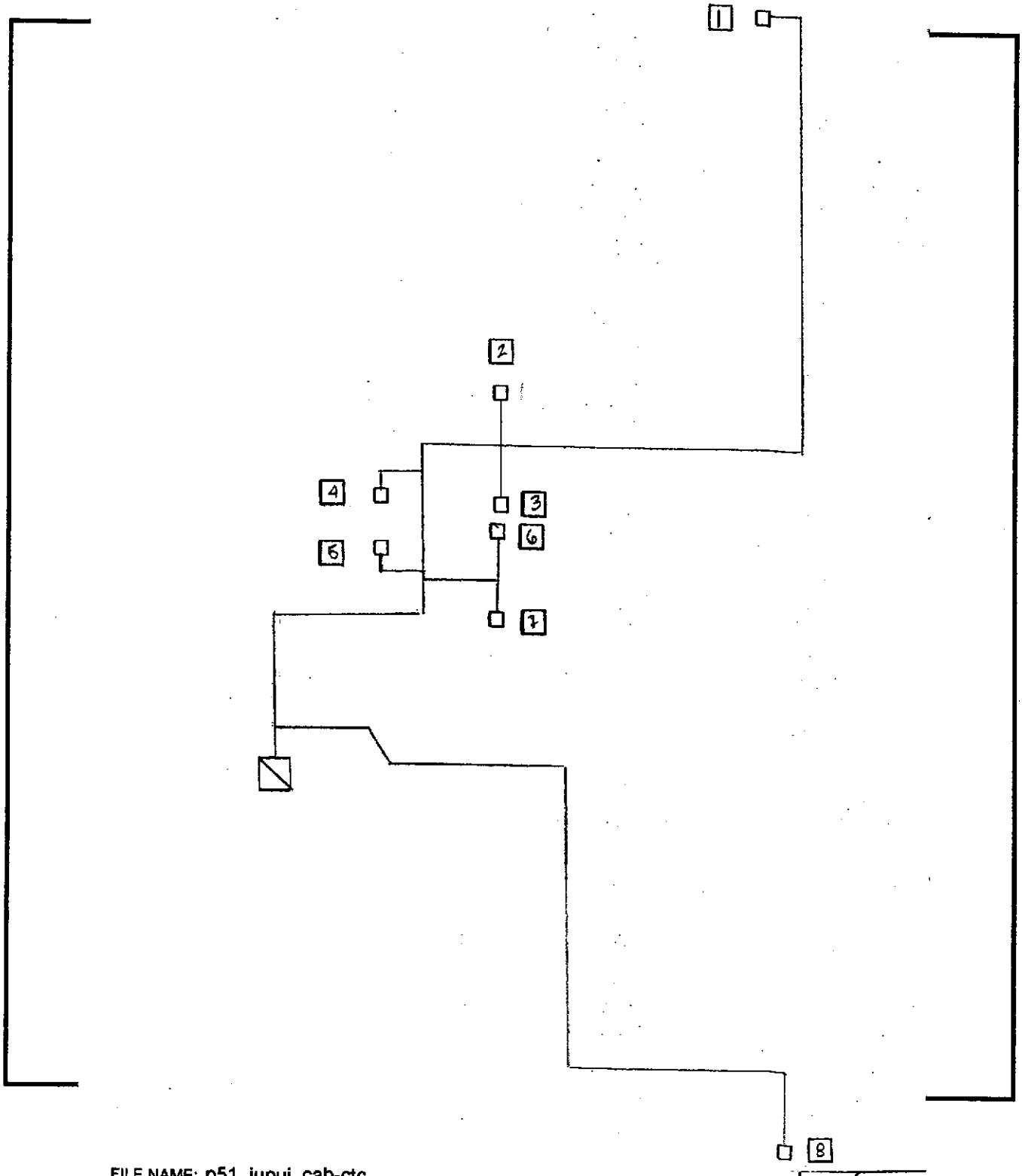
Certification 2426

SYSTEM DIAGRAM

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT EF-1

LOCATION CAB LOWER LEVEL



FILE NAME: p51_iupui_cab-ctc

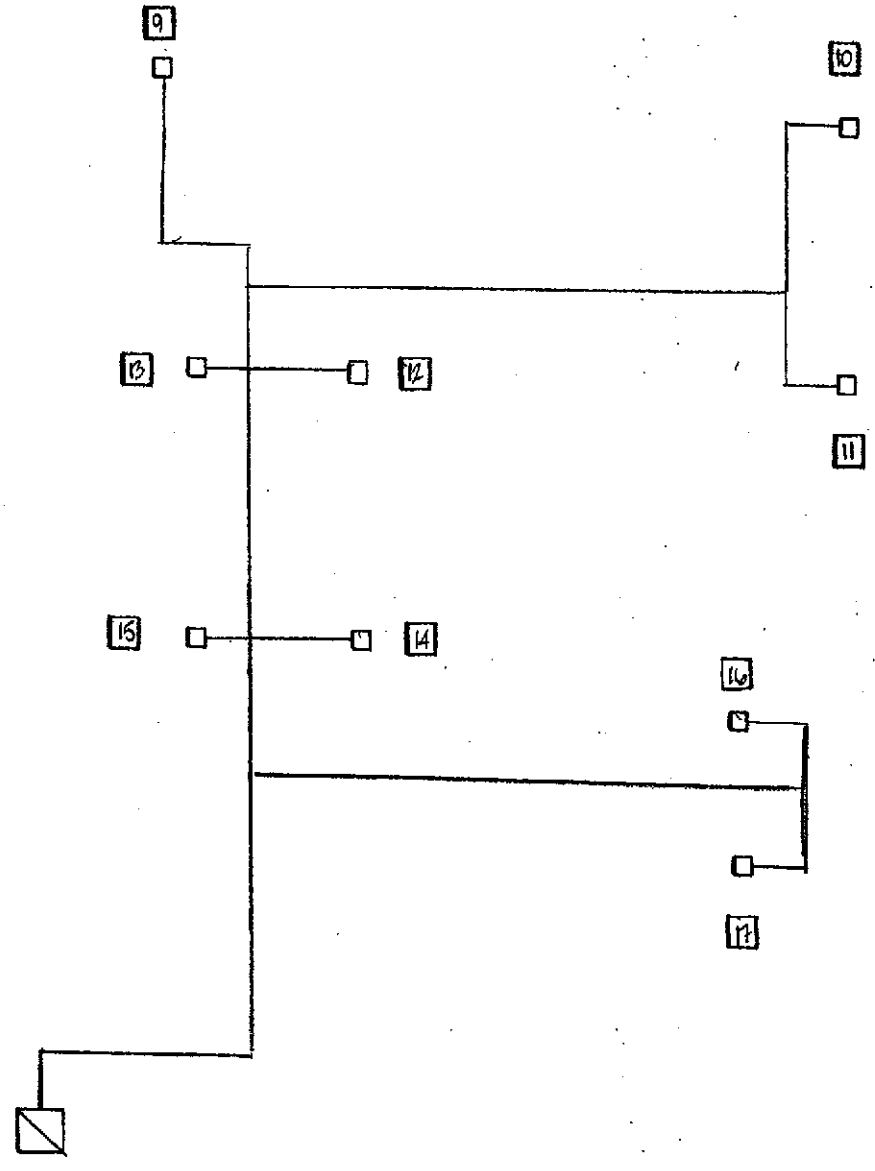
TEST DATE:

READINGS BY:

SYSTEM DIAGRAM

SYSTEM/UNIT EF-1

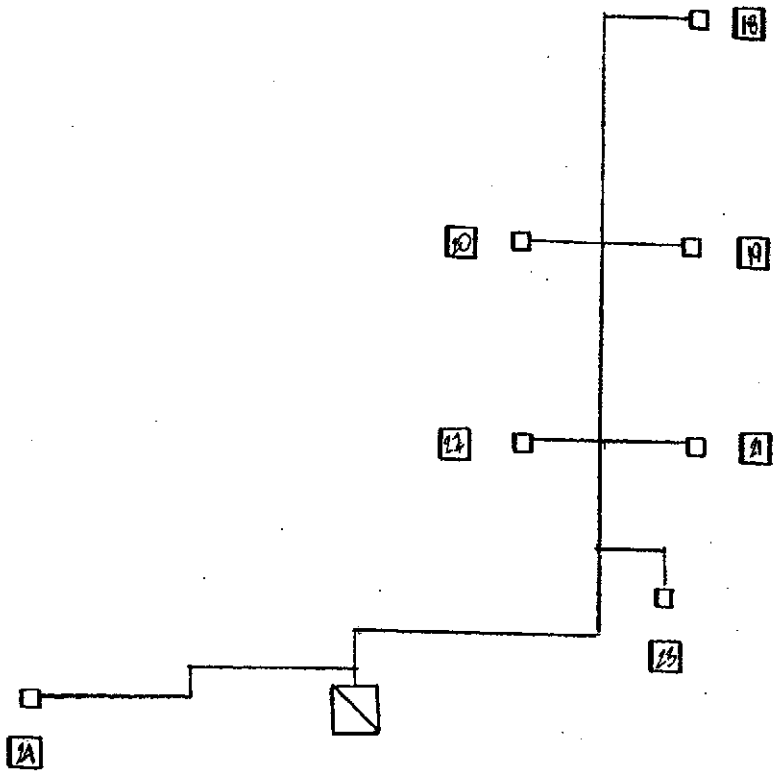
PROJECT IUPUI CAB/CTC
LOCATION CAB First Floor



SYSTEM DIAGRAM

SYSTEM/UNIT EF-1

PROJECT IUPUI CAB/CTC
LOCATION CAB Second Floor

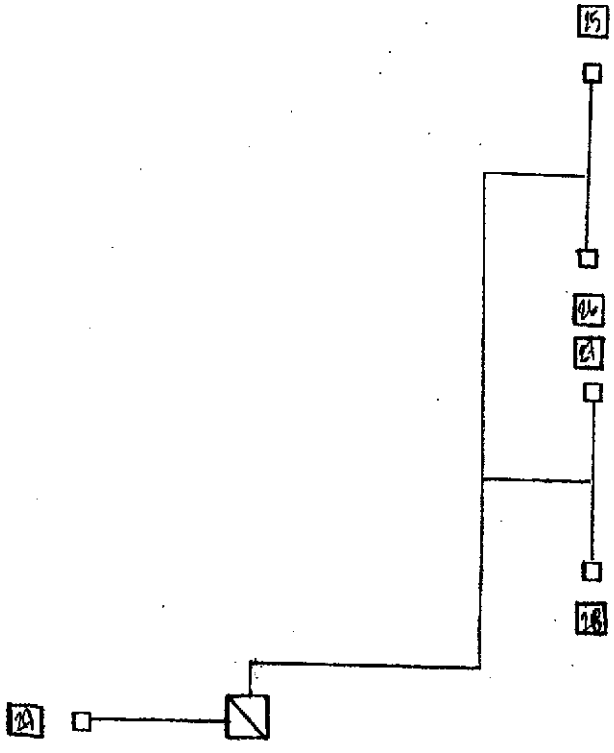


NEBB

SYSTEM DIAGRAM

SYSTEM/UNIT EF-1

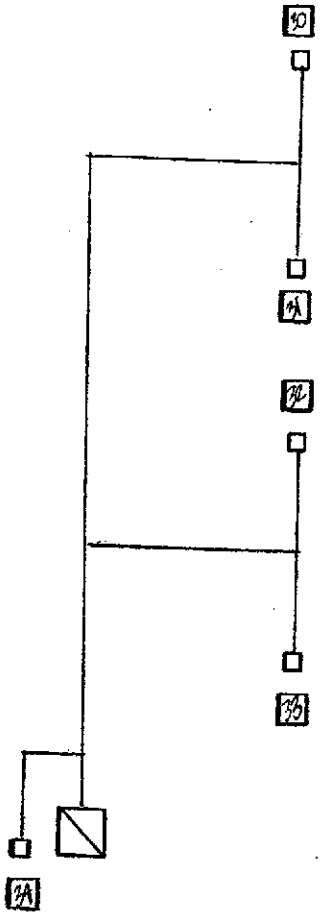
PROJECT IUPUI CAB/CTC
LOCATION CAB Third Floor



SYSTEM DIAGRAM

SYSTEM/UNIT EF-1

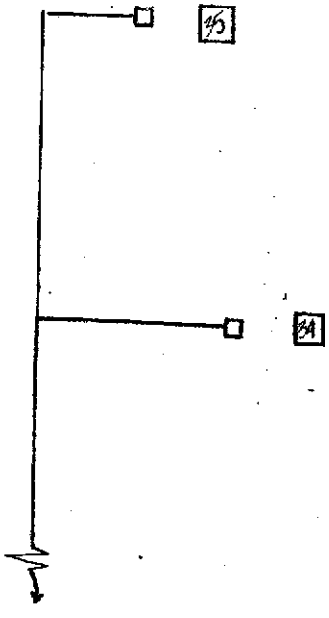
PROJECT IUPUI CAB/CTC
LOCATION CAB Fourth Floor



SYSTEM DIAGRAM

SYSTEM/UNIT EF-1

PROJECT IUPUI CAB/CTC
LOCATION CAB Fifth Floor

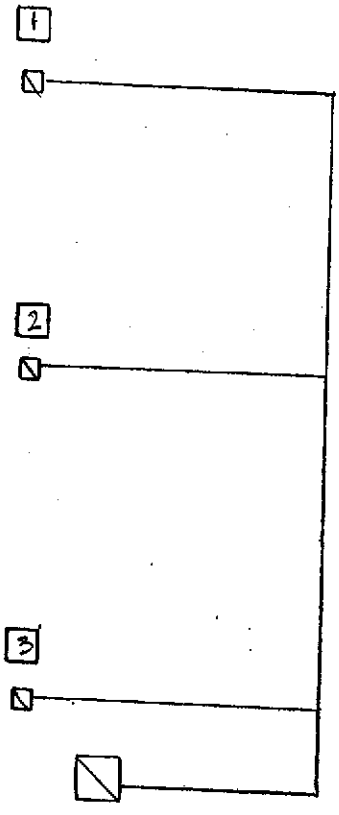


NEBB

SYSTEM DIAGRAM

SYSTEM/UNIT EF-2

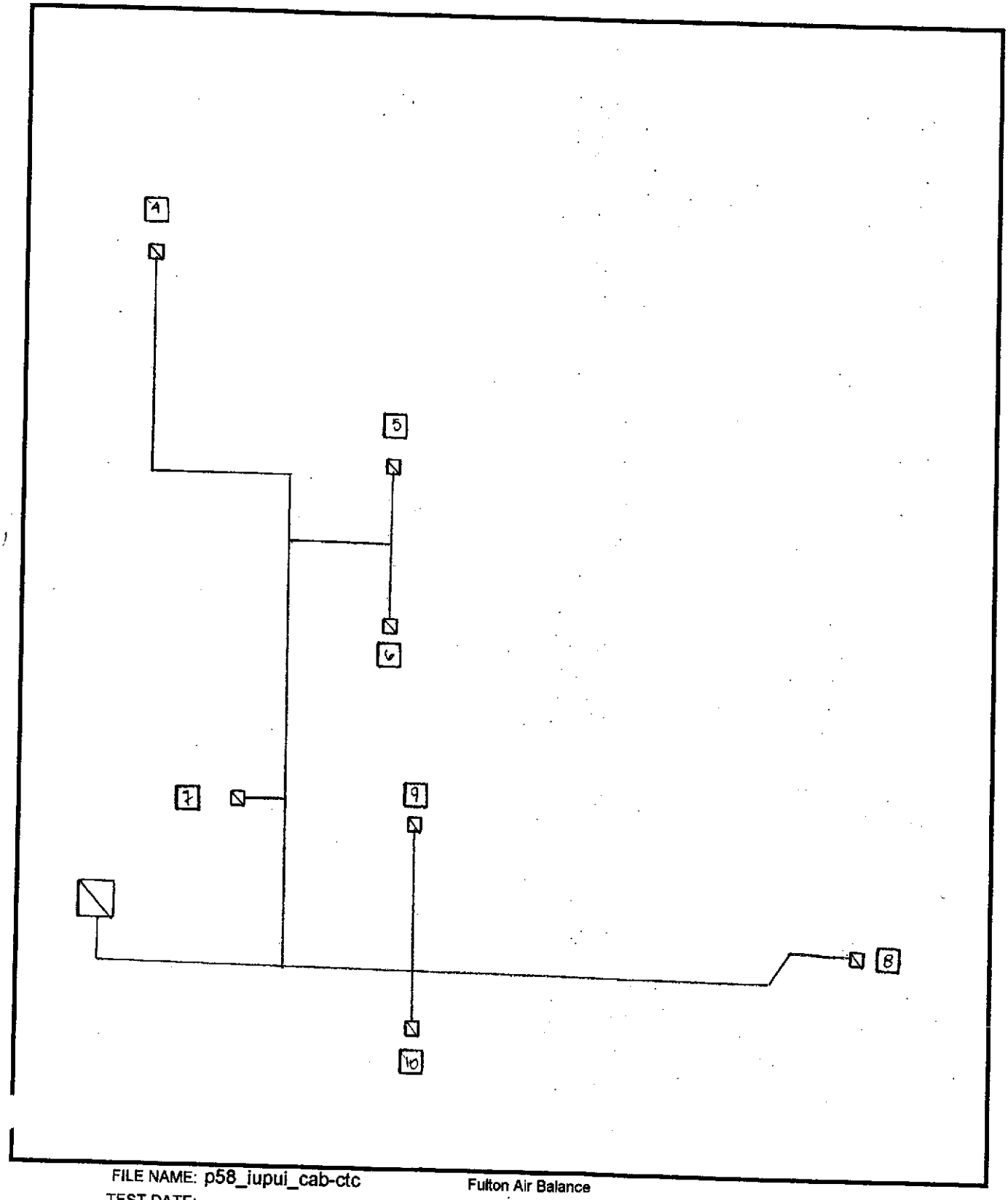
PROJECT IUPUI CAB/CTC
LOCATION CTC LOWER LEVEL



SYSTEM DIAGRAM

SYSTEM/UNIT EF-2

PROJECT IUPUI CAB/CTC
LOCATION CTC FIRST FLOOR

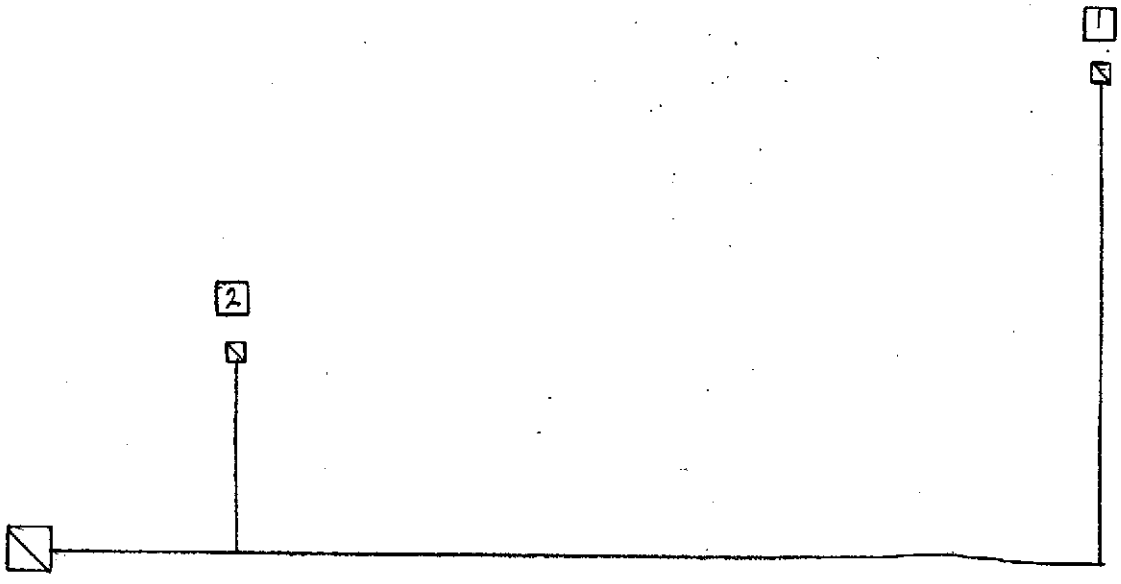


SYSTEM DIAGRAM

SYSTEM/UNIT EF-3

PROJECT IUPUI CAB/CTC

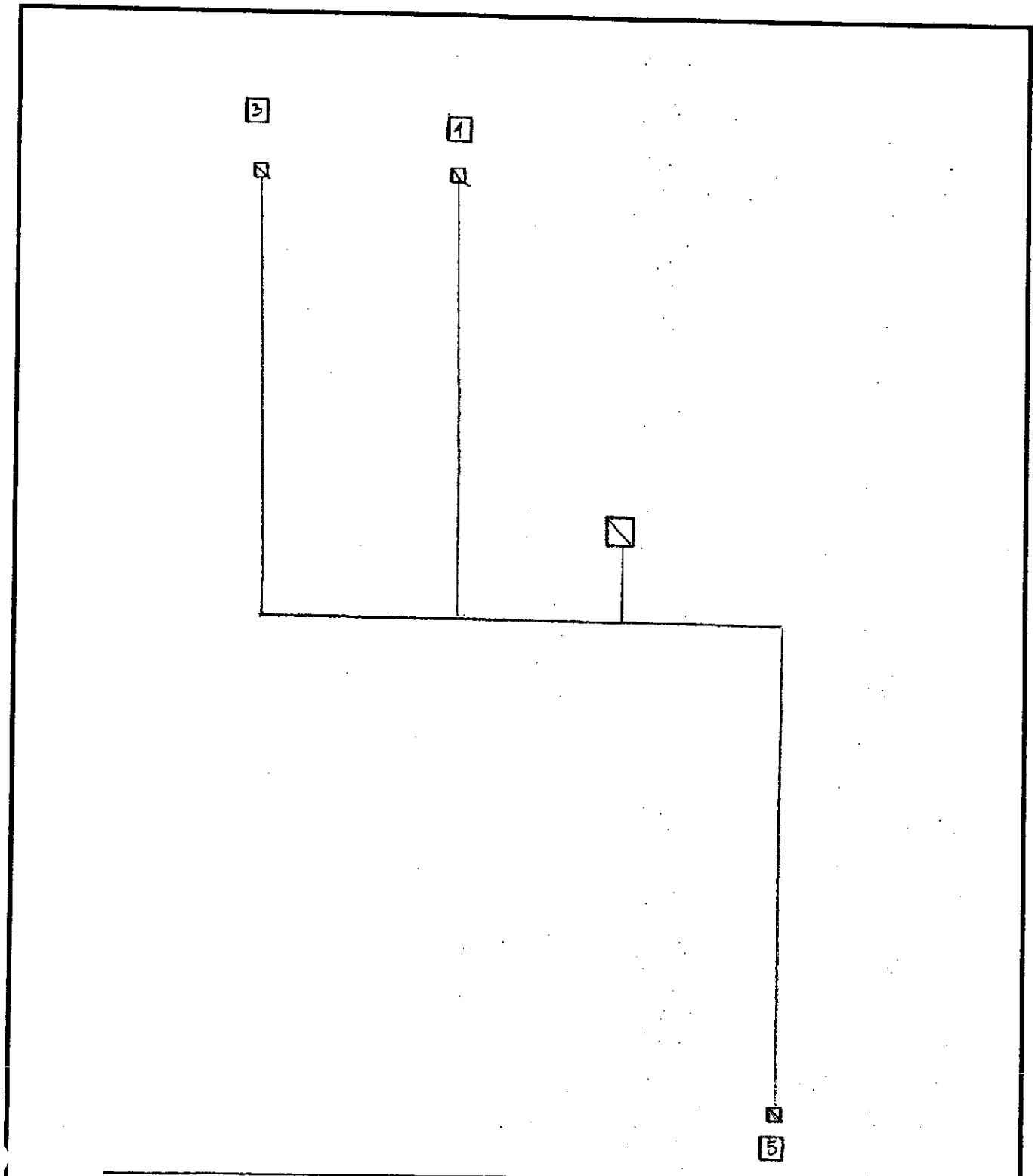
LOCATION CTC - LOWER LEVEL



SYSTEM DIAGRAM

SYSTEM/UNIT EF-3

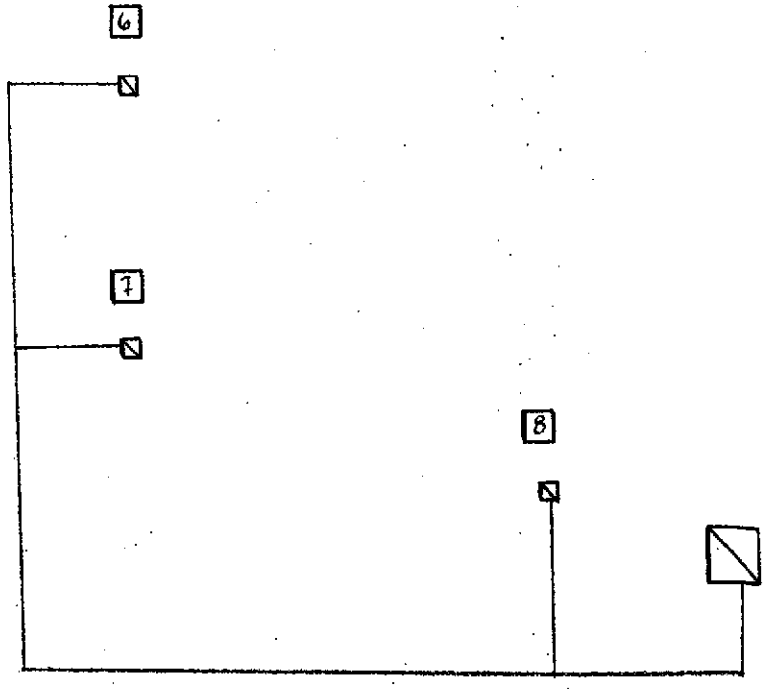
PROJECT IUPUI CAB/CTC
LOCATION CTC -First Floor



SYSTEM DIAGRAM

SYSTEM/UNIT EF-3

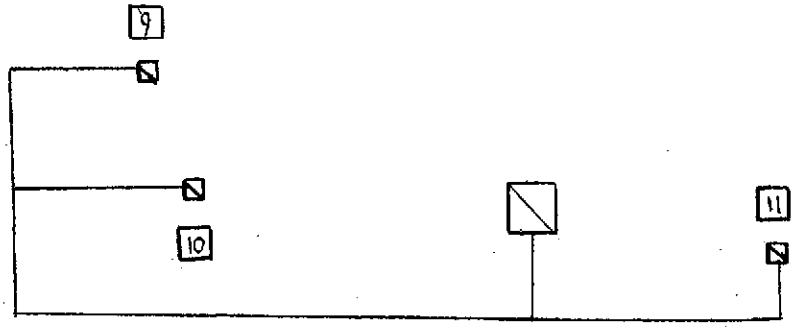
PROJECT IUPUI CAB/CTC
LOCATION CTC -Second Floor



SYSTEM DIAGRAM

SYSTEM/UNIT EF-3

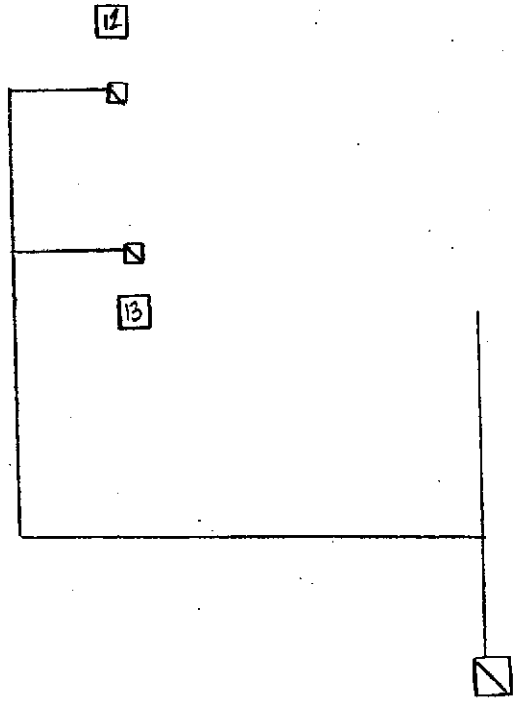
PROJECT IUPUI CAB/CTC
LOCATION CTC -Third Floor



SYSTEM DIAGRAM

SYSTEM/UNIT EF-3

PROJECT IUPUI CAB/CTC
LOCATION CTC -Fourth Floor



AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM EF-4

OUTLET MANUFACTURER: NA

TEST APPARATUS Amp probe

AREA SERVED	OUTLET				DESIGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
Lightwell	1	X	24x18			2000				2170	*

REMARKS: * Fan set by Bhp. See fan sheet

READINGS BY: KAH

File Name: p6_iupui_cab-ctc_D

Test Date: 05/18/05

Fulton Air Balance

Certification 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. FCU-1 (EAST)		FAN NO. FCU-2		FAN NO. FCU-3	
Location	001A		001		001	
Service	001A		001		001	
Manufacturer	Trane		Trane		Trane	
Model Number	LPCAA06F2		LPCAA08F2		LPCAA08F2	
Serial Number	TO3H50797		TO3C14981		TO3C14983	
Type/Class	Packaged AHU / NS		Packaged AHU / NS		Packaged AHU / NS	
Motor Make/Style	Baldor / OPSB		Baldor / OPSB		Baldor / OPSB	
Motor HP/RPM/Frame	2/1725/56H		3/1725/56H		3/1725/56H	
Volts/Phase/Hertz	208-230-460/3/60		208-230-460/3/60		208-230-460/3/60	
F.L. Amps/S.F.	5.9-5.6-2.8/1.15		8.7-8.0-4.0/1.15		8.7-8.0-4.0/1.15	
Motor Sheave Make/Model	Browning		Browning		Browning	
Motor Sheave Diam./Bore	1VL40 / 5/8"		1VL40 / 5/8"		1VL40 / 5/8"	
Fan Sheave Make	Browning		Browning		Browning	
Fan Sheave Diam./Bore	AK51 / 3/4"		BX50 / 1"		BX50 / 1"	
No. Belts/Make/Size	1/Browning/A46		1/Browning/BX32		1/Browning/BX32	
Sheave Center Distance	18"		11 1/8"		11"	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	3000	(1) 3048	4000	(2) 4126	4000	(3) 3924
Fan RPM	1133	947	1283	1176	1283	1243
S.P. In/Out	NS	-1.25"/+.10"	NS	-1.45"/+0.0"	NS	-1.85"/+0.0"
Total S.P.	1.89	1.35"	2.07	1.45"	2.07	1.85
Voltage	460	479 479 478	460	480 481 479	460	479 481 478
Amperage	2.8	2.3 2.3 2.6	4.0	3.1 3.2 2.9	4.0	3.3 3.6 3.5
Bhp	1.682	1.78	2.419	2.40	2.419	2.71
Hz						

REMARKS:

(1) Determined by 3 min. RVA reading of 574 average FPM across a 34.75" x 22" (Free area) return opening.

(2) Determined by 3 min. RVA reading of 777 average FPM across a 34.75" x 22" (Free area) return opening.

(3) Determined by 3 min. RVA reading of 739 average FPM across a 34.75" x 22" (Free area) return opening.

READINGS BY: WLK

TEST DATE: 5/14/2005

FILE NAME: p1_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. FCU-4		FAN NO. FCU-5		FAN NO.	
Location	001		002			
Service	001		002			
Manufacturer	Trane		Trane			
Model Number	LPCAA08F2		BCHC054D2			
Serial Number	TO3C14985		TO3C14989			
Type/Class	Packaged AHU / NS		Packaged AHU / NS			
Motor Make/Style	Baldor / OPSB		Marathon/DP			
Motor HP/RPM/Frame	3/1725/56H		3/4 / 1725 / 56			
Volts/Phase/Hertz	208-230-460/3/60		277/1/60			
F.L. Amps/S.F.	8.7-8.0-4.0/1.15		4.3/1.15			
Motor Sheave Make/Model	Browning		Browning			
Motor Sheave Diam./Bore	1VL40 / 5/8"		1VL40 / 5/8"			
Fan Sheave Make	Browning		SST			
Fan Sheave Diam./Bore	BX50 / 1"		AL84 / 3/4"			
No. Belts/Make/Size	1/Browning/BX32		1/Carlisle/AX47			
Sheave Center Distance	11 3/8"		15 5/8"			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	4000	(1) 4158	1800	(2) 1886		
Fan RPM	1283	1147	839	602		
S.P. In/Out	NS	-1.50"/+0.0"	NS	-0.46"/+0.0"		
Total S.P.	2.09	1.50"	1.13	0.46"		
Voltage	460	478 480 479	277	279		
Amperage	4.0	3.4 3.2 3.2	4.3	2.8		
Bhp	2.419	2.55	0.651	0.49		
Hz						

REMARKS:

(1) Determined by 3 min. RVA reading of 783 average FPM across a 34.75" x 22" (Free area) return opening.

(2) Determined by 3 min. RVA reading of 460 average FPM across a 33.75" x 17.5" (Free area) return opening.

READINGS BY: WLK

TEST DATE: 5/17/2005

FILE NAME: p2_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. FCU-6		FAN NO. FCU-7		FAN NO.	
Location	Central Attendant Services		Central Attendant Services			
Service	Central Attendant Services		Central Attendant Services			
Manufacturer	Trane		Trane			
Model Number	FCJB0603H		FCJB0603H			
Serial Number	TO3C14998		TO3C14997			
Type/Class	Fan Coil Unit		Fan Coil Unit			
Motor Make/Style	A. O. Smith / TP		A. O. Smith / TP			
Motor HP/RPM/Frame	.12/1080-600/NS		.12/1080-600/NS			
Volts/Phase/Hertz	277/1/60		277/1/60			
F.L. Amps/S.F.	.6/NS		.6/NS			
Motor Sheave Make/Model	Direct Drive		Direct Drive			
Motor Sheave Diam./Bore	Direct Drive		Direct Drive			
Fan Sheave Make	Direct Drive		Direct Drive			
Fan Sheave Diam./Bore	Direct Drive		Direct Drive			
No. Belts/Make/Size	Direct Drive		Direct Drive			
Sheave Center Distance	Direct Drive		Direct Drive			
Filters	1/34 X 9 1 / TA		1/34 X 9 x 1 / TA			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	370	393	370	348		
Fan RPM	Medium (1)	Low	Medium (2)	Low		
S.P. In/Out	NS	NS	NS	NS		
Total S.P.	.01 NA	NS	.01 NA	NS		
Voltage	277	277	277	277		
Amperage	.6	0.2	.6	.02		
Bhp						
Hz						

REMARKS: AK 1.25 Vel = 314 AK 1.25 VEL = 279

(1) Fan will not run in medium speed

(2) Fan will not run in medium speed

READINGS BY: WG

TEST DATE: 5/18/2005

FILE NAME: p3_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. FCU-7		FAN NO. FCU-8		FAN NO. FCU-9	
Location			Elevator Mechanical Rm 698		Electrical Mechanical Rm 695	
Service			Elevator Mechanical Rm 698		Electrical Mechanical Rm 695	
Manufacturer			Trane		Trane	
Model Number			BCHC024D2		BCHC024D2	
Serial Number			TO3C14991		TO3C14993	
Type/Class			Package Unit/NS		Package Unit/NS	
Motor Make/Style			Marathon/DP		Marathon/DP	
Motor HP/RPM/Frame			1/3 / 1725 / 56		1/3 / 1725 / 56	
Volts/Phase/Hertz			277/1/60		277/1/60	
F.L. Amps/S.F.			2.5/1.15		2.5/1.15	
Motor Sheave Make/Model			NA		NA	
Motor Sheave Diam./Bore			3 3/4" ADJ / 5/8"		3 3/4" ADJ / 5/8"	
Fan Sheave Make			Browning		Browning	
Fan Sheave Diam./Bore			AK74S / 3/4"		AK74S / 3/4"	
No. Belts/Make/Size			1/Browning/AX43		1/Browning/AX43	
Sheave Center Distance			14 3/8"		14 5/16"	
TEST DATA	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
CFM			800	(1) 836	800	(2) 818
Fan RPM			1207	661	1207	672
S.P. In/Out			NS	-0.31"/+0.0"	NS	-0.34"/+0.0"
Total S.P.			1.20	0.31"	1.20	0.32
Voltage			277	279	277	280
Amperage			2.5	1.9	2.5	1.9
Bhp			0.288	0.253	0.288	0.253
Hz						

REMARKS:
(1) Airflow determined by RVA reading of 414 FPM across a 20 3/4" x 14" return opening.
(2) Airflow determined by RVA reading of 405 FPM across a 20 3/4" x 14" return opening.

READINGS BY: WLK

TEST DATE: 5/18/2004
FILE NAME: p4_iupui_cab-ctc_E

FULTON AIR BALANCE
Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTR

FAN DATA	FAN NO. FCU-10		FAN NO. FCU-11		FAN NO.	
Location	Elevator Mechanical Rm 697		001A			
Service	Elevator Mechanical Rm 697		001A			
Manufacturer	Trane		Trane			
Model Number	BCHC024D2		LPCAA06F2			
Serial Number	TO3C14995		TO3C14979			
Type/Class	Package Unit / NS		Package Unit / NS			
Motor Make/Style	Marathon/DP		Baldor/ OPSB			
Motor HP/RPM/Frame	1/3 / 1725 / 56		2 / 1725 / 56H			
Volts/Phase/Hertz	277/1/60		208-230-460/3/60			
F.L. Amps/S.F.	2.5/1.15		5.9-5.6-2.8 / 1.15			
Motor Sheave Make/Model	NA		Browning			
Motor Sheave Diam./Bore	3 3/4" ADJ / 5/8"		1VL34 / 5/8"			
Fan Sheave Make	Browning		Browning			
Fan Sheave Diam./Bore	AK74S / 3/4"		AK44 X 3/4"			
No. Belts/Make/Size	1/Browning/A43		1/Browning/AX46			
Sheave Center Distance	14 5/16"		19"			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	800	(1) 808	3000	(1) 3032		
Fan RPM	1207	713	1133	896		
S.P. In/Out	NS	-0.34"/+0.0"	NS	-1.15/+0.06		
Total S.P.	1.20	0.34"	1.89	1.21"		
Voltage	277	282	460	476 476 475		
Amperage	2.5	1.7	2.8	2.3 2.0 2.0		
Bhp	0.288	0.228	1.682	1.55		
Hz						

REMARKS: (1) Airflow determined by RVA reading of 400 FPM across a 20 3/4" x 14" return opening.

READINGS BY: WLK

TEST DATE: 5/17/2004

FILE NAME: p5_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-1

LOCATION Lower Level - 019

UNIT DATA	
Make/Model No.	Liebert / FH376C
Type/Size	FC / NS
Serial Number	308021-001
Arrangement/Class	Drawthru / 1
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2BK90H / 1 3/16"
N. Belts/make/size	2/Goodyear/B42
No. Filters/type/size	6/Pleated/24 X 18 X 4

MOTOR DATA	
Make/Frame	U. S. Motors / 213T
H.P./RPM	7.5 / 1765
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	21.0-19.0-9.5 / 1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	11"
Sheave Oper. Diam.	One Turn Open

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	9100	(1) 9091
Total S.P.	NS	2.24"
Fan RPM	NS	1130
External S.P.	.30	.04"
Motor Volts	460	479 481 480
Motor Amps	9.5	9.1 9.3 8.7
Corrected F.L.Amps	NA	9.10
B.H.P.	NS	7.4
Outside Air	NA	NA
Return Air	9100	9091
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	0.04"
Suction S.P.	NS	2.2"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	1.0"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position		

REMARKS:

(1) Determined by RVA traverse of 755 average FPM across 5' 8" x 2' 1/2" (free area) return opening

(2) Total drop across both the CW and reheat coils is 1.20" (2.2" - 1.0")

READINGS BY: WLK

File Name: p6_iupui_cab-ctc_E
TEST DATE: 5/13/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-2

LOCATION Lower Level - 024

UNIT DATA	
Make/Model No.	Liebert / FH529C
Type/Size	FC / NS
Serial Number	308021-003
Arrangement/Class	Drawthru / 1
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2BK90H / 1 7/16"
N. Belts/make/size	2/Goodyear/B40
No. Filters/type/size	8/Pleated/24 X 18 X 4

MOTOR DATA	
Make/Frame	U. S. Motors / 215T
H.P./RPM	10 / 1760
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	27.2-24.6-12.3/1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	10 1/8"
Sheave Oper. Diam.	Midrange

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000	(1) 11,957
Total S.P.	NS	2.06"
Fan RPM	NS	1085
External S.P.	.30	0.06"
Motor Volts	460	477 477 476
Motor Amps	12.3	10.2 10.3 10.4
Corrected F.L.Amps	NA	11.87
B.H.P.	NS	8.68
Outside Air	NA	NA
Return Air	12,000	11,957
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	0.06"
Suction S.P.	NS	2.0"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	0.80"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position		

REMARKS:

(1) Determined by RVA traverse of 734 average FPM across 7' 8" x 2' 1/2" (free area) return opening

(2) Total drop across both the CW and reheat coils is 1.20" (2.0" - 8.80")

READINGS BY: WLK

File Name: p7_iupui_cab-ctc_E

TEST DATE: 5/12/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-3

LOCATION 024

UNIT DATA	
Make/Model No.	Liebert / UH529C
Type/Size	
Serial Number	
Arrangement/Class	Upflow /
Discharge	
Make Sheave	
Sheave Diam/Bore	
N. Belts/make/size	
No. Filters/type/size	

MOTOR DATA	
Make/Frame	
H.P./RPM	10
Volts/Phase/Hertz	
F.L. Amps/S.F.	
Make Sheave	
Sheave Diam/Bore	
Sheave Center Distance	
Sheave Oper. Diam.	

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000 (1)	
Total S.P.		
Fan RPM	1750	
Extemal S.P.	.30	
Motor Volts		
Motor Amps		
Corrected F.L.Amps		
B.H.P.		
Outside Air		
Return Air		
Relief Air		

TEST DATA	DESIGN	ACTUAL
Discharge S.P.		
Suction S.P.		
Reheat Coil Delta S.P.		
Cooling Coil Delta S.P.		
Preheat Coil Delta S.P.		
Filters Delta S.P.		
Duct S.P. Setpoint		
Frequency Drive Output		
Vortex Damp. Position		
Out. Air Damp. Position		
Ret. Air Damp. Position		
Relief Damp. Position		

REMARKS: (1) Outlet total 7995

5/12/04 FUTURE UNIT

READINGS BY: WLK

File Name: p8_iupui_cab-ctc_E
TEST DATE: 5/12/04

Fulton Air Balance
Certification No. 2426

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB-CTC SYSTEM CRAC-3

OUTLET MANUFACTURER: TEST APPARATUS Flowhood

AREA SERVED	OU TLET				DES IGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
024	1	EE	12	1.0		535					
024	2	EE	12	1.0		535					
024	3	EE	12	1.0		535					
024	4	EE	12	1.0		535					
024	5	EE	12	1.0		535					
024	6	EE	12	1.0		535					
024	7	EE	12	1.0		535					
024	8	EE	12	1.0		535					
024	9	EE	12	1.0		530					
024	10	EE	12	1.0		530					
024	11	EE	12	1.0		530					
024	12	EE	12	1.0		530					
024	13	EE	12	1.0		530					
024	14	EE	12	1.0		530					
024	15	EE	12	1.0		535					
						7995					

REMARKS:

5/12/04 FUTURE UNIT

READINGS BY: WLK

File Name: p9_iupui_cab-ctc_E

Test Date:

Fulton Air Balance

Certification 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-4

LOCATION Lower Level 024

UNIT DATA	
Make/Model No.	Liebert / FH529C
Type/Size	FC / NS
Serial Number	308021-007
Arrangement/Class	Drawthru/1
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2BK90H / 1 7/16"
N. Belts/make/size	2/Goodyear/B40
No. Filters/type/size	8/Pleated/24X18X4

MOTOR DATA	
Make/Frame	US Motors / 215T
H.P./RPM	10 / 1760
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	27.2-24.6-12.3 / 1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	10 1/8"
Sheave Oper. Diam.	Midrange

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000	(1) 11,924
Total S.P.	NS	2.0"
Fan RPM	NS	1086
External S.P.	.30	0.05"
Motor Volts	460	475 475 475
Motor Amps	12.3	10.4 10.2 10.3
Corrected F.L.Amps	NA	11.91
B.H.P.	NS	8.65
Outside Air	NA	NA
Return Air	12,000	11,924
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	0.05"
Suction S.P.	NS	-1.95"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	0.80"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position	NA	NA

REMARKS:
(1) Determined by RVA reading of 732 average FPM across 7'-8" x 2'-1 1/2" (free area) return opening.
(2) Total drop across both the CW and Reheat coil is 1.15" (1.95 - .80).

READINGS BY: WLK

File Name: p10_iupui_cab-ctc_E
TEST DATE: 5/13/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-5

LOCATION Lower Level 024

UNIT DATA	
Make/Model No.	Liebert / FH529C
Type/Size	FC / NS
Serial Number	308021-007
Arrangement/Class	Drawthru/1
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2BK90H / 1 7/16"
N. Belts/make/size	2/Goodyear/B40
No. Filters/type/size	8/Pleated/24X18X4

MOTOR DATA	
Make/Frame	US Motors / 215T
H.P./RPM	10 / 1760
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	27.2-24.6-12.3 / 1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	10 1/8"
Sheave Oper. Diam.	Midrange

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000	(1) 11,827
Total S.P.	NS	2.10"
Fan RPM	NS	1091
External S.P.	.30	0.05"
Motor Volts	460	476 478 479
Motor Amps	12.3	10.2 10.6 10.0
Corrected F.L.Amps	NA	11.85
B.H.P.	NS	8.66
Outside Air	NA	NA
Return Air	12,000	11,827
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	0.05"
Suction S.P.	NS	-2.05"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	0.95"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position	NA	NA

REMARKS:

(1) Determined by RVA reading of 726 average FPM across 7'-8" x 2'-1 1/2" (free area) return opening.

(2) Total drop across both the CW and Reheat coil is 1.10" (2.05 - .95").

READINGS BY: WLK

File Name: p11_iupui_cab-ctc_E
TEST DATE: 5/13/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-6

LOCATION Lower Level 024

UNIT DATA	
Make/Model No.	Liebert / FH529C
Type/Size	FC / NS
Serial Number	308021-006
Arrangement/Class	Drawthru/NS
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2BK90H / 1 7/16"
N. Belts/make/size	2/Goodyear/B40
No. Filters/type/size	8/Pleated/24X18X4

MOTOR DATA	
Make/Frame	US Motors / 215T
H.P./RPM	10 / 1760
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	27.2-24.6-12.3 / 1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	10 1/8"
Sheave Oper. Diam.	Midrange

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000	(1) 12,152
Total S.P.	NS	2.0"
Fan RPM	NS	1093
External S.P.	.30	0.05"
Motor Volts	460	475 475 477
Motor Amps	12.3	10.3 9.7 9.9
Corrected F.L.Amps	NA	11.89
B.H.P.	NS	8.38
Outside Air	NA	NA
Return Air	12,000	12,152
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	0.05"
Suction S.P.	NS	-1.95"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	0.80"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position	NA	NA

REMARKS:

(1) Determined by RVA reading of 746 average FPM across 7'-8" x 2'-1 1/2" (free area) return opening.

(2) Total drop across both the CW and Reheat coil is 1.15" (1.95 - .80).

READINGS BY: WLK

File Name: p12_iupui_cab-ctc_E
TEST DATE: 5/13/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-7

LOCATION Lower Level 019

UNIT DATA	
Make/Model No.	Liebert / FH376C
Type/Size	FC / NS
Serial Number	308021-002
Arrangement/Class	Drawthru/1
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2BK90H / 1 3/16"
N. Belts/make/size	2/Goodyear/B40
No. Filters/type/size	6/Pleated/24X18X4

MOTOR DATA	
Make/Frame	US Motors / 213T
H.P./RPM	7.5 / 1765
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	21.0-19.0-9.5/1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	10"
Sheave Oper. Diam.	One turn open

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	9100	(1) 9441
Total S.P.	NS	2.09"
Fan RPM	NS	1128
External S.P.	.30	.04"
Motor Volts	460	480 479 481
Motor Amps	9.5	9.1 9.3 9.1
Corrected F.L.Amps	NA	9.1
B.H.P.	NS	7.55
Outside Air	NA	
Return Air	9100	9441
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	0.04"
Suction S.P.	NS	-2.05"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	1.0"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position	NA	NA

REMARKS:

(1) Determined by RVA traverse reading of 784 average FPM across 5'-8" x 2'-1 1/2" (free area) return opening.

(2) Total drop across both the CW and Reheat coil is 1.05" (12.05 - 1.0).

READINGS BY: WLK

File Name: p13_iupui_cab-ctc_E
TEST DATE: 5/14/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC-8

LOCATION 024

UNIT DATA	
Make/Model No.	Liebert / UH529C
Type/Size	
Serial Number	
Arrangement/Class	Upflow /
Discharge	
Make Sheave	
Sheave Diam/Bore	
N. Belts/make/size	
No. Filters/type/size	

MOTOR DATA	
Make/Frame	
H.P./RPM	10
Volts/Phase/Hertz	
F.L. Amps/S.F.	
Make Sheave	
Sheave Diam/Bore	
Sheave Center Distance	
Sheave Oper. Diam.	

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000 (1)	
Total S.P.		
Fan RPM	1750	
External S.P.	.30	
Motor Volts		
Motor Amps		
Corrected F.L.Amps		
B.H.P.		
Outside Air		
Return Air		
Relief Air		

TEST DATA	DESIGN	ACTUAL
Discharge S.P.		
Suction S.P.		
Reheat Coil Delta S.P.		
Cooling Coil Delta S.P.		
Preheat Coil Delta S.P.		
Filters Delta S.P.		
Duct S.P. Setpoint		
Frequency Drive Output		
Vortex Damp. Position		
Out. Air Damp. Position		
Ret. Air Damp. Position		
Relief Damp. Position		

REMARKS: (1) Outlet total 8025

5/12/04 FUTURE UNIT

READINGS BY: WLK

File Name: p14_iupui_cab-ctc_E
TEST DATE: 5/12/04

Fulton Air Balance
Certification No. 2426

AIR OUTLET TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM CRAC - 8

OUTLET MANUFACTURER:

TEST APPARATUS Flowhood

AREA SERVED	OUTLET				DESIGN		PRELIMINARY			FINAL	% of
	No.	TYPE	SIZE	AK	VEL	AIRFLOW	VEL	VEL	VEL	AIRFLOW	DESIGN
024	1	EE	12	1.0		570					
024	2	EE	12	1.0		570					
024	3	EE	12	1.0		570					
024	4	EE	12	1.0		575					
024	5	EE	12	1.0		570					
024	6	EE	12	1.0		570					
024	7	EE	12	1.0		575					
024	8	EE	12	1.0		575					
024	9	EE	12	1.0		575					
024	10	EE	12	1.0		575					
024	11	EE	12	1.0		575					
024	12	EE	12	1.0		575					
024	13	EE	12	1.0		575					
024	14	EE	12	1.0		575					
						8025					

REMARKS:

5/12/04 FUTURE UNIT

READINGS BY: WLK

File Name: p15_iupui_cab-ctc_E

Test Date:

Fulton Air Balance

Certification 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC 9

LOCATION Lower Level 024

UNIT DATA	
Make/Model No.	Liebert / FH529C
Type/Size	FC / NS
Serial Number	308021-008
Arrangement/Class	Drawthru / NS
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2/BK90H X 1 7/16"
N. Belts/make/size	2/Goodyear/B40
No. Filters/type/size	8/Pleated/24x18x4

MOTOR DATA	
Make/Frame	US Motors / 215T
H.P./RPM	10 / 1760
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	27.2-24.6-12.3/1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	10"
Sheave Oper. Diam.	Midrange

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000	(1) 12,332
Total S.P.	NS	2.11
Fan RPM	NS	1084
External S.P.	.30	.06
Motor Volts	460	475 475 475
Motor Amps	12.3	10.6 40.4 10.2
Corrected F.L.Amps	NA	11.91
B.H.P.	NS	8.73
Outside Air	NA	NA
Return Air	12,000	12,332
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	+0.06"
Suction S.P.	NS	-2.05"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	0.90"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position	NA	NA
	NA	NA

REMARKS:

(1) Determined by RVA reading of 757 average FPM across 7' 8" X 2 /1/2" (free area) return opening.

(2) Total drop across both the CW and Reheat Coil is 1.15" (2.05" - .90").

READINGS BY: WLK

File Name: p16_iupui_cab--ctc_E

TEST DATE: 5/12/04

Fulton Air Balance
Certification No. 2426

AIR APPARATUS TEST REPORT

PROJECT IUPUI CAB/CTC

SYSTEM/UNIT CRAC 10

LOCATION Lower Level 024

UNIT DATA	
Make/Model No.	Liebert / FH529C
Type/Size	FC / NS
Serial Number	308021-005
Arrangement/Class	Drawthru / NS
Discharge	Downflow
Make Sheave	Browning
Sheave Diam/Bore	2/BK90H X 1 7/16"
N. Belts/make/size	2/Goodyear/B40
No. Filters/type/size	8/Pleated/24x18x4

MOTOR DATA	
Make/Frame	US Motors / 215T
H.P./RPM	10 / 1760
Volts/Phase/Hertz	208-230-460/3/60
F.L. Amps/S.F.	27.2-24.6-12.3/1.15
Make Sheave	Browning
Sheave Diam/Bore	2VP60 / 1 3/8"
Sheave Center Distance	10"
Sheave Oper. Diam.	Midrange

TEST DATA	DESIGN	ACTUAL
Total Cfm (l/s)	12,000	(1) 12,055
Total S.P.	NS	2.12"
Fan RPM	NS	1087
External S.P.	.30	0.07"
Motor Volts	460	475 475 475
Motor Amps	12.3	10.3 10.8 10.3
Corrected F.L.Amps	NA	11.91
B.H.P.	NS	8.79
Outside Air	NA	NA
Return Air	12,000	12,055
Relief Air	NA	NA

TEST DATA	DESIGN	ACTUAL
Discharge S.P.	NS	+0.07"
Suction S.P.	NS	-2.05"
Reheat Coil Delta S.P.	NS	(2)
Cooling Coil Delta S.P.	NS	(2)
Preheat Coil Delta S.P.	NA	NA
Filters Delta S.P.	NS	0.90"
Duct S.P. Setpoint	NA	NA
Frequency Drive Output	NA	NA
Vortex Damp. Position	NA	NA
Out. Air Damp. Position	NA	NA
Ret. Air Damp. Position	NA	NA
Relief Damp. Position	NA	NA

REMARKS:

(1) Determined by RVA reading of 740 average FPM across 7' 8" X 2 /1/2" (free area) return opening.

(2) Total drop across both the CW and Reheat Coil is 1.15" (2.05" - .90").

READINGS BY: WLK

File Name: p17_iupui_cab-ctc_E

TEST DATE: 5/12/04

Fulton Air Balance
Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CTC-6-2		FAN NO.		FAN NO.	
Location	Unassigned					
Service	Unassigned					
Manufacturer	Trane					
Model Number	FFDB0203B					
Serial Number						
Type/Class	Cabinet Unit Heater					
Motor Make/Style						
Motor HP/RPM/Frame	.03					
Volts/Phase/Hertz	277/1/60					
F.L. Amps/S.F.						
Motor Sheave Make/Model						
Motor Sheave Diam./Bore						
Fan Sheave Make						
Fan Sheave Diam./Bore						
No. Belts/Make/Size						
Sheave Center Distance						
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	170	(1)				
Fan RPM	Medium					
S.P. In/Out	NS					
Total S.P.	0.08					
Voltage	277					
Amperage						
Bhp						
Hz						

REMARKS: (1) May not be installed

READINGS BY:

TEST DATE:

FILE NAME: p18_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CTC-01		FAN NO. CUH-CTC-02		FAN NO.	
Location	Stair 099F		Unisex 037			
Service	Stair 099F		Unisex 037			
Manufacturer	Trane		Trane			
Model Number	FFHB0303B		FFBB0203B			
Serial Number	TO3D24933					
Type/Class	Cabinet Unit Heater		Cabinet Unit Heater			
Motor Make/Style	A. O. Smith / TP		A. O. Smith / TP			
Motor HP/RPM/Frame	1/25/980-580/NS		.03/980-655/NS			
Volts/Phase/Hertz	277/1/60		277/1/60			
F.L. Amps/S.F.	.3/NS		.02/NS			
Motor Sheave Make/Model	Direct Drive		Direct Drive			
Motor Sheave Diam./Bore	Direct Drive		Direct Drive			
Fan Sheave Make	Direct Drive		Direct Drive			
Fan Sheave Diam./Bore	Direct Drive		Direct Drive			
No. Belts/Make/Size	Direct Drive		Direct Drive			
Sheave Center Distance	Direct Drive		Direct Drive			
Filter	NA		1/Throwaway/19 X 9 X 1			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	220	212	170	185		
Fan RPM	Medium	Low	Medium	Medium		
S.P. In/Out	NS	NS	NS	NS		
Total S.P.	0.01	NS	0.03	NA		
Voltage	277	267	277	274		
Amperage	0.3	0.1	0.2	.01		
Bhp						
Hz						

AK = .56 VEL = 378 AK = .68 VEL = 272

REMARKS:

READINGS BY: WG/PA

TEST DATE: 4/16/2007 FULTON AIR BALANCE

FILE NAME: p19_iupui_cab-ctc_E Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CTC-4-1		FAN NO. CUH-CTC-5-1		FAN NO. CUH-CTC-6-1	
Location	Unisex 499W		Stair 599B		Stair 599A	
Service	Unisex 499W		Stair 599B		Stair 599A	
Manufacturer	Trane		Trane		Trane	
Model Number	FFBB0203		FFBB0403A		FFDB0203B	
Serial Number	TO3D24923		TO3D24921		TO3D24922	
Type/Class	Cabinet Unit Heater		Cabinet Unit Heater		Cabinet Unit Heater	
Motor Make/Style	A. O. Smith		A. O. Smith		A. O. Smith	
Motor HP/RPM/Frame	.03/980-580/NS		.05/1050-580/NS		.03/980-580/NS	
Volts/Phase/Hertz	277/1/60		277/1/60		277/1/60	
F.L. Amps/S.F.	.2/NS		.4/NS		.2/NS	
Motor Sheave Make/Model	Direct Drive		Direct Drive		Direct Drive	
Motor Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Make	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
No. Belts/Make/Size	Direct Drive		Direct Drive		Direct Drive	
Sheave Center Distance	Direct Drive		Direct Drive		Direct Drive	
Filter	1/ 19 X 9 X 1 / TA		1/ 24 X 9 X 1 / TA		1/ 19 X 9 X 1 / TA	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	170	208	250	245	170	180
Fan RPM	Medium	Low	Medium	Medium	Medium	High
S.P. In/Out	NS	NS	NS	NS	NS	NS
Total S.P.	0.03	NS	0.01	NS	0.03	NS
Voltage	277	277	277	278	277	277
Amperage	.2	.2	.4		.2	.2
Bhp						
Hz						
	AK = .68 VEL = 306		AK= .68 VEL = 360		AK = .68 VEL = 265	

REMARKS:

READINGS BY: WG/PA

TEST DATE: 4/16/2007

FILE NAME: p20_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CTC-1-2		FAN NO. CUH-CTC-1-3		FAN NO. CUH-CTC-1-4	
Location	Corridor 199D		Vestibule 199E		Vestibule 199E	
Service	Corridor 199D		Vestibule 199E		Vestibule 199E	
Manufacturer	Trane		Trane		Trane	
Model Number	FFBB0203A		FFBB0403A		FFBB0403B	
Serial Number	TO3D24926		TO3D24931		TO3D204918	
Type/Class	Cabinet Unit Heater		Cabinet Unit Heater		Cabinet Unit Heater	
Motor Make/Style	A. O. Smith		A. O. Smith		A. O. Smith \ TP	
Motor HP/RPM/Frame	.03/1080-600/NS		.06/1080-600/NS		.06/1080-600/NS	
Volts/Phase/Hertz	277/1/60		277/1/60		277/1/60	
F.L. Amps/S.F.	0.2/NS		.5/NS		.5/NS	
Motor Sheave Make/Model	Direct Drive		Direct Drive		Direct Drive	
Motor Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Make	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
No. Belts/Make/Size	Direct Drive		Direct Drive		Direct Drive	
Sheave Center Distance	Direct Drive		Direct Drive		Direct Drive	
Filter	1/Throwaway /19 X 9 X 1		1/Throwaway/ 34 X 9 X 1		1/Throwaway/ 24 X 9 X 1	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	170	187	220	288	220	288
Fan RPM	Medium	Low	Medium	Low	Medium	Low
S.P. In/Out	NS	NS	NS	NS	NS	NS
Total S.P.	0.03	.03	0.01	0.01	0.01	.01
Voltage	277	278	277	276	277	277
Amperage	0.2	0.2	.5	.3	.5	.4
	AK = .68 VEL = 276		AK = .83 VEL = 348		AK = .83 VEL = 347	

REMARKS: * Unit not running on 10/27/04

READINGS BY: WG

TEST DATE: 05/18/05

FILE NAME: p21_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CAB 0-3		FAN NO. CUH-CAB-0-4		FAN NO. CUH-CAB 0-5	
Location	Stairwell 099C		Stairwell 099M		Stairwell 099L	
Service	Stairwell 099C		Stairwell 099M		Stairwell 099L	
Manufacturer	Trane		Trane		Trane	
Model Number	FFHB0303B		FFBB060		FFBB060	
Serial Number	TO3D24930					
Type/Class	Cabinet Unit Heater		Cabinet Unit Heater		Cabinet Unit Heater	
Motor Make/Style	A. O. Smith		A. O. Smith		A. O. Smith	
Motor HP/RPM/Frame	.04/980-580/NS		.12/1080-600/NS		.12/1080-600/NS	
Volts/Phase/Hertz	277/1/50-60		277/1/60		277/1/60	
F.L. Amps/S.F.	0.3/NS		.6/NS		.6/NS	
Motor Sheave Make/Model	Direct Drive		Direct Drive		Direct Drive	
Motor Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Make	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
No. Belts/Make/Size	Direct Drive		Direct Drive		Direct Drive	
Sheave Center Distance	Direct Drive		Direct Drive		Direct Drive	
Filter	1/Throwaway /19 X 9 X 1		1/Throwaway/ 34 X 9 X 1		1/Throwaway/ 34 X 9 X 1	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	220	231	400	)393	400	408
Fan RPM	Medium	Medium	Medium	High	Medium	(2) High
S.P. In/Out	NS	NS	NS	NS	NS	NS
Total S.P.		NS		NS		NS
Voltage	277	281	277	277	277	278
Amperage	.3	.3	.6	.2	.6	.2
	AK = .68 VEL = 340		AK = 1.04 VEL = 361		AK = 1.25 VEL = 326	

REMARKS:

READINGS BY: WG/PA

TEST DATE: 4/16/2007

FILE NAME: p22_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CTC-1-1		FAN NO.		FAN NO.	
Location	Stairwell 199F					
Service	Stairwell 199F					
Manufacturer	Trane					
Model Number	FFHBB0203B					
Serial Number	TO3D24919					
Type/Class	Cabinet Unit Heater					
Motor Make/Style	A. O. Smith / TP					
Motor HP/RPM/Frame	.03/1080-600/NS					
Volts/Phase/Hertz	277/1/60					
F.L. Amps/S.F.	0.4/NS					
Motor Sheave Make/Model	Direct Drive					
Motor Sheave Diam./Bore	Direct Drive					
Fan Sheave Make	Direct Drive					
Fan Sheave Diam./Bore	Direct Drive					
No. Belts/Make/Size	Direct Drive					
Sheave Center Distance	Direct Drive					
Filter	1/Throwaway /19 X 9 X 1					
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	170	256				
Fan RPM	Medium	Medium				
S.P. In/Out	NS	NA				
Total S.P.	0.03	NA				
Voltage	277	265				
Amperage	0.4	0.1				

AK = .68 VEL = 377

REMARKS:

READINGS BY: KAH

TEST DATE: 05/18/05

FILE NAME: p23_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CTC 2-1		FAN NO. CUH-CTC-3-1		FAN NO. CUH-CTC-3-25	
Location	Unisex 299W		Unisex 399W		Stairwel 399L	
Service	Unisex 299W		Unisex 399W		Stairwel 399L	
Manufacturer	Trane		Trane		Trane	
Model Number	FFBB0203A		FFBB0203A		FFBB0603A	
Serial Number	TO3D24925		TO3D24924		TO3D24929	
Type/Class	Cabinet Unit Heater		Cabinet Unit Heater		Cabinet Unit Heater	
Motor Make/Style	A. O. Smith		A. O. Smith		A. O. Smith	
Motor HP/RPM/Frame	.03/980-655/NS		.03/980-655/NS		.12/1080-600/NS	
Volts/Phase/Hertz	277/1/60		277/1/60		277/1/60	
F.L. Amps/S.F.	0.2/NS		.2/NS		.6/NS	
Motor Sheave Make/Model	Direct Drive		Direct Drive		Direct Drive	
Motor Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Make	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
No. Belts/Make/Size	Direct Drive		Direct Drive		Direct Drive	
Sheave Center Distance	Direct Drive		Direct Drive		Direct Drive	
Filter	1/Throwaway /19 X 9 X 1		1/Throwaway /19 X 9 X 1		1/Throwaway/ 34 X 9 X 1	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	170	168	170	174	400	437
Fan RPM	Medium	Low	Medium	Low	Medium	Low
S.P. In/Out	NS	NS	NS	NS	NS	NS
Total S.P.	0.03	NS	0.03	NS	0.01	NS
Voltage	277	274	277	277	277	277
Amperage	.2	.1	.2	.1	.6	.1
	AK = .68 VEL = 247		AK =.68 VEL = 256		AK = 1.25 VEL = 350	

REMARKS:

READINGS BY: WG

TEST DATE: 05/18/05

FILE NAME: p24_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

FAN TEST REPORT

PROJECT IUPUI CAB/CTC

FAN DATA	FAN NO. CUH-CAB-1-5		FAN NO. CUH-CAB-1-6		FAN NO. CUH-CAB-1-7	
Location	Stairwell 199C		Stairwell 199T		Vestibule 199W	
Service	Stairwell 199C		Stairwell 199T		Vestibule 199W	
Manufacturer	Trane		Trane		Trane	
Model Number	FFBB0303b		FFDB0303B		FFBB0303B	
Serial Number	TO3D24919		TO3D24920		TO3D24932	
Type/Class	Cabinet Unit Heater		Cabinet Unit Heater		Cabinet Unit Heater	
Motor Make/Style	A. O. Smith		A. O. Smith / MTP		A. O. Smith / TP	
Motor HP/RPM/Frame	.05/1080-600/NS		.05/1080-600/NS		.05/1080-600/NS	
Volts/Phase/Hertz	277/1/60		277/1/60		277/1/60	
F.L. Amps/S.F.	0.4/NS		.4/NS		.4/NS	
Motor Sheave Make/Model	Direct Drive		Direct Drive		Direct Drive	
Motor Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Make	Direct Drive		Direct Drive		Direct Drive	
Fan Sheave Diam./Bore	Direct Drive		Direct Drive		Direct Drive	
No. Belts/Make/Size	Direct Drive		Direct Drive		Direct Drive	
Sheave Center Distance	Direct Drive		Direct Drive		Direct Drive	
Filter	1/Throwaway /19 X 9 X 1		1/Throwaway /19 X 9 X 1		1/Throwaway/ 19 X 9 X 1	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	190	198	190	198	190	210
Fan RPM	Medium	Medium	Medium	Low	Medium	Low
S.P. In/Out	NS	NS	NS	NS	NS	NS
Total S.P.	0.01	NS	0.01	NS	0.01	NS
Voltage	277	270	277	268	277	266
Amperage	0.4	0.1	0.4	0.1	0.4	0.1
	AK = .68 VEL = 292		AK =.75 VEL = 264		AK = .68 VEL = 309	

REMARKS:

READINGS BY: WG

TEST DATE: 05/18/05

FILE NAME: p25_iupui_cab-ctc_E

FULTON AIR BALANCE

Certification No. 2426

PUMP TEST REPORT

PROJECT IUPUI CAB/CTC

DESIGN DATA	PUMP NO. PCHP-1	PUMP NO. PCHP-2	PUMP NO. PCHP-1	PUMP NO. PCHP-2
Location	MER 007	MER 007	MER 007	MER 007
Service	Chiller/Backup	Chiller/Backup	Chiller/Freeze Protection	Chiller/Freeze Protection
Manufacturer	Taco	Taco	Taco	Taco
Model Number	FI 3011	FI 3011	FI 3011	FI 3011
Serial Number	281452-1	2B1452-2	281452-1	281452-2
GPM/Ft. Head	350/85FT	350/85FT	350/85FT	350/85FT
Required NPSH	10FT	10FT	10FT	10FT
Pump RPM	1765	1765	1765	1765
Impeller Diameter	9.7"	9.7	9.7	9.7
Motor Mfr./Frame	Baldor/254T	Baldor/254T	Baldor/254T	Baldor/254T
Motor HP/RPM	15/1765	15/1765	15/1765	15/1765
Volts/Phase/Hertz	230-460/3/60	230-460/3/60	230-460/3/60	230-460/3/60
F.L. Amps/S.F.	35.4-17.7/1.15	35.4-17.7/1.15	35.4-17.7/1.15	35.4-17.7/1.15
Seal Type	Mechanical	Mechanical	Mechanical	Mechanical
ACTUAL				
Pump Off Press.	91 psig	97 psig	95 psig	102 psig
Valve Shut Diff.	92.4	90 ft.	90 ft.	90 ft.
Act. Impeller Diam.	9.7"	9.7"	9.7"	9.7"
Valve Open Diff.	69.3 ft.	69.3 ft.	69.3 ft.	69.3 ft.
Valve Open GPM	470 gpm	470 gpm	470 gpm	470 gpm
Final Dishg. Press.	126 psig	134 psig	135 psig	142 psig
Final Suction Press.	91 psig	97 psig	95 psig	102 psig
Final Delta P	80.9 ft.	85.5 ft.	92.4 ft.	92.4 ft.
Final GPM	360 gpm	350 gpm	265 gpm	265 gpm
Voltage	480/479/479	480/480/479	480/479/479	480/480/479
Amperage	12.2/11.5/12.2	12.3/11.4/12.3	10/9.7/10.3	10.3/9.8/10.4
Bhp	10.6	10.6	8.8	9.0

Remarks: Delta P Setpoint is 7.7 psi

READINGS BY: CAF

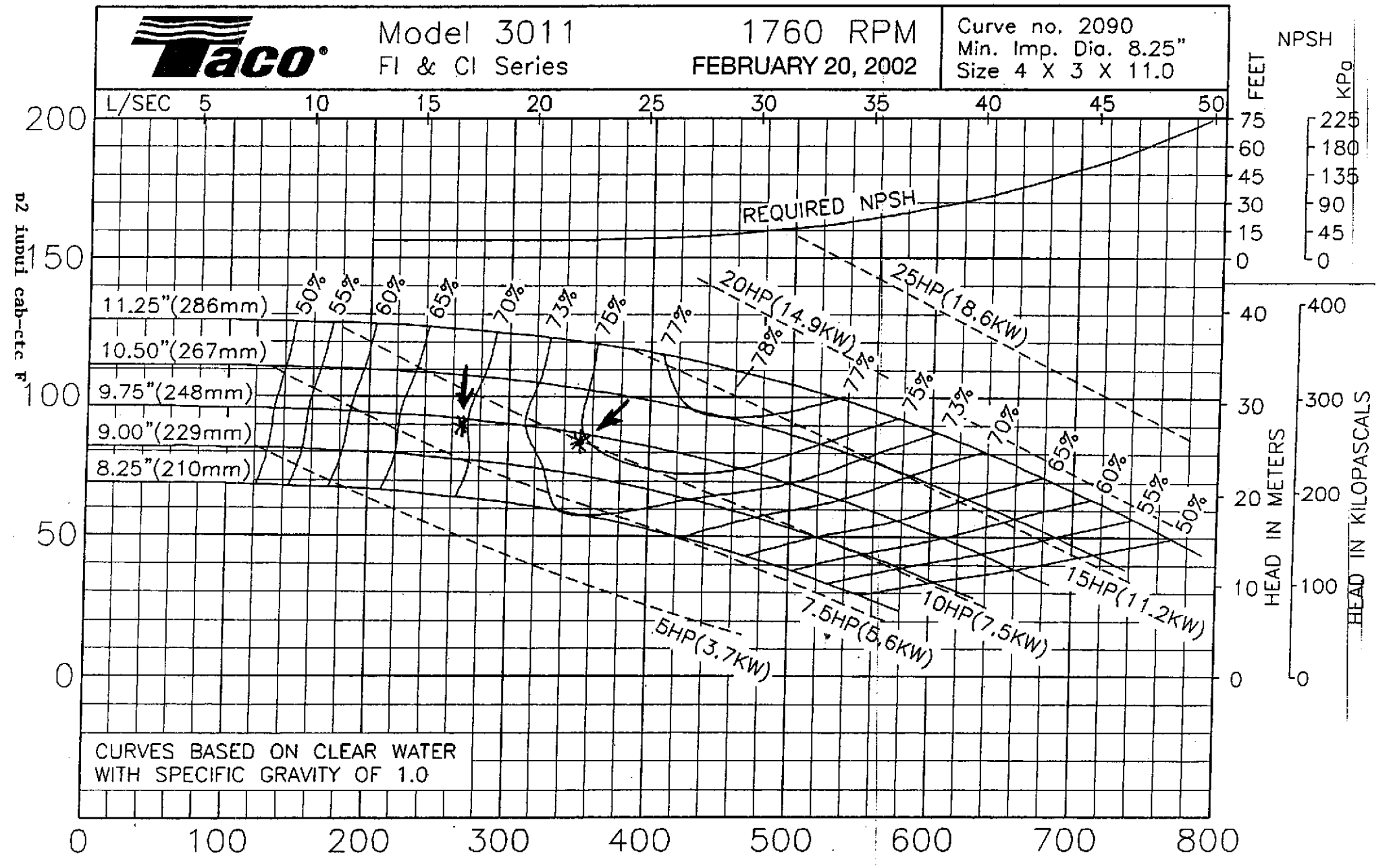
Fulton Air Balance

Certification No. 2426

File Name: p1_iupui_cab-ctc_F

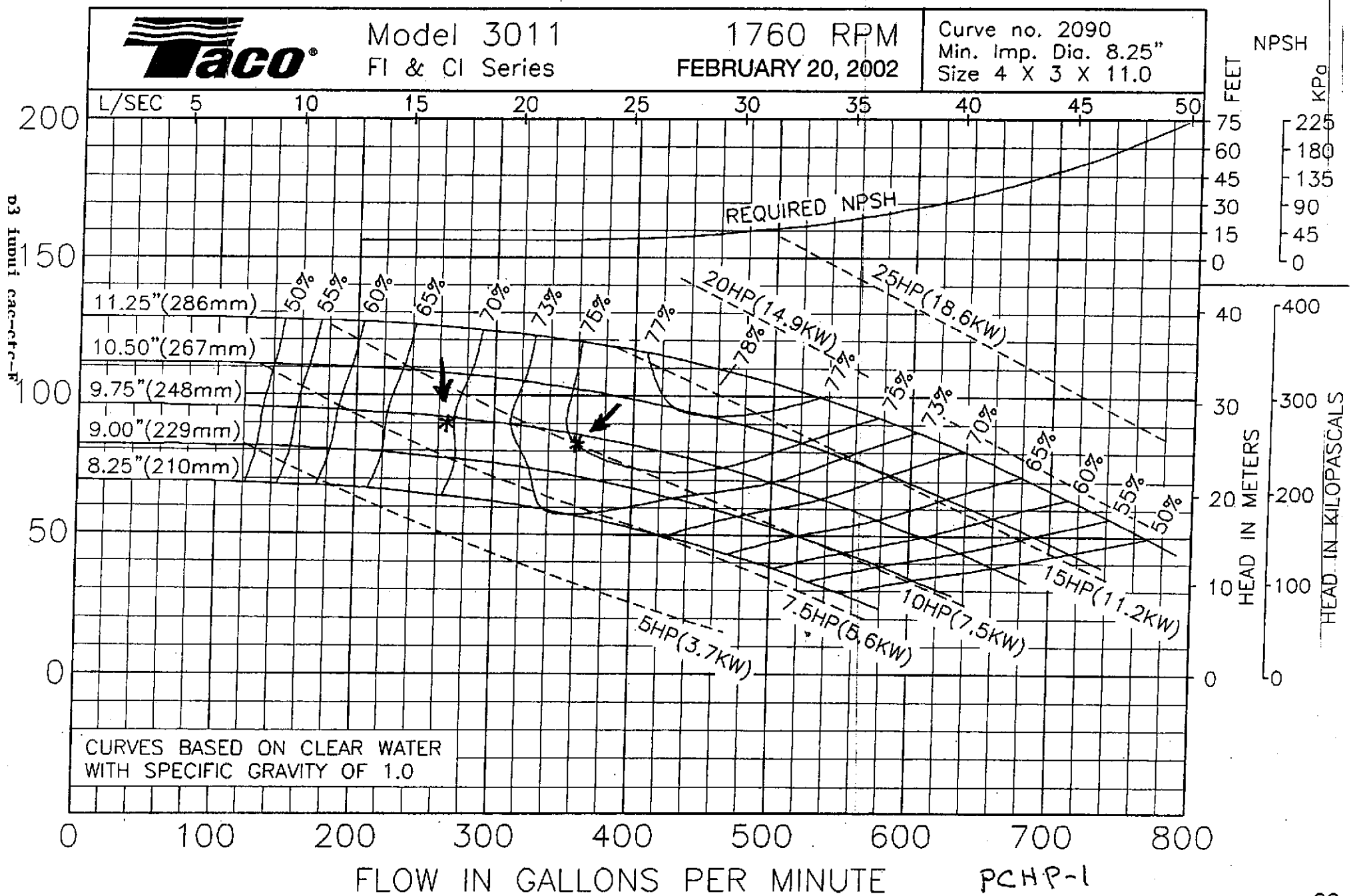
Test Date: 5/13/05

FLOW IN GALLONS PER MINUTE



PCHP-2

23


Taco
Model 3011
FI & CI Series
1760 RPM
FEBRUARY 20, 2002
Curve no. 2090
Min. Imp. Dia. 8.25"
Size 4 X 3 X 11.0
L/SEC 5 10 15 20 25 30 35 40 45 50
FEET 75 60 45 30 15 0
NPSH KPa 225 180 135 90 45 0
REQUIRED NPSH
11.25"(286mm)
10.50"(267mm)
9.75"(248mm)
9.00"(229mm)
8.25"(210mm)
50% 55% 60% 65% 70% 73% 75% 77% 78% 77% 75% 73% 70% 65% 60% 55% 50%
20HP(14.9KW)
25HP(18.6KW)
15HP(11.2KW)
10HP(7.5KW)
7.5HP(5.6KW)
5HP(3.7KW)
HEAD IN METERS 40 30 20 10 0
HEAD IN KILOPASCALS 400 300 200 100 0
CURVES BASED ON CLEAR WATER
WITH SPECIFIC GRAVITY OF 1.0
200 150 100 50 0
0 100 200 300 400 500 600 700 800
FLOW IN GALLONS PER MINUTE
PCHP-1

Chiller Freeze Protection Mode

Bypass Valve at 50%
60" actual delta P gives 271.7 Gpm

Bypass Valve at 40%
80" actual delta P gives 313.7 Gpm

5/13/05

FLOW METER TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION: Basement

SYSTEM/UNIT Backup Chiller
MANUFACTURER Liebert & Trane

SERVICE OR DESIGNATION	SIZE	MODEL	DESIGN GPM	DESIGN DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
CRAC - 1	21.6 Mbh	FH376C	30.8	47"	34"	26.2	
CRAC - 2	315 Mbh	FH529C	45	109"	75"	37.3	
CRAC - 3		Future					
CRAC - 4	315 Mbh	FH529C	45	109"	82"	39	
CRAC - 5	315 Mbh	FH529C	45	109"	77"	37.8	
CRAC - 6	315 Mbh	FH529C	45	109"	77"	37.8	
CRAC - 7	21.6 Mbh	FH376C	30.8	47"	35"	26.6	
CRAC - 8		Future					
CRAC - 9	315 Mbh	FH529C	45	109"	73"	36.8	
CRAC - 10	315 Mbh	FH529C	45	109"	74"	37.1	
						278.6	
		Valve CV					
FCU - 1		7.3	15.8	129.7"	90"	13.2	
FCU - 2		11.6	20.3	84.9"	68"	18.2	Wide Open
FCU - 3		11.6	20.3	84.9"	57"	16.6	
FCU - 4		11.6	20.3	84.9"	58"	16.8	
FCU - 5		7.3	14.7	112.3"	75"	12	
FCU - 11		11.6	15.8	51.4"	36"	13.2	
						90	

REMARKS:

READINGS BY: CAF

File Name: p5_iupui_cab-ctc_F
Test Date: 5/13/05

APPARATUS COIL TEST REPORT

PROJECT IUPUI CAB/CTC

COIL DATA	COIL NO. CTC-1		COIL NO. CTC-2		COIL NO. CAB-3	
System Number	CTC-1		CTC-2		CAB-3	
Location	5TH FL CTC MECH RM		5TH FL CTC MECH RM		5TH FL CAB MECH RM	
Coil Type	Cooling Coil		Cooling Coil		Cooling Coil	
No. Rows-Fins/Inch	8/110 per ft		8/110 per ft		8/98 per ft	
Manufacturer	Trane		Trane		Trane	
Model Number						
Face Area Sq Ft	78.75ft²		78.75ft²		81.74ft²	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
Air Quantity, CFM	40,000	40614	40,000	37859	81000	78382
Air Velocity, FPM	507.94	515.73	507.94	480.75	501.61	495.47
Pressure Drop In w.g.	0.74	0.6	0.74	0.53	0.82	0.5
Out Air DB/WB						
Ret Air DB/WB						
Ent Air DB/WB	80.6/66.7				78/64	
Lvg Air DB/WB	53.02/52.81				52.8/52.57	
Air Delta T						
Water Flow GPM	240	(1)	240	(1)	391.8	(1)
Pressure Drop Ft w.g.	7.73ft	(1)	7.73FT	(1)	9.74FT	(1)
Ent. Water Temperature	45		45		45	
Lvg Water Temperataure	59.02-		59.02		59	
Water Delta P	14.02	(1)	14.02	(1)	14	(1)
Exp Valve/Refrig	NA	NA	NA	NA	NA	NA
Refrlg Suction Press	NA	NA	NA	NA	NA	NA
Refrig Sucton Temp	NA	NA	NA	NA	NA	NA
Inlet Steam Press	NA	NA	NA	NA	NA	NA
Total Capacity	1683 Mbh				2742.8	

REMARKS: (1) See Flow Meter Test Report

READINGS BY: WLI

Fulton Air Balance, Inc.
Certification No.2426

File Name: p6_iupui_cab-ctc_F
Test Date: 5/25/04

APPARATUS COIL TEST REPORT

PROJECT IUPUI CAB/CTC

COIL DATA	COIL NO. CRAC-1		COIL NO. CRAC-2		COIL NO.	
System Number	CRAC-1		CRAC-2			
Location						
Coil Type	Chilled Water		Chilled Water			
No. Rows-Fins/Inch	6/NS		6/NS			
Manufacturer	Liebert		Liebert			
Model Number						
Face Area Sq Ft	18.5ft²		25ft²			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
Air Quantity, CFM	9,100	(1)	12,000	(1)		
Air Velocity, FPM	491.9	(1)	480	(1)		
Pressure Drop In w.g.	NS	(1)	NS	(1)		
Out Air DB/WB						
Ret Air DB/WB						
Ent Air DB/WB	72/60		72/60			
Lvg Air DB/WB	52.1/51.1		51.1/50.2			
Air Delta T	19.9/8.9		20.9/9.8			
Water Flow GPM	30.8	(2)	45	(2)		
Pressure Drop Ft w.g.	(2)	(2)	(2)	(2)		
Ent. Water Temperature	45		45			
Lvg Water Temperataure	59		59			
Water Delta P	14		14			
Exp Valve/Refrig	NA	NA	NA	NA		
Refrlg Suction Press	NA	NA	NA	NA		
Refrig Sucton Temp	NA	NA	NA	NA		
Inlet Steam Press	NA	NA	NA	NA		
Total Capacity	211.3 Mbh		308.8 Mbh			

Remarks: (1) See Air Apparatus Test Report
(2) See Flow Meter Test Report

READINGS BY:
Fulton Air Balance, Inc.
Certification No.2426

File Name: p7_iupui_cab-ctc_F
Test Date:

APPARATUS COIL TEST REPORT

PROJECT IUPUI CAB/CTC

COIL DATA	COIL NO. CRAC-4		COIL NO. CRAC-5		COIL NO. CRAC-6	
System Number	CRAC-4		CRAC-5		CRAC-6	
Location						
Coil Type	Chilled Water		Chilled Water.		Chilled Water	
No. Rows-Fins/Inch	6/NS		6/NS		6/NS	
Manufacturer	Liebert		Liebert		Liebert	
Model Number						
Face Area Sq Ft	25ft²		25ft²		25ft²	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
Air Quantity, CFM	12,000	(1)	12,000	(1)	12,000	(1)
Air Velocity, FPM	480	(1)	480	(1)	480	(1)
Pressure Drop In w.g.	NS	(1)	NS	(1)	NS	(1)
Out Air DB/WB						
Ret Air DB/WB						
Ent Air DB/WB	72/60		72/60		72/60	
Lvg Air DB/WB	51.1/50.2		51.1/50.2		51.1/50.2	
Air Delta T	20.9/9.8		20.9/9.8		20.9/9.8	
Water Flow GPM	45	(2)	45	(2)	45	(2)
Pressure Drop Ft w.g.	(2)	(2)	(2)	(2)	(2)	(2)
Ent. Water Temperature	45		45		45	
Lvg Water Temperataure	59		59		59	
Water Delta P	14		14		14	
Exp Valve/Refrig	NA	NA	NA	NA	NA	NA
Refrig Suction Press	NA	NA	NA	NA	NA	NA
Refrig Sucton Temp	NA	NA	NA	NA	NA	NA
Inlet Steam Press	NA	NA	NA	NA	NA	NA
Total Capacity	308.8 Mbh		308.8 Mbh		308.8 Mbh	

Remarks: (1) See Air Apparatus Test Report
(2) See Flow Meter Test Report

READINGS BY:
Fulton Air Balance, Inc.
Certification No.2426

File Name: p8_iupui_cab-ctc_F
Test Date:

APPARATUS COIL TEST REPORT

PROJECT IUPUI CAB/CTC

COIL DATA	COIL NO. CRAC-7		COIL NO. CRAC-9		COIL NO.	
System Number	CRAC-7		CRAC-9			
Location						
Coil Type	Chilled Water		Chilled Water			
No. Rows-Fins/Inch	6/NS		6/NS			
Manufacturer	Liebert		Liebert			
Model Number						
Face Area Sq Ft	18.5ft²		25ft²			
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
Air Quantity, CFM	9,100	(1)	12,000	(1)		
Air Velocity, FPM	491.9	(1)	480	(1)		
Pressure Drop In w.g.	NS	(1)	NS	(1)		
Out Air DB/WB						
Ret Air DB/WB						
Ent Air DB/WB	72/60		72/60			
Lvg Air DB/WB	52.1/51.1		51.1/50.2			
Air Delta T	20.9/9.8		20.9/9.8			
Water Flow GPM	30.8	(2)	45	(2)		
Pressure Drop Ft w.g.	(2)	(2)	(2)	(2)		
Ent. Water Temperature	45		45			
Lvg Water Temperataure	59		59			
Water Delta P	14		14			
Exp Valve/Refrig	NA	NA	NA	NA		
Refrlg Suction Press	NA	NA	NA	NA		
Refrig Sucton Temp	NA	NA	NA	NA		
Inlet Steam Press	NA	NA	NA	NA		
Total Capacity	211.3 Mbh		308.8 Mbh			

Remarks: (1) See Air Apparatus Test Report
(2) See Flow Meter Test Report

READINGS BY:
Fulton Air Balance, Inc.
Certification No.2426

File Name: p9_iupui_cab-ctc_F
Test Date:

APPARATUS COIL TEST REPORT

PROJECT IUPUI CAB/CTC

COIL DATA	COIL NO. CRAC-10		COIL NO.		COIL NO.	
System Number	CRAC-10					
Location						
Coil Type	Chilled Water					
No. Rows-Fins/Inch	6/NS					
Manufacturer	Liebert					
Model Number						
Face Area Sq Ft	25ft²					
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
Air Quantity, CFM	12,000	(1)				
Air Velocity, FPM	480	(1)				
Pressure Drop In w.g.	NS	(1)				
Out Air DB/WB						
Ret Air DB/WB						
Ent Air DB/WB	72/60					
Lvg Air DB/WB	51.1/50.2					
Air Delta T	20.9/9.8					
Water Flow GPM	45	(2)				
Pressure Drop Ft w.g.	(2)	(2)				
Ent. Water Temperature	45					
Lvg Water Temperataure	59					
Water Delta P	14					
Exp Valve/Refrig	NA	NA				
Refrig Suction Press	NA	NA				
Refrig Sucton Temp	NA	NA				
Inlet Steam Press	NA	NA				
Total Capacity	308.8 Mbh					

Remarks: (1) See Air Apparatus Test Report
(2) See Flow Meter Test Report

READINGS BY:
Fulton Air Balance, Inc.
Certification No.2426

File Name: p10_iupui_cab-ctc_F
Test Date:

FLOW METER TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Chill Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	MODEL	DESIGN GPM	DESIGN DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
CTC-1 / Top Coil	NA	Coil Drop	60	92.76"	92"	59.8	
CTC-1 Mid-Top Coil	NA	Coil Drop	60	92.76"	98"	61.7	
CTC-1/Mid-Bot Coil	NA	Coil Drop	60	92.76"	98"	61.7	
CTC-1/Bot Coil	NA	Coil Drop	60	92.76"	95"	60.7	
CTC-2/Top Coil	NA	Coil Drop	60	92.76"	93"	60.1	
CTC-2/Mid-Top Coil	NA	Coil Drop	60	92.76"	92"	59.8	
CTC-2/Mid-Bot Coil	NA	Coil Drop	60	92.76"	90"	59.1	
CTC-2/Bot Coil	NA	Coil Drop	60	92.76"	94"	60.4	
CAB-Upstream Coils							
CAB/Top Coil	NA	Coil Drop	65.3	4.216 psig	4.5 psig	67.5	
CAB/Mid Coil	NA	Coil Drop	65.3	4.216 psig	4.5 psig	67.5	
CAB/Bot Coil	NA	Coil Drop	65.3	4.216 psig	4.0 psig	63.6	
CAB/Downstream Coils							
CAB/Top Coil	NA	Coil Drop	65.3	4.216 psig	4.0 psig	63.6	
CAB/Mid Coil	NA	Coil Drop	65.3	4.216 psig	4.0 psig	63.6	
CAB/Bot Coil	NA	Coil Drop	65.3	4.216 psig	4.5 psig	67.5	

REMARKS: * Readings taken with cw pump maintaining 11.9 psig at the DPT (Setpoint is 12.0 psig)

READINGS BY: WLK

File Name: p11_iupui_cab-ctc_F
Test Date: 5/26/04

FLOW METER TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Chilled Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	CV	DESIGN GPM	DESIGN DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
CRAC-1	(3)	41	30.8	15.6"	16"	31.1	
CRAC-2	(3)	41	45	33.4"	36"	46.7	
CRAC-3	(3)	----------	----------	FUTURE UNIT	----------	----------	----------
CRAC-4	(3)	41	45	33.4"	34"	45.4	
CRAC-5	(3)	41	45	33.4"	36"	46.7	
CRAC-6	(3)	41	45	33.4"	35"	46.1	
CRAC-7	(3)	41	30.8	15.6"	16"	31.1	
CRAC-8	(3)	----------	----------	FUTURE UNIT	----------	----------	----------
CRAC-9	(3)	41	45	33.4"	35"	46.1	
CRAC-10	(3)	41	45	33.4"	35"	46.1	
FCU-1	(3)	7.3	15.8	4.68 PSI	4.5 PSI	15.49	
FCU-2	(3)	11.6	20.3	84.9"	86"	20.43	
FCU-3	(3)	11.6	20.3	84.9"	88"	20.67	
FCU-4	(3)	11.6	20.3	84.9"	89"	20.79	
FCU-5	(3)	7.3	14.7	4.05 PSI	4.0 PSI	14.6	
FCU-6	(3)		1.0	Relocated to 1st floor ?		Relocated to 1st floor ?	
FCU-7	(3)		1.0	Relocated to 1st floor ?		Relocated to 1st floor ?	
FCU-8	(3)	11.6	4.0	3.3"	5.0"	4.92	(1)
FCU-9	(3)	11.6	4.0	3.3"	13.0"	7.94	(1)
FCU-10	(3)	11.6	4.0	3.3"	10.0"	6.97	(1)
FCU-11	(3)	11.6	15.8	51.4"	54.0"	16.19	

REMARKS:
(1) Valve closed 90%
(2) Readings shown were taken with DPT set at 12.0 PSI and diversity of 110 GPM valved off.
(3) Terminals balanced with cv ratings across 2-way valves.

READINGS BY: WLK

File Name: p64_iupui_cab-ctc_F
Test Date: 5/25/04

APPARATUS COIL TEST REPORT

PROJECT IUPUI CAB/CTC

COIL DATA	COIL NO. CTC-1		COIL NO. CTC-2		COIL NO. CAB-3	
System Number	CTC-1		CTC-2		CAB-3	
Location						
Coil Type	Heating		Heating		Heating	
No. Rows-Fins/Inch	1/80 per ft		1/80 per ft		2/80 per ft	
Manufacturer	Trane		Trane			
Model Number						
Face Area Sq Ft	78.75ft²		78.75ft²		36ft²	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
Air Quantity, CFM	40,000	*	40,000	*	17,000	*
Air Velocity, FPM	507.94	*	507.94	*	472.22	*
Pressure Drop In w.g.	0.07	*	0.07	*	0.11	*
Out Air DB/WB						
Ret Air DB/WB						
Ent Air DB/WB	55/NA		55/NA		0/NA	
Lvg Air DB/WB	66.1/NA		65/NA		75/NA	
Air Delta T	11.1/NA		10/NA		75	
Water Flow GPM	43.4	(1)	43.4	(2)	138.5	(3)
Pressure Drop Ft w.g.	1.3FT	(1)	1.3FT	(2)	4.66FT	(3)
Ent. Water Temperature	120	118°F	120°F	119°F	180	119
Lvg Water Temperataure	97.65	82°F	89°F	96°F	160.05	921°
Water Delta P	22.35	35°F	31	23°F	19.95	26.9°
Exp Valve/Refrig	NA	NA	NA	NA	NA	
Refrlg Suction Press	NA	NA	NA	NA	NA	
Refrig Sucton Temp	NA	NA	NA	NA	NA	
Inlet Steam Press	NA	NA	NA	NA	NA	
Total Capacity	484.02 Mbh				1382.74 Mbh	

Remarks: (1) Two coil banks set @ 22.5 gpm each / 20ft head loss @ 35°
(2) Two coil banks set @ 21 gpm each / 17ft head loss @ 34°
(3) Two coil banks set @ 69.25 gpm each / 4.66ft @ 2.41ft

READINGS BY: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV 1-0-1	1/2"	1.4	.73	72"	70"	1.37	
VAV 1-0-2	1/2"	1.4	.73	72"	72"	1.4	
VAV 1-0-3	1/2"	1.9	1.8	16"	17"	1.82	
VAV 1-1-1	1/2"	4.2	4.6	6"	8"	6.11	
VAV 1-1-2	1/2"	0.5	.73	26"	26"	0.5	
VAV 1-1-3	1/2"	1.0	.73	52"	55"	1.4	
VAV 1-1-4	1/2"	0.5	.73	26"	27"	0.515	
VAV 1-1-5	1/2"	1.0	.73	52"	52"	1.0	
VAV 1-1-6	1/2"	0.5	.73	26"	26"	0.51	
VAV 1-1-7	1/2"	0.5	.73	26"	25"	0.495	
VAV-1-5-1	1/2"	1.0	.73	52"	52"	1.0	
VAV-1-5-2	1/2"	3.5	1.8	104.7"	104"	3.5	
VAV-1-5-3	1/2"	1.0	.73	52"	52"	1.0	
VAV-1-5-4	1/2"	1.4	.73	102"	102"	1.4	
VAV-1-5-5	1/2"	1.0	.73	52"	52"	1.0	
VAV-1-5-6	1/2"	1.0	.73	52"	52"	1.0	
VAV-1-5-7	1/2"	0.5	.73	26"	26"	0.5	
VAV-1-5-8	1/2"	2.1	1.8	37.7"	38"	2.1	
VAV-1-5-9	1/2"	0.9	.73	42"	42"	0.9	
VAV-1-5-10	1/2"	3.2	1.8	87.6"	88"	3.2	
VAV-1-5-11	1/2"	1.0	.73	52"	52"	1.0	
VAV-1-5-12	1/2"	1.0	.73	(1)	(1)	1.0	(1)
VAV-1-5-13	1/2"	1.6	.73	133"	134"	1.61	
VAV-1-5-14	1/2"	0.5	.73	26"	26"	0.5	
VAV-1-5-15	1/2"	1.2	.73	74.9"	75"	1.2	
VAV-1-5-16	1/2"	1.0	.73	52"	51"	1.0	
VAV-1-5-17	1/2"	1.0	.73	52"	52"	1.0	

REMARKS: (1) No access to actuator or valve

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV 1-5-18	1/2"	2.7	1.8	62.4"	64"	2.71	
VAV 1-5-19	1/2"	2.7	1.8	62.4"	69"	2.71	
VAV 3-0-1	1/2"	1.2	.73	62.5"	62"	1.2	
VAV 3-0-2	1/2"	0.5	.73	26"	23"	0.5	(2)
VAV 3-0-3	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-4	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-0-5	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-6	1/2"	0.5	.73	26"	26"	0.5	(1)
VAV 3-0-7	1/2"	1.6	.73	83"	88"	1.61	(1)
VAV 3-0-8	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-9	1/2"	2.6	1.8	22.3"	23"	1.81	
VAV 3-0-10	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-11	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-12	1/2"	2.4	1.8	17.1"	17"	1.8	
VAV 3-0-13	1/2"	1.6	.73	133"	132"	1.6	
VAV 3-0-14	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-15	1/2"	2.6	1.8	58"	56"	2.58	
VAV 3-0-16	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-17	1/2"	2.3	1.8	56"	56"	2.3	
VAV 3-0-18	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-0-19	1/2"	1.3	.73	88"	87"	1.3	
VAV 3-0-20	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-0-21	1/2"	3.6	1.8	111"	110"	1.8	
VAV 3-0-22	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-0-23	1/2"	2.3	1.8	45"	45"	2.3	
VAV 3-0-24	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-0-25	1/2"	1.6	.73	133"	133"	1.6	

REMARKS: (1) Valve closed, 95%
(2) Valve 100% open

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV 3-0-26	1/2"	2.0	1.8	34"	33"	1.8	
VAV 3-0-27	1/2"	1.0	.73	52"	50"	.97	(1)
VAV 3-0-28	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-1-1	1/2"	3.9	1.8	33.4"	32"	3.87	(3)
VAV 3-1-2	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-1-3	1/2"	3.9	1.8	33.4"	34"	3.95	(3)
VAV 3-1-4	1/2"	4.3	4.6	5.6"	6"	4.32	
VAV 3-1-5	1/2"	4.7	4.6	6"	8"	6.11	*
VAV 3-1-6	1/2"	4.6	(1)	100"	100"	4.6	
VAV 3-1-7	1/2"	1.3	.73	67.6"	67"	1.3	
VAV 3-1-8	1/2"	1.5	.73	78"	76"	1.48	(3)
VAV 3-1-9	1/2"	4.5	4.6	6"	9"	6.87	*
VAV 3-1-10	1/2"	3.0	1.8	25.6"	26"	3.0	
VAV 3-1-11	1/2"	4.5	4.3	7"	10"	7.63	*
VAV 3-1-12	1/2"	3.2	1.8	27"	27"	3.2	
VAV 3-1-13	1/2"	1.0	.73	52"	53"	1.0	
VAV 3-1-14	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-1-15	1/2"	2.0	1.8	17"	17"	2.0	
VAV 3-1-16	1/2"	1.8	1.8	15.4"	16"	1.81	
VAV 3-1-17	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-1-18	1/2"	1.0	.73	52"	53"	1.0	
VAV 3-1-19	1/2"	1.8	1.8	15.4"	16"	1.81	
VAV 3-1-20	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-1-21	1/2"	1.8	.73	93.6"	95"	1.82	
VAV 3-1-22	1/2"	0.5	.73	26"	27"	0.55	

REMARKS: * Valve closed, 95%

(1) Nexus 3/4" 2A valve installed. Set with Nexus flow chart @ 100 ins = 4.6 gpm

(3) Valve 100% open

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV 3-2-1	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-2-2	1/2"	1.6	.73	83"	83"	1.6	(3)
VAV 3-2-3	1/2"	2.0	1.0	17"	18"	2.05	
VAV 3-2-4	1/2"	2.4	1.8	21"	21"	2.4	
VAV 3-2-5	1/2"	1.5	.73	78"	76"	1.48	
VAV 3-2-6	1/2"	1.5	.73	78"	78"	1.5	
VAV 3-2-7	1/2"	2.0	1.8	17"	17"	1.8	
VAV 3-2-8	1/2"	4.2	4.6	6"	15"	4.9	(2)
VAV 3-2-9	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-2-10	1/2"	1.5	.73	78"	78"	1.5	
VAV 3-2-11	1/2"	1.5	1.8	13"	13"	0.5	
VAV 3-2-12	1/2"	2.1	.73	109"	100"	1.92	*
VAV 3-2-13	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-2-14	1/2"	0.5	.73	26'	26"	0.5	
VAV 3-2-15	1/2"	0.5	.73	26"	26"	0.5	
VAV 3-2-16	1/2"	1.5	.73	78"	78"	1.5	
VAV 3-2-17	1/2"	2.7	1.8	23"	23"	2.7	
VAV 3-2-18	1/2"	4.0	1.8	34"	34"	4.0	
VAV 3-2-19	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-2-20	1/2"	4.0	1.8	78"	80"	1.86	
VAV 3-2-21	1/2"	1.0	.73	52"	52"	1.0	
VAV 3-2-22	1/2"	3.9	1.8	33"	34"	3.93	
VAV 3-2-23	1/2"	1.5	.73	78"	78"	1.5	
VAV 3-2-24	1/2"	0.5	.73	26"	26"	0.5	

REMARKS: * Valve 100% open

(1) Cannot access box on heating valve

(2) Valve 95% closed

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV-3-3-1	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-2	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-3	1/2"	1.0	.73	52"	52"	1.0	(1)
VAV-3-3-4	1/2"	1.0	.73	52"	50"	1.0	(1)
VAV-3-3-5	1/2"	0.5	.73	26"	25"	0.5	(1)
VAV-3-3-6	1/2"	0.5	.73	26"	25"	0.5	(1)
VAV-3-3-7	1/2"	1.0	.73	52"	50"	1.0	(1)
VAV-3-3-8	1/2"	0.5	.73	26"	25"	0.5	
VAV-3-3-9	1/2"	0.5	.73	26"	25"	0.5	
VAV-3-3-10	1/2"	0.5	.73	26"	25"	0.5	
VAV-3-3-11	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-12	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-13	1/2"	0.5	.73	26"	25"	0.5	
VAV-3-3-14	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-15	1/2"	0.5	.73	26"	25"	0.5	
VAV-3-3-16	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-17	1/2"	0.5	.73	26"	25"	0.5	
VAV-3-3-18	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-19	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-20	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-21	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-22	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-23	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-24	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-25	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-26	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-27	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-28	1/2"	0.5	.73	26"	26"	0.5	

REMARKS: (1) Valves 100% open

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV-3-3-29	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-30	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-31	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-32	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-33	1/2"	2.0	1.8	17"	17"	2.0	
VAV-3-3-34	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-35	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-36	1/2"	3.7	1.8	31.6"	32"	3.71	
VAV-3-3-37	1/2"	0.5	.73	26"	25"	0.5	
VAV-3-3-38	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-39	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-3-40	1/2"	4.0	1.8	34.2"	34"	4.0	
VAV-3-3-41	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-3-42	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-1	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-2	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-3	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-4	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-5	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-6	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-7	1/2"	0.5	.73	26"	27"	0.5	
VAV-3-4-8	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-9	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-10	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-11	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-12	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-13	1/2"	0.5	.73	26"	26"	0.5	

REMARKS:

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV-3-4-14	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-15	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-16	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-17	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-18	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-19	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-20	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-21	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-22	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-23	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-24	1/2"	1.0	.73	52"	53"	1.0	
VAV-3-4-25	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-26	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-27	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-28	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-29	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-30	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-31	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-32	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-33	1/2"	1.5	.73	78"	70"	1.3	
VAV-3-4-34	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-35	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-36	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-37	1/2"	0.5	.73	26"	26'	0.5	
VAV-3-4-38	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-39	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-40	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-41	1/2"	0.5	.73	26"	26"	0.5	

REMARKS:

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV-3-4-42	1/2"	1.0	.73	52"	(2)	(2)	
VAV-3-4-43	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-44	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-45	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-46	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-47	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-48	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-4-49	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-50	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-4-51	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-5-1	1/2"	0.6	.73	31.2"	31"	0.6	
VAV-3-5-2	1/2"	2.9	1.8	24.8"	24"	1.79	
VAV-3-5-3	1/2"	1.3	.73	67.6"	62"	1.3	
VAV-3-5-4	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-5-5	1/2"	1.0	.73	52"	51"	0.99	
VAV-3-5-6	1/2"	1.0	.73	52"	50"	0.98	
VAV-3-5-7	1/2"	1.0	.73	52"	51"	1.0	
VAV-3-5-8	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-9	1/2"	1.0	.73	52"	49"	0.97	
VAV-3-5-10	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-11	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-12	1/2"	1.0	.73	52"	51"	1.0	
VAV-3-5-13	1/2"	1.0	.73	52"	50"	1.0	
VAV-3-5-14	1/2"	1.0	.73	52"	50"	1.0	(1)
VAV-3-5-15	1/2"	1.0	.73	52"	50"	1.0	
VAV-3-5-16	1/2"	1.0	.73	52"	50"	1.0	(1)
VAV-3-5-17	1/2"	1.0	.73	52"	49"	0.97	

REMARKS:

(1) Valve 100% open

(2) No access due to informatics equipment

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
VAV-3-5-18	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-5-19	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-5-20	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-5-21	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-22	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-23	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-5-24	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-25	1/2"	0.5	.73	26"	26"	0.5	
VAV-3-5-26	1/2"	3.5	1.8	30"	31"	1.81	
VAV-3-5-27	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-28	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-29	1/2"	1.5	.73	78"	74"	1.4	
VAV-3-5-30	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-31	1/2"	1.0	.73	52"	52"	1.0	
VAV-3-5-32	1/2"	1.0	.73	52"	52"	1.0	

REMARKS:

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
FPTU 1-1-8	1/2"	0.5	.73	13"	15"	0.54	
FPTU 1-1-9	1/2"	0.7	.73	25.5"	(3)	(3)	
FPTU 1-1-10	1/2"	0.7	.73	25.5"	27"	0.72	
FPTU 1-1-11	1/2"	1.3	.73	67"	68"	1.34	
FPTU 1-1-12	1/2"	1.0	.73	52"	52"	1.0	
FPTU 1-1-13	1/2"	1.0	.73	52"	52"	1.0	
FPTU 1-1-14	1/2"	1.0	.73	52"	52"	1.0	
FPTU 1-2-1	1/2"	1.5	.73	117"	115"	1.5	
FPTU 1-2-2	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-2-3	1/2"	0.6	.73	31"	31"	0.61	(1)
FPTU 1-2-4	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 1-2-5	1/2"	2.5	1.8	53.5"	54"	2.5	
FPTU 1-2-6	1/2"	2.5	.73	53.5"	48"	2.3	
FPTU 1-2-7	1/2"	1.0	.73	52"	54"	1.1	
FPTU 1-2-8	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-2-9	1/2"	1.0	.73	52"	56"	1.05	
FPTU 1-2-10	1/2"	1.3	.73	67"	68"	1.31	
FPTU 1-2-11	1/2"	0.5	.73	26"	28"	0.54	(1)
FPTU 1-3-1	1/2"	3.0	1.8	77"	80"	3.0	
FPTU 1-3-2	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 1-3-3	1/2"	0.9	.73	42"	44"	0.4	
FPTU 1-3-4	1/2"	0.5	.73	26"	36"	0.5	(1)
FPTU 1-3-5	1/2"	0.5	.73	26"	36"	0.5	(1)
FPTU 1-3-6	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-3-7	1/2"	0.6	.73	31"	31"	0.6	
FPTU 1-3-8	1/2"	1.1	.73	63"	52"	1.0	(2)

REMARKS: (1) Valve is 95% closed
(2) Valve is 100% open
(3) HW valve unaccessable due to piping configuration. Valve set to 85% closed.

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
FPTU 1-3-9	1/2"	1.1	.73	63"	52"	1.0	(3)
FPTU 1-3-10	1/2"	0.6	.73	31"	31"	0.6	
FPTU 1-3-11	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 1-3-12	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 1-3-13	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 1-3-14	1/2"	0.6	.73	18.7"	26"	0.6	
FPTU 1-3-15	1/2"	0.7	.73	36"	36"	0.7	(2)
FPTU 1-3-16	1/2"	0.7	.73	36"	36"	0.7	(2)
FPTU 1-3-17	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-3-18	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-4-1	1/2"	0.6	.73	31"	31"	0.6	(1)
FPTU 1-4-2	1/2"	5.0	4.6	32.7"	35"	5.1	
FPTU 1-4-3	1/2"	1.7	1.8	26.2"	29"	1.73	
FPTU 1-4-4	1/2"	0.8	.73	42"	42"	0.83	
FPTU 1-4-5	1/2"	0.5	.73	26"	26"	0.52	(1)
FPTU 1-4-6	1/2"	0.9	.73	42.2"	44"	0.9	
FPTU 1-4-7	1/2"	0.9	.73	42.2"	43"	0.9	
FPTU 1-4-8	1/2"	0.6	.73	31"	31"	0.6	(1)
FPTU 1-4-9	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-4-10	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-4-11	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-4-12	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-4-13	1/2"	0.7	.73	36"	37"	0.72	
FPTU 1-4-14	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 1-4-15	1/2"	0.8	.73	42"	42"	0.8	
FPTU 1-4-16	1/2"	0.7	.73	36"	36"	0.7	
FPTU 1-4-17	1/2"	0.7	.73	36"	36"	0.7	

REMARKS:

(1) Valve is 95% closed
(2) Boxes have been moved first floor
(3) Valve is 100% open

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
FPTU 2-0-1						(3)	
FPTU 2-0-2						(3)	
FPTU 2-0-3	1"	1.5	2A	11"	12"	1.51	(2)
FPTU 2-0-4	1"	1.5	.73	115"	116"	1.505	
FPTU 2-0-5						(3)	
FPTU 2-0-6						(3)	
FPTU 2-1-1	1/2"	0.7	.73	36"	38"	0.72	(1)
FPTU 2-1-2	1/2"	0.7	.73	36"	38"	0.72	(1)
FPTU 2-1-3	1/2"	0.7	.73	36"	38"	0.72	(1)
FPTU 2-1-4	1/2"	0.5	.73	26"	27"	0.65	(1)
FPTU 2-1-5	1/2"	0.5	.73	26"	28"	0.67	(1)
FPTU 2-1-6	1/2"	0.5	.73	26"	27"	0.65	(1)
FPTU 2-1-7	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-1-8	1/2"	0.5	.73	26"	19"	0.59	(1)
FPTU 2-1-9	1/2"	0.6	.73	18.7"	21"	0.65	(1)
FPTU 2-1-10	1/2"	0.7	.73	26"	26"	0.71	
FPTU 2-1-11	1/2"	1.3	.73	72"	74"	1.31	
FPTU 2-1-12	1/2"	1.3	.73	72"	72"	1.3	
FPTU 2-1-13	1/2"	1.3	.73	88"	91"	1.32	
FPTU 2-1-14	1/2"	1.3	.73	88"	89"	1.305	
FPTU 2-1-15	1/2"	1.3	.73	88"	90"	1.31	
FPTU 2-1-16	1/2"	1.3	.73	88"	88"	1.3	
FPTU 2-1-17	1/2"	1.3	.73	88"	90"	1.31	
FPTU 2-1-18	1/2"	1.3	.73	88"	91"	1.32	
FPTU 2-1-19	1/2"	1.3	.73	88"	91"	1.38	
FPTU 2-1-20	1/2"	1.3	.73	88"	80"	1.3	
FPTU 2-1-21	1/2"	1.0	.73	52"	50"	0.98	

REMARKS:

(1) Valve is 95% closed
(2) Valve is 100% open
(3) FPTU boxes deleted

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
FPTU 2-3-1	1/2"	0.4	.73	20"	20"	0.5	(1)
FPTU 2-3-2	1/2"	0.7	.73	36"	33"	0.63	
FPTU 2-3-3	1/2"	1.6	.73	133.2"	135"	1.62	
FPTU 2-3-4	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 2-3-5	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-3-6	1/2"	0.7	.73	36"	37"	0.7	
FPTU 2-3-7	1/2"	0.7	.73	36"	37"	0.72	
FPTU 2-3-8	1/2"	2.0	1.8	34.2"	36"	2.0	
FPTU 2-3-9	1/2"	0.8	.73	42"	42"	0.8	
FPTU 2-3-10	1/2"	0.8	.73	42"	42"	0.8	
FPTU 2-3-11	1/2"	1.0	.73	52"	51"	1.0	
FPTU 2-3-12	1/2"	3.7	1.8	32"	32"	3.7	(2)
FPTU 2-3-13	1/2"	3.7	1.8	32"	32"	3.7	(2)
FPTU 2-3-14	1/2"	4.0	4.6	20.9"	20"	4.0	(2)
FPTU 2-3-15	1/2"	0.8	.73	42"	42"	0.8	
FPTU 2-3-16	1/2"	0.8	.73	42"	42"	0.8	
FPTU 2-3-17	1/2"	0.8	.73	42"	42"	0.8	
FPTU 2-3-18	1/2"	0.8	.73	42"	42"	0.8	
FPTU 2-3-19	1/2"	0.8	.73	42"	42"	0.8	
FPTU 2-3-20	1/2"	1.0	.73	52"	54"	1.0	
FPTU 2-3-21	1/2"	1.0	.73	52"	53"	1.0	
FPTU 2-3-22	1/2"	1.0	.73	52"	54"	1.05	
FPTU 2-4-1	1/2"	0.8	.73	42"	42"	0.81	
FPTU 2-4-2	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-3	1/2"	0.8	.73	42"	42"	0.81	
FPTU 2-4-4	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 2-4-5	1/2"	0.7	.73	36"	36"	0.7	

REMARKS:
(1) Valve is 95% closed
(2) Valve is 100% open

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
FPTU 2-4-6	1/2"	0.6	.73	31"	31"	0.6	(1)
FPTU 2-4-7	1/2"	2.0	1.8	34.2"	34"	2.0	
FPTU 2-4-8	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 2-4-9	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-10	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-11	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 2-4-12	1/2"	0.5	.73	26"	26"	0.5	(1)
FPTU 2-4-13	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-14	1/2"	0.7	.73	36"	36"	0.71	
FPTU 2-4-15	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-16	1/2"	2.0	1.8	34.2"	36"	1.81	
FPTU 2-4-17	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-18	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-19	1/2"	0.6	.73	31"	31"	0.63	(1)
FPTU 2-4-20	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-21	1/2"	0.8	.73	42"	42"	0.80	
FPTU 2-4-22	1/2"	0.8	.73	42"	42"	0.81	
FPTU 2-4-23	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-24	1/2"	0.7	.73	36"	36"	0.7	
FPTU 2-4-25	1/2"	0.6	.73	(2)	(2)	(2)	
FPTU 2-3-26	1/2"	0.5	.73	26"	26"	0.5	(1)

REMARKS:
(1) Valve is 95% closed
(2) Coil not piped! Cooling only FPTU

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
RAC 0-1	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 0-2	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 0-3	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 0-4	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 0-5	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 0-6	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 0-7	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 0-8	1/2"	0.5	.73	26"	*	*	(1)
RAC 1-1	1/2"	0.5	.73	26"	26"	0.5	(1)
RAC 1-2	1/2"	0.5	.73	26"	26"	0.5	(1)

REMARKS: (1) Valve is 95% closed

* Valve not accessable. Located under permanent furniture.

Readings By: KAH

WATER OUTLET TEST REPORT

PROJECT: IUPUI CAB/CTC
LOCATION:

SYSTEM/UNIT Heating Water
MANUFACTURER

SERVICE OR DESIGNATION	SIZE	DESIGN GPM	CONTROL VALVE CV	CONTROL VALVE DELTA P	ACTUAL VALVE DELTA P	ACTUAL GPM	NOTES
CUH - CTC-0-1	1/2"	0.8	.73	33"	35"	0.82	
CUH - CTC-0-2	1/2"	0.44	.73	10"		(2)	(2)
CUH-CAB-0-3	1/2"	0.8	.73	42"	42"	0.81	
CUH-CAB-0-4	1/2"	1.7	1.8	25"	25"	1.8	
CUH-CAB-0-5	1/2"	1.7	1.8	25"		(2)	(2)
CUH-CTC-1-1	1/2"	0.44	.73	10"	10"	0.44	
CUH-CTC-1-2	1/2"	0.44	.73	10"	10"	0.44	
CUH-CTC-1-3	1/2"	1.2	4.6	1.9"	2.0"	1.21	
CUH-CTC-1-4	1/2"	1.2	4.6	1.9"	2.0"	1.21	
CUH-CAB-1-5	1/2"	0.95	.73	47"	45"	0.44	
CUH-CAB-1-6	1/2"	0.95	1.0	25"	26"	1.03	(1)
CUH-CAB-1-7	1/2"	0.95	1.0	25"	25"	0.95	
CUH-CTC-2-1	1/2"	0.44	1.8	2"	10"	0.44	(1)
CUH-CTC-3-1	1/2"	0.44	.73	10"	10"	0.44	(1)
CUH-CTC-3-2	1/2"	1.7	1.8	25"	25"	1.8	
CUH-CTC-4-1	1/2"	0.44	.73	10"	10"	0.44	(1)
CUH-CTC-5-1	1/2"	0.90	.73	42"	42"	0.90	
CUH-CTC-6-1	1/2"	0.44	.73	10"	10"	0.44	100% OPEN
CUH-CTC-6-2	1/2"	0.44	.73	10"	10"	0.44	100% OPEN
PUH-CTC-L-1	1/2"	1.4	1.8	17"	18"	1.43	
PUH-CAB-56	1/2"	.7	1.8	4.19"	5"	1.84	(1)
FCU-8	1/2"	1.4	1.8	17"	18"	1.43	(1)
FCU-9	1/2"	1.4	1.8	17"	18"	1.43	
FCU-10	1/2"	1.4	.73	102"	103"	1.41	

REMARKS: (1) Valve is 95% closed
(2) Valves would not activate. IUPUI notified.

Readings By:

AIR TEMPERATURE DIFFERENTIAL TEST REPORT

PROJECT: IUPUI CAB/CTC
O.A.T. _____

SYSTEM: Heatng Water
E.W.T.: _____

SERVICE OR DESIGNATION	DEVICE NUMBER	DESIGN GPM	DESIGN DELTA T	ENTERING AIR TEMP	LEAVING AIR TEMP	ACTUAL DELTA T	NOTES
FPTU-1-1-8				55°	96.3°	41.3°	
FPTU-1-1-9				55°	84.3°	29.3°	
FPTU-1-1-10				55°	86.1°	31.1°	
FPTU-1-1-11				55°	91.2°	36.2°	
FPTU-1-1-12				55°	96.7°	41.7°	
FPTU-1-1-13				55°	89.4°	34.4°	
FPTU-1-1-14				55°	94.6°	39.6°	
FPTU 1-2-1				55°	93.2°	38.2°	
FPTU 1-2-2				55°	91.6°	36.6°	
FPTU 1-2-				55°	93.3°	38.3°	
FPTU 1-2-4				55°	89.4°	34.4°	
FPTU 1-2-5				55°	92.30°	37.3°	
FPTU 1-2-6				55°	93.4°	38.4°	
FPTU 1-2-7				55°	78.2°	23.2°	*1
FPTU 1-2-8				55°	89.9°	34.9°	
FPTU 1-2-9				55°	91.3°	36.3°	
FPTU 1-2-10				55°	79.4°	24.4°	*1
FPTU 1-2-11				55°	94.8°	39.8°	
FPTU 1-3-1				55°	89.6°	34.6°	
FPTU 1-3-2				55°	94°	39°	
FPTU 1-3-3				55°	93.1°	38.1°	
FPTU 1-3-4				55°	89.8°	34.8°	
FPTU 1-3-5				55°	89.7°	34.7°	
FPTU 1-3-6				55°	96.3°	41.3°	
FPTU 1-3-7				55°	91.4°	36.4°	
FPTU 1-3-8				55°	91°	36°	

REMARKS: EWT: 118

*1 Cause of lower Delta T is unknown.

READINGS BY:

AIR TEMPERATURE DIFFERENTIAL TEST REPORT

PROJECT: IUPUI CAB/CTC
O.A.T. _____

SYSTEM: Heating Water
E.W.T.: _____

SERVICE OR DESIGNATION	DEVICE NUMBER	DESIGN GPM	DESIGN DELTA T	ENTERING AIR TEMP	LEAVING AIR TEMP	ACTUAL DELTA T	NOTES
FPTU 1-3-9				55°	87.3°	32.3°	
FPTU 1-3-10				55°	92.4°	37.4°	
FPTU 1-3-11				55°	98.3°	43.3°	
FPTU 1-3-12				55°	99.1°	44.1°	
FPTU 1-3-13				55°	101.0°	46°	
FPTU 1-3-14				55°	93.4°	38.4°	
FPTU 1-3-15				55°	92.3°	37.3°	
FPTU 1-3-16				55°	82.2°	27.1°	
FPTU 1-3-17				55°	96.4°	41.4°	
FPTU 1-3-18				55°	93.2°	38.2°	
FPTU 1-4-1				55°	89.3°	34.3°	
FPTU 1-4-2				55°	87.1°	32.1°	
FPTU 1-4-3				55°	87.4°	32.4°	
FPTU 1-4-4				55°	94.8°	39.8°	
FPTU 1-4-5				55°	82.9°	27.4°	
FPTU 1-4-6				55°	79°	24°	*1
FPTU 1-4-7				55°	87°	34°	
FPTU 1-4-8				55°	95.6°	40.6°	
FPTU 1-4-9				55°	96.4°	41.4°	
FPTU 1-4-10				55°	86.9°	31.9°	
FPTU 1-4-11				55°	110.8°	55.8°	
FPTU 1-4-12				55°	89.5°	34.5°	
FPTU 1-4-13				55°	89.3°	34.3°	
FPTU 1-4-14				55°	91.6°	36.6°	
FPTU 1-4-15				55°	91°	36°	
FPTU 1-4-16				55°	93.2°	38.2°	
FPTU 1-4-17				55°	94.7°	39.7°	

REMARKS: EWT: 118°F

*1 Cause for lower Delta T is unknown.

READINGS BY:

AIR TEMPERATURE DIFFERENTIAL TEST REPORT

PROJECT: IUPUI CAB/CTC
O.A.T. _____

SYSTEM: Heating Water
E.W.T.: _____

SERVICE OR DESIGNATION	DEVICE NUMBER	DESIGN GPM	DESIGN DELTA T	ENTERING AIR TEMP	LEAVING AIR TEMP	ACTUAL DELTA T	NOTES
FPTU 2-1-22				55°	94.3°	34.3°	
FPTU 2-1-23				55°	90.2°	35.2°	
FPTU 2-1-24				55°	88.7°	33.7°	
FPTU 2-1-25				55°	91.7°	36.7°	
FPTU 2-1-26				55°	89.4°	34.4°	
FPTU 2-1-27				55°	86.6°	31.6°	
FPTU 2-1-28				55°	93.1°	38.1°	
FPTU 2-2-1				55°	98.5°	43.5°	
FPTU 2-2-2				55°	89.2°	34.2°	
FPTU 2-2-3				55°	99.5°	44.5°	
FPTU 2-2-4				55°	91.3°	36.3°	
FPTU 2-2-5				55°	87.4°	32.4°	
FPTU 2-2-6				55°	83.1°	38.1°	
FPTU 2-2-7				55°	90°	35°	
FPTU 2-2-8				55°	87.4°	32.7°	
FPTU 2-2-9				55°	89°	34°	
FPTU 2-2-10				55°	92°	37°	
FPTU 2-2-11				55°	72.6°	17.6°	(2)
FPTU 2-2-12				55°	98.8°	43.8°	
FPTU 2-2-13				55°	94.4°	39.4°	
FPTU 2-2-14				55°	96.3°	41.3°	
FPTU 2-2-15				55°	96.4°	41.4°	
FPTU 2-2-16				55°	67.7°	12.7°	(2)
FPTU 2-2-17				55°	90.1°	35.1°	
FPTU 2-2-18				55°	(1)	(1)	(1)

REMARKS: EWT: 118°F
(1) FPTU's linked together via single stat
(2) Cause for lower Delta T is unknown.

READINGS BY: KAH

AIR TEMPERATURE DIFFERENTIAL TEST REPORT

PROJECT: IUPUI CAB/CTC
O.A.T. _____

SYSTEM: Heating Water
E.W.T.: _____

SERVICE OR DESIGNATION	DEVICE NUMBER	DESIGN GPM	DESIGN DELTA T	ENTERING AIR TEMP	LEAVING AIR TEMP	ACTUAL DELTA T	NOTES
FPTU 2-3-1				55°	95.2°	40.2°	
FPTU 2-3-2				55°	94.6°	41.6°	
FPTU 2-3-3				55°	96.8°	41.8°	
FPTU 2-3-4				55°	92.6°	37.6°	
FPTU 2-3-5				55°	93.5°	38.5°	
FPTU 2-3-6				55°	101.7°	46.7°	
FPTU 2-3-7				55°	91.4°	36.4°	
FPTU 2-3-8				55°	89.9°	34.9°	
FPTU 2-3-9				55°	93.4°	38.4°	
FPTU 2-3-10				55°	88.2°	33.2°	
FPTU 2-3-11				55°	89°	39°	
FPTU 2-3-12				55°	90.4°	35.4°	
FPTU 2-3-13				55°	92.1°	37.1°	
FPTU 2-3-14				55°	98.2°	40.2°	
FPTU 2-3-15				55°	86.4°	31.4°	
FPTU 2-3-16				55°	97.6°	42.6°	
FPTU 2-3-17				55°	98.4°	43.4°	
FPTU 2-3-18				55°	83.3°	28.3°	
FPTU 2-3-19				55°	74.7°	19.7°	*1
FPTU 2-3-20				55°	96.7°	41.7°	
FPTU 2-3-21				55°	86.7°	31.7°	
FPTU 2-3-22				55°	91°	36°	
FPTU 2-4-1				55°	77°	22°	*1
FPTU 2-4-2				55°	85.6°	30.6°	
FPTU 2-4-3				55°	87.1°	32.1°	
FPTU 2-4-4				55°	93.2°	38.2°	
FPTU 2-4-5				55°	89.6°	34.6°	

REMARKS: EWT: 119°F
*1 Cause for lower Delta T is unknown.

READINGS BY: KAH

AIR TEMPERATURE DIFFERENTIAL TEST REPORT

PROJECT: IUPUI CAB/CTC
O.A.T. _____

SYSTEM: Heating Water
E.W.T.: _____

SERVICE OR DESIGNATION	DEVICE NUMBER	DESIGN GPM	DESIGN DELTA T	ENTERING AIR TEMP	LEAVING AIR TEMP	ACTUAL DELTA T	NOTES
FPTU 2-4-6				55°	78.6°	23.6°	*1
FPTU 2-4-7				55°	91.7°	36.7°	
FPTU 2-4-8				55°	91.1°	36.1°	
FPTU 2-4-9				55°	93.6°	38.6°	
FPTU 2-4-10				55°	96.2°	41.2°	
FPTU 2-4-11				55°	89.3°	34.3°	
FPTU 2-4-12				55°	94.8°	39.8°	
FPTU 2-4-13				55°	93.7°	38.7°	
FPTU 2-4-14				55°	92.4°	37.4°	
FPTU 2-4-15				55°	98.3°	43.3°	
FPTU 2-4-16				55°	87.3°	32.3°	
FPTU 2-4-17				55°	91.4°	36.4°	
FPTU 2-4-18				55°	92.2°	37.2°	
FPTU 2-4-19				55°	94.7°	39.7°	
FPTU 2-4-20				55°	92.7°	37.7°	
FPTU 2-4-21				55°	93.1°	38.1°	
FPTU 2-4-22				55°	89.6°	34.6°	
FPTU 2-4-23				55°	91.2°	36.2°	
FPTU 2-4-24				55°	92.3°	37.3°	
FPTU 2-4-25				55°	94.7°	39.7°	
FPTU 2-4-26				55°	91.2°	36.2°	

REMARKS: EWT: 118°F
*1 Cause for lower Delta T is unknown.

READINGS BY: KAH

PUMP TEST REPORT

PROJECT IUPUI CAB/CTC

DESIGN DATA	PUMP NO. RFCP-1	PUMP NO. HWP-2	PUMP NO.	PUMP NO.
Location	(1)	5th floor		
Service		Circulating Pump		
Manufacturer	B &G	Tacp		
Model Number	Series 90 1AA	1935C1N1		
Serial Number		1634025		
GPM/Ft. Head	7 / 10'	70/15'		
Required NPSH				
Pump RPM		NA		
Impeller Diameter		4.6		
Motor Mfr./Frame		Baldor/560		
Motor HP/RPM	.25	3/4 / 1725		
Volts/Phase/Hertz	120	230/460/3/60		
F.L. Amps/S.F.		3/1.15		
Seal Type		Mechanical		
ACTUAL				
Pump Off Press.	(1)	14 psig		
Valve Shut Diff.	(1)	NA ft.		
Act. Impeller Diam.	(1)	4.5		
Valve Open Diff.	(1)	(2) ft.		
Valve Open GPM	(1)	(2) gpm		
Final Dishg. Press.	(1)	NA psig		
Final Suction Press.	(1)	NA psig		
Final Delta P	(1)	1575 ft.		
Final GPM	(1)	42.06 gpm		
Voltage	(1)	482/482/480		
Amperage	(1)	1.3/1.2/1.2		

Remarks: (1) RFCP - 1 HAS BEEN DELETED
(2) Balance valves not installed

READINGS BY: KAH

Fulton Air Balance
Certification No. 2426

File Name: p36_iupui_cab/ctc
Test Date: 5/18/05

Submittal Data Information 1900 Series Pumps

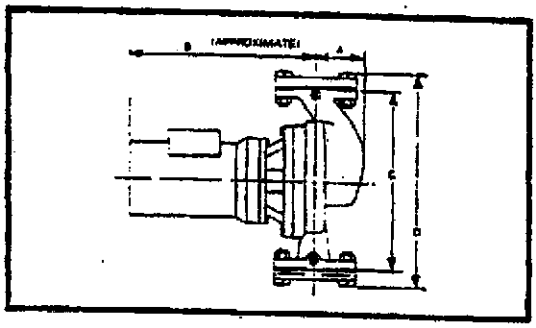
301-245

MODEL 1935

SUPERSEDES: NEW

Job: IUPUI-CAB/CTC BLDG

ITEM NO.	MODEL NO.	IMPELLER DIA.	G.P.M.	HEAD IN FT.	H.P.	ELECTRICAL CHARACTERISTI
HWP-3	1935-C	4.6"	70	15'	3/4	460/3

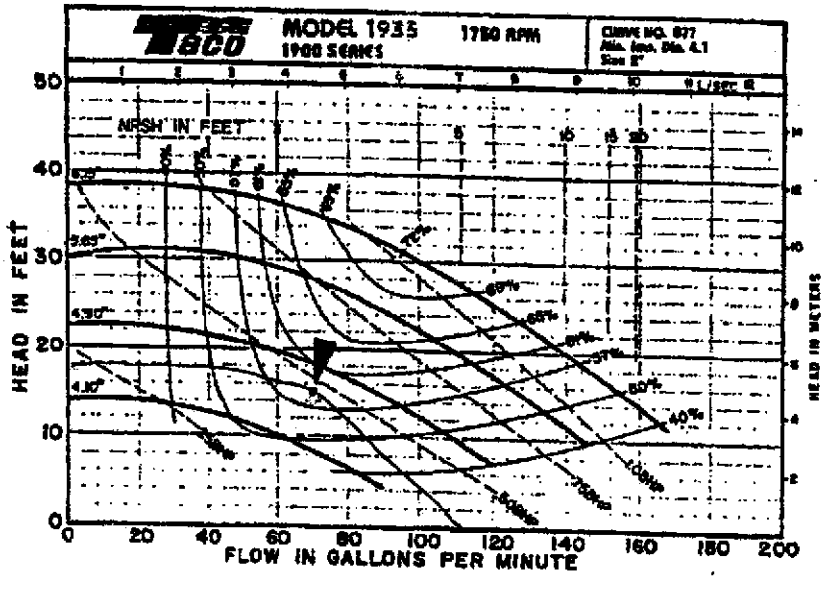


SIZES & DIMENSIONS:

(APPROXIMATE)

MODEL	Flange Size	H.P.	Watts	A	B	C	D
1935	2	½ (¾) 1 1½	373 560 746 1119	3½ (89)*	13¾ (349)* 14¾ (375)* 15¾ (400)* 15¾ (400)*	13½ (343)*	16⅛ (410)

*Millimeters



SPECIFICATIONS:

MOTORS

1750 RPM, Three Phase, 208/230/460V, 60Hz, Nema 56 C Frame Motors.
Also available in Single Phase 115/208/230V, 1/4 HP 1 1/2 HP.
Motors are Nema 56 C Frame, sealed ball bearing design, and require no maintenance.

BODY

Cast Iron with in-line flanged connections. Also available in optional all bronze. Companion flanges available with the pump.

IMPELLER

One Piece Cast Bronze, Closed, Dynamically Balanced Impeller.

DRIVE

Close Coupled Direct Driven Pump.

SHAFT

Alloy Steel with Cupro Nickel Shaft Sleeve.

MECHANICAL SEAL

2 Piece Standard 250°F(121°C) Max. Operating Temp Optional 300°F(149°C) Max. Operating Temp.

WORKING PRESSURE

175 PSI (1207kPa) in accordance with ASA B16.1.
NOTE: Pump flanges are tapped for gauges.

COMPARE. YOU'LL TAKE TACO.

TACO, Inc., 1160 Cranston St., Cranston, RI 02920 (401) 942-8000 Telex: 92-7627
TACO, (Canada) Ltd., 1310 Aimco Blvd., Mississauga, Ontario L4W 1B2 (416) 625-2160 Telex: 06-961179

Form No. F301-245 Effective Date 10/1/88

PUMP TEST REPORT

PROJECT IUPUI CAB/CTC

DESIGN DATA	PUMP NO. PCHP-1	PUMP NO. PCHP-2	PUMP NO. SCHP-1	PUMP NO. SCHP-2
Location	Mechanical Room 007	Mechanical Room 007	Mechanical Room 007	Mechanical Room 007
Service	Chiller	Chiller	CW Loop	CW Loop
Manufacturer	Taco	Taco	Taco	Taco
Model Number	FI3011	FI3011	FI6011	FI6011
Serial Number	281452 / 1	NA	278979 / 2	278979 / 1
GPM/Ft. Head	350 / 85'	350 / 85'	1200 / 80'	1200 / 80'
Required NPSH	10ft	10FT	12ft	12ft
Pump RPM	1765	1765	1775	1775
Impeller Diameter	9.7	9.7	9.75	9.75
Motor Mfr./Frame	Baldor / 254T	Baldor / 254T	Baldor / 324T	Baldor / 324T
Motor HP/RPM	15 / 1765	15 / 1765	40 / 1775	40 / 1775
Volts/Phase/Hertz	230-460/3/60	230-460/3/60	230-460/3/60	230-460/3/60
F.L. Amps/S.F.	35.4-17.7 / 1.15	35.4-17.7 / 1.15	92-46 / 1.15	92-46 / 1.15
Seal Type	Mechanical	Mechanical	Mechancial	Mechanical
Chiller Drop	99.6 in	99.6 in		
ACTUAL				
Pump Off Press.	74 psig	74 psig	107 psig	107 psig
Valve Shut Diff.	92.4 ft	90 ft.	94.7 ft.	94.7 ft.
Act. Impeller Diam.	9.7 in	9.7 in	9.75in	9.75 in
Valve Open Diff.	69.3 ft.	69.3 ft.	73.9 ft.	73.9 ft.
Valve Open GPM	470 gpm	470 gpm	1400 gpm	1400 gpm
Final Dishg. Press.	129 psig	126 psig	(1) 134 psig	(1) 133 psig
Final Suction Press.	94 psig	91 psig	(1) 34 psig	(1) 99 psig
Final Delta P	35 ft.	35 ft.	(1) 1250 ft.	(1) 34 ft.
Final GPM	350 gpm	350 gpm	(1) 458 gpm	(1) 1250 gpm
Voltage	479 480 478	475 475 475	(1) 37.6	(1) 37.7
Amperage	123.6 13.6 12.6	13.3 13.9 14.0		
Chiller Drop	100 in	100 in		

Remarks: (1) Reading taken with pump maintaining DPT setting of 12.0 psi.

READINGS BY: WLK

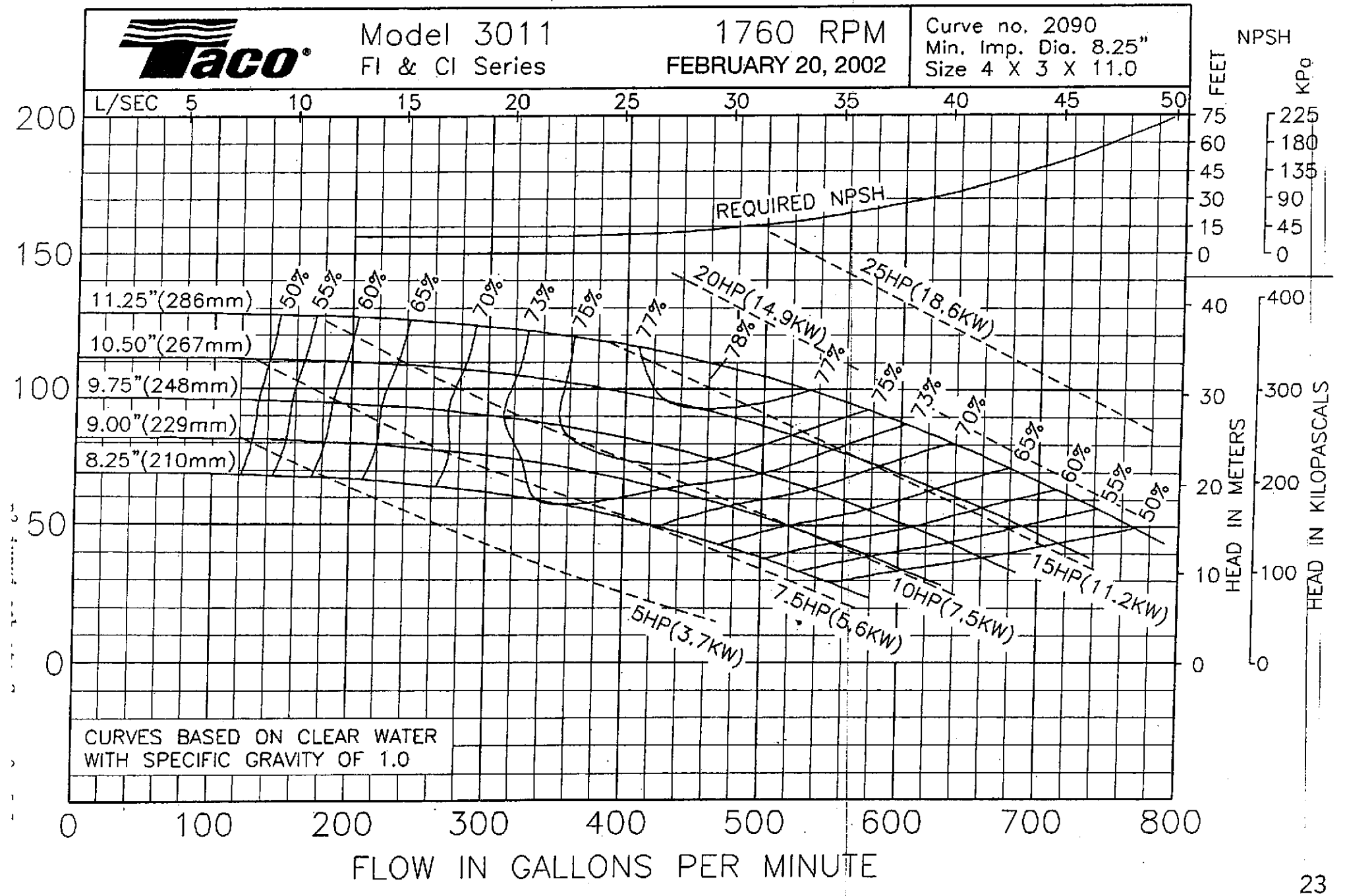
Fulton Air Balance

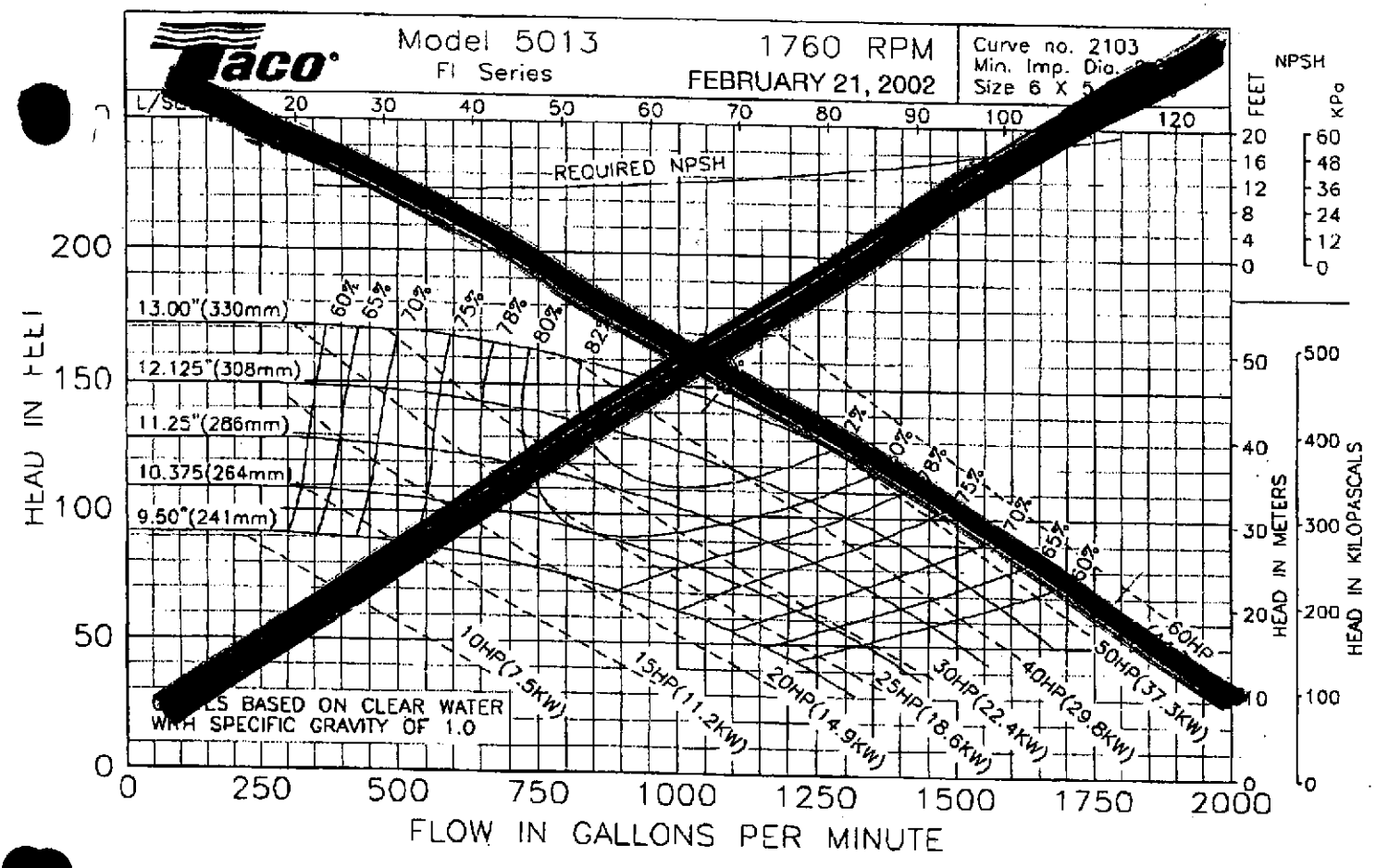
Certification No. 2426

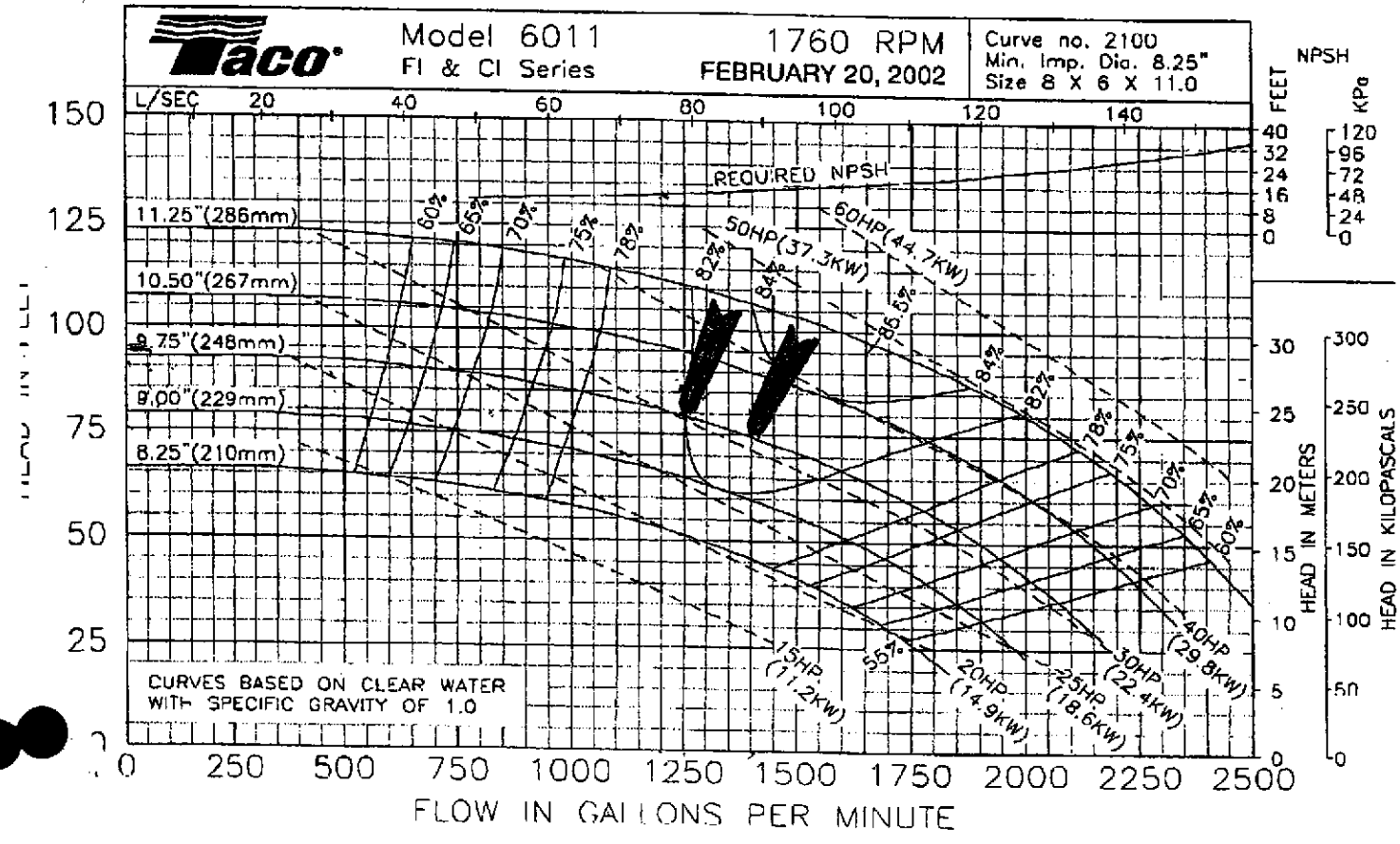
File Name: p1_iupuicab_ctc_G

Test Date: 5/25/04

FLOW IN GALLONS PER MINUTE







SECONDARY C.W. PUMPS

PUMP TEST REPORT

PROJECT IUPUI CAB/CTC

DESIGN DATA	PUMP NO. HWP-1	PUMP NO. HWP-2	PUMP NO.	PUMP NO.
Location	Mer 007	Mer 007		
Service	Heating Water	Heating Water		
Manufacturer	Taco	Taco		
Model Number	FI5011	FI5011		
Serial Number	None	None		
GPM/Ft. Head	680 / 90ft	680 / 90ft		
Required NPSH	10ft	10ft		
Pump RPM	1760	1760		
Impeller Diameter	10.1	10.7		
Motor Mfr./Frame	Baldor / 284T	Baldor / 284T		
Motor HP/RPM	25 / 1770	25 / 1770		
Volts/Phase/Hertz	230-460/3/60	230-460/3/60		
F.L. Amps/S.F.	60-30 / 1.15	60-30 / 1.15		
Seal Type	Mechanical	Mechanical		
ACTUAL				
Pump Off Press.	38 psig	38 psig		
Valve Shut Diff.	102.3 ft	101.6 ft.		
Act. Impeller Diam.	10.1"	10.1"		
Valve Open Diff.	84 ft.	87.8 ft.		
Valve Open GPM	800 gpm	760 gpm		
Final Dishg. Press.	76.5 psig	76.5 psig		
Final Suction Press.	37 psig	37 psig		
Final Delta P	91.2 ft.	91.2 ft.		
Final GPM	660 gpm	660 gpm		
Voltage	452	446		
Amperage	27.1	28.2		
Bhp	22.2	22.8		

Remarks:

$\Delta P = 76.5 - 37 = 39.5$ PSIG

$39.5 \times 2.31 = 91.2$ FT. OF HEAD

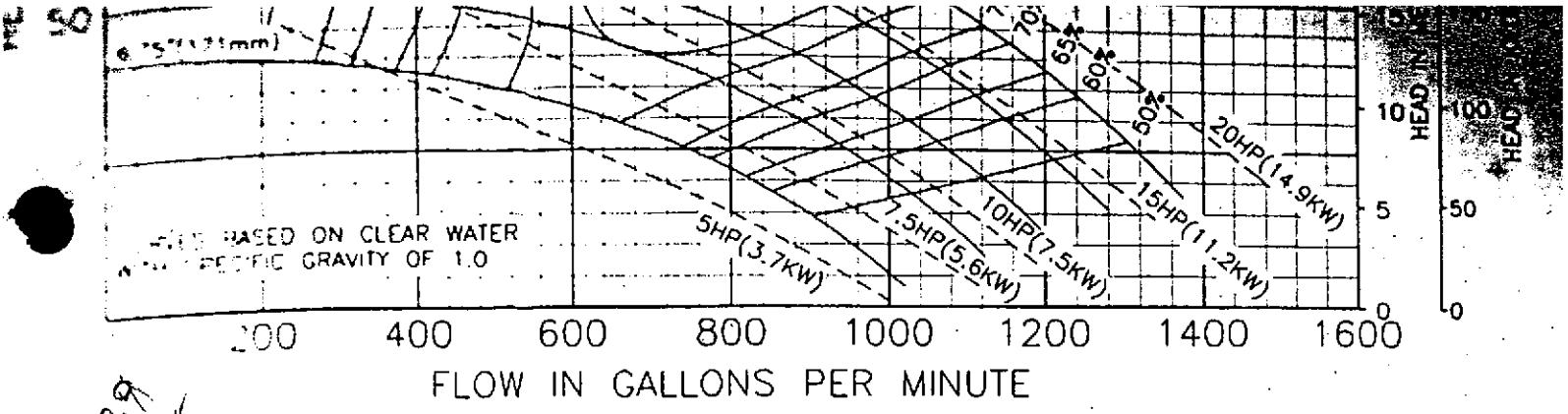
READINGS BY: CAF

Fulton Air Balance

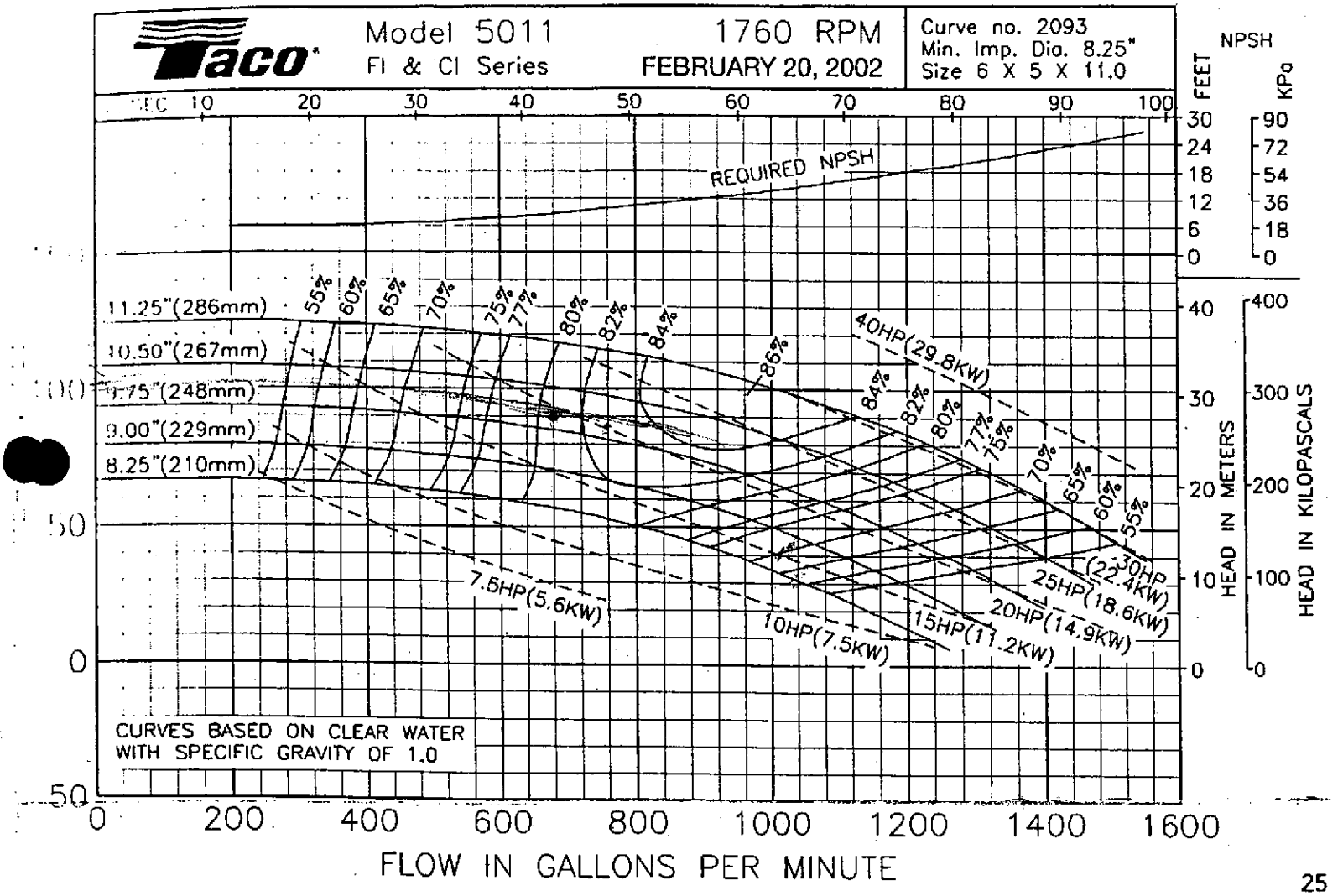
Certification No. 2426

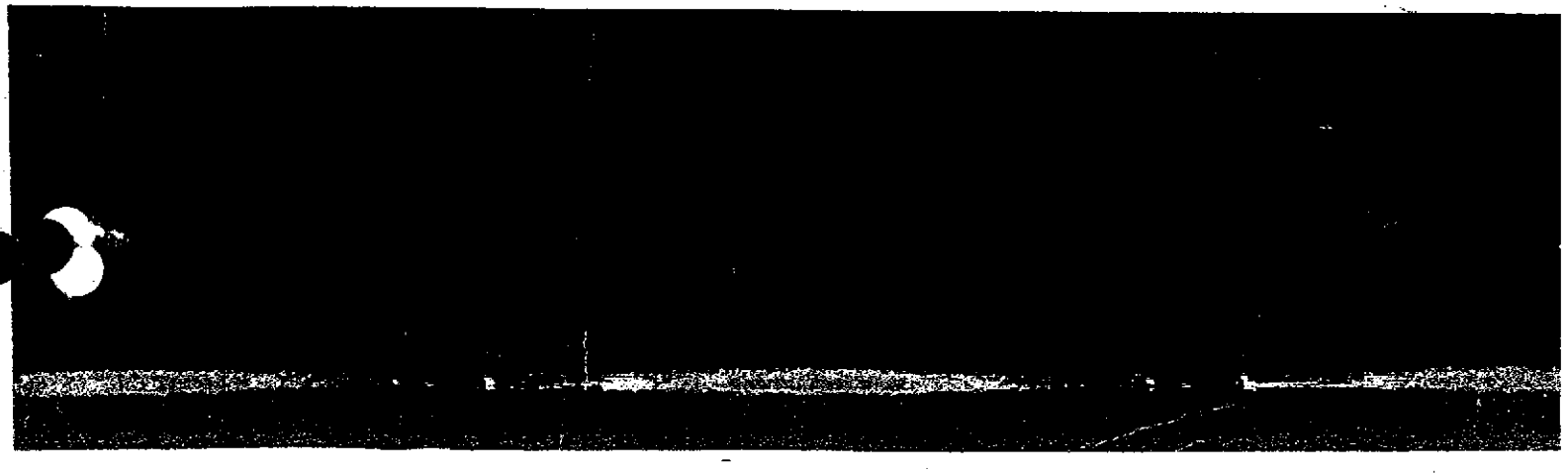
File Name: p5_iupui_cb-ctc_G

Test Date: 5/18/05


CURVES BASED ON CLEAR WATER
WITH SPECIFIC GRAVITY OF 1.0
5HP(3.7KW)
7.5HP(5.6KW)
10HP(7.5KW)
15HP(11.2KW)
20HP(14.9KW)
200
400
600
800
1000
1200
1400
1600
FLOW IN GALLONS PER MINUTE

22.9
445


Taco
Model 5011
FI & CI Series
1760 RPM
FEBRUARY 20, 2002
Curve no. 2093
Min. Imp. Dia. 8.25"
Size 6 X 5 X 11.0
NPSH
FEET
KPa
REQUIRED NPSH
11.25"(286mm)
10.50"(267mm)
9.75"(248mm)
9.00"(229mm)
8.25"(210mm)
40HP(29.8KW)
30HP(22.4KW)
25HP(18.6KW)
20HP(14.9KW)
15HP(11.2KW)
10HP(7.5KW)
7.5HP(5.6KW)
CURVES BASED ON CLEAR WATER
WITH SPECIFIC GRAVITY OF 1.0
HEAD IN METERS
HEAD IN KILOPASCALS
FLOW IN GALLONS PER MINUTE



CERTIFIED TEST, ADJUST, AND BALANCE REPORT

DATE: 5/28/2024

PROJECT:

NAME	ICTC CRAC RM 25
ADDRESS	Indianapolis, IN

TABB TAB FIRM:

NAME	Fulton Air Balance
ADDRESS	4212 West 71st Street Indianapolis, Indiana 46268
PHONE	(317) 328-4614

CERTIFICATION

PROJECT: ICTC RM 25
ADDRESS: Indianapolis, IN

THE DATA PRESENTED IN THIS REPORT IS AN EXACT RECORD OF SYSTEM PERFORMANCE AND WAS OBTAINED IN ACCORDANCE WITH TABB STANDARD PROCEDURES. ANY VARIANCE FROM DESIGN QUANTITIES WHICH EXCEED TABB TOLERANCES ARE NOTED THROUGHOUT THIS REPORT.

THE AIR DISTRIBUTION SYSTEMS HAVE BEEN TESTED & BALANCED AND FINAL ADJUSTMENTS HAVE BEEN MADE IN ACCORDANCE WITH TABB PROCEDURAL STANDARDS AND PROJECT SPECIFICATIONS

TABB FIRM Fulton Air Balance

CERTIFIED BY: Cammeron Bauer DATE: 5/28/2024

THE HYDRONIC DISTRIBUTION SYSTEMS HAVE BEEN TESTED & BALANCED AND FINAL ADJUSTMENTS HAVE BEEN MADE IN ACCORDANCE WITH TABB PROCEDURAL STANDARDS AND THE PROJECT SPECIFICATIONS

TABB FIRM Fulton Air Balance

CERTIFIED BY: Cammeron Bauer DATE: 5/28/2024

SUBMITTED & CERTIFIED BY:

TABB FIRM Fulton Air Balance

TABB SUPERVISOR Cammeron Bauer

SIGNATURE: Cammeron J Bauer

DATE: 9/30/2024 CERTIFICATION EXPIRATION DATE

Name:	Cammeron J Bauer
Certification:	TABB Supervisor
Certification #:	TB984557S
Expiration Date:	09/30/2025
Contractor:	Fulton Air Balance

FAN COIL TEST REPORT

PROJECT ICTC RM 25

FAN DATA	CRAC 1		CRAC 5		CRAC 6	
Location	RM 25		RM 25		RM 25	
Service	RM 25		RM 25		RM 25	
Manufacturer	LIEBERT		LIEBERT		LIEBERT	
Model Number	CFD-120-C1L-0-I0		CFD-120-C1L-0-I0		CFD-120-C1L-0-I0	
Serial Number	NS		NS		NS	
Type/Class	CRAC / NS		CRAC / NS		CRAC / NS	
Motor Make/Style	NS		NS		NS	
Motor Hp/RPM/Frame	4.7 / VAV / NS		4.7 / VAV / NS		4.7 / VAV / NS	
Volts/Phase/Hertz	460 / 3/60		460 / 3/60		460 / 3/60	
F.L. Amps/S.F.	4.7 / NS		4.7 / NS		4.7 / NS	
Motor Sheave Make/Model	DD		DD		DD	
Motor Sheave Diam./Bore	DD		DD		DD	
Fan Sheave Make	DD		DD		DD	
Fan Sheave Diam./Bore	DD		DD		DD	
No. Belts/Make/Size	DD		DD		DD	
Sheave Center Distance	DD		DD		DD	
Filter	3 /29X37X4		3 / 29X37X4		3 / 29X37X4	
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	11400	11218	11400	10988	11400	12544
Fan RPM	NS	ECM	NS	ECM	NS	ECM
Outside Air	NA	NA	NA	NA	NA	NA
Voltage	460	480	460	479	460	480
Amperage	4.7	3.3	4.7	3.2	4.7	3.3
SPEED	NS	60%	NS	60%	NS	60%

REMARKS:

TEST DATE: 5/10/2024 READINGS BY: RMS

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT: ICTC RM 25 SYSTEM/UNIT: CRAC-1

LOCATION/ZONE: NS SERVICE: SUPPLY

ALTITUDE Standard DENSITY: Standard CORR.FACTOR: 1.0

DUCT	REQUIRED	ACTUAL
S.P. NA Air Temp		
Size 32.25/78.5 Area 19.21	FPM 593 CFM 11,400	FPM 584 CFM 11,218

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	591	572	560	622	593	655					
	2	524	569	592	633	642	609					
	3	513	486	577	545	606	626					
	4											
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS:

Test Date: 5/10/2024 READINGS BY: RMS

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT: ICTC RM 25 SYSTEM/UNIT: CRAC 5

LOCATION/ZONE: NS SERVICE: SUPPLY

ALTITUDE Standard DENSITY: Standard CORR.FACTOR: 1.0

DUCT	REQUIRED	ACTUAL
S.P. NA Air Temp		
Size 35.25/78.5 Area 19.21	FPM 593 CFM 11,400	FPM 572 CFM 10,988

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	567	541	575	631	594	629					
	2	524	571	535	523	592	557					
	3	533	538	615	586	547	643					
	4											
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS:

Test Date: 5/10/2024 READINGS BY: RMS

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT: ICTC RM 25 SYSTEM/UNIT: CRAC-6

LOCATION/ZONE: NS SERVICE: SUPPLY

ALTITUDE Standard DENSITY: Standard CORR.FACTOR: 1.0

DUCT	REQUIRED	ACTUAL
S.P. NA Air Temp		
Size 35.25/78.5 Area 19.21	FPM 593 CFM 11,400	FPM 653 CFM 12,544

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	717	614	628	650	666	689					
	2	607	578	717	753	584	549					
	3	729	719	611	635	612	689					
	4											
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS:

Test Date: 5/10/2024 READINGS BY: RMS

FAN COIL TEST REPORT

PROJECT ICTC RM 25

FAN DATA	CRAC 7		CRAC		CRAC	
Location	RM 25					
Service	RM 25					
Manufacturer	LIEBERT					
Model Number	CFD-060-C1L-0-I0					
Serial Number	NS					
Type/Class	CRAC / NS					
Motor Make/Style	NS					
Motor Hp/RPM/Frame	4.7 / VAR / NS					
Volts/Phase/Hertz	460 / 3/60					
F.L. Amps/S.F.	4.7 / NS					
Motor Sheave Make/Model	DD					
Motor Sheave Diam./Bore	DD					
Fan Sheave Make	DD					
Fan Sheave Diam./Bore	DD					
No. Belts/Make/Size	DD					
Sheave Center Distance	DD					
Filter	3 / 23X37X4					
TEST DATA	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
CFM	8950	9760				
Fan RPM	NS	ECM				
Outside Air	NA	NA				
Voltage	460	481				
Amperage	4.7	1.4				
SPEED	NS	60%				

REMARKS:

TEST DATE: READINGS BY:

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT: ICTC RM 25 SYSTEM/UNIT: CRAC-7

LOCATION/ZONE: NS SERVICE: SUPPLY

ALTITUDE Standard DENSITY: Standard CORR.FACTOR: 1.0

DUCT	REQUIRED	ACTUAL
S.P. NA Air Temp Size 35.25/68.5 Area 16.77	FPM 534 CFM 8,950	FPM 582 CFM 9,760

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
	1	546	554	630	585	599	532					
	2	599	496	599	599	652	557					
	3	542	534	606	630	629	594					
	4											
	5											
	6											
	7											
	8											
	9											
	10											
	11											
	12											
	13											
	14											
	15											
	16											
DISTANCE FROM DUCT EDGE												
VELOCITY SUB-TOTALS												

NOTE: Take readings with air blowing toward the observer.

REMARKS:

Test Date: READINGS BY:

FLOW METER TEST REPORT

PROJECT: ICTC RM 25

SYSTEM/UNIT: CW

LOCATION: NS

MANUFACTURER: NEXUS

SERVICE OR DESIGNATION	SIZE	MODEL	DESIGN GPM	Design Delta	ACTUAL VALVE DELTA P	ACTUAL GPM	Dial Set Point
CRAC-1		6B	54.4	94.24	54.00	41.20	100.00%
CRAC-2		6B	54.4	94.24	67.70	46.20	100.00%
CRAC-6		6B	54.4	94.24	80.00	50.10	100.00%
CRAC-7		6B	51.0	82.82	69.30	46.70	100.00%

REMARKS:

TEST DATE: 8/4/2021

READINGS BY: ACY

N.E.B.B. CERTIFIED TEST, ADJUST AND BALANCE REPORT

DATE: 12/1/2025

PROJECT

NAME: IU-ICTC Data Center Crac Unit Replacement
ADDRESS: 535 W Michigan St
Indianapolis, IN 46202

ARCHITECT

NAME: Heapy
ADDRESS: 3850 Priority Way Dr S
Indianapolis, IN 46240
PHONE: (317) 571-8795

DESIGN ENGINEER

NAME: Heapy
ADDRESS: 3850 Priority Way Dr S
Indianapolis, IN 46240
PHONE: (317) 571-8795

HVAC CONTRACTOR

NAME: Irish Mechanical Services Inc.
ADDRESS: 7008 E 43rd St.
Indianapolis, IN 46226
PHONE: (317) 294-9875

N.E.B.B. TAB FIRM

NAME: Reliance Engineering
ADDRESS: 1445 Brookville Way, Suite C
Indianapolis, IN 46239
PHONE: (317) 713-7412

TAB CERTIFICATION NUMBER: 3366

CERTIFICATION

PROJECT: IU-ICTC Data Center Crac Unit Replacement
ADDRESS: 535 W Michigan St
Indianapolis, IN 46202

THE DATA PRESENTED IN THIS REPORT IS AN EXACT RECORD OF SYSTEM PERFORMANCE AND WAS OBTAINED IN ACCORDANCE WITH NEBB STANDARD PROCEDURES. ANY VARIANCE FROM DESIGN QUANTITIES WHICH EXCEED NEBB TOLERANCES ARE NOTED THROUGHOUT THIS REPORT.

THE AIR DISTRIBUTION SYSTEMS HAVE BEEN TESTED & BALANCED AND FINAL ADJUSTMENTS HAVE BEEN MADE IN ACCORDANCE WITH NEBB "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, BALANCING OF ENVIRONMENTAL SYSTEMS" AND PROJECT SPECIFICATIONS.

N.E.B.B. TAB FIRM: RELIANCE ENGINEERING

REG. NO. 3366 CERTIFIED BY: Steve A. Miller DATE: 12/1/2025
(AIR TAB SUPERVISOR)

THE HYDRONIC DISTRIBUTION SYSTEMS HAVE BEEN TESTED & BALANCED AND FINAL ADJUSTMENTS HAVE BEEN MADE IN ACCORDANCE WITH NEBB "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, BALANCING OF ENVIRONMENTAL SYSTEMS" AND THE PROJECT SPECIFICATIONS.

N.E.B.B. TAB FIRM: RELIANCE ENGINEERING

REG. NO. 3366 CERTIFIED BY: Steve A. Miller DATE: 12/1/2025
(HYDRONIC TAB SUPERVISOR)

SUBMITTED & CERTIFIED BY: Steve A. Miller

N.E.B.B. TAB FIRM: RELIANCE ENGINEERING

TAB SUPERVISOR: CERTIFIED BY: Steve A. Miller

REG. NO. 3366 SIGNATURE:___ _____

DATE: 12/1/2025 CERTIFICATION EXPIRATION DATE: December 31, 2026

Reliance Engineering, LLC
NEBB
STEVE A. MILLER
CERTIFICATION
3366
Exp. 12/31/26
Air and Hydronic Testing

Independent. Responsive. Results.

TABLE OF CONTENTS

PROJECT IU-ICTC Data Center Crac Unit Replacement

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

INSTRUMENT CALIBRATION REPORT

PROJECT: IU-ICTC Data Center Crac Unit Replacement

INSTRUMENT / SERIAL NUMBER	APPLICATION	DATE OF USE	CALIBRATION TEST DATE
Shortridge Balometer / 016137	Direct Airflow	12/1/2025	9/8/2025
Shortridge ADM / M03117	Static/Velocity Pressure	12/1/2025	8/25/2025
Shortridge HDM / W09003	Water Pressure	12/1/2025	8/28/2025
Fluke Multimeter / 56511052MV	Amperage/Voltage	12/1/2025	8/26/2025
SEE END OF REPORT FOR INSTRUMENT CALIBRATION CERTIFICATES			

N.E.B.B. TAB FIRM: RELIANCE ENGINEERING

REGISTRATION NO. 3366

TAB SUPERVISOR: Steve A. Miller

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

reliance
Independent. Responsive. Results.

REPORT ABBREVIATION SHEET

AK	=	AREA CORRECTION FACTOR	No.	=	NUMBER
CFM	=	CUBIC FEET PER MINUTE	N.R.	=	NOT REQUIRED
DELTA P	=	DIFFERENTIAL PRESSURE	NS	=	NOT STATED
DIAM	=	DIAMETER	NT	=	NOT TAKEN
DIFF	=	DIFFERENTIAL	O.S.A.	=	OUTSIDE AIR
E	=	EAST	P.D.	=	PRESSURE DROP
EDT	=	ESTIMATED DESIGN TOTAL	PRESS.	=	PRESSURE
F.L. AMPS	=	FULL LOAD AMPERAGE	RET.	=	RETURN AIR
FT	=	FEET	R.P.M.	=	REVOLUTIONS PER MINUTE
FF	=	FULL FLOW	R.R.	=	RESTROOMS
GPM	=	GALLONS PER MINUTE	S	=	SOUTH
H.P.	=	HORSE POWER	SF	=	SET FLOW
HZ	=	HERTZ	S.F.	=	SERVICE FACTOR
IN	=	INCHES	S.P.	=	STATIC PRESSURE
MFR.	=	MANUFACTURER	VEL.	=	VELOCITY IN FEET PER MINUTE
NPSH	=	NET POSITIVE SUCTION HEAD	W	=	WEST
N	=	NORTH			
NA	=	NOT APPLICABLE			
NF	=	NO FLOW			

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

CRAC-2 is running at 100% fan speed and 122% airflow. Fans would not change speed when commanded to at the unit interface.

CRAC-4 is running at 100% fan speed and 108% airflow.

CRAC-2 CHW balance valve was measured at 81% water flow. Balance Valve is 100% open. Control support confirmed the CHW system was maintaining it's current setpoint.

CRAC-4 CHW balance valve was measured at 94% water flow. Balance Valve is 100% open.

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

FAN COIL TEST REPORT

PROJECT: **IU-ICTC Data Center Crac Unit Replacement**

FAN DATA	FAN COIL NO.	CRAC-2	FAN COIL NO.	CRAC-4	FAN COIL NO.	
Manufacturer	VERTIV LIEBERT CW		VERTIV LIEBERT CW			
Model Number	CW084DC1A10DO4		CW084DC1A10DO4			
Serial Number	N25H006343		N25H006344			
Motor H.P.	4.15		4.15			
Volts / Phase / Hertz	460/3/60		460/3/60			
F.L. Amps	22.6		22.6			
Filter	8 / 24x20x4		8 / 24x20x4			
TEST DATA	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
CFM	11400	13963	11400	12350		
Fan CFM Heating	NA	NA	NA	NA		
Fan CFM Cooling	11400	13963	11400	12350		
Heating GPM	NA	NA	NA	NA		
Cooling GPM	64.4	52.1	64.4	60.7		
Voltage	460	482	460	482		
Amperage	8.0	3.8	8.0	3.7		

FAN DATA	FAN COIL NO.		FAN COIL NO.		FAN COIL NO.	
Manufacturer						
Model Number						
Serial Number						
Motor H.P.						
Volts / Phase / Hertz						
F.L. Amps						
Filter						
TEST DATA	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
CFM						
Fan CFM Heating						
Fan CFM Cooling						
Heating GPM						
Cooling GPM						
Voltage						
Amperage						
Filter						

REMARKS: 2 FAN MOTORS IN EACH UNIT

DATE: 12/1/2025 **READINGS BY:** CRK,JJ

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

reliance
Independent. Responsive. Results.

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT: IU-ICTC Data Center Crac Unit Replacement **SYSTEM / UNIT:** CRAC-2

LOCATION / ZONE: MACHINE ROOM **SERVICE:** RETURN

ALTITUDE: Standard **DENSITY:** Standard **CORR. FACTOR:** 1 0.85

DUCT					REQUIRED				ACTUAL			
Duct Static:		**Air Temp:**	NA				**SCFM:**	NA			**SCFM:**	NA
Size:	88	32	**Area:**	16.62	**FPM:**	686	**CFM:**	11,400	**FPM:**	840	**CFM:**	13963
# BOTTOM:		**# EDGE:**										122%

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
N/A	1	915	750	914	885							
N/A	2	678	852	886	841							
N/A	3											
N/A	4											
N/A	5											
N/A	6											
N/A	7											
N/A	8											
N/A	9											
N/A	10											
N/A	11											
N/A	12											
N/A	13											
N/A	14											
N/A	15											
N/A	16											
DISTANCE FROM DUCT EDGE		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VELOCITY SUB-TOTALS		1593	1602	1800	1726	0	0	0	0	0	0	0

NOTE: Take Readings with air blowing towards the observer

REMARKS: Total FPM: 6721 / 8 = 840 x 16.62 = 13963 CFM

FANS IN UNIT WILL NOT SLOW DOWN WHEN COMMANDED AT INTERFACE ON UNIT - WILL NOT ALLOW LOCAL OVERRIDE

TEST DATE: 12/1/2025 **READINGS BY:** CRK,JJ **PAGE:** 8 of 20

RECTANGULAR DUCT TRAVERSE REPORT

PROJECT: IU-ICTC Data Center Crac Unit Replacement **SYSTEM / UNIT:** CRAC-4

LOCATION / ZONE: MACHINE ROOM **SERVICE:** RETURN

ALTITUDE: Standard **DENSITY:** Standard **CORR. FACTOR:** 1 0.85

DUCT					REQUIRED				ACTUAL			
Duct Static:		**Air Temp:**	NA				**SCFM:**	NA			**SCFM:**	NA
Size:	88	32	**Area:**	16.62	**FPM:**	686	**CFM:**	11,400	**FPM:**	743	**CFM:**	12350
# BOTTOM:		**# EDGE:**										108%

DISTANCE FROM BOTTOM	POSITION	1	2	3	4	5	6	7	8	9	10	11
N/A	1	851	811	708	681							
N/A	2	726	740	714	714							
N/A	3											
N/A	4											
N/A	5											
N/A	6											
N/A	7											
N/A	8											
N/A	9											
N/A	10											
N/A	11											
N/A	12											
N/A	13											
N/A	14											
N/A	15											
N/A	16											
DISTANCE FROM DUCT EDGE		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VELOCITY SUB-TOTALS		1577	1551	1422	1395	0	0	0	0	0	0	0

NOTE: Take Readings with air blowing towards the observer

REMARKS: Total FPM: 5945 / 8 = 743 x 16.62 = 12350 CFM

RUNNING @ 100% FAN SPEED

TEST DATE: 12/1/2025 **READINGS BY:** CRK,JJ **PAGE:** 9 of 20

reliance
Independent. Responsive. Results.

MANUAL BALANCE VALVE TEST REPORT

PROJECT: IU-ICTC Data Center Crac Unit Replacement **SYSTEM:** CHW

LOCATION: **MANUFACTURER:** NEXUS

SERVICE OR DESIGNATION	SIZE	MODEL	DESIGN GPM	DESIGN VALVE P.D INCH	ACTUAL VALVE P.D INCH	ACTUAL GPM	VALVE SETTING	NOTES
CRAC-2	3	ORTURI 6B	64.4	46.0	30.1	52.1	100%	
CRAC-4	3	ORTURI 6B	64.4	46.0	40.8	60.7	100%	

REMARKS:

TEST DATE: 12/1/2025 **READINGS BY:** CRK,JJ **PAGE:** 10 of 20

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

Indiana Standards Laboratory

2919 SHELBY STREET
INDIANAPOLIS, INDIANA 46203-5236

REPORT of CALIBRATION

DATE	09/08/2025	REPORT NUMBER	282626
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	8400
NOMENCLATURE	Balometer	SERIAL NUMBER	016137
TOLERANCE	± 3 % reading ± 7 CFM		
MACHINE NUMBER	B24100		
SUBMITTED BY	Reliance Engineering 1445 Brookville Way Suite C Indianapolis, IN 46239- USA	P.O. NUMBER	5020-25095
PROCEDURE	ISL-060-BALOMETER-01-0814	TEMPERATURE	20 °C
CAL INTERVAL	12 Months	HUMIDITY	44 %RH
PREVIOUS REPORT	0	NEXT CAL DUE	09/08/2026
		TECHNICIAN	MWC
RECEIVED CONDITION	In-tolerance		
RETURNED CONDITION	In-tolerance, no adjustments required.		
COMMENTS	Calibrated with Shortridge Airdata Multimeter, s/n M03117		
CALIBRATION SOURCE(S)	246661 275404		
UNCERTAINTY	As per the customer's request, measurement uncertainty is not reported.		

CERTIFICATION

After careful inspection of the above-described instrument, tests were performed in-laboratory to establish calibration accuracy. All equipment utilized in the testing is maintained by this laboratory and checked frequently against standards that have been certified traceable to SI Units through National Institute of Standards and Technology (NIST) or another National Metrology Institute (NMI).

It is hereby certified that the test instrument meets all the original manufacturer's performance specifications for the ranges and functions tested, unless otherwise noted above.
The calibration results indicate the status of the device at the time of calibration. Any number of factors may influence the performance of this device during its calibration interval. It is the responsibility of the user to maintain an adequate calibration interval for this device.
Test documentation is on file and may be viewed in our office. Testing was completed per ISL Quality Manual: Doc-001-Rev26 dated 01/01/2024, and ISO/IEC 17025, ANAB Accredited Certificate Number L-2222.

ilac-MRA ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT

Approved By *Anthony Mason*
Quality Manager
service@indianastandards.com, 317-787-6578

As Left is for after adjustment readings, otherwise it will be blank.
This report shall not be reproduced except in full, without the written approval of Indiana Standards Laboratory.

REPORT NUMBER 282626 Page 1 of 2 PRINTED ON 09/09/25

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

DATE	09/08/2025	REPORT NUMBER	282626
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	8400
NOMENCLATURE	Balometer	SERIAL NUMBER	016137
TOLERANCE	± 3 % reading ± 7 CFM		

CALIBRATION SOURCES

Source	Manufacturer	Nomenclature	Model	Serial	Cal Due
246661	Meriam Instruments	Flowmeter, Element, Laminar	50MC2-8	726430-C1	09/30/25
275404	Flow Dynamics	Flow Indicator	FDI-C7009	98-060	05/31/26

CALIBRATION DATA

		Test Limits			Test Result	
Direction	Range	Nominal Indication	Low Limit	High Limit	Standard Actual	UUT Indicated
	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
Hood to Back	250	70	81	99	90	90
	250	180	159	183	171	170
	500	200	202	228	215	215
	500	300	294	326	310	310
	500	450	436	476	456	450
	1000	600	586	636	611	591
	1000	900	888	956	922	918
	2000	1200	1179	1265	1222	1230
Back to Hood	250	70	81	99	90	90
	250	180	159	183	171	170
	500	200	202	228	215	210
	500	300	294	326	310	310
	500	450	436	476	456	460
	1000	600	586	636	611	630
	1000	900	888	956	922	945
	2000	1200	1179	1265	1222	1255

As Left is for after adjustment readings, otherwise it will be blank.

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

Indiana Standards Laboratory

2919 SHELBY STREET
INDIANAPOLIS, INDIANA 46203-5236

REPORT of CALIBRATION

DATE	08/25/2025	REPORT NUMBER	282102
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	ADM-870C
NOMENCLATURE	Multimeter, Airdata	SERIAL NUMBER	M03117
TOLERANCE	Refer to data		
MACHINE NUMBER	ITB255		
SUBMITTED BY	Reliance Engineering 1445 Brookville Way Suite C Indianapolis, IN 46239- USA	P.O. NUMBER	5020-25095
PROCEDURE	ISL-060-AVTF-03-0712	TEMPERATURE	20 °C
CAL INTERVAL	12 Months	HUMIDITY	48 %RH
PREVIOUS REPORT	262531	NEXT CAL DUE	08/25/2026
		TECHNICIAN	MWC
RECEIVED CONDITION	In-tolerance		
RETURNED CONDITION	In-tolerance, no adjustments required.		
COMMENTS			

CALIBRATION SOURCE(S) 215771 279293 269028 258006 258008 279302 279700 252327

UNCERTAINTY As per the customer's request, measurement uncertainty is not reported.

CERTIFICATION

After careful inspection of the above-described instrument, tests were performed in-laboratory to establish calibration accuracy. All equipment utilized in the testing is maintained by this laboratory and checked frequently against standards that have been certified traceable to SI Units through National Institute of Standards and Technology (NIST) or another National Metrology Institute (NMI).

It is hereby certified that the test instrument meets all the original manufacturer's performance specifications for the ranges and functions tested, unless otherwise noted above.
The calibration results indicate the status of the device at the time of calibration. Any number of factors may influence the performance of this device during its calibration interval. It is the responsibility of the user to maintain an adequate calibration interval for this device.
Test documentation is on file and may be viewed in our office. Testing was completed per ISL Quality Manual: Doc-001-Rev26 dated 01/01/2024, and ISO/IEC 17025, ANAB Accredited Certificate Number L-2222.

ilac-MRA ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT

Approved By *Anthony Mason*
Quality Manager
service@indianastandards.com, 317-787-6578

As Left is for after adjustment readings, otherwise it will be blank.

REPORT NUMBER 282102 Page 1 of 3 PRINTED ON 09/08/25

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

DATE	08/25/2025	REPORT NUMBER	282102
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	ADM-870C
NOMENCLATURE	Multimeter, Airdata	SERIAL NUMBER	M03117
TOLERANCE	Refer to data		

CALIBRATION SOURCES

Source	Manufacturer	Nomenclature	Model	Serial	Cal Due
215771	Ruska Instrument Corp.	Indicator, Float Position	2465-801	50777	06/30/26
252327	Dwyer Instruments, Inc.	Pitot Tube	160F-18	A26A0	01/31/29
258006	Ruska Instrument Corp.	Piston-Cylinder	2465-760	TL-595	05/31/29
258008	Ruska Instrument Corp.	Weight	2465-799	51001	05/31/29
269028	Fluke	Module, Pressure	PM600-A700K	4220031	01/31/26
279293	Dwyer Instruments, Inc.	Manometer, Micro	1430	005694	08/31/28
279302	ESI	Resistance Standard	RS-925A	420007	08/31/26
279700	Fluke Corp.	Well, Field Metrology	9170	A76215	08/31/26

CALIBRATION DATA

Test Description				Test Limits				Test Result		
Function / Test	Range Low	Range High	Model Serial #	Standard	Low Limit	High Limit	Indicated Units	As Found / UUT indicated		U_{exp} (k=2)
AP	14	40	ADM-870C	28.4	27.7	29.1	inHg	28.4		
	14	40	M03117	40.0	39.1	40.9	inHg	40.0		
	14	40		15.0	14.6	15.4	inHg	15.0		
Delta P	0.5	50	ADM-870C	0.0500	0.0480	0.0520	inH2O	0.0500		
	0.5	50	M03117	0.1500	0.1460	0.1540	inH2O	0.1490		
	0.5	50		0.2500	0.2440	0.2560	inH2O	0.2485		
	0.5	50		0.3500	0.3420	0.3580	inH2O	0.3480		
	0.5	50		2.000	1.959	2.041	inH2O	1.985		
	0.5	50		7.875	7.716	8.034	inH2O	7.825		
	0.5	50		21.94	21.50	22.38	inH2O	21.80		
	0.5	50		30.14	29.53	30.75	inH2O	29.90		
	0.5	50		38.34	37.57	39.11	inH2O	38.05		
	0.5	50		48.89	47.91	49.87	inH2O	48.50		
Velgrid	25	2500	Velgrid	200	186	214	FPM	200		
	25	2500	M14352-VG	300	284	316	FPM	305		
	25	2500		500	478	522	FPM	510		
Airfoil	25	5000	Airfoil	300	283	317	FPM	300		
	25	5000	ISL	1500	1447	1553	FPM	1495		
	25	5000		3000	2902	3098	FPM	3010		
Pitot	25	8000	160-18	300	284	316	FPM	305		
	25	8000	M14352-18	1500	1448	1552	FPM	1500		
	25	8000		3000	2902	3098	FPM	2990		

As Left is for after adjustment readings, otherwise it will be blank.

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

DATE	08/25/25	REPORT NUMBE	282102
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	ADM-870C
NOMENCLATURE	Multimeter, Airdata	SERIAL NUMBER	M03117

Test Description				Test Limits				Test Result		
Function / Test	Range Low	Range High	Model Serial #	Standard	Low Limit	High Limit	Indicated Units	As Found / UUT indicated	As Left / UUT indicated	U_{exp} (k=2)
Temp Input	-67	250	ADM-870C	32.0	31.5	32.5	°F	31.9		
	-67	250	M03117	100.4	99.9	100.9	°F	100.2		
	-67	250		158.3	157.8	158.8	°F	158.1		
TemProbe	32	158	ADT442	32.0	31.5	32.5	°F	31.9		
	32	158	11377	95.0	94.5	95.5	°F	94.7		
	32	158		155.0	154.5	155.5	°F	154.7		

As Left is for after adjustment readings, otherwise it will be blank.

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

Indiana Standards Laboratory

2919 SHELBY STREET
INDIANAPOLIS, INDIANA 46203-5236

REPORT of CALIBRATION

DATE	08/28/2025	REPORT NUMBER	282104
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	HDM-250
NOMENCLATURE	Multimeter, HydroData	SERIAL NUMBER	W09003
TOLERANCE	Pressure ± 2 % reading + 1 digit; Temp ± 0.5 °F		

SUBMITTED BY	Reliance Engineering 1445 Brookville Way Suite C Indianapolis, IN 46239- USA	P.O. NUMBER	5020-25095
PROCEDURE	ISL-050-PRESS-07-0222	TEMPERATURE	22 °C
CAL INTERVAL	12 Months	HUMIDITY	44 %RH
PREVIOUS REPORT	262922	NEXT CAL DUE	08/28/2026
		TECHNICIAN	JAD
RECEIVED CONDITION	In-tolerance		
RETURNED CONDITION	In-tolerance, no adjustments required.		
COMMENTS			
CALIBRATION SOURCE(S)	269027 269029 279302		
UNCERTAINTY	As per the customer's request, measurement uncertainty is not reported.		

CERTIFICATION

After careful inspection of the above-described instrument, tests were performed in-laboratory to establish calibration accuracy. All equipment utilized in the testing is maintained by this laboratory and checked frequently against standards that have been certified traceable to SI Units through National Institute of Standards and Technology (NIST) or another National Metrology Institute (NMI).

It is hereby certified that the test instrument meets all the original manufacturer's performance specifications for the ranges and functions tested, unless otherwise noted above.
The calibration results indicate the status of the device at the time of calibration. Any number of factors may influence the performance of this device during its calibration interval. It is the responsibility of the user to maintain an adequate calibration interval for this device.
Test documentation is on file and may be viewed in our office. Testing was completed per ISL Quality Manual: Doc-001-Rev26 dated 01/01/2024, and ISO/IEC 17025, ANAB Accredited Certificate Number L-2222.

ilac-MRA

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
CALIBRATION AND DIMENSIONAL MEASUREMENT

Approved By *Anthony Mason*
Quality Manager
service@indianastandards.com, 317-787-6578

As Left is for after adjustment readings, otherwise it will be blank.

REPORT NUMBER 282104 Page 1 of 3 PRINTED ON 09/08/25

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

DATE	08/28/2025	REPORT NUMBER	282104
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	HDM-250
NOMENCLATURE	Multimeter, HydroData	SERIAL NUMBER	W09003
TOLERANCE	Pressure ± 2 % reading + 1 digit; Temp ± 0.5 °F		

CALIBRATION SOURCES

Source	Manufacturer	Nomenclature	Model	Serial	Cal Due
269027	Fluke	Module, Pressure	PM600-A7M	4102031	01/31/26
269029	Fluke	Module, Pressure	PM500-BG100K	45650002	01/31/26
279302	ESI	Resistance Standard	RS-925A	420007	08/31/26

CALIBRATION DATA

Test Description				Test Limits				Test Result *	
Function / Test	Range	Applied / Nominal	Applied Units	Standard Actual	Low Limit	High Limit	Indicated Units	As Found / UUT indicated	As Left / UUT indicated
Pressure	P1	0	psi	0.00	-0.01	0.01	psi	0.00	
Pressure	P1	50	psi	50.0	48.9	51.1	psi	50.1	
Pressure	P1	100	psi	100.0	97.9	102.1	psi	100.5	
Pressure	P1	150	psi	150.0	146.9	153.1	psi	150.8	
Pressure	P1	200	psi	200.0	195.9	204.1	psi	201.2	
Vacuum	P2	0	inHg	0.00	-0.01	0.01	inHg	0.00	
Vacuum	P2	-5	inHg	-5.00	-5.11	-4.89	inHg	-5.02	
Vacuum	P2	-15	inHg	-15.00	-15.31	-14.69	inHg	-15.09	
Vacuum	P2	-25	inHg	-25.00	-25.51	-24.49	inHg	-25.19	
Pressure	Pd	0	inH2O	0.00	-0.01	0.01	inH2O	0.00	
Pressure	Pd	20	inH2O	20.0	19.5	20.5	inH2O	19.7	
Pressure	Pd	40	inH2O	40.0	39.1	40.9	inH2O	39.6	
Pressure	Pd	60	inH2O	60.0	58.7	61.3	inH2O	59.5	
Pressure	Pd	80	inH2O	80.0	78.3	81.7	inH2O	79.2	
Pressure	Pd	100	inH2O	100.0	97.9	102.1	inH2O	99.0	
Pressure	Pd	0	inH2O	0.00	-0.01	0.01	ftH2O	0.00	
Pressure	Pd	240	inH2O	20.0	19.5	20.5	ftH2O	19.6	
Pressure	Pd	480	inH2O	40.0	39.1	40.9	ftH2O	39.5	
Pressure	Pd	720	inH2O	60.0	58.7	61.3	ftH2O	59.3	
Pressure	Pd	960	inH2O	80.0	78.3	81.7	ftH2O	79.1	
Pressure	Pd	1200	inH2O	100.0	97.9	102.1	ftH2O	98.8	

As Left is for after adjustment readings, otherwise it will be blank.

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

DATE	08/28/25	REPORT NUMBE	282104
MANUFACTURER	Shortridge Instruments, Inc.	MODEL NUMBER	HDM-250
NOMENCLATURE	Multimeter, HydroData	SERIAL NUMBER	W09003

Test Description				Test Limits				Test Result	
Function / Test	Range	Applied / Nominal	Applied Units	Standard Actual	Low Limit	High Limit	Indicated Units	As Found / UUT indicated	As Left / UUT indicated
Temp	-	7355	Ω	32.0	31.5	32.5	°F	32.0	
Temp	-	4482	Ω	50.0	49.5	50.5	°F	50.0	
Temp	-	1200	Ω	104.0	103.5	104.5	°F	104.0	

As Left is for after adjustment readings, otherwise it will be blank.

REPORT NUMBER 282104 Page 3 of 3 PRINTED ON 09/08/25

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

Indiana Standards Laboratory

2919 SHELBY STREET
INDIANAPOLIS, INDIANA 46203-5236

REPORT of CALIBRATION

DATE	08/26/2025	REPORT NUMBER	282099
MANUFACTURER	Fluke Corp.	MODEL NUMBER	323
NOMENCLATURE	Multimeter, True RMS Clamp	SERIAL NUMBER	56511052MV
TOLERANCE	Manufacturer Specifications		

SUBMITTED BY	Reliance Engineering 1445 Brookville Way Suite C Indianapolis, IN 46239- USA	P.O. NUMBER	5020-25095
PROCEDURE	ISL-010-DMMGEN-04-0115	TEMPERATURE	22 °C
CAL INTERVAL	12 Months	HUMIDITY	40 %RH
PREVIOUS REPORT	0	NEXT CAL DUE	08/26/2026
		TECHNICIAN	JWB
RECEIVED CONDITION	In-tolerance		
RETURNED CONDITION	In-tolerance, no adjustments required.		
COMMENTS			

CALIBRATION SOURCE(S) 277227

UNCERTAINTY As per the customer's request, measurement uncertainty is not reported.

CERTIFICATION

After careful inspection of the above-described instrument, tests were performed in-laboratory to establish calibration accuracy. All equipment utilized in the testing is maintained by this laboratory and checked frequently against standards that have been certified traceable to SI Units through National Institute of Standards and Technology (NIST) or another National Metrology Institute (NMI).

It is hereby certified that the test instrument meets all the original manufacturer's performance specifications for the ranges and functions tested, unless otherwise noted above.
The calibration results indicate the status of the device at the time of calibration. Any number of factors may influence the performance of this device during its calibration interval. It is the responsibility of the user to maintain an adequate calibration interval for this device.
Test documentation is on file and may be viewed in our office. Testing was completed per ISL Quality Manual: Doc-001-Rev26 dated 01/01/2024, and ISO/IEC 17025, ANAB Accredited Certificate Number L-2222.

ilac-MRA ANAB ANSI National Accreditation Board ACCREDITED CALIBRATION AND DIMENSIONAL MEASUREMENT

Approved By *Anthony Mason*
Quality Manager
service@indianastandards.com, 317-787-6578

As Left is for after adjustment readings, otherwise it will be blank.

REPORT NUMBER 282099 Page 1 of 2 PRINTED ON 09/08/25

PROJECT: IU-ICTC Data Center Crac Unit Replacement

LOCATION: Indianapolis, IN 46202

DATE	08/26/2025	REPORT NUMBER	282099
MANUFACTURER	Fluke Corp.	MODEL NUMBER	323
NOMENCLATURE	Multimeter, True RMS Clamp	SERIAL NUMBER	56511052MV
TOLERANCE	Manufacturer Specifications		

CALIBRATION SOURCES

Source	Manufacturer	Nomenclature	Model	Serial	Cal Due
277227	Fluke Corp.	Calibrator, Digital	5520A	1533001	07/31/26

CALIBRATION DATA

Test Description				Test Limits				Test Result	
Function / Test	Range	Applied / Nominal	Frequency	Standard Actual	Low Limit	High Limit	Indicated Units	As Found / Indicated	As Left / Indicated
			(Hz)						
ACV	600	10	50	10.0	9.4	10.6	V	10.0	
ACV	600	600	50	600.0	590.5	609.5	V	598.7	
ACV	600	600	400	600.0	590.5	609.5	V	598.2	
DCV	600	-600	-	-600.0	-606.5	-593.5	V	-598.6	
DCV	600	10	-	10.0	9.4	10.6	V	9.9	
DCV	600	600	-	600.0	593.5	606.5	V	598.8	
Resistance	400	0	-	0.0	-0.5	0.5	Ω	0.0	
Resistance	400	10	-	10.0	9.4	10.6	Ω	9.8	
Resistance	400	350	-	350.0	346.0	354.0	Ω	349.9	
Resistance	4000	3500	-	3500	3460	3540	Ω	3496	
		(50 Turn)							
ACA	400	0.12	50	6.0	5.4	6.6	A	6.0	
ACA	400	0.48	150	24.0	22.9	25.1	A	24.1	
ACA	400	4.2	50	210.0	205.3	214.7	A	211.8	
ACA	400	7.8	50	390.0	381.7	398.3	A	394.3	
ACA	400	7.8	150	390.0	379.8	400.2	A	397.3	
ACA	400	7.8	400	390.0	379.8	400.2	A	395.0	

As Left is for after adjustment readings, otherwise it will be blank.

Reliance Engineering - 1445 Brookville Way, Suite C Indianapolis, IN 46239 Office: (317) 713-7412
www.reliance-engineers.com

N. E. B. B.

CERTIFIED TEST, ADJUST, AND BALANCE REPORT

DATE 09/23/20

PROJECT: IUPUI IN-076 ICTC RM 019/024
CRAC UNIT REPLACEMENT

ADDRESS: INDIANAPOLIS, IN

ENGINEER: HEAPY

HVAC CONTRACTOR: FERRER

NEBB BALANCE FIRM: TOTAL BALANCE, INC.
1031 HARRISON STREET
INDIANAPOLIS, IN 46202
(317) 955-7825
NEBB CERT. # 2863

FILE NO. 209359

N E B B CERTIFICATION

PROJECT: IUPUI IN-076 ICTC RM 019/024
CRAC UNIT REPLACEMENT

ADDRESS: INDIANAPOLIS, IN

THE DATA PRESENTED IN THIS REPORT IS A RECORD OF SYSTEM MEASUREMENTS AND FINAL ADJUSTMENTS THAT HAVE BEEN OBTAINED IN ACCORDANCE WITH THE CURRENT EDITION OF THE NEBB *PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS.* ANY VARIANCES FROM DESIGN QUANTITIES, WHICH EXCEED NEBB TOLERANCES, ARE NOTED IN THE TEST - ADJUST - BALANCE REPORT PROJECT SUMMARY.

NEBB TAB FIRM: TOTAL BALANCE INC.

REG NO. 2863 CERTIFIED BY ANDREW W. HEACOX DATE 09/23/20

EXPIRATION DATE: 03/31/21

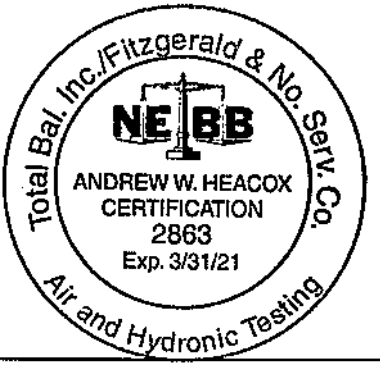
SUBMITTED & CERTIFIED BY:

NEBB TAB FIRM: TOTAL BALANCE INC.
1031 HARRISON STREET
INDIANAPOLIS, IN 46202
(317) 955-7825

TAB SUPERVISOR ANDREW W. HEACOX

REG NO. 2863 SIGNATURE Andrew W. Heacox

DATE 09/23/20



Total Balance, Inc.

Instrument Calibration Report

Instrument/ Serial No.	Application	Calibration Test Date
Hydronic Manometer/71950247	Water Differential Pressure	1/20
Shortridge ADM-860/M08408	CFM/Velocity/Pressure	11/19
Psychrometer/062920010	Temperatures	7/20
Extech/54001298	Temperatures	8/19
Anemometer/1005343	Velocity	9/19
Fluke/45340832	Amps/Volts	12/19
Digital Tachometer/B42B9019	RPM	12/19

Remarks:

NEBB TAB Firm: Total Balance, Inc.

Registration No. : 2863

TOTAL BALANCE, INC ABBREVIATION LIST

ACPH = AIR CHANGES PER HOUR
AHU = AIR HANDLING UNIT
AK=FIELD CALCULATED CORRECTION FACTOR VELOCITY MULTIPLIER
APD = AIR PRESSURE DROP
BDD = BACKDRAFT DAMPER
BOS = BOTTOM OF SHEAVE
CD = CEILING DIFFUSER
CFM = CUBIC FEET PER MINUTE
CHW OR CW = CHILLED WATER
CU. FT. = CUBIC FEET
CWC = CHILLED WATER COIL
DB = DRY BULB (°F)
DP = DIFFERENTIAL PRESSURE
EA = EXHAUST AIR
EF = EXHAUST FAN
EG = EXHAUST GRILLE
EMG = EXPANDED METAL GRILLE
EP = EXPANDED PLASTIC
FC = FLOW CO-EFFICIENT
FF = FLOW FACTOR
FG = FLOW GAIN
FPM = FEET PER MINUTE
GPM = GALLONS PER MINUTE
HW = HOT WATER
HWC = HOT WATER COIL
HZ = HERTZ
K-FACTOR = CALIBRATION FACTOR
LAD = LINEAR AIR DIFFUSER
MAU = MAKEUP AIR UNIT
MD = MOTORIZED DAMPER
MOS = MIDDLE OF SHEAVE
NA = NOT ACCESSIBLE/NOT APPLICABLE
NG = NOT GIVEN
NI = NOT INSTALLED
NR = NO READING
NS = NOT SPECIFIED
OA = OUTDOOR AIR
OBD = OPPOSED BLADE DAMPER
OD = OUTSIDE DIAMETER
PSI OR # = POUNDS PER SQUARE INCH
RA = RETURN AIR
RAG = RETURN AIR GRILLE
RF = RETURN FAN
RH = RELATIVE HUMIDITY
SA=SUPPLY AIR
SAD=SUPPLY AIR DIFFUSER
SAG=SUPPLY AIR GRILLE
SD=SUPPLY DIFFUSER
SF=SUPPLY FAN
TOS=TOP OF SHEAVE
TP=THERMALLY PROTECTED
VD=VOLUME DAMPER
VFD=VARIABLE FREQUENCY DRIVE
WB=WET BULB (°F)
WC=WATER COLUMN
WM=WIRE MESH
WO=WIDE OPEN
WSHP=WATER SOURCE HEAT PUMP
ZD=ZONEDAMPER

TOTAL BALANCE, INC.

AIR APPARATUS
TEST REPORT

PROJECT **IUPUI CRAC UNIT** SYSTEM/UNIT CRAC-3

LOCATION 024

UNIT DATA	VERTIV		MOTOR DATA	*
Make/Model No.	CW084DC1A1D275		Make/Frame	NG NG
Type/Size	DOWNFLOW		H.P./RPM	4.15 NG
Serial Number	N00E150009		Volts/Phase/Hertz	460 3 60
Arr./Class			F.L. Amps/S.F.	4.0 NG
Discharge	VERTICAL		Make Sheave	DIRECT DRIVE
Make Sheave	DIRECT DRIVE		Sheave Diam/Bore	
Sheave Diam/Bore			Sheave ¢ Distance	
No. Belts/make/size			Sheave Operating Dia.	
No. Filters/type/size	8 PLTD 18X24X4			

TEST DATA	DESIGN	ACTUAL		TEST DATA	DESIGN	ACTUAL
Total CFM	11,900	13,046		Discharge S.P.	NG	0.09
Total S.P.	NG	1.37		Suction S.P.	NG	-1.28
Fan RPM	NG	100%		Reheat Coil ΔP	NG	NA
External S.P.	NG	.18		Cooling Coil ΔP	NG	.54
Motor Volts T1,T2,T3	460	481/482/479		Preheat Coil ΔP	NG	NA
Motor Amps T1,T2,T3	4.0	3.4/3.6/3.4		Filters ΔP	NG	.65
Motor Amps T1, T2, T3	4.0	3.5/3.4/3.3				
Outside Air CFM	0	0				
Return Air CFM	11,900	13,046		Frequency Drive	NG	NA
				Out. Air Damp. Position	NG	0%
				Ret. Air Damp. Position	NG	100%

REMARKS:

*TWO MOTORS

TEST DATE 9/17/20 READINGS BY TR

TOTAL BALANCE, INC.

AIR APPARATUS
TEST REPORT

PROJECT IUPUI CRAC UNIT SYSTEM/UNIT CRAC-8

LOCATION 019

UNIT DATA	VERTIV		MOTOR DATA	*
Make/Model No.	CW084DC1A1D275		Make/Frame	NG NG
Type/Size	DOWNFLOW		H.P./RPM	4.15 NG
Serial Number	N00E150008		Volts/Phase/Hertz	460 3 60
Arr./Class			F.L. Amps/S.F.	4.0 NG
Discharge	VERTICAL		Make Sheave	DIRECT DRIVE
Make Sheave	DIRECT DRIVE		Sheave Diam/Bore	
Sheave Diam/Bore			Sheave ¢ Distance	
No. Belts/make/size			Sheave Operating Dia.	
No. Filters/type/size	8 PLTD 18X24X4			

TEST DATA	DESIGN	ACTUAL		TEST DATA	DESIGN	ACTUAL
Total CFM	11,900	12,898		Discharge S.P.	NG	0.10
Total S.P.	NG	1.35		Suction S.P.	NG	-1.25
Fan RPM	NG	100%		Reheat Coil ΔP	NG	NA
External S.P.	NG	.18		Cooling Coil ΔP	NG	.50
Motor Volts T1,T2,T3	460	480/481/478		Preheat Coil ΔP	NG	NA
Motor Amps T1,T2,T3	4.0	3.5/3.5/3.3		Filters ΔP	NG	.67
Motor Amps T1,T2,T3	4.0	3.4/3.6/3.2				
Outside Air CFM	0	0				
Return Air CFM	11,900	12,898		Frequency Drive	NG	NA
				Out. Air Damp. Position	NG	0%
				Ret. Air Damp. Position	NG	100%

REMARKS:

*TWO MOTORS

TEST DATE 9/17/20 READINGS BY TR

TOTAL BALANCE, INC.

AIR OUTLET
TEST REPORT

PROJECT IUPUI CRAC UNIT SYSTEM CRAC UNITS

OUTLET MANUFACTURER NG TEST APPARATUS 860/VELGRID

AREA SERVED	NO.	TYPE	SIZE	AK	DESIGN VEL	DESIGN CFM	PRELIM. VEL	PRELIM. CFM	FINAL VEL	FINAL CFM	REMARKS
CRAC-3											
024	1	OPEN	95X32	21.11	564	11,900			618	13,046	
CRAC-8											
019	1	OPEN	95X32	21.11	564	11,900			611	12,898	

REMARKS:

TEST DATE 9/17/20 READINGS BY TR

TOTAL BALANCE, INC.

BALANCE VALVE/FLOW
METER TEST REPORT

PROJECT IUPUI CRAC UNIT SYSTEM/UNIT CRAC

LOCATION

SERVICE OR DESIGNATION	SIZE	MODEL	DESIGN GPM	ACTUAL VALVE SETPOINT	ACTUAL VALVE ΔP	ACTUAL GPM	NOTES
CRAC-3	6B	NEXUS	63.1	OPEN	90.1"	53.19	
CRAC-8	6B	NEXUS	63.1	OPEN	99.8"	55.98	

REMARKS:

UNITS WERE STILL ABLE TO ACHIEVE 54.3 DAT.

TEST DATE 9/17/20 READINGS BY TR

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES

PHONE: 317-293-8880
FAX: 317-293-0374

04/09/26

FOR INFORMATION CONTACT
KENNETH ROOKS

ENGINEERING DATA FOR
IUI ICTC CRAC 11, 12 & 13

525 W MICHIGAN ST.
INDIANAPOLIS, IN 46202
IU PROJECT #20251317, IN
USA

44OP-414307

IU PROJECT #20251317
ARCHITECT

HEAPY ENGINEERING
ENGINEER

CONTRACTOR

DWG	DESCRIPTION
	GENERAL
	Cover Sheet
	General Noted for Controls Installation Contractor
TTRM1	TX-I/O Termination Spec.
TTRM2	TX-I/O Termination Spec. 2
TTRM3	TX-I/O Termination Spec. 3
	CONTROL DRAWINGS
001	COMMUNICATION RISER
001A	COMMUNICATION RISER BOM
010	FLN WIRING SPECIFICATIONS
011	ALN WIRING SPECIFICATIONS
101	COMPUTER ROOM A/C UNIT 11
101A	COMPUTER ROOM A/C UNIT 11 WIRING
101B	CRAC UNIT 11 BOM & SOO
102	COMPUTER ROOM A/C UNIT 12
102A	COMPUTER ROOM A/C UNIT 12 WIRING
102B	CRAC UNIT 12 BOM & SOO
103	COMPUTER ROOM A/C UNIT 13 ALTERNATE 2
103A	COMPUTER ROOM A/C UNIT 13 WIRING ALTERNATE 2
103B	CRAC UNIT 13 BOM & SOO ALTERNATE 2
	DDC PANEL LAYOUTS
N01	IC CRAC PXCM-4
N01A	PXCM-4p002
N01B	IC CRAC PXCM-4

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

Table of Contents

440P414307
0
TOCA

GENERAL NOTES FOR CONTROLS INSTALLATION CONTRACTOR (CIC)

1. All work shall be performed in accordance with the contract documents and all applicable codes and standards.
2. Provide and install all wiring, conduit, circuit breakers, etc., and any needed mounting hardware to install control devices/panels (brackets, extensions, stands, etc.) for a complete installation.
3. Mount, wire and pipe (control pneumatics) all devices including panels, sensors, relays, actuators, switches, sensor covers/guards, etc. for a complete installation.
4. All installation of the energy management system and components is by the CIC unless noted otherwise.
5. IU,IUI,IUK,IUE. , through Siemens Building Technologies, Inc., will provide all system controllers, relays, transformers, sensors, prefabricated auxiliary panels and switches unless otherwise noted. The CIC will provide all installation materials necessary to mount, install, and wire all controls devices.
6. All devices to be installed according to manufacturer's recommendations and the contract documents. Field verify exact locations of all devices/equipment. Coordinate with Siemens.
7. All routings for electrical installation are to be verified by the CIC.
8. C.I.C. shall be responsible for interlock wiring between VFDs and local disconnect switches, where applicable.
9. C.I.C. shall coordinate their work with Siemens, the Contractor, other Subcontractors, and the Owner.
10. All control devices and panels that require 120V power that are not powered by the division 26 contractor shall require a dedicated circuit from its own breaker. Provide circuit breakers and power wiring where required.
11. Mount panels on racks when wall space is not available. The engineer shows panel locations on HVAC drawings. Actual panel locations are to be coordinated with the contractors and owner.
12. All line voltage wiring shall be installed in conduit.
13. All wiring must be pulled in one length. Splicing is not allowed. All Control wiring shall be continuous.
14. All wiring in mechanical rooms, concealed and inaccessible places and/or where required by project plans and specifications shall be installed in conduit.
15. Any conductor carrying voltage greater than 24VAC shall not occupy the same conduit as low voltage wiring.
16. Conduits installed outdoors or encased in concrete shall be in rigid conduit.
17. Open cable shall be installed only where space is accessible and allowed by the project plans and specifications. In these cases, cable shall be rated for space they occupy. Provide plenum rated materials as required.
18. See specifications and IU PPA Control Design Standard document for conduit use & installation requirements.
19. Provide as-built record drawings of installation of the system.
20. Record drawings shall include routing and sizing of communications wiring, sensor wiring, power trunk wiring, transformer locations, field device locations, etc.
21. C.I.C. shall receive, handle, and store, as needed, all material to be installed under their contract. Subcontractor shall be responsible for verification of quantity received. The CIC will be responsible for verifying all received material. Discrepancies must be immediately documented with the shipping company prior to their leaving the delivery site and shall be reported in writing to Siemens Building Technologies, Inc. within 48 hours. The CIC is responsible for the security of all materials received and stored. The CIC will replace, at his expense, any materials missing or damaged.
22. Provide and install all tags and labels per plans and specifications for all control devices. Coordinate tag and label text, size and type with Siemens. Tag wiring at the field panel with the full point name. Tag wiring at the field device with the full point address.
23. Terminate all wiring. If necessary, CIC will make all cutover terminations under the supervision of Siemens Building Technologies at startup, unless otherwise directed by Siemens.
24. CIC is responsible for participating in the commissioning process to the extent that it involves their installation work.
25. For wire runs to devices that require 24 VAC such as electric valve actuators, electric damper actuators, sensing devices, etc., CIC shall use the following wiring arrangement:
    a. For devices that use a three-wire arrangement per the control drawings for carrying the 24VAC power and signal to the device, install cable type 18-gauge 3 conductor (18-3C) unless otherwise noted on control wiring diagrams. Neutral is tied together at the auxiliary panel.
    b. For devices that use a four-wire arrangement per the control drawings for carrying the 24VAC power and signal to the device, use the following cable types unless otherwise noted on control wiring diagrams.
        i. Install cable type 14-gauge 2 conductor (14-2C) for the 24VAC powering the device.
        ii. Install cable type 18-gauge 2 conductor (18-2C) for the signal controlling the device.
        iii. Tie neutrals together at the device.
    c. QPA and Q series sensors may be landed to the RTS port on the BACnet TEC controller and will have a pre-terminated wire in either 50- or 100-foot length. See individual drawing details for further information.
26. C.I.C. shall use control wire according to the following schedule. Purchase wire manufactured by one of the following three vendors or approved equal. If wire size is not specified coordinate with Siemens and plan on using 12 gauge.
27. Minimum conduit size: 3/4".
28. Control wiring concealed in walls will be in EMT conduit. Existing wall will be 3/4" flex if inaccessible.
29. Wire size for terminal equipment devices will be either 18 AWG – 2 conductor or 18 AWG – 3 conductor wire unless otherwise noted or providing power to the TEC.

Anixter

Description	Part Number	Application
ETHERNET 23AWG, CAT6	CMP-00424AVA-7-06	Ethernet Network Communication cabling (verify type/color)
24-1p (STR) SHD Cable-Plenum	H-B-TSP24LC-CMP	BLN trunks
24-1p (STR) SDH Cable-Plenum	H-F-TSP24LC-CMP	FLN trunks
24-1.5p (STR) FT-6 Cable-Plenum	H-F-1.5TSP24LC-CMP	MSTP FLN BACnet trunks
20-2c (Solid) Cable-Plenum	KNX-TSP20LC-CMP	KNX Cable for DXR
18-2c (STR) Cable-Plenum	H-TP18-CMP	Point/low voltage wiring
18-3c (STR) Cable-Plenum	H-3C18-CMP	DXR/TEC actuators, transducers
18-6c (STR) Cable-Plenum	1806C-2-2N-01	Point/low voltage wiring
14-2c (STR) Cable-Plenum	H-2C14-CL3P	24VAC power trunk/power for devices

Anixter Contact: Gina Menolascino, Siemens Industry Account Manager
888-479-3830
2301 Patriot Blvd. Glenview, IL, 60026
sbt@anixter.com

Belden

Description	Part Number	Application
ETHERNET 23AWG, CAT6	2413F D151000	Ethernet Network Communication cabling (verify type/color)
24-1p (STR) SHD Cable-Plenum	YR48881 0031000 (CMP)	BLN trunks
24-1p (STR) SDH Cable-Plenum	YR49243 2121000 (CMP)	FLN trunks
24-1.5p (STR) FT-6 Cable-Plenum	SPECIAL ORDER WIRE	MSTP FLN BACnet trunks
20-2c (Solid) Cable-Plenum	SPECIAL ORDER WIRE	KNX Cable for DXR
18-2c (STR) Cable-Plenum	YM48514 0061000	Point/low voltage wiring
18-3c (STR) Cable-Plenum	YM48447 0061000	DXR/TEC actuators, transducers
18-6c (STR) Cable-Plenum	SPECIAL ORDER WIRE	Point/low voltage wiring
14-2c (STR) Cable-Plenum	YM48515 0131000	24VAC power trunk/power for devices

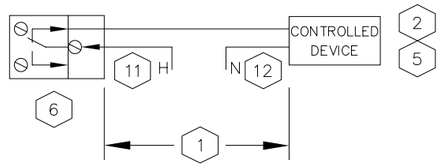
Belden Contact: Communications Supply Corporation
317-266-1600
1560 Indiana Avenue, Indianapolis, IN 46202
buybelden@gocsc.com

The Cable Company

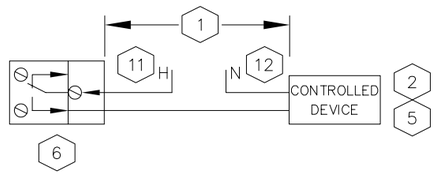
Description	Part Number	Application
ETHERNET 23AWG, CAT6	5652P66CMP1000	Ethernet Network Communication cabling (verify type/color)
24-1p (STR) SHD Cable-Plenum	5200BLN	BLN trunks
24-1p (STR) SDH Cable-Plenum	5200FLN	FLN trunks
24-1.5p (STR) FT-6 Cable-Plenum	5201P67FLN1000	MSTP FLN BACnet trunks
20-2c (Solid) Cable-Plenum	5212-P47KNX1003	KNX Cable for DXR
18-2c (STR) Cable-Plenum	5041SBT	Point/low voltage wiring
18-3c (STR) Cable-Plenum	5043SBT	DXR/TEC actuators, transducers
18-6c (STR) Cable-Plenum	5046P33CMP	Point/low voltage wiring
14-2c (STR) Cable-Plenum	5061SBT	24VAC power trunk/power for devices

TCC Contact: Caitlin/Bart
800-677-9473
498 Bonnie Lane, Elk Grove Village, IL 60007
ilsales@tccwire.com

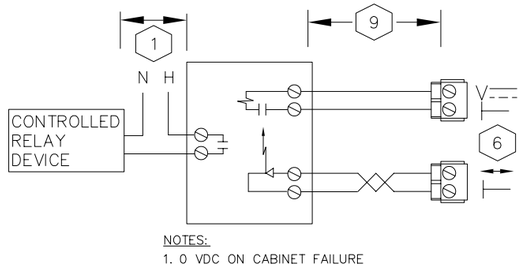
30. CIC shall create and keep an up to date list of DXR Bar Codes in a binder that is accessible to Siemens. CIC will create a list of terminal equipment that is controlled by DXR Controllers. CIC will remove the Bar Code from the DXR Controllers at the time of controls installation for each DXR and affix the Bar Code next to the associated Terminal Equipment Name in the DXR Bar Code Binder. CIC will scan the information and transmit in .pdf format to Siemens upon request.
31. CIC installation verification list. CIC shall create and keep an up to date list of the status of Mechanical System and Terminal Equipment controls installation in a binder that is accessible to Siemens. CIC will update Siemens weekly with the status of controls installation for each Mechanical System and each piece of Terminal Equipment.



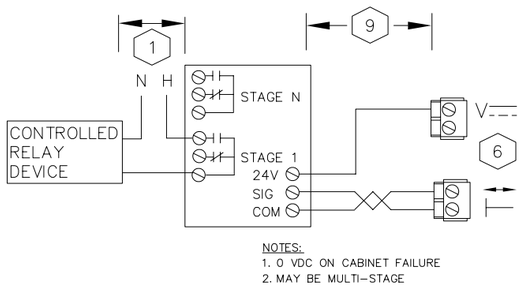
A 00 — DIGITAL OUTPUT (6R) NC
PULSED OR LATCHED



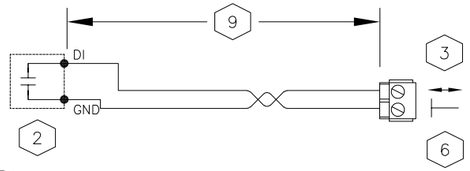
B 00 — DIGITAL OUTPUT (6R) NO
PULSED OR LATCHED



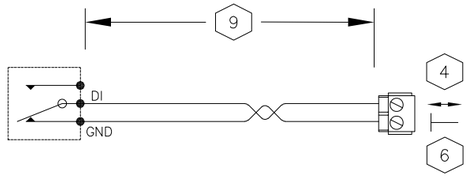
C 00 — DIGITAL OUTPUT (8U,8X) Latched
VOLTAGE TO SOLID STATE RELAY



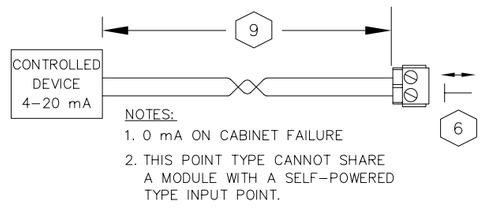
D 00 — DIGITAL OUTPUT (8U,8X) Sequenced
VOLTAGE TO SEQUENCING MODULE



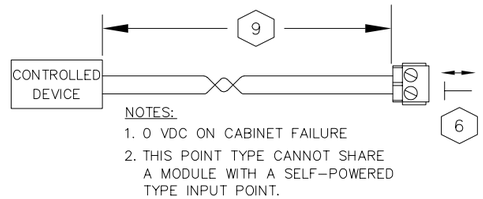
E 00 — DIGITAL INPUT (8D,16D,8U,8x)
DRY CONTACT



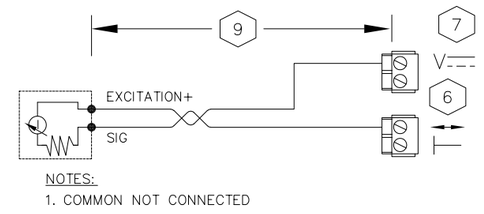
F 00 — DIGITAL INPUT (8D,16D,8U,8X)
PULSE ACCUMULATOR



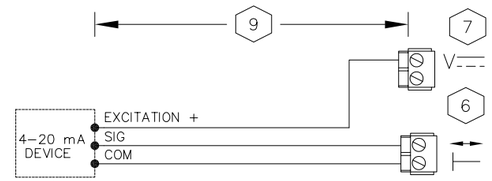
H 00 — ANALOG OUTPUT (8X) 4-20 mA



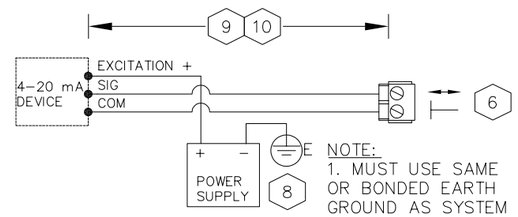
I 00 — ANALOG OUTPUT (8U,8X) 0-10VDC



M 00 — ANALOG INPUT (8X) 4-20 mA
2-WIRE INTERNAL POWERED



N 00 — ANALOG INPUT (8X) 4-20mA
3-WIRE INTERNAL POWERED



O 00 — ANALOG INPUT (8X) 4-20mA
3-WIRE EXTERNAL POWERED

NOTES:

1. MAXIMUM WIRE RUN LENGTHS ARE BASED ON THE CURRENT DRAW AND WIRE GAGE. SEE DRAWING TWIR.
2. SEE CONTROL DRAWINGS FOR NORMAL DE-ENERGIZED CONTACT STATE
3. MAXIMUM CONTACT CLOSURE RATE IS 10 PER SECOND
   8D, 16d EXCITATION = 24VDC, 8mA
   8U, 8X EXCITATION = 24VDC, 8mA, 20ms, 100mA
4. 8D, 16D MAXIMUM PULSE RATE = 10Hz (50ms PER STATE, 100ms PER PULSE)
   8U, 8X MAXIMUM PULSE RATE = 20Hz (25ms PER STATE, 50ms PER PULSE)
5. PXC MODULAR DO CONTACT RATINGS
   AC OPERATION:
   4A @ 240VAC (RESISTIVE)
   3A @ 240VAC (INDUCTIVE)
   SIZE 4 MOTOR STARTER
   DC OPERATION:
   40W @ < 50VDC
   20W @ > 50VDC
6. REFER TO PXC MODULAR PANEL FOR ACTUAL POINT ADDRESSES. REFER TO TXMI TERMINATION TABLES FOR ACTUAL TERMINALS FOR EACH PANEL ADDRESS. COMMON TERMINAL MAY BE SHARED BY 2 POINTS.
7. REFER TO DRAWING P1 ON TWIR FOR MAXIMUM CURRENT PROVIDED BY THE 24VDC SENSOR SUPPLY ON P1 BIM OR BUS POWER SUPPLY
8. EXTERNAL POWER SUPPLY CAN EITHER BE A 24VDC POWER SUPPLY OR A 24VAC TRANSFORMER DEPENDING ON THE SENSOR SELECTED. IF NOT AN ISOLATED NC CLASS 2 CIRCUIT THEN POWER SOURCE, NEUTRAL AND PXC MODULAR COMMON MUST BE BOTH CONNECTED TO THE SAME OR BONDED BUILDING APPROVED EARTH GROUND. FOR FURTHER DETAILS SEE EARTH GROUNDING RULES (125-3002) APOGEE WIRING GUIDELINES FOR FIELD PANELS AND EQUIPMENT CONTROLLERS.
9. 50mA OR LESS – 750ft/230m
   50mA TO 100mA – 375ft/115m
10. 100mA TO 150mA – 250ft/76m
    150mA TO 200mA – 187ft/57m
    200mA TO 250mA – 150ft/46m
11. WHERE H TERMINAL IS NOT A NEC CLASS 2 CIRCUIT, RELAY COMMON TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED TO 10A MAXIMUM BY AN NEC APPROVED MEANS. NOT A FUSE.
12. WHERE REQUIRED, N TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED BY AN NEC APPROVED MEANS.

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

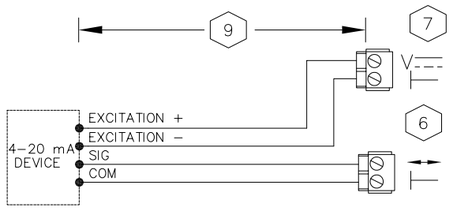
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

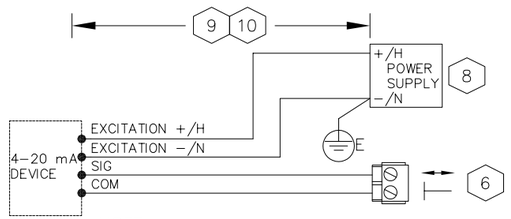
TX-I/O Termination Spec.

440P414307
0
TTRM1



P 00 — ANALOG INPUT (8X) 4–20mA

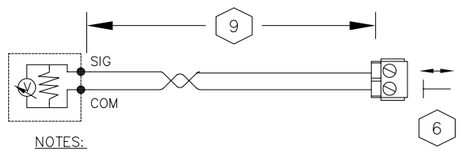
4–WIRE INTERNAL POWERED



NOTE:
1. MUST USE SAME OR BONDED EARTH GROUND AS SYSTEM NEUTRAL

Q 00 — ANALOG INPUT (8X) 4–20mA

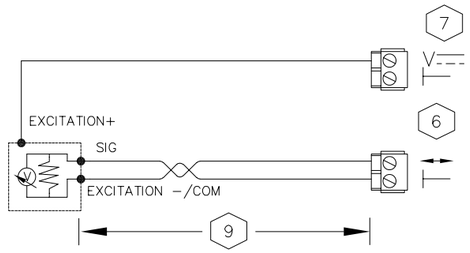
4–WIRE EXTERNAL POWERED



NOTES:
1. TRANSDUCER POWERED FROM ISOLATED INPUT
2. TRANSDUCER OUTPUT VOLTAGE

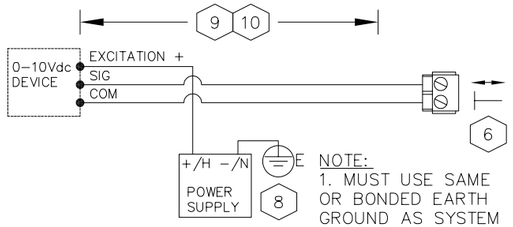
R 00 — ANALOG INPUT (8U,8X) 0–10 Vdc

SELF POWERED TRANSDUCER



S 00 — ANALOG INPUT (8U,8X) 0–10VDC

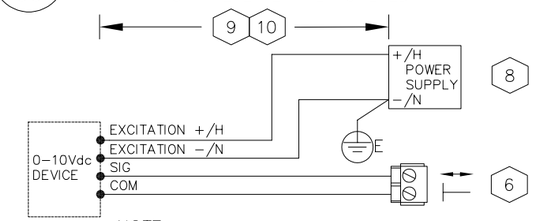
3–WIRE INTERNAL POWERED



NOTE:
1. MUST USE SAME OR BONDED EARTH GROUND AS SYSTEM NEUTRAL

T 00 — ANALOG INPUT (8U,8X) 0–10VDC

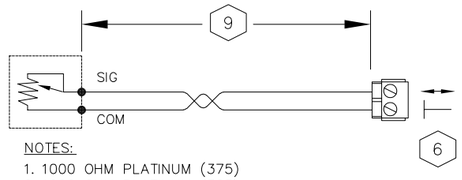
3–WIRE EXTERNAL POWERED



NOTE:
1. MUST USE SAME OR BONDED EARTH GROUND AS SYSTEM NEUTRAL

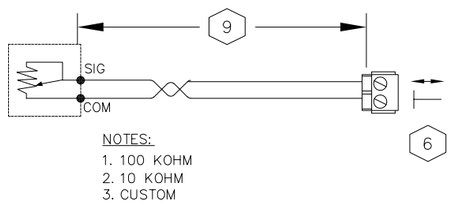
U 00 — ANALOG INPUT (8U,8X) 0–10VDC

4–WIRE EXTERNAL POWERED



NOTES:
1. 1000 OHM PLATINUM (375)
2. 1000 OHM PLATINUM (385)
3. 1000 OHM NICKEL
4. CUSTOM

V 00 — ANALOG INPUT (8X,8U) RTD



NOTES:
1. 100 KOHM
2. 10 KOHM
3. CUSTOM

W 00 — ANALOG INPUT (8X,8U) THERMISTOR

TXM1 TERMINATION TABLES

1. ALL TXM1 TERMINALS (MEASURING, NEUTRAL, RELAY, SUPPLY) ARE CONNECTED IN THE PLUG–IN I/O MODULE, NOT IN THE TERMINAL BUS.

		TXM1.8D, TXM1.16D							
I/O POINT		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SYSTEM NEUTRAL[1]	⊥ (–)	1	3	5	7	9	11	13	15
DIGITAL INPUT	⏐ (+)	2	4	6	8	10	12	14	16

1. NEUTRAL CAN BE CONNECTED TO ANY NEUTRAL TERMINAL ON SAME MODULE AND SEVERAL CAN SHARE SAME NEUTRAL TERMINAL.

		TXM1.16D							
I/O POINT		(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
SYSTEM NEUTRAL	⊥ (–)	18	20	22	24	26	28	30	32
DIGITAL INPUT[1]	⏐ (+)	19	21	23	25	27	29	31	33

1. NO PULSE ACCUMULATOR

		TXM1.8U, TXM1.8U–ML							
I/O POINT		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SYSTEM NEUTRAL	⊥ (–)	2	6	10	14	19	23	27	31
UNIVERSAL I/O	⏐ (+)	4	8	12	16	21	25	29	33
24V AC/DC ACTUATOR SUPPLY[1]	~		7		15		24		32

1. 24V DC ONLY AVAILABLE WITH BUS CONNECTOR MODULE (BCM) POWERED EXTERNALLY BY DC SUPPLY.

		TXM1.8X, TXM1.8X–ML							
I/O POINT		(1)	(2)	(3)	(4)	(5)[1]	(6)[1]	(7)[1]	(8)[1]
SYSTEM NEUTRAL	⊥ (–)	2	6	10	14	19	23	27	31
UNIVERSAL I/O	⏐ (+)	4	8	12	16	21	25	29	33
24V AC/DC ACTUATOR SUPPLY[2]	~		7		15		24		32
24V DC SENSOR SUPPLY[3]	⎓	3		11		20		28	

1. 4–20 mA OUTPUT AVAILABLE ON POINTS 5–8 ONLY.

2. 24V DC ONLY AVAILABLE WITH BUS CONNECTOR MODULE (BCM) POWERED EXTERNALLY BY DC SUPPLY.

3. MAY POWER EXTERNAL SENSORS 0.6w (25mA) OR 1.2w (50mA) PER TERMINATION UP TO 2.4w (100mA) MAXIMUM FOR ALL TERMINATIONS.

		TXM1.6R, TXM1.6R–M					
I/O POINT		(1)	(2)	(3)	(4)	(5)	(6)
COMMON[1]	⏐ (C)	3	9	15	20	26	32
NORMALLY CLOSED	⌐⏐ (NC)	4	10	16	19	25	31
NORMALLY OPEN	⏐ (NO)	2	8	14	21	27	33

1. COMMONS ARE NOT INTERNALLY CONNECTED.

NOTE: REFER TO TERMINATION SHEET #1 FOR INSTALLATION DETAILS.

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

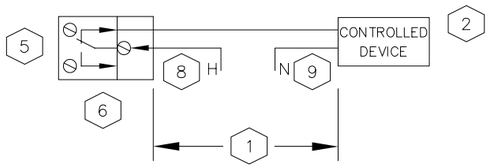
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

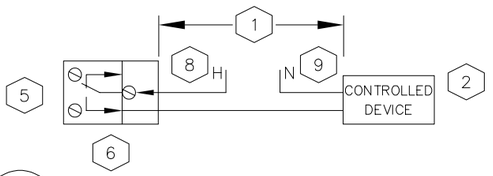
TX-I/O Termination Spec. 2

440P414307
0
TTRM2



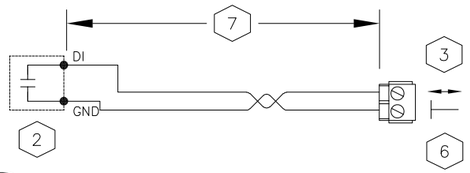
A
00

DIGITAL OUTPUT (1.4D3R, 1.8T) NC
PULSED OR LATCHED



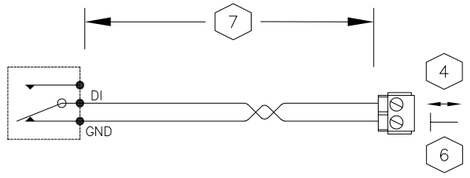
B
00

DIGITAL OUTPUT (1.4D3R, 1.8T) NO
PULSED OR LATCHED



E
00

DIGITAL INPUT (1.4D3R)
DRY CONTACT



F
00

DIGITAL INPUT (1.4D3R)
PULSE ACCUMULATOR

NOTES:

1. MAXIMUM WIRE RUN LENGTHS ARE BASED ON THE CURRENT DRAW AND WIRE GAUGE. SEE DRAWING P7WIR.
2. SEE CONTROL DRAWINGS FOR NORMAL DE-ENERGIZED CONTACT STATE
3. MAXIMUM CONTACT CLOSURE RATE IS 10 PER SECOND
4. 1.4D3R MAXIMUM PULSE RATE UP TO 10Hz
5. DO CONTACT RATINGS
   AC OPERATION:
   4A @ 250VAC (RESISTIVE)
   3A @ 250VAC (INDUCTIVE)

   DC OPERATION:
   4A @ 30VDC (RESISTIVE), UL APPLICATIONS
   3A @ 30VDC GENERAL PURPOSE
   3A @ 30VDC (RESISTIVE)
6. REFER TO PXC7 PANEL FOR ACTUAL POINT ADDRESSES. REFER TO TXM TERMINATION TABLES FOR ACTUAL TERMINALS FOR EACH PANEL ADDRESS. COMMON TERMINAL MAY BE SHARED BY 2 POINTS.
7. 50mA OR LESS – 750ft/230m
   50mA TO 100mA – 375ft/115m
8. WHERE H TERMINAL IS NOT A NEC CLASS 2 CIRCUIT, RELAY COMMON TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED TO 10A MAXIMUM BY AN NEC APPROVED MEANS. NOT A FUSE.
9. WHERE REQUIRED, N TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED BY AN NEC APPROVED MEANS.

		TXM1.4D3R		
I/O POINT		(1)	(2)	(3)
SUPPLY		3	9	15
NORMALLY OPEN	(NO)	2	8	14
NORMALLY CLOSED	(NC)	4	10	16

		TXM1.4D3R			
I/O POINT		(5)	(6)	(7)	(8)
SYSTEM NEUTRAL[1]	⊥ (–)	26	28	30	32
DIGITAL INPUT	(+)	27	29	31	33

1. TERMINALS 26, 28, 30, 32 ARE SYSTEM NEUTRAL TERMINALS.

THEY ARE INTERCONNECTED, NOT IN THE TERMINAL BASE BUT IN THE PLUG-IN I/O MODULE. WHEN I/O MODULE IS REMOVED, THERE IS NO CONNECTION.

THE SYSTEM NEUTRAL OF A DIGITAL INPUT CAN BE CONNECTED TO ANY SYSTEM NEUTRAL TERMINAL.

		TXM1.8T							
I/O POINT		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SUPPLY[1]	~	2	6	10	14	19	23	27	31
DIGITAL OUTPUT[2]	(+)	4	8	12	16	21	25	29	33

1.THE LOAD CAN BE CONNECTED DIRECTLY TO THE CORRESPONDING OUTPUT TERMINALS. NO SEPARATE 24VAC SUPPLY IS REQUIRED.

2. THE TRIAC CLOSES THE CONTACT TO ⊥ (SYSTEM NEUTRAL).

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

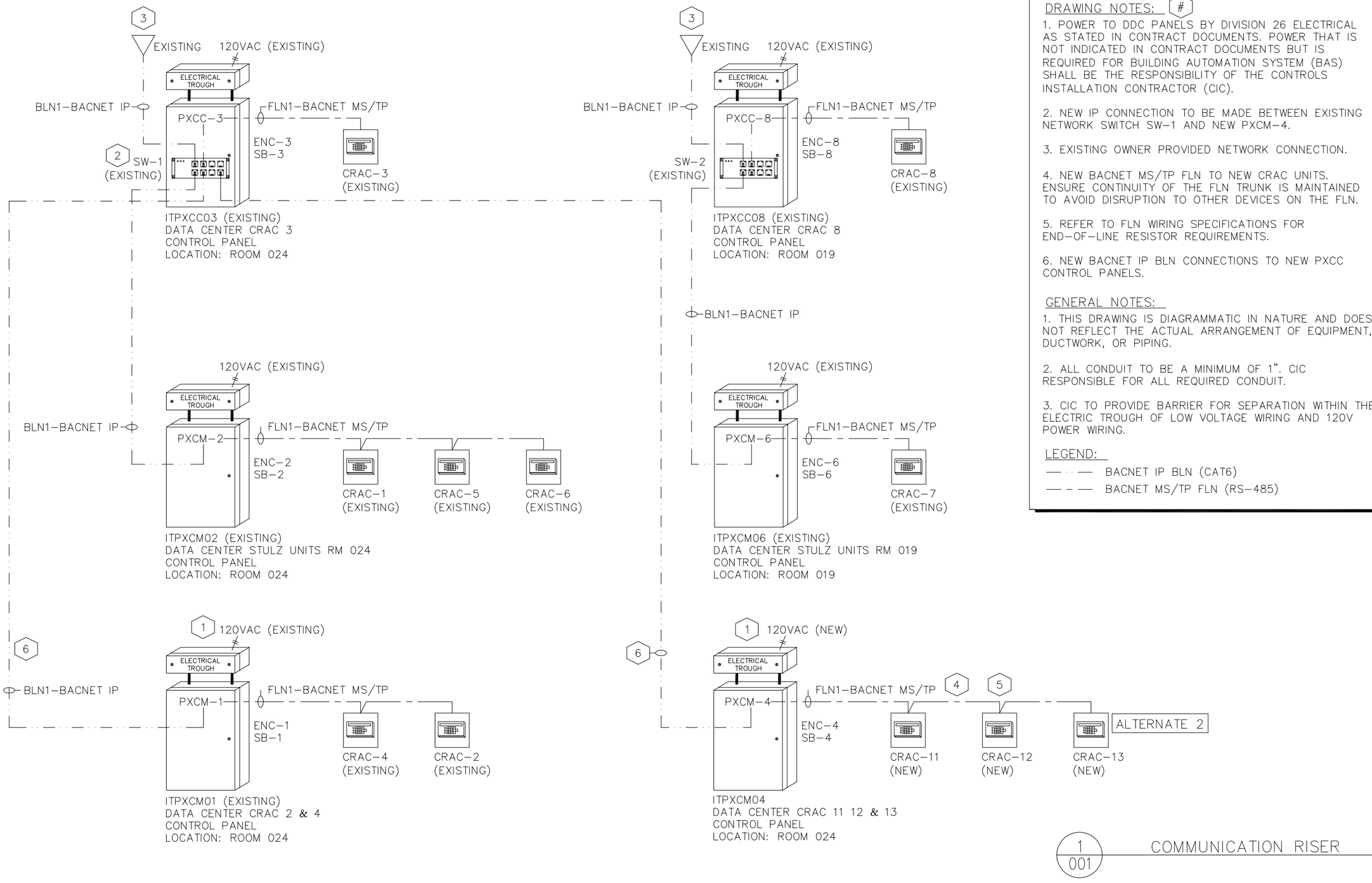
IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

TX-I/O Termination Spec. 3

440P414307
0

TTRM3



DRAWING NOTES: (#)

1. POWER TO DDC PANELS BY DIVISION 26 ELECTRICAL AS STATED IN CONTRACT DOCUMENTS. POWER THAT IS NOT INDICATED IN CONTRACT DOCUMENTS BUT IS REQUIRED FOR BUILDING AUTOMATION SYSTEM (BAS) SHALL BE THE RESPONSIBILITY OF THE CONTROLS INSTALLATION CONTRACTOR (CIC).

2. NEW IP CONNECTION TO BE MADE BETWEEN EXISTING NETWORK SWITCH SW–1 AND NEW PXCM–4.

3. EXISTING OWNER PROVIDED NETWORK CONNECTION.

4. NEW BACNET MS/TP FLN TO NEW CRAC UNITS. ENSURE CONTINUITY OF THE FLN TRUNK IS MAINTAINED TO AVOID DISRUPTION TO OTHER DEVICES ON THE FLN.

5. REFER TO FLN WIRING SPECIFICATIONS FOR END–OF–LINE RESISTOR REQUIREMENTS.

6. NEW BACNET IP BLN CONNECTIONS TO NEW PXCC CONTROL PANELS.

GENERAL NOTES:

1. THIS DRAWING IS DIAGRAMMATIC IN NATURE AND DOES NOT REFLECT THE ACTUAL ARRANGEMENT OF EQUIPMENT, DUCTWORK, OR PIPING.

2. ALL CONDUIT TO BE A MINIMUM OF 1". CIC RESPONSIBLE FOR ALL REQUIRED CONDUIT.

3. CIC TO PROVIDE BARRIER FOR SEPARATION WITHIN THE ELECTRIC TROUGH OF LOW VOLTAGE WIRING AND 120V POWER WIRING.

LEGEND:

—··— BACNET IP BLN (CAT6)

—– – —– BACNET MS/TP FLN (RS–485)

1/001 COMMUNICATION RISER

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/09/26

COMMUNICATION RISER

440P414307
0
001

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
ENC 1	1	PXA-ENC34	SIEMENS	149475	ENCLOSURE ASSY 34
Panel Mounted Devices					
SB 1	1	PXA-SB115V192VA	SIEMENS	588783	SERVICE BOX 115V, 24VAC, 192VA

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

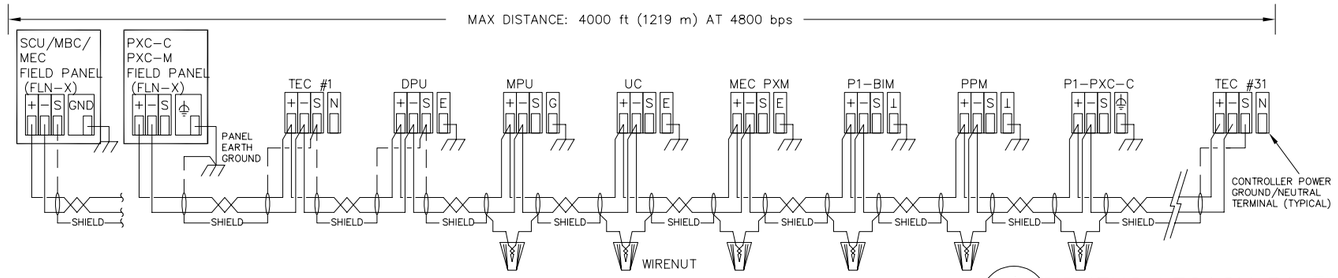
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

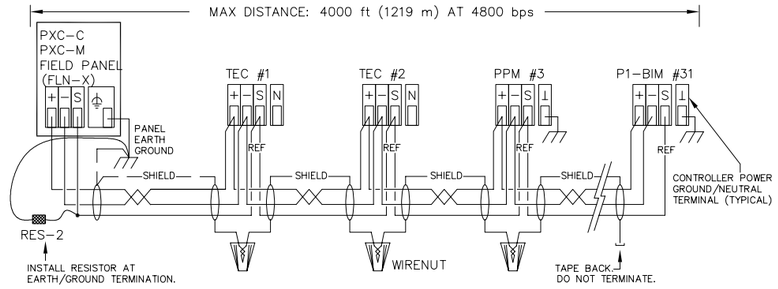
COMMUNICATION RISER BOM

440P414307
0
001A



1 010 SIEMENS LEGACY P1 FLN NETWORK

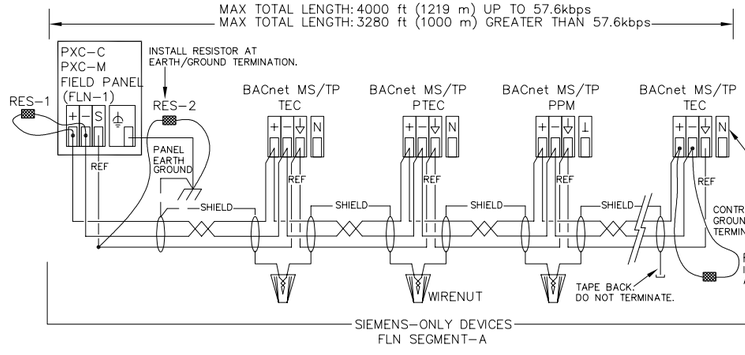
SIEMENS P1 FLOOR LEVEL NETWORK (FLN)
COMMUNICATION PROTOCOL: RS–485
WIRING FOR 1 PAIR (2 CONDUCTOR TSP)



RES–2
550–974P10
EARTH TERMINATOR RESISTOR

2 010 SIEMENS P1 FLN NETWORK

SIEMENS P1 FLOOR LEVEL NETWORK (FLN)
COMMUNICATION PROTOCOL: RS–485
WIRING FOR 1.5 PAIR (2 CONDUCTOR TSP, & 1 CONDUCTOR)



NOTES:

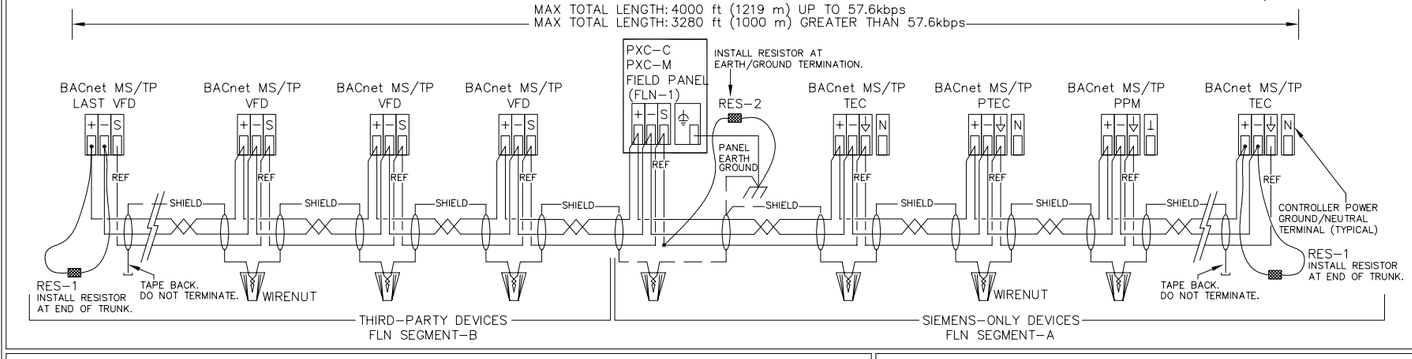
1) FLN WIRING MUST BE CONNECTED IN A DAISY–CHAIN.
2) FOR SIEMENS–ONLY FLN NETWORK, WIRE AS SHOWN FOR FLN SEGMENT–A. INSTALL END–OF–LINE RESISTOR RES–1 AT FIELD PANEL AND ON LAST TEC.
3) FOR FLN NETWORK WITH SIEMENS & THIRD–PART DEVICES, WIRE AS SHOWN WITH FLN SEGMENT–A AND SEGMENT–B. INSTALL END–OF–LINE RESISTOR RES–1 ON LAST TEC AND ON LAST THIRD–PARTY DEVICE. DO NOT INSTALL E–O–L RESISTOR ON FIELD PANEL.

RES–1
550–975P100
120 OHM 1/2W RESISTOR

RES–2
550–974P10
EARTH TERMINATOR RESISTOR

3 010 BACnet MS/TP FLN NETWORK

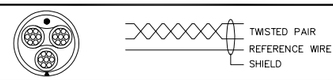
BACnet MASTER/SLAVE TOKEN PASSING NETWORK
COMMUNICATION PROTOCOL: RS–485
WIRING FOR 1.5 PAIR (2 CONDUCTOR TSP, & 1 CONDUCTOR)



FLN TSP CABLE SPECIFICATIONS

TWISTED PAIR 24 AWG (STRANDED) 12 PICOFARAD/FT CAPACITANCE OR LESS 4 TWISTS PER FOOT.
SHIELD 100% OVERALL FOIL

PART NUMBERS
ANNIXTER PART NUMBER: H–AF–TSP24LC–CMPBX–P DESCRIPTION: ALN/FLN24AWG,STR,TSP,LOCAP,CMP (FT–6)

FLN 1.5 PAIR CABLE SPECIFICATIONS

TWISTED PAIR 24 AWG (STRANDED) 11 PICOFARAD/FT CAPACITANCE CONDUCTOR TO CONDUCTOR. 24 PICOFARAD/FT CAPACITANCE CONDUCTOR TO SHIELD. 4 TWISTS PER FOOT.
REFERENCE WIRE 24 AWG (STRANDED), 3 INCH LAY WITH TWISTED PAIR
SHIELD 100% OVERALL FOIL WITH DRAIN WIRE

PART NUMBERS
ANNIXTER PART NUMBER: H–A–1.5TSP24LC–CMP–Y DESCRIPTION: 24–1.5PR STR TC FFEP FT6 SHD YEL (FT–6)
CERCO PART NUMBER: 8304R DESCRIPTION: 22AWG 3C STR FT6 ORG (FT–6)

NOTES:

NEVER RUN NETWORK CABLING CLOSER THAN 5 FEET TO A VARIABLE FREQUENCY DRIVE (VFD) EXCEPT AT THE POINT WHERE THE NETWORK MUST CONNECT TO THE VFD. NETWORK ENTRY INTO A VFD MUST BE THROUGH A SEPERATE CONDUIT AND ALL NETWORK WIRING MUST BE KEPT AS FAR AS POSSIBLE FROM HIGH POWER CABLING IN THE DRIVE.

NEVER RUN NETWORK CABLE CLOSER THAN 5 FEET FROM CONDUITS CARRYING 100KVA OR GREATER. ALWAYS CROSS HIGH POWER CABLES (AT A DISTANCE OF 5 FEET) AT A 90° ANGLE.

NETWORK RUN IN OPEN CABLE TRAYS WITH CIRCUITS CARRYING 20 AMPS SHOULD BE NO CLOSER THAN 26 INCHES TO THE HIGHER POWER CABLES.

NETWORK RUN IN ENCLOSED TRAYS WITH CONDUITS CARRYING OVER 20 AMPS SHOULD BE NO CLOSER THAN 18 INCHES TO THE HIGHER POWER CABLES.

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

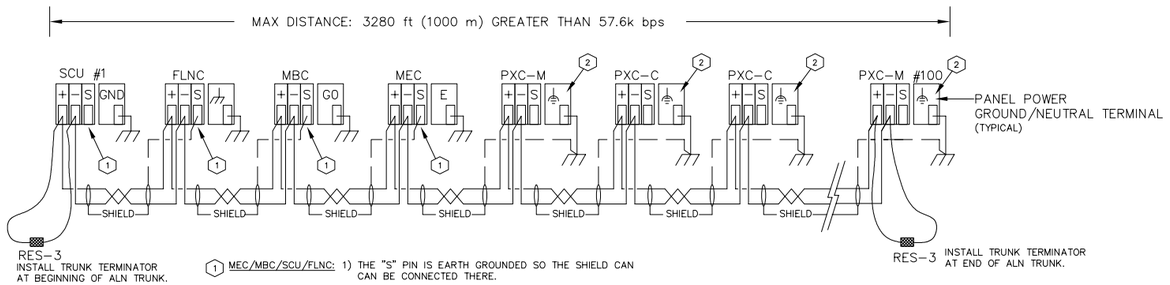
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

FLN WIRING SPECIFICATIONS

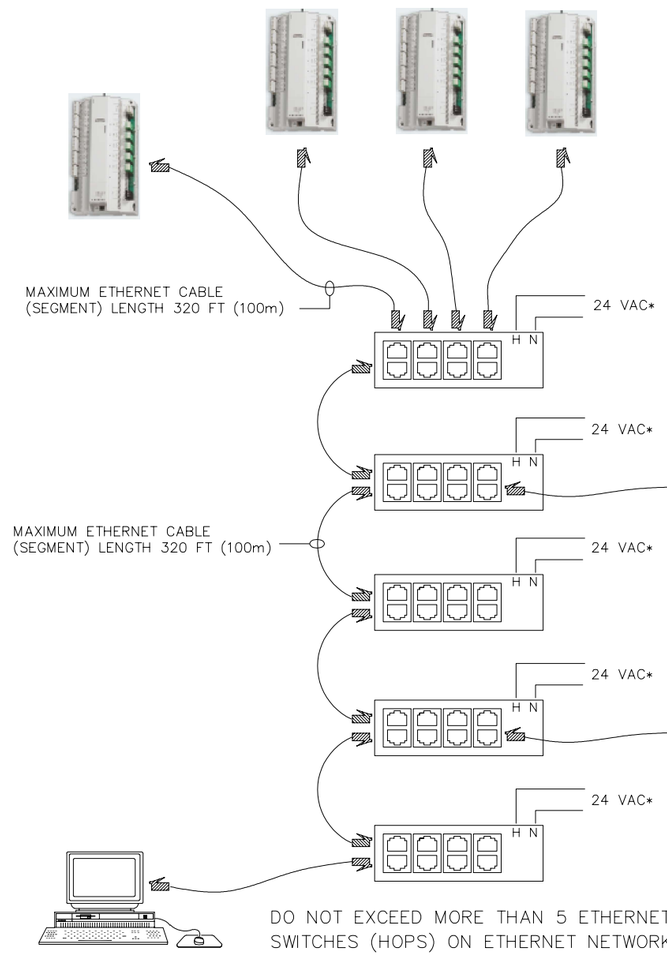
440P414307
1
010



RES-3
538-664
BLN TRUNK TERMINATOR

1 / 011 SIEMENS P2 ALN (BLN) NETWORK

SIEMENS P2 AUTOMATED LEVEL NETWORK (ALN)
COMMUNICATION PROTOCOL: RS-485

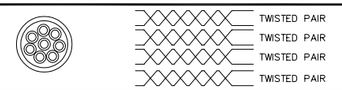


APPLICABLE TO:
MLN (WORKSTATION TO ETHERNET)
ALNs (ETHERNET, BACnet/IP, AEM)
HUBS, SWITCHES, ROUTERS
NETWORK INTERFACE CARD

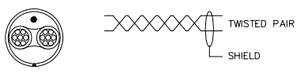
NOTE: –
* CERTAIN MODELS MAY REQUIRE 24 VDC OR 120 VAC..

2 / 011 SIEMENS ETHERNET NETWORK

10Base-T/100Base-TX
COMMUNICATION PROTOCOL: ETHERNET TCP/IP

ALN ETHERNET CABLE SPECIFICATIONS

4 UNSHIELDED TWISTED PAIR (UTP) 24 AWG (SOLID) 17 PICOFARAD/FT CAPACITANCE AT 1KHz, 1MHz IEEE802.3 CATEGORY 5 CERTIFIED OR BETTER
SHIELD NONE

PART NUMBERS
PLEASE REFER TO CERCO AND ANIXTER CABLE PART NUMBERS (SEE DRAWINGS 6A & 6B).

ALN TSP CABLE SPECIFICATIONS

TWISTED PAIR 24 AWG (STRANDED) 12 PICOFARAD/FT CAPACITANCE OR LESS 4 TWISTS PER FOOT.
SHIELD 100% OVERALL FOIL

PART NUMBERS
PLEASE REFER TO CERCO AND ANIXTER CABLE PART NUMBERS (SEE DRAWINGS 6A & 6B).

NOTES:

NEVER RUN NETWORK CABLING CLOSER THAN 5 FEET TO A VARIABLE FREQUENCY DRIVE (VFD) EXCEPT AT THE POINT WHERE THE NETWORK MUST CONNECT TO THE VFD. NETWORK ENTRY INTO A VFD MUST BE THROUGH A SEPERATE CONDUIT AND ALL NETWORK WIRING MUST BE KEPT AS FAR AS POSSIBLE FROM HIGH POWER CABLING IN THE DRIVE.

NEVER RUN NETWORK CABLE CLOSER THAN 5 FEET FROM CONDUITS CARRYING 100KVA OR GREATER. ALWAYS CROSS HIGH POWER CABLES (AT A DISTANCE OF 5 FEET) AT A 90° ANGLE.

NETWORK RUN IN OPEN CABLE TRAYS WITH CIRCUITS CARRYING 20 AMPS SHOULD BE NO CLOSER THAN 26 INCHES TO THE HIGHER POWER CABLES.

NETWORK RUN IN ENCLOSED TRAYS WITH CONDUITS CARRYING OVER 20 AMPS SHOULD BE NO CLOSER THAN 18 INCHES TO THE HIGHER POWER CABLES.

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

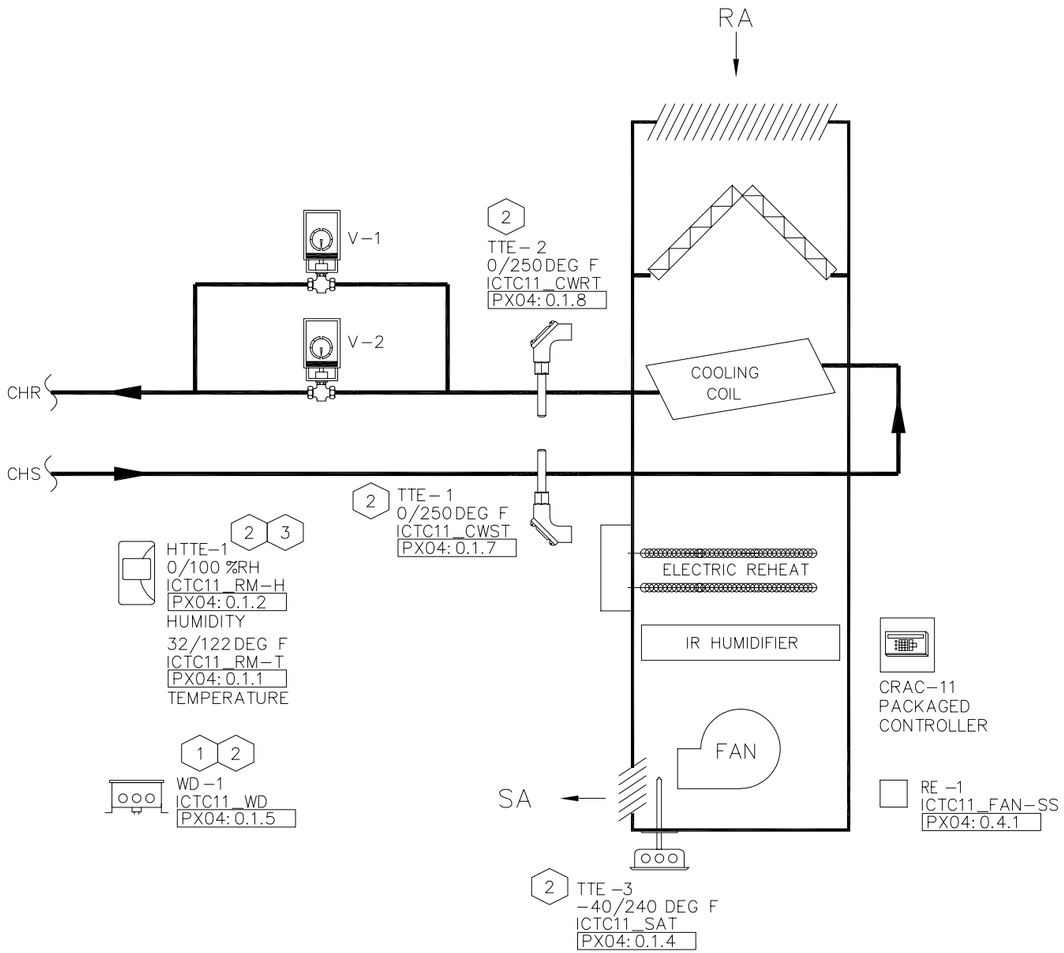
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

ALN WIRING SPECIFICATIONS

440P414307
1
011



1/101 CRAC-11 FLOW DIAGRAM

TYPICAL OF QTY: (1)
LOCATION: MACHINE ROOM 024
SERVICE: MACHINE ROOM 024

DRAWING NOTES: (#)

1. WATER DETECTOR PROBES SHALL BE FULLY ADJUSTED TO DETECTOR WATER AT THE LOWEST POSSIBLE HEIGHT.

2. DEVICE TO BE FURNISHED BY SIEMENS AND INSTALLED BY CIC. IMMERSION TEMPERATURE SENSORS INSTALLED BY MECHANICAL CONTRACTOR.

3. MOUNTED SPACE SENSOR AS NOTED ON FLOOR PLANS/CONTACT DOCUMENTS.

GENERAL NOTES:

1. THIS DRAWING IS DIAGRAMMATIC IN NATURE AND DOES NOT REFLECT THE ACTUAL ARRANGEMENT OF EQUIPMENT, DUCTWORK, OR PIPING.

2. ALL DEVICES ARE TO BE FURNISHED AND INSTALLED BY OTHERS UNLESS OTHERWISE NOTED.

REF#	FIELD PANEL NAME	FIELD PANEL NODE NAME
PX04	PXCM-4	PXCM-4

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

COMPUTER ROOM A/C UNIT 11

440P414307
0
101

FIELD WIRING

STARTER / VFD / PACKAGED CONTROLLER WIRING

DRAWING NOTES: (#)
1. REFER TO COMMUNICATION RISER FOR CONTINUATION AND FOR RS-485 WIRING SPECIFICATIONS.

GENERAL NOTES:
1. ALL WIRING TO MEET REQUIREMENTS OF STANDARD WIRING SPECIFICATIONS DRAWINGS.

CRAC-11
UNIT CONTROLLER
SHD
-
+
BACNET MS/TP
1,5 PAIR RS-485 NETWORK
1

WD-1
LEAK DETECTOR
WD-1B-C
POWER
COMMON
RELAY 1
RED
WHT
YEL
ORG
BLU

RE-1
CRAC-11
REMOTE START/STOP CONTACTS
X2: 5
X2: 6

HTTE-1
ZONE COMBINATION TEMPERATURE & HUMIDITY SENSOR
32/122 DEG F
0/100 % RH
RED
WHT
BLK
WHT

TTE-1
CW SUPPLY IMMERSION TEMPERATURE SENSOR
0/250 DEG F

TTE-2
CW RETURN IMMERSION TEMPERATURE SENSOR
0/250 DEG F

TTE-3
SUPPLY AIR TEMPERATURE SENSOR
-40/240 DEG F
WHT
BLK

COMPONENT PANEL / POWER

24VAC POWER FROM UNIT TRANSFORMER
24C
24C
24H
24H

WHT
BLK

FIELD PANEL

21	19	ICTC11_WD PX04: 0.1.5
3	4	2	ICTC11_FAN_SS PX04: 0.4.1
7	4	2	ICTC11_RM-T PX04: 0.1.1 TEMPERATURE
8	6	ICTC11_RM-H PX04: 0.1.2 HUMIDITY
29	27	ICTC11_CWST PX04: 0.1.7
33	31	ICTC11_CWRT PX04: 0.1.8
16	14	ICTC11_SAT PX04: 0.1.4

1 / 101A
ELECTRICAL WIRING DIAGRAM
CRAC-11

REF#	FIELD PANEL NAME	FIELD PANEL NODE NAME
PX04	PXCM-4	PXCM-4

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS
SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

COMPUTER ROOM A/C UNIT 11 WIRING

440P414307
101
101A

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
A 1	1	AQA2200-2X4	SIEMENS		SERIES 2200/3200 3-1/2 x 5 TRIM PLATE
HTTE 1	1	QFA32SS.EWSN	SIEMENS	129104	ROOM RH&T, ANALOG, BLANK FRONT
TTE 1-2	2	QAE2012.005	SIEMENS	149919	IMMERSION TMP SNSR, PT 1K OHM(385) 2.5"
TTE 3	1	QAM2030.045	SIEMENS	149915	DUCT PNT TEMP, 10K OHM TYPE 2, 18" RIGID
WD 1	1	WD-1B-C	KELE INC		WATER DETECTOR SPDT W/DEENERGIZED RELAY

CRAC UNIT - SEQUENCE OF OPERATION

1. CRAC UNITS SHALL BE DOWNFLOW INCLUDE TWO ECM FANS, CHILLED WATER COIL, ELECTRIC REHEAT WITH SCR CONTROL, INFRARED HUMIDIFIER.

2. SUPPLY FAN SYSTEM SPEED CONTROL

   2.1. THE ECM FAN SHALL ENERGIZE AND MODULATE TO MAINTAIN FAN CONTROL.

3. CHILLED WATER COOLING COIL

   3.1. CONTROL VALVES SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE (ADJ.).

4. INFRARED HUMIDIFIER

   4.1. HUMIDIFIER SHALL ENERGIZE AND OPERATE TO MAINTAIN SPACE HUMIDITY SETPOINT (ADJ.).

5. DEHUMIDIFICATION CYCLE

   5.1. CHILLED WATER VALVES SHALL OPEN 100&. ELECTRIC REHEAT SHALL MODULATE TO MAINTAIN SPACE HUMIDITY.

6. ALARMS

   6.1. ALARM OUTPUTS SHALL INCLUDE

      6.1.1. FAN FAULT
      6.1.2. HIGH SPACE TEMPERATURE
      6.1.3. LOW SPACE TEMPERATURE
      6.1.4. HIGH SPACE HUMIDITY
      6.1.5. LOW SPACE HUMIDITY
      6.1.6. WATER DETECTION
      6.1.7. GENERAL ALARM

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

CRAC UNIT 11 BOM & SOO

440P414307
0
101B

DRAWING NOTES: (#)

1. WATER DETECTOR PROBES SHALL BE FULLY ADJUSTED TO DETECTOR WATER AT THE LOWEST POSSIBLE HEIGHT.

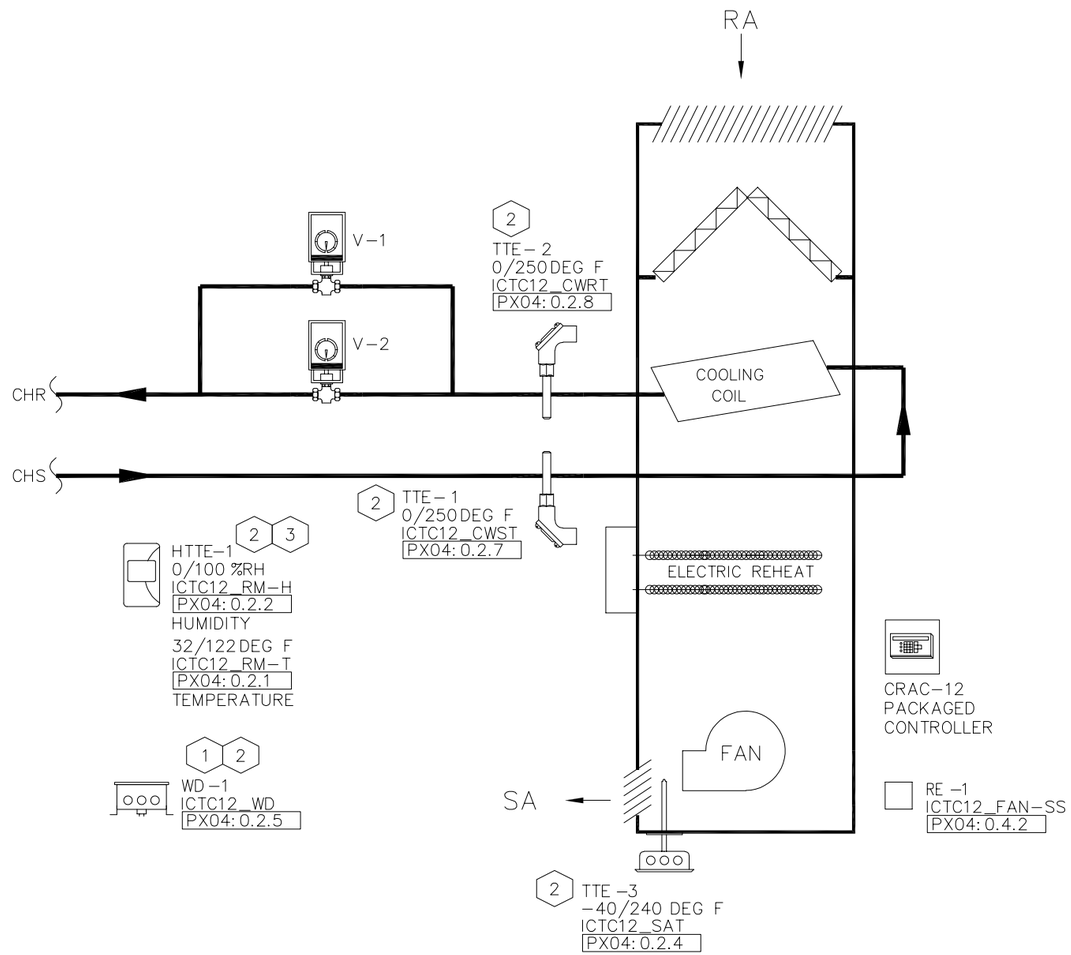
2. DEVICE TO BE FURNISHED BY SIEMENS AND INSTALLED BY CIC. IMMERSION TEMPERATURE SENSORS INSTALLED BY MECHANICAL CONTRACTOR.

3. MOUNTED SPACE SENSOR AS NOTED ON FLOOR PLANS/CONTACT DOCUMENTS.

GENERAL NOTES:

1. THIS DRAWING IS DIAGRAMMATIC IN NATURE AND DOES NOT REFLECT THE ACTUAL ARRANGEMENT OF EQUIPMENT, DUCTWORK, OR PIPING.

2. ALL DEVICES ARE TO BE FURNISHED AND INSTALLED BY OTHERS UNLESS OTHERWISE NOTED.



1/101 CRAC-12 FLOW DIAGRAM

TYPICAL OF QTY: (1)
LOCATION: MACHINE ROOM 024
SERVICE: MACHINE ROOM 024

REF#	FIELD PANEL NAME	FIELD PANEL NODE NAME
PX04	PXCM-4	PXCM-4

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

COMPUTER ROOM A/C UNIT 12

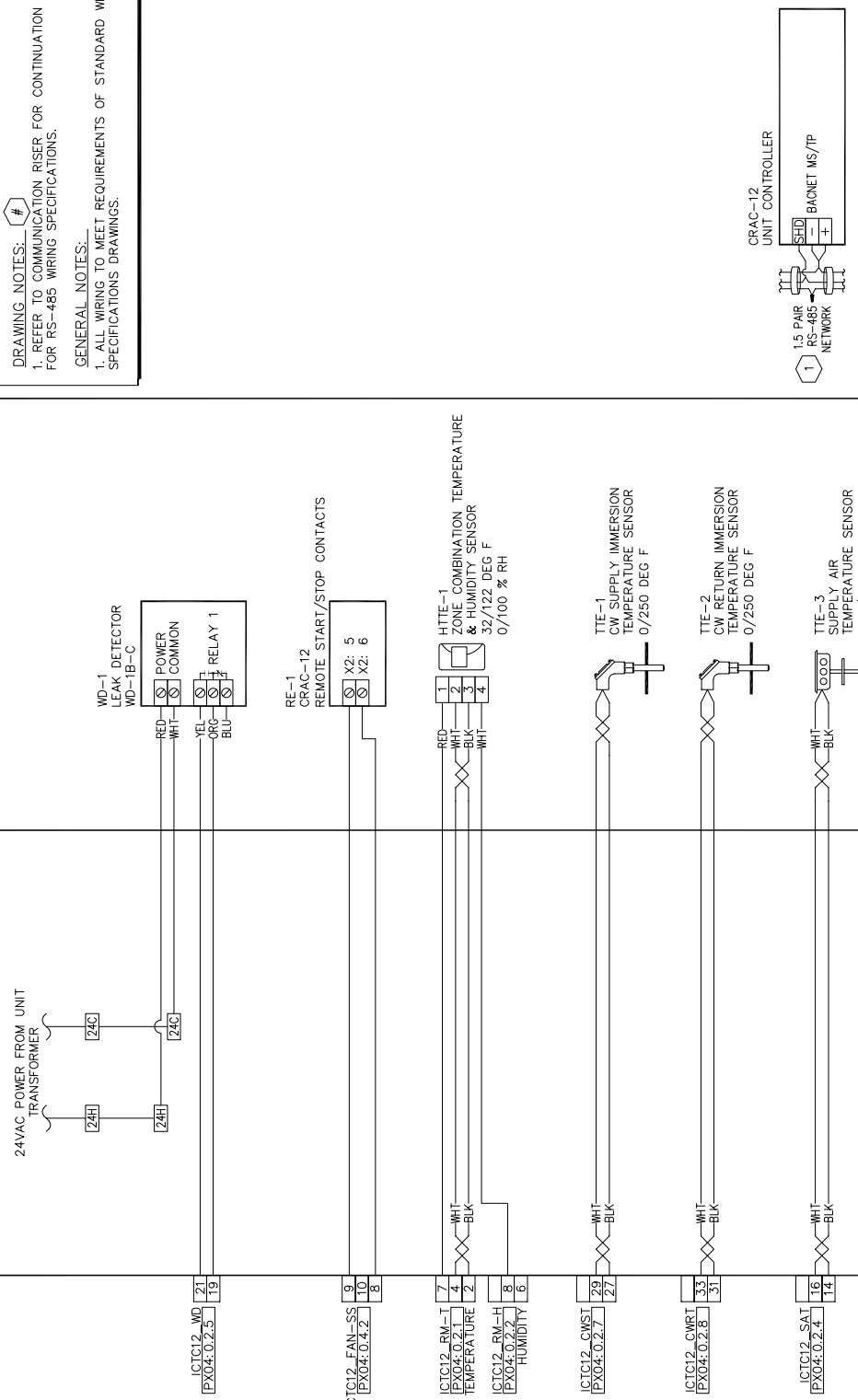
440P414307
0

102

FIELD WIRING | **STARTER / VFD / PACKAGED CONTROLLER WIRING**

DRAWING NOTES: (#)
1. REFER TO COMMUNICATION RISER FOR CONTINUATION AND FOR RS-485 WIRING SPECIFICATIONS.

GENERAL NOTES:
1. ALL WIRING TO MEET REQUIREMENTS OF STANDARD WIRING SPECIFICATIONS DRAWINGS.



1 / 102A ELECTRICAL WIRING DIAGRAM
CRAC-12

REF#	FIELD PANEL NAME	FIELD PANEL NODE NAME
PX04	PXCM-4	PXCM-4

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS
SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

COMPUTER ROOM A/C UNIT 12 WIRING

440P414307
101
102A

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
A 1	1	AQA2200-2X4	SIEMENS		SERIES 2200/3200 3-1/2 x 5 TRIM PLATE
HTTE 1	1	QFA32SS.EWSN	SIEMENS	129104	ROOM RH&T, ANALOG, BLANK FRONT
TTE 1-2	2	QAE2012.005	SIEMENS	149919	IMMERSION TMP SNSR, PT 1K OHM(385) 2.5"
TTE 3	1	QAM2030.045	SIEMENS	149915	DUCT PNT TEMP, 10K OHM TYPE 2, 18" RIGID
WD 1	1	WD-1B-C	KELE INC		WATER DETECTOR SPDT W/DEENERGIZED RELAY

CRAC UNIT - SEQUENCE OF OPERATION

1. CRAC UNITS SHALL BE DOWNFLOW INCLUDE TWO ECM FANS, CHILLED WATER COIL, ELECTRIC REHEAT WITH SCR CONTROL.

2. SUPPLY FAN SYSTEM SPEED CONTROL

2.1. THE ECM FAN SHALL ENERGIZE AND MODULATE TO MAINTAIN FAN CONTROL.

3. CHILLED WATER COOLING COIL

3.1. CONTROL VALVES SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE (ADJ.).

4. ALARMS

4.1. ALARM OUTPUTS SHALL INCLUDE

4.1.1. FAN FAULT
4.1.2. HIGH SPACE TEMPERATURE
4.1.3. LOW SPACE TEMPERATURE
4.1.4. HIGH SPACE HUMIDITY
4.1.5. LOW SPACE HUMIDITY
4.1.6. WATER DETECTION
4.1.7. GENERAL ALARM

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

CRAC UNIT 12 BOM & SOO

440P414307
0
102B

DRAWING NOTES: (#)

1. WATER DETECTOR PROBES SHALL BE FULLY ADJUSTED TO DETECTOR WATER AT THE LOWEST POSSIBLE HEIGHT.

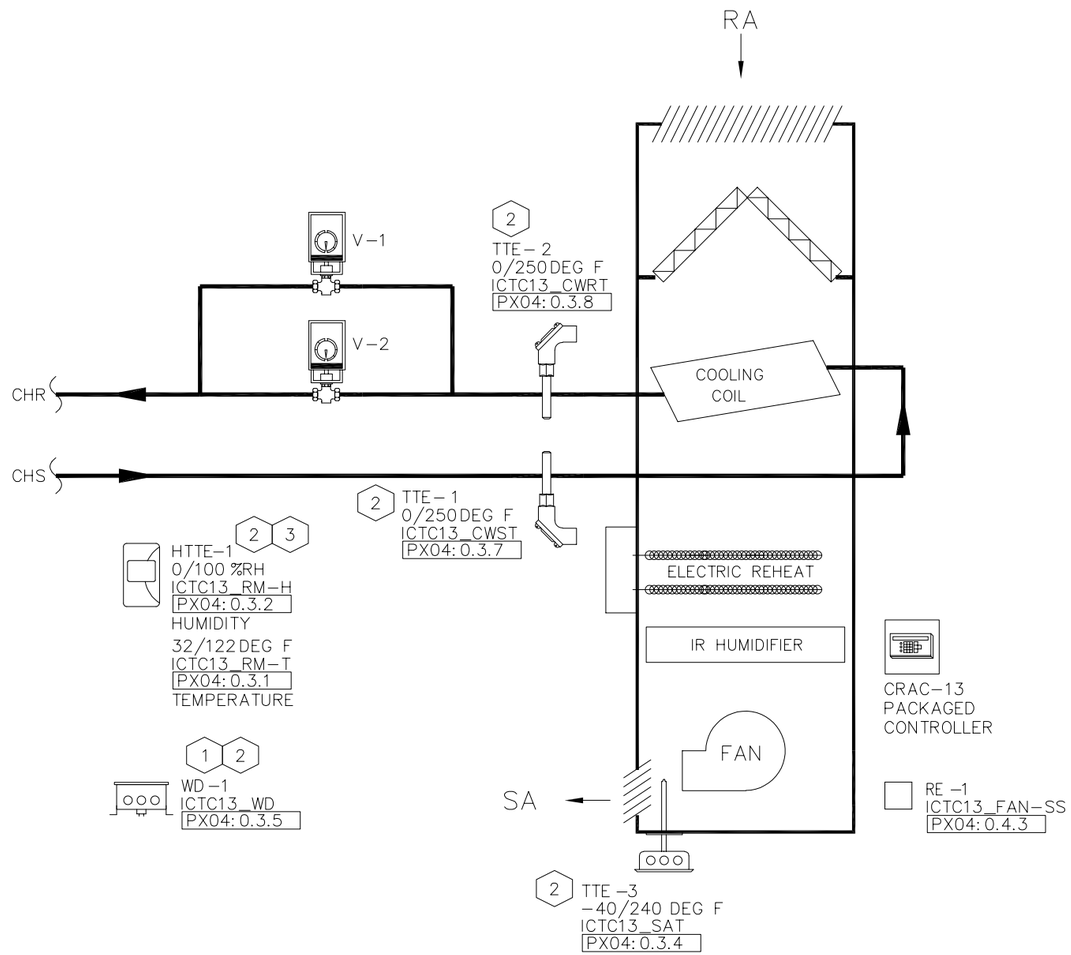
2. DEVICE TO BE FURNISHED BY SIEMENS AND INSTALLED BY CIC. IMMERSION TEMPERATURE SENSORS INSTALLED BY MECHANICAL CONTRACTOR.

3. MOUNTED SPACE SENSOR AS NOTED ON FLOOR PLANS/CONTACT DOCUMENTS.

GENERAL NOTES:

1. THIS DRAWING IS DIAGRAMMATIC IN NATURE AND DOES NOT REFLECT THE ACTUAL ARRANGEMENT OF EQUIPMENT, DUCTWORK, OR PIPING.

2. ALL DEVICES ARE TO BE FURNISHED AND INSTALLED BY OTHERS UNLESS OTHERWISE NOTED.



1/101 CRAC-13 FLOW DIAGRAM

TYPICAL OF QTY: (1)
LOCATION: MACHINE ROOM 024
SERVICE: MACHINE ROOM 024

REF#	FIELD PANEL NAME	FIELD PANEL NODE NAME
PX04	PXCM-4	PXCM-4

ALTERNATE 2

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

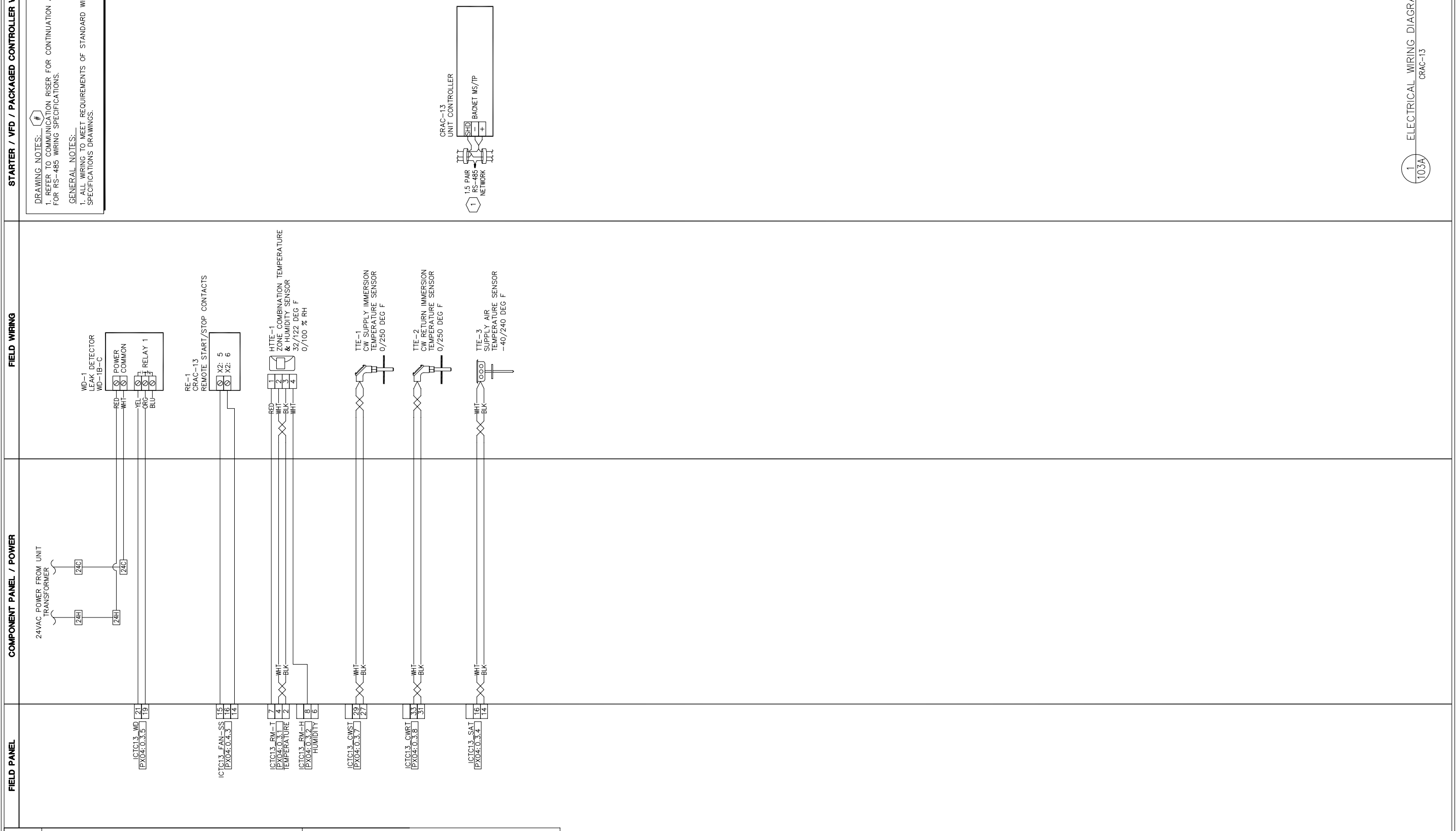
COMPUTER ROOM A/C UNIT 13

440P414307
0
103

FIELD WIRING | **STARTER / VFD / PACKAGED CONTROLLER WIRING**

DRAWING NOTES: (#)
1. REFER TO COMMUNICATION RISER FOR CONTINUATION AND FOR RS-485 WIRING SPECIFICATIONS.

GENERAL NOTES:
1. ALL WIRING TO MEET REQUIREMENTS OF STANDARD WIRING SPECIFICATIONS DRAWINGS.



REF#	FIELD PANEL NAME	FIELD PANEL NODE NAME
PX04	PXCM-4	PXCM-4

1 / 103A ELECTRICAL WIRING DIAGRAM
CRAC-13

ALTERNATE 2

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS
SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION
3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

COMPUTER ROOM A/C UNIT 13 WIRING

440P414307
101
103A

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
A 1	1	AQA2200-2X4	SIEMENS		SERIES 2200/3200 3-1/2 x 5 TRIM PLATE
HTTE 1	1	QFA32SS.EWSN	SIEMENS	129104	ROOM RH&T, ANALOG, BLANK FRONT
TTE 1-2	2	QAE2012.005	SIEMENS	149919	IMMERSION TMP SNSR, PT 1K OHM(385) 2.5"
TTE 3	1	QAM2030.045	SIEMENS	149915	DUCT PNT TEMP, 10K OHM TYPE 2, 18" RIGID
WD 1	1	WD-1B-C	KELE INC		WATER DETECTOR SPDT W/DEENERGIZED RELAY

CRAC UNIT - SEQUENCE OF OPERATION

1. CRAC UNITS SHALL BE DOWNFLOW INCLUDE TWO ECM FANS, CHILLED WATER COIL, ELECTRIC REHEAT WITH SCR CONTROL, INFRARED HUMIDIFIER.

2. SUPPLY FAN SYSTEM SPEED CONTROL

   2.1. THE ECM FAN SHALL ENERGIZE AND MODULATE TO MAINTAIN FAN CONTROL.

3. CHILLED WATER COOLING COIL

   3.1. CONTROL VALVES SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE (ADJ.).

4. INFRARED HUMIDIFIER

   4.1. HUMIDIFIER SHALL ENERGIZE AND OPERATE TO MAINTAIN SPACE HUMIDITY SETPOINT (ADJ.).

5. DEHUMIDIFICATION CYCLE

   5.1. CHILLED WATER VALVES SHALL OPEN 100&. ELECTRIC REHEAT SHALL MODULATE TO MAINTAIN SPACE HUMIDITY.

6. ALARMS

   6.1. ALARM OUTPUTS SHALL INCLUDE

      6.1.1. FAN FAULT
      6.1.2. HIGH SPACE TEMPERATURE
      6.1.3. LOW SPACE TEMPERATURE
      6.1.4. HIGH SPACE HUMIDITY
      6.1.5. LOW SPACE HUMIDITY
      6.1.6. WATER DETECTION
      6.1.7. GENERAL ALARM

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

CRAC UNIT 13 BOM & SOO

440P414307
0
103B

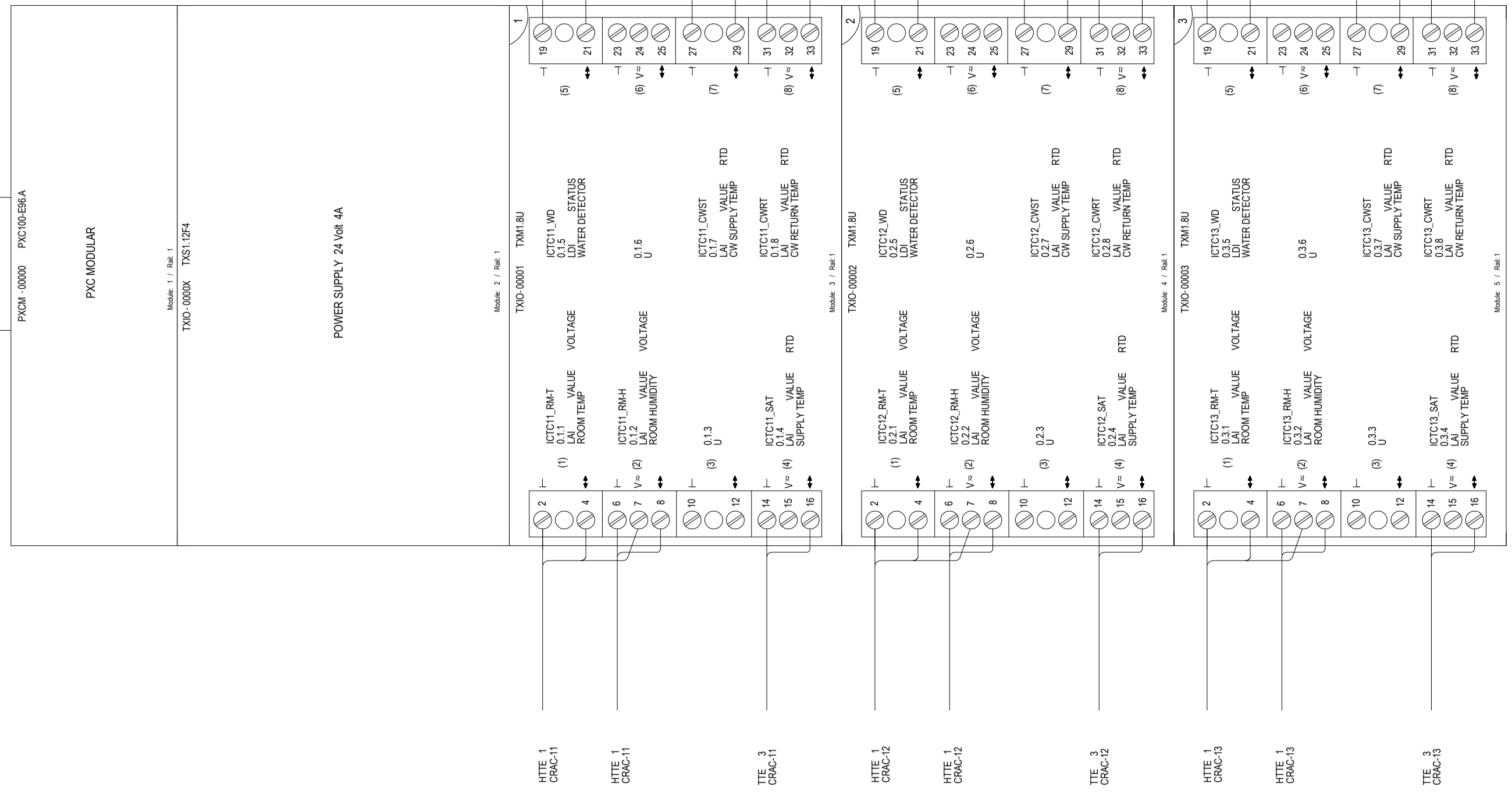
PXCM - 00000 PXC100-E96.A

PXC MODULAR

Module: 1 / Rail: 1

TXIO - 0000X TXS1.12F4

POWER SUPPLY 24 Volt 4A



REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

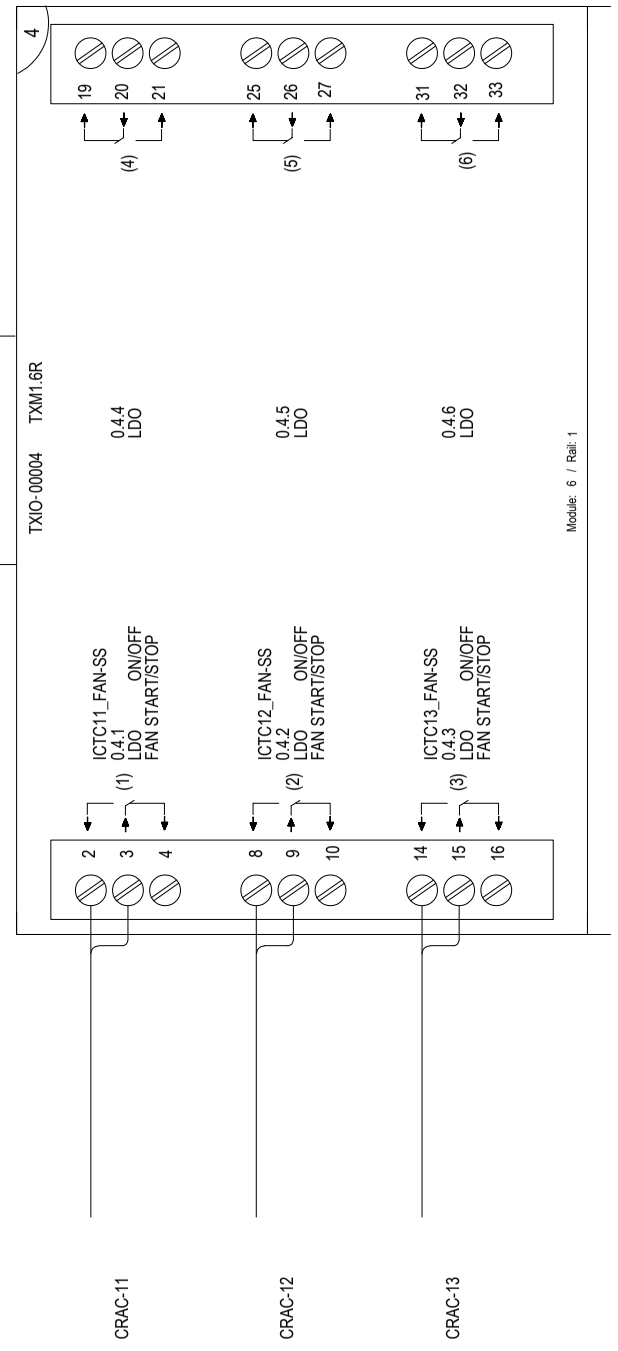
IUI ICTC CRAC 11, 12 & 13

IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

IC CRAC PXCM-4

440P414307
0
N01



REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

PXCM-4p002

440P414307
0
N01A

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Panel Mounted Devices					
PXCM 000	1	PXC100-E96.A	SIEMENS	149478	PXC MOD, BACNET, TX-I/O, 96 NODE, APOGEE
	1	TXA1.K24	SIEMENS	149476	@ADDRESS KEY 1-24
	1	TXS1.12F4	SIEMENS	149476	24VDC SUPPLY 1200MA, 4 A FUSE
	3	TXM1.8U	SIEMENS	149476	8 UNIVERSAL I/O MODULE
	1	TXM1.6R	SIEMENS	149476	6 RELAY OUTPUT MODULE

REVISION HISTORY

00	4/9/2026	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
INDIANAPOLIS, IN 46268
UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

IUI ICTC CRAC 11, 12 & 13
IU PROJECT #20251317, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		04/09/26	04/08/26

IC CRAC PXCM-4

440P414307
0
N01B

SIEMENS

Technical Specification Sheet
Document No.149-478
April 1, 2023

PXC Modular Series

Figure 1. PXC Modular.

Description

The PXC Modular Series (Programmable Controller–Modular) is a high-performance modular Direct Digital Control (DDC) supervisory field panel, which is an integral part of the APOGEE® Automation System.

The PXC Modular operates stand-alone or networked to perform complex control, monitoring, and energy management functions without relying on a higher-level processor.

- Up to 100 modular field panels communicate on a peer-to-peer network.
- With the addition of TX-I/O modules and a TX-I/O Power Supply on a self-forming bus, the PXC Modular can directly control up to 500 points.

> See the APOGEE Wiring Guidelines for Field Panels and Equipment Controllers (125-3002) for information on setting up this configuration.

With the addition of an Expansion Module, the PXC Modular also provides central monitoring and control for distributed Field Level Network (FLN) devices.

Features

- Modular hardware components match initial control requirements while providing for future expansion.
- Automation Level Network (ALN) support for peer-to-peer communications over industry standard 10/100Base-T TCP/IP networks or RS-485 P2 networks.
- Optional support for P1 FLN devices.
- Optional support for P1 Wireless FLN.
- Optional operation as a P1 device with default applications.
- HMI RS-232 and USB ports, which provide laptop connectivity for local operation and engineering.
- DIN rail mounted device with removable terminal blocks simplifies installation and servicing.
- Proven program sequences to match equipment control applications.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control, and monitoring functions.
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes (License required with Firmware revision 2.8.18 and higher).
- PXM10T and PXM10S support: Optional LCD Local user interface with HOA (Hand-off-auto) capability and point commanding and monitoring features.

Hardware

PXC Modular

- The Modular is a microprocessor-based multi-tasking platform for program execution and communication with other field panels. It scans field data, optimizes control parameters, and manages operator requests for data in seconds.
- The program and database information stored in the Modular memory is protected with a battery backup. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure. When battery replacement is necessary, the Modular illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.
- The Modular firmware, including the operating system, is stored in non-volatile flash memory.
- LEDs provide instant visual indication of overall operation, network communication, and battery status.
- Two self-forming buses are an integral part of the flexibility of the Modular. A self-forming bus to the right of the controller (see Figure 3) supports up to 500 points through TX-I/O™ modules. Another self-forming bus to the left of the controller (see Figure 5) supports hardware connection to subsystems through Expansion Modules.

TX-I/O Modules

TX-I/O Modules are modular expansion I/O consisting of an electronics module and terminal base. The electronics modules perform A/D or D/A conversion, signal processing and point monitoring and command output through communication with the Modular. The terminal bases provide for termination of field wiring and connection of a self-forming bus. For more information, see the *TX-I/O Product Range Technical Specification Sheet* (149-476).

TX-I/O Power Supply

The TX-I/O Power Supply provides power for TX-I/O modules and peripheral devices. Multiple Power Modules can be used in parallel to meet the power needs of large concentrations of I/O points (see Figure 2 and Figure 3). For more information, see the *TX I/O Product Range Technical Specification Sheet* (149-476).

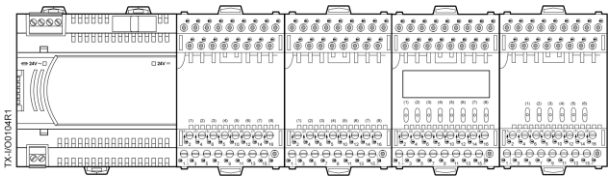


Figure 2. TX-I/O Power Supply and TX-I/O Modules.

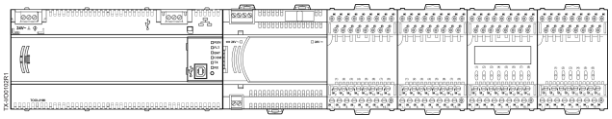


Figure 3. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

PXC Modular Expansion Module

The Modular Expansion Module (see Figure 4) provides the hardware connection for Field Level Network (FLN) devices.

Using the Triple RS-485 Expansion Module, the Modular supports up to three RS-485 networks of P1 Field Level Network devices. With the Expansion Module the PXC Modular can also provide wireless FLN support.

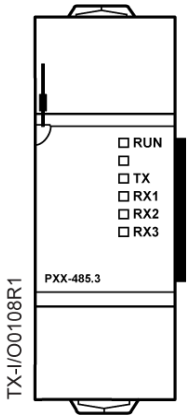


Figure 4. RS-485 Expansion Module.

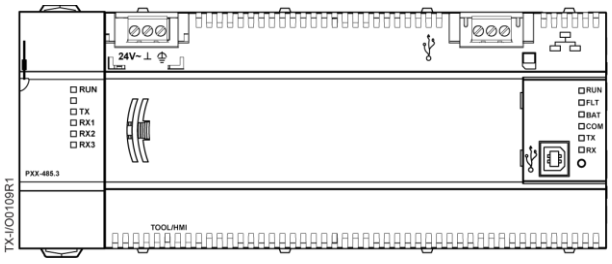


Figure 5. RS-485 Expansion Module and PXC Modular.

Modular Control Panels with Application Flexibility

The PXC Modular is a high performance controller with extensive flexibility to customize each field panel with the exact hardware and program for the application. As a result, the user only purchases what is needed.

For example, in monitoring applications, the control panel can be customized with the number and type of points to match the sensor devices. For monitoring and controlling a large number of (on-off) fans or motors, more digital points can be added (see Figure 6).

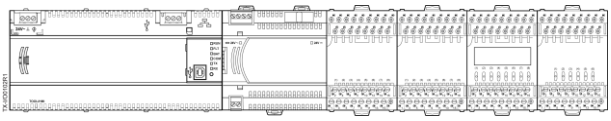


Figure 6. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

Alternately, if no local point control is required, the PXC Modular can be used to monitor and control Field Level Network devices using the Expansion Modules (see Figure 7).

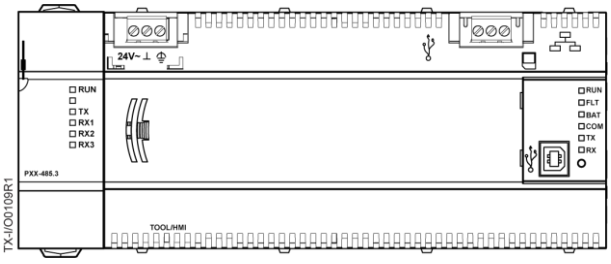


Figure 7. RS-485 Expansion Module and PXC Modular.

Of course, the PXC Modular can be used for both direct point monitoring and control **and** as a system controller for Field Level Network devices (see Figure 8).

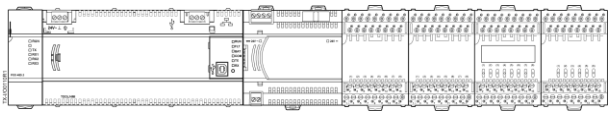


Figure 8. RS-485 Expansion Module, PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

In a stand-alone configuration, the PXC Modular can fulfill all requirements of a supervisory network coordinator by managing operation schedules and alarms and communicating for the connected devices.

The control program for each field panel is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a “BASIC” type programming language, provides direct digital control and energy management sequences to precisely control equipment and optimize energy usage.

Global Information Access

The HMI port supports operator devices, such as a local user interface or simple CRT terminal, and a phone modem for dial-in service capability. Devices connected to the operator terminal port gain global information access.

Multiple Operator Access

Multiple operators can access the network simultaneously. Multiple operator access ensures that alarms are reported to an alarm printer while an operator accesses information from a local terminal. When using the Ethernet TCP/IP ALN option, multiple operators may also access the controller through concurrent Telnet sessions and/or local operator terminal ports.

Menu Prompted, English Language Operator Interface

The PXC Modular field panel includes a simple, yet powerful menu driven English Language Operator Interface that provides, among other things:

- Point monitoring and display
- Point commanding
- Historical trend collection and display for multiple points
- Equipment scheduling
- Program editing and modification via Powers Process Control Language (PPCL)
- Alarm reporting and acknowledgment
- Continual display of dynamic information

Built-in Direct Digital Control Routines

The PXC Modular provides stand-alone Direct Digital Control (DDC) to deliver precise HVAC control and comprehensive information about system operation. It receives information from sensors in the building, processes the information, and directly controls the equipment. The following functions are available in the PXC Modular:

- Adaptive Control, an auto-adjusting closed loop control algorithm. Provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. Superior in terms of response time, holding steady state, and minimizing error, oscillations, and actuator repositioning.
- Closed Loop Proportional, Integral and Derivative (PID) control
- Logical sequencing
- Alarm detection and reporting
- Reset schedules

Built-in Energy Management Applications

The following applications are programmed in the PXC Modular and require simple parameter input for implementation:

- Automatic Daylight Saving Time switchover
- Calendar-based scheduling
- Duty cycling
- Economizer control
- Equipment scheduling, optimization and sequencing
- Event scheduling
- Holiday scheduling
- Night setback control
- Peak Demand Limiting (PDL)
- Start-Stop Time Optimization (SSTO)
- Temperature-compensated duty cycling
- Temporary schedule override

Modular Series Specifications

Dimensions (L × W × D)	
PXC Modular	7.56" × 3.54" × 2.76" (192 mm × 90 mm × 70 mm)
FLN Expansion Module	1.26" × 3.54" × 2.76" (32 mm × 90 mm × 70 mm)
DIN rail (EN 60715 TH 35-7.5, steel)	1.38" × 0.30" × 0.04" (35 mm × 7.5 mm × 1 mm)

Processor, Battery, and Memory	
Processor	MPC885 (PowerPC)
Processor Clock Speed	133 MHz
Memory	80 MB (64 MB SDRAM, 16 MB Flash ROM)
Serial EEPROM	4 KB
Secure Digital (SD) memory card (for future use)	Expandable or removable non-volatile memory
Battery backup of SDRAM	30 days (accumulated), AA (LR6) 1.5 Volt Alkaline (non-rechargeable)
Battery backup of Real Time Clock	12 months (accumulated), Coin cell (BR2032) 3 Volt lithium
Real Time Clock Initial Accuracy	±30 seconds/month typical @ 77°F (25°C)

Communication	
Ethernet/IP Automation Level Network (ALN)	10Base-T or 100Base-TX compliant
P2 Automation Level Network (ALN)	RS-485, 1200 bps to 115.2 Kbps, 1/8 load
P1 Wired/Wireless Field Level Network (FLN) on PXX-485.3 Expansion Module	RS-485 x 3, 4800 bps to 38.4 Kbps, 1/8 load
TX-I/O self-forming bus connection	115.2 Kbps, 5 pin connector (middle pin is not connected)
Human-Machine Interface (HMI) Advanced User Mode	RS-232 compliant, 1200 bps to 115.2 Kbps
USB Device port (for non-smoke control applications only)	USB 1.1 (12 Mbps) and 2.0 (480 Mbps), Type B female connector. Self-powered, does not use or supply USB power.
Prior to June 2013	USB 1.0 (1.5 Mbps) and 1.1 (12 Mbps).
USB Host port *on selected models* (for ancillary smoke control applications only).	USB 1.0 (1.5 Mbps), 1.1 (12 Mbps), and 2.0 (480Mbps), Type A female connector. USB unit loads (5V, 500 mA).
Prior to June 2013	USB 1.0 (1.5 Mbps) and 1.1 (12 Mbps), Type A female connector.

Electrical	
Power Requirements	24 Vac +/-20% input @ 50/60 Hz
Power Consumption (Maximum)	24 VA @ 24 Vac
AC Power	NEC Class 2
Communication	NEC Class 2

Operating Environment	
Ambient operating environment	Operate in a dry location, which is protected from exposure to salt spray or other corrosive elements. Exposure to flammable or explosive vapors must be prevented.
Operating temperature	32°F to 122°F (0°C to 50°C
Shipping and storage environment	-13°F to 158°F (-25°C to 70°C)
Relative Humidity	5% to 95% rh, non-condensing
Mounting Surface	Building wall or structural member (Do not mount on HVAC components or any other vibrating surface.) **CE Compliance** Requires installation inside a metal enclosure rated at IP30 minimum. **Smoke Control Applications** Requires installation inside a PX series enclosure
Vibration	Compliance to IEC 60721, 3M2, and 2M2
Protection to EN60529	IP 20

Agency Listings	
UL	UL 864 UUKL Smoke Control Equipment - Conforms to UL864 9th and 10th Edition. UL 864 UUKL7 Smoke Control Equipment - Conforms to UL864 9th and 10th Edition. CAN/ULC-S527-M8 UL 916 PAZX - Conforms to UL916 9th and 10th Edition. UL 916 PAZX7 - Conforms to UL916 9th and 10th Edition.
Agency Compliance	CFR47 Part 15, Class A; CFR47 Part 15, Class B - with metal enclosure, maximum opening Australian EMC Framework - with metal enclosure, maximum opening size is 34" European EMC Directive (CE) - with metal enclosure, maximum opening size is 34" RoHS Compliant UKCA - Electromagnetic Compatibility Regulations (S.I. 2016 No. 1091 / S.I. 2012 No. 3032)
OSHPD Seismic Certification	Product meets OSHPD Special Seismic Preapproval certification (OSH-0217-10) under California Building Code 2010 (CBC2010) and International Building Code 2009 (IBC2009) when installed within the following Siemens enclosure part numbers: PXA-ENC18, PXA-ENC19, or PXA-ENC34.

Electrical Disturbance Testing	
Dips and Interrupts	per EN 61000-4-11
Electrical Fast Transients (EPT)	per EN 61000-4-4, 1 kV signal, 2 kV AC power
Electrical Surge Immunity	per EN 61000-4-5 AC power: 2 kV common mode, 1 kV differential mode Signal lines: 1 kV CM, 5 kV DM
Electrostatic Discharge (ESD)	per EN 61000-4-2, 4 kV contact, 8 kV air discharge
RF Conducted Immunity	per EN 61000-4-6 @ 10V
RF Radiated Immunity	per EN 61000-4-3 @ 10V/m

Ordering Information

PXC Modular Series

Product Number	Description
PXC00-PE96.A	PXC Modular, Ethernet/IP or RS-485 ALN, P1 FLN. PXX-485.3 is also required as the connection to the FLN devices.
PXC100-PE96.A	PXC Modular, Ethernet/IP or RS-485 ALN, P1 FLN, self-forming TX-I/O Island Bus. PXX-485.3 is also required as the connection to the FLN devices.
PXX-485.3	Provides FLN support for the PXC Modular. Includes three RS-485 P1 FLN connections or one MS/TP FLN connection; maximum of 96 devices supported.

Optional Licenses

Product Number	Description
PXF-TXIO.A	License to enable the Island Bus on PXC00-E96.A and PXC00-PE96.A.
LSM-VAEM	License to enable Virtual AEM support when the P2 ALN is connected to RS-485
LSM-ADAPT	License to use the Adaptive Control added in FW 2.8.18 and later

Accessories

Product Number	Description
PXM10S	Controller mounted Operator Display module with point monitor and optional blue backlight
PXM10T	Controller mounted Operator Display module
PXA-HMI.CABLEP5	Serial cable required for PXM10T/S connection to PXC Series controllers.
PXA-MOD.CON	PXC Modular Connector Kit - Fits one PXC Modular

Service Boxes and Enclosures

Product Number	Description
PXA-SB115V192VA	PX Series Service Box—115V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB115V384VA	PX Series Service Box—115V, 24 Vac, 50/60 Hz, 384 VA
PXA-SB230V192VA	PX Series Service Box—230V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB230V384VA	PX Series Service Box—230V, 24 Vac, 50/60 Hz, 384 VA
PXA-ENC18	18" Enclosure (Utility Cabinet) (UL Listed NEMA Type 1 Enclosure)
PXA-ENC19	19” Enclosure (UL Listed NEMA Type 1 Enclosure)
PXA-ENC34	34” Enclosure (UL Listed NEMA Type 1 Enclosure)

Documentation

Product Number	Description
125-3582	PXC Modular Series Owner's Manual
125-1896	APOGEE Powers Process Control Language (PPCL) User's Manual

Disposal

The device is considered an electronic device for disposal in accordance with the European Guidelines and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

Siemens Industry, Inc.
Smart Infrastructure
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
USA
Tel. 1 + 847-215-1000

Your feedback is important to us. If you have comments about this document, please send them to SBT_technical.editor.us.sbt@siemens.com.

Document No. 149-478
Printed in the USA

SIEMENS

Installation Instructions
Document No. 553-130
January 18, 2023

19” and 34” PX Series Enclosure Assemblies

Product Description

The 19” and 34” PX series enclosures (see Figure 1 and Figure 2) are UL Smoke Control listed for indoor use to:

- provide a degree of protection to personnel against incidental contact with the enclosed Siemens Building Control devices
- provide a degree of protection for those devices against falling dirt

The 19” and 34” PX series enclosures are factory-equipped with the following:

- Factory-installed backplane assembly, which includes wire tie down rails and DIN rails
- Mounting features for PX series service box
- Removable hinged door with key lock and label pouch
- Conduit knockouts and venting

The 19” and 34” PX series enclosures, when installed per this instruction, are certified to comply with IBC 2009 and CBC 2010 and may be used with following List of Equipment/Components with HCAI Special Seismic Certification Preapproval (OSP)

- OSP-217 and OSP-218

Product Numbers

PXA-ENC34 34” PX Series Enclosure Assembly

PXA-ENC19 19” PX Series Enclosure Assembly

See Figures 4 and 5 for enclosure dimensions.

Caution Notation

CAUTION:		Equipment damage or loss of data may occur if you do not follow the procedure as specified.

Expected Installation Time

30 minutes

Required Tools and Materials

- Adjustable wrench or pliers
- Electric drill
- Punch
- Hammer
- Level
- Marker
- Screwdrivers, small and medium Phillips
- Tape measure
- Tie-wraps
- Wire stripper/side cutters
- Four corrosion resistant 1/4” - 20 Bolts, flat washers and nuts

To mount on concrete or masonry:

- Hammer drill
- 1/2 inch carbide tipped masonry bit
- Four 1/4-20 corrosion resistant wall anchors

Prerequisites

CAUTION:

Do not mount the enclosure on ductwork, HVAC components, or any other vibrating surface.

- Mount the enclosure at least 12 feet (3.7 m) away from devices that can generate Radio Frequency Interference (RFI), such as Electro-pneumatic devices (EPs), relays, and walkie-talkies.
- Mount the enclosure at least 5 feet (1.5 m) away from 100 kVa or larger motors and variable frequency drives (VFD).

CAUTION:

Anchorage is not preapproved for Seismic Certification and must be approved by the Inspector of Record before installation.

Seismic Certification Preapproval requires:

- Installed Equipment is listed in OSP.
- Enclosures are non-isolated wall mounted using four 1/4” minimum diameter bolts.
- Enclosure assembly certification includes enclosure with door, service box, installed equipment and wiring.
- Total assembly weight not to exceed 50 lbs. for 19” enclosure assembly or 100 lbs. for 34” enclosure assembly.
- Center of gravity is located from origin at enclosure lower left mounting hole to 9 x 8 x 2 inches for 19” assembly or 10 x 16 x 2.5 inches for 34” assembly. Variance due to installed components is < 10%.
- DIN Rails mounted on backplane using three supplied screws each.
- Listed equipment not capable of being installed on DIN rails may be fastened to the backplane with supplied screws.
- Listed communication devices may be fastened to enclosure or backplane and power packs to outlet with 3M® Dual Lock® Reclosable Fasteners SJ3560 (Type 250). Use two pair for devices and one pair for power packs. Minimum 1” square per 2 lbs.

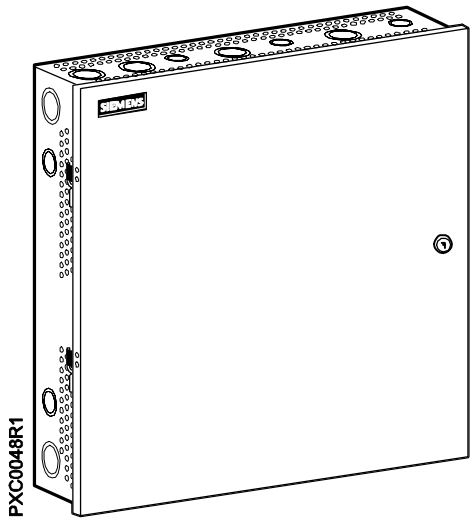


Figure 1. 19” PX Series Enclosure Assembly.

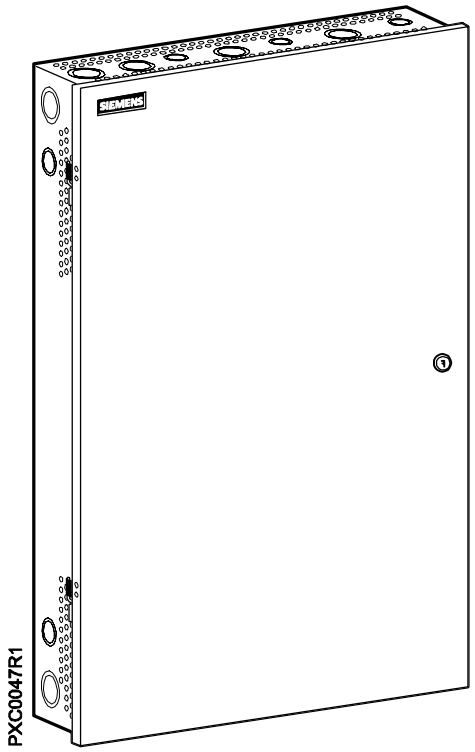


Figure 2. 34” PX Series Enclosure Assembly.

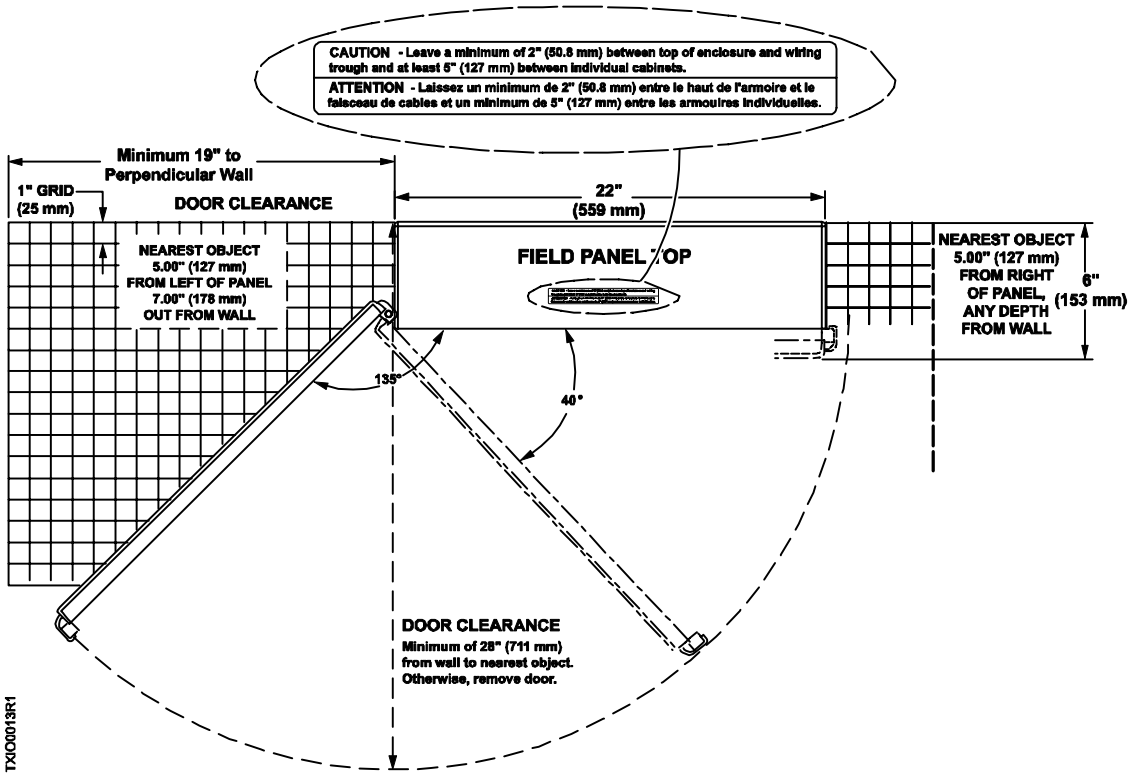


Figure 3. Spacing Requirements.

Installation

NOTE: Follow all safety regulations and local codes when installing this equipment.

1. Determine the mounting location of the enclosure using the spacing requirements shown in Figure 3 and Figure 6. See Figure 4 and Figure 5 for panel dimensions.
   - Minimum spacing between the panel and any left (hinged side) obstruction is 1 inch spacing for every 1 inch of depth, starting at 5 inches (127 mm) to the left (see Figure 6).
   - Minimum spacing between the panel and any right (lock side) obstruction is 5 inches (127 mm) to the right at any depth (see Figure 6).
   - Space between door panel and opening obstruction must be at least 11 inches (279.4 mm) to allow for door removal at 40 degrees, or 28 inches (711 mm) with a cabinet mounting at least 19 inches (483 mm) from the left side wall to allow door to completely open at 135 degrees.
2. Draw a level line 6 feet (1.8 m) above the floor on the wall or surface where the enclosure will be mounted.
3. Draw a horizontal line 1.5 inches down from the 6 foot mark.
4. Mark two vertical centerlines, 16 inches apart and at least 8 inches from any adjacent wall.
5. Drill through each marked centerline to create the mounting holes.
6. Use hammer and punch to remove knockouts:
   a. Punch one entrance on the right-most knockout (either on the top or side) for the line voltage wiring to the service box.
   b. Punch additional entrances as needed making sure the Class 2 wiring knockout is at least 2 inches (50.8 mm) from other wiring knockouts.

WARNING:

Separate knockouts should be used for high voltage and low voltage wiring. Leave at least a 2-inch (50.8 mm) space between the Class 2 and other wires in the panel.

7. Partially insert mounting bolts in holes.
8. Mount the enclosure to the wall. Check the enclosure to be sure it is level.
9. Tighten the mounting bolts.
10. Drill the two lower mounting holes.
11. Insert and tighten the remaining mounting bolts.
12. Mount the door on the enclosure.
13. Connect the door grounding wire to the stud inside the enclosure.
14. Run conduit and pull wires into the panel. Be sure to leave enough wire for future changes or additions, and to allow for full door swing clearance (see Figure 6).
15. Label each wire.
16. Place the product layout sheet in the label pouch inside the door.

The installation is now complete.

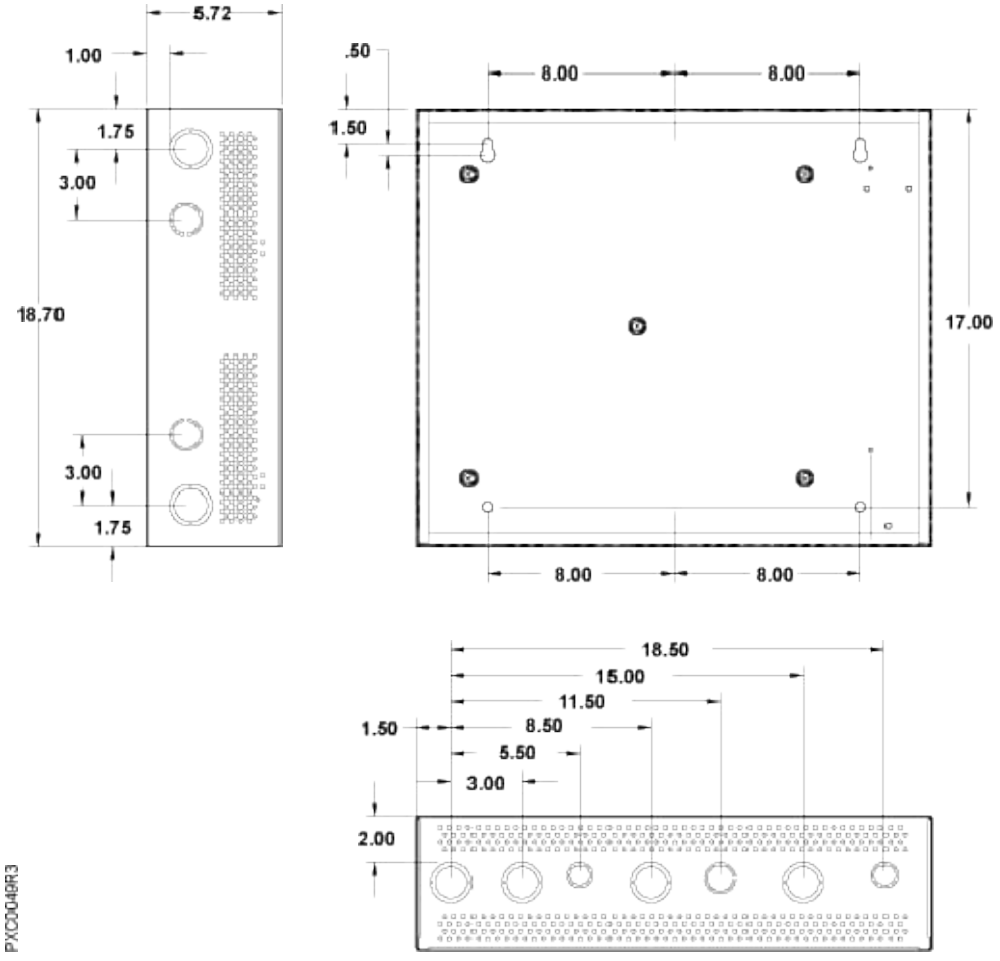


Figure 4. 19” PX Series Enclosure Dimensions.

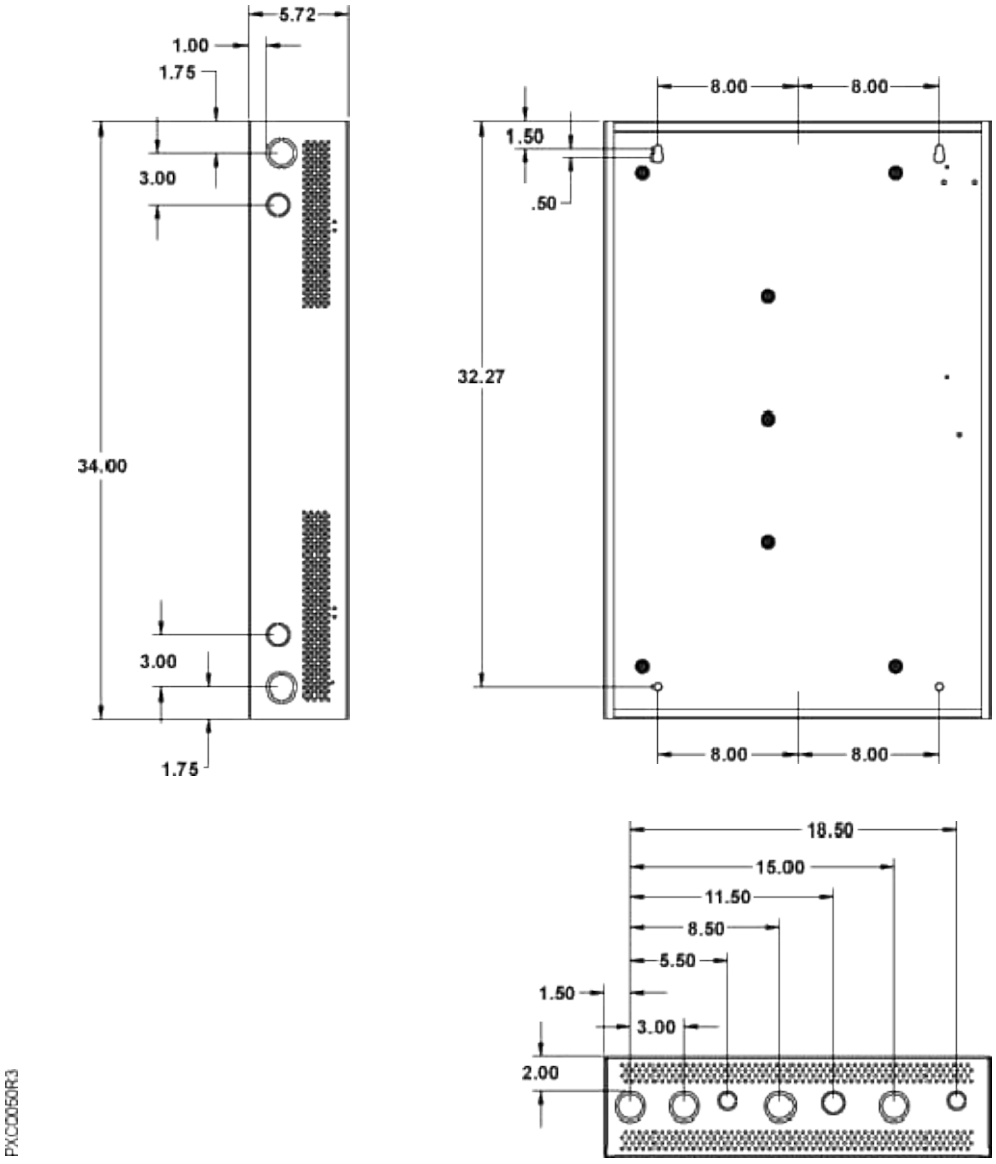


Figure 5. 34" PX Series Enclosure Dimensions.

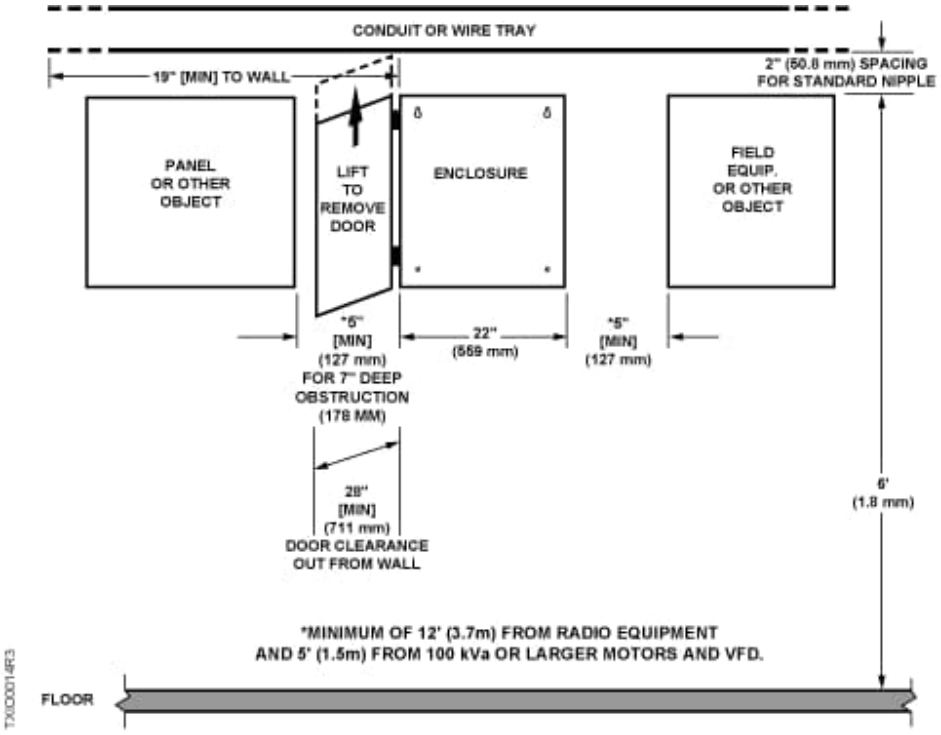


Figure 6. 19” and 34” PX Series Enclosure Placement.

Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
USA
Tel. 1 + 847-215-1000

Your feedback is important to us. If you have comments about this document, please send them to technical.editor@siemens.com.

SIEMENS

Installation Instructions
Document No. 553-131
August 16, 2013

PX Series
Service Box Assemblies

Product Description

The PX Series Service Box Assemblies transform 115 Vac or 230 Vac to 24 Vac that power HVAC control components. The 192 VA service boxes mount directly inside a 19-inch or 34-inch PX Series Enclosure or as a replacement in older MEC Enclosures. The 384 VA service boxes provide additional power for larger systems and mount only in the 34 inch PX Series Enclosure. The service boxes are Smoke Control and Energy Management listed when installed per this instruction.

The service box assemblies consist of:

- Chassis for mounting inside enclosure
- Transformer for converting either 115 Vac or 230 Vac to 24 Vac sized for either 192 VA or 384 VA
- ON/OFF Circuit breaker for transformer
- Two Class 1 power limited 24 Vac outputs including one terminal for earth ground for use inside enclosure only
- One Class 2 output with circuit breaker to distribute up to 96 VA for use outside the enclosure
- Duplex Service Outlet (115 Vac models only)
- Wire cover for field connections

Product Numbers

PXA-SB115V192VA	Service Box 115V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB115V384VA	Service Box 115V, 24 Vac, 50/60 Hz, 384 VA
PXA-SB230V192VA	Service Box 230V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB230V384VA	Service Box 230V, 24 Vac, 50/60 Hz, 384 VA

Warning/Caution Notations

WARNING:	⚠	Personal injury/loss of life may occur if you do not perform a procedure as specified.
CAUTION:	⚠	Equipment damage or loss of data may occur if you do not perform a procedure as specified.

Required Tools and Materials

- Medium Phillips screwdriver
- 11/32-inch nut driver
- 7/16-inch nut driver

Expected Installation Time

15 Minutes

Prerequisites

- Enclosure(s) installed.
- AC power brought to enclosure(s) and power turned OFF at the circuit breaker.
- If using optional TX-I/O Bus (not available on all hardware), it is pulled between enclosures using single 2 twisted pair (TP) or two 1 TP wire tied together. See TX-I/O Bus steps for maximum length by wire gauge.

Smoke Control Application Requirements

UL864 and NFPA92A compliant installations require the 115V or 230V PX Series Service Box Assembly installed inside the 19-inch or 34-inch PX Series Enclosure Assembly (PXA-ENC19 or PXA-ENC34). For more information, see *PX Series Enclosure Assemblies Installation Instructions* (553-130).

For smoke control installations, the 24 Vac Actuator Output is a supplementary circuit intended for general HVAC equipment only. It can not power smoke control devices.

Optional: See the Field Purchasing Guide for ordering the relay required for Smoke Control listing if a TX-I/O Bus is powered from multiple service boxes. (TX-I/O Bus not available on all hardware.)

RIB2401C UL864 Listed Relay, SPDT 24 Vac 10A

Energy Management Applications

For energy management installations the service box may be installed in any NEMA Type 1 enclosure if the optional side wall kit is installed (PXA-SW192VA or PXA-SW384VA). For more information, see *PX Series Service Box Sidewall Kit Installation Instructions* (553-135).

Optional: For TX-I/O Bus powered from multiple service boxes, use UL Listed relay RIB2401C. For more information, see manufacturer installation instructions.

Instructions

WARNING:

This installation should only be done by a qualified electrician.

WARNING:

Turn off AC power to the MEC enclosure at a circuit breaker panel.

1. Be sure the AC power to the enclosure is OFF at the circuit breaker panel.
2. Place the service box in the right side of the enclosure. See Figure 1 and Figure 3.
3. Fasten the service box inside the enclosure with the three locknuts (two on top and one on the bottom).
4. Connect the green/yellow wire at the marked earth ground lug on the enclosure.

CAUTION:

The green wire grounds the transformer secondary neutral. This is required whenever the primary side is greater than 150 Vac, required by local code or if used to power TX-I/O Modules.

5. If required connect the green wire at the marked earth ground lug on the enclosure. Otherwise, tape back the green wire terminal.
6. Do one of the following:

   - **115 Vac models:** Connect the AC hot (black wire) and AC neutral (white wire) with wire nuts.
   - **230 Vac models:** Screw the AC hot (black wire) and AC neutral (white wire) to the terminal block.

7. Fasten wire cover to the top of the service box.

For hardware without a TX-I/O Bus or TX-I/O Bus not extending between enclosures, skip to step 8; otherwise, choose Option 1 or Option 2 below:

Option 1: If powering both enclosures from a single service box, continue with the following:

a. Connect a twisted pair of TX-I/O Bus cable from the service box 24 Vac (~) and (⊥) terminals of the Class 2 output connector to the corresponding pins of TXS1.12F4, TXB1.P1, or TXS1.EF4 in the other enclosure.

b. Connect the second twisted pair between the CS and CD terminals of the TXS1.12F4, TXB1.P1, or TXS1.EF4 in each enclosure.

Option 2: If using multiple service boxes to power a TX-I/O Bus, continue with the following:

CAUTION:

DO NOT connect the 24 Vac (~) terminals between the multiple service boxes.

a. Do the steps for a single service box except do not connect the 24 Vac (~) wire and CS wire.

b. Screw the relay onto the enclosure backplane.

c. Connect the relay coil 24 Vac terminal to the service box 24 Vac (~) terminal.

d. Connect the relay coil neutral terminal to the service box neutral (⊥) terminal.

e. Connect the CS wire entering and/or leaving enclosure to the relay contact common terminal.

f. Connect the CS wire inside enclosure to the relay contact normally open terminal (NO).

8. If present, fasten wires from the component power connectors to connectors on the side of the service box. See Figure 2 and Figure 4.
9. Restore power to the enclosure at the circuit breaker panel.

The installation is now complete.

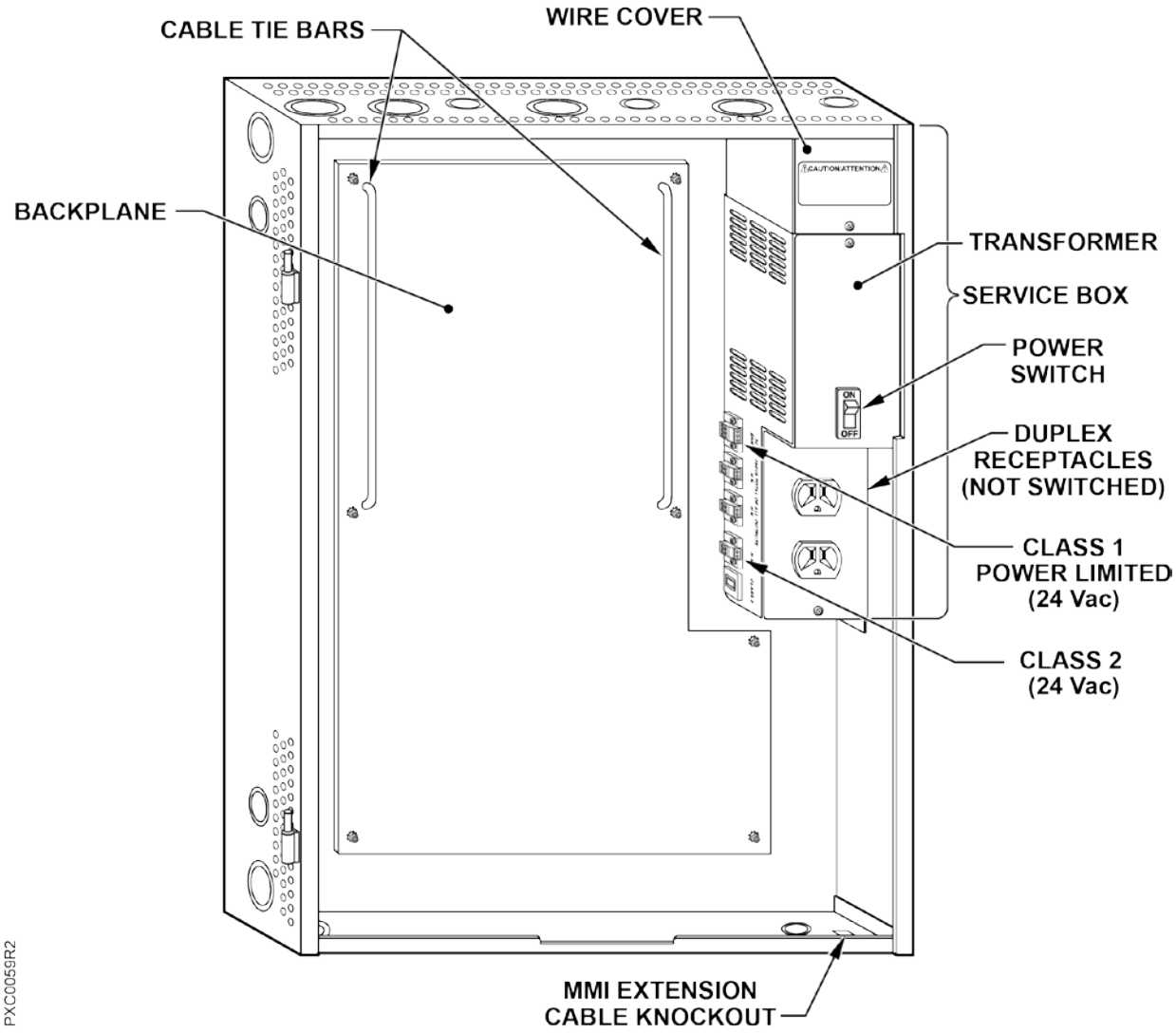


Figure 1. Placement of the 384 VA Service Box in a 34 inch PX Series Enclosure.

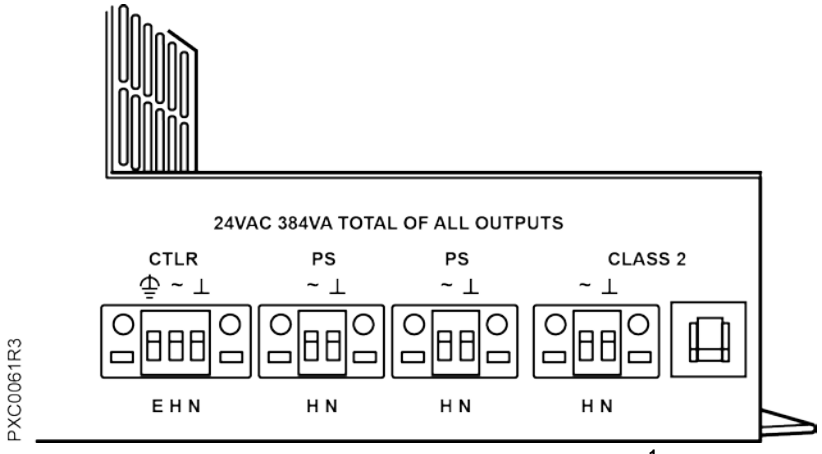


Figure 2. 384 VA Service Box Connections[1].

1. 384VA model connectors will fit one 12 gauge and one 14 gauge wire or three 14 gauge or smaller wires.

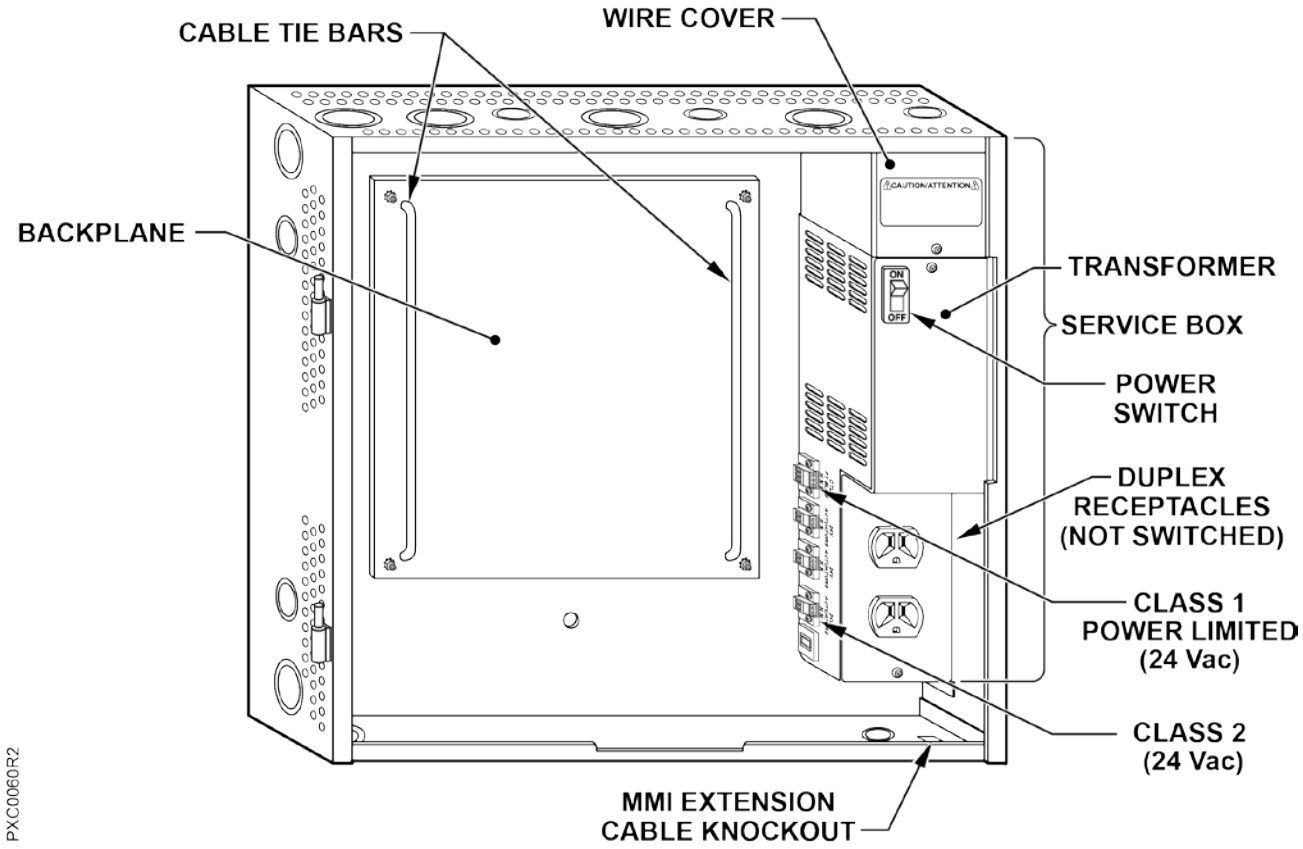


Figure 3. Placement of the 192 VA Service Box in a 19 inch PX Series Enclosure.

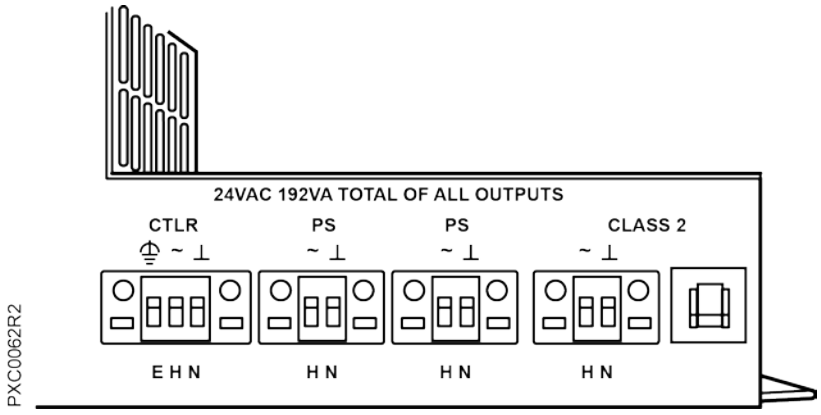


Figure 4. 192 VA Service Box Connections[2].

2. 192VA model connectors will fit one 12 gauge wire, one 14 and one 16 gauge wire or three 16 gauge or smaller wires.

Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
USA
1-847-215-1000

Your feedback is important to us. If you have comments about this document, please send them to SBT_technical.editor.us.sbt@siemens.com.

SIEMENS

Technical Specification Sheet
Document No. 149-714
February 19, 2018

Series QAA2200 Room Temperature Sensors & Series QFA3200 Room Humidity Sensors

QxAx2xx.EWSN
Sensing Only

QxAx2xx.FWSN
Full HMI

Description

Series QAA2200 Room Temperature and Series QFA3200 Room Humidity + Temperature sensors are engineered to enable accurate and efficient control of room comfort. A wide variety of output signals is available for compatibly with nearly any control system. The patented housing design seamlessly blends into any décor and features strategically placed ventilation slots to maximize airflow and optimize accuracy.

The QFA3200 units combine a temperature sensor with a relative humidity sensor in a single housing to reduce installation time and improve overall room aesthetics.

Installation is quick and straightforward with all hardware included for mounting on a standard 2” × 4” electrical box. Screws and anchors are provided for mounting the sensor directly to a wall. Matching gaskets and trim rings are also available.

The “E” versions have a blank front to prevent unauthorized adjustments and are ideal for high traffic areas or remote spaces that are not supervised.

The “F” versions feature a full HMI that can display room conditions and temperature setpoint. The display is easily configured to limit the information that is available to the occupant. Temperature setpoint can be adjusted using soft touch plus (+) and minus (-) keys, and an override key enables the user to manually signal to the controller that the space is occupied.

Specifications

Temperature	
Measuring range	32°F to 122°F (0°C to 50°C)
Accuracy	
1K Ω Pt	± 0.54°F (0.3°C) @ 32°F (0°C)
1K Ω (32°F) Ni	± 0.72°F (0.4°C) @ 32°F (0°C)
1K Ω (70°F) Ni	± 0.75°F (0.4°C) @ 75°F (24°C)
10K Ω Type II	± 0.4°F (0.22°C) @ 77°F (25°C)
10K Ω Type III	± 0.4°F (0.22°C) @ 77°F (25°C)
100K Ω Type II	± 0.36°F (0.2°C) @ 77°F (25°C)
4 to 20 mA/0 to 10V	± 0.9°F (0.5°C)
Humidity (QFA32xx only)	
Measuring Range	0 to 100% rh
Accuracy	± 2% between 10 to 90%
Long-Term Stability	<0.5% rh/year
Resolution	0.03% rh
Repeatability	+/-0.1% rh
Setpoint/Override (“F” versions only)	
Setpoint Signal	
QxAx2**SS**.FWSN	4 to 20 mA or 0 to 10V/0 to 5V
All others	0 to 10V/0 to 5V
Setpoint Range	55°F to 95°F (13°C to 35°C)
Override Contact	Momentary, 1A @ 24 Vac max.
Input Power	18 to 36 Vdc or 24 Vac ± 20%
VA Rating	1.5 VA, max.
Agency Listing	UL 916
Color	White
Dimensions	4.5” × 2.75” × 1.18” (115 mm × 70 mm × 30 mm)
Shipping Weight	6 oz. (170 g)

Product Ordering Information

Part Number[1]	Temperature Output	Humidity Output	Display	Setpoint Adjustment
QAA2212.EWSN	Pt 1K Ω (385a) RTD	—	—	—
QAA2212.FWSN			•	•
QAA2220.EWSN	Ni 1K Ω @ 32°F RTD		—	—
QAA2220.FWSN			•	•
QAA2221.EWSN	Ni 1K Ω @ 70°F RTD		—	—
QAA2221.FWSN			•	•
QAA2230.EWSC[2]	10K Ω Type II Thermistor		—	—
QAA2230.EWSN				
QAA2230.FWSC[2]			•	•
QAA2230.FWSN				
QAA2232.EWSN	10K Ω Type III Thermistor		—	—
QAA2232.FWSN			•	•
QAA2235.EWSN	100K Ω Type 2 Thermistor		—	—
QAA22SS.EWSN	0 to 10V/4 to 20 mA (Selectable)			
QAA22SS.FWSN			•	•
QFA3212.EWSN	Pt 1K Ω (385a) RTD	4 - 20 mA or 0 - 10V/ 0 - 5V (Selectable)	—	—
QFA3212.FWSN			•	•
QFA3230.FWSN	10K Ω Type II Thermistor			
QFA3232.FWSN	10K Ω Type III Thermistor			
QFA32SS.EWSN	0 to 10V/4 to 20mA		—	—
QFA32SS.FWSN			•	•

[1]For no-logo version, change "S" to "N" in Part Number position 10.

[2]For use with TALON® LON controllers.

Accessories Ordering Information

Description	Part Number
Room Unit Back Plate (10-pack)*	AQA2200-INTL
Room Unit Back Plate (Single)*	AQA2200-2X4
Room Sensor Insulating Gasket (10-pack) (Recommended for hollow wall installations.)	563-102 GSKT KIT
Replacement QFA Sensing Element	AQF3060

***** For use when installing Series 2200/3200 Sensors on conduit boxes other than U.S. style 2" × 4". Back plate measures 3-1/4" × 5" (82.55 mm × 127 mm).

Disposal

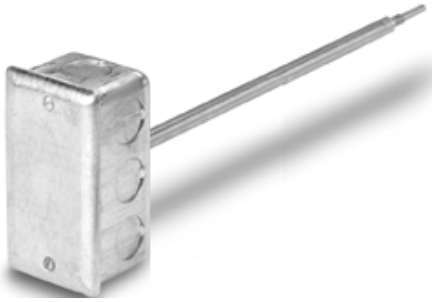
The devices are considered electrical and electronic equipment for disposal in terms of the applicable European Directive and may not be disposed of as domestic garbage.

- Dispose of the devices through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

SIEMENS

Technical Specification Sheet
Document No. 149-915
June 7, 2016

Duct Temperature Sensors



Rigid Probe

Rigid Probe – Bracket Mount

Flexible Probe

Description

Siemens Duct Temperature Sensors monitor and transmit changes in duct air temperature to the HVAC control system. They provide an accurate, reliable indication of duct air temperature. The sensor resistance varies proportionally to the actual temperature being measured.

Sensors are offered with a variety of probe lengths to fit almost any size duct. Longer probes are typically flexible for easier handling and installation (see *Product Ordering Information* on the following page for details).

Multiple output signals are available to ensure compatibility with most common HVAC control systems.

Features

- Variety of sensing elements.
- Suitable for multiple duct applications.
- Responsive to temperature change.
- Accurate and reliable indication of duct temperature.
- Familiar installation process does not require special tools.

Specifications

Output Signals	100K Ω Thermistor 10K Ω Type 2 Thermistor 10K Ω Type 3 Thermistor 1K Ω @ 32°F Ni RTD 1K Ω @ 70°F Ni RTD 1K Ω Pt RTD (375a) 1K Ω Pt RTD (385a) 4 to 20mA • -4°F to 122°F • 20°F to 120°F • 30°F to 250°F 10K Ω Matched Pair Thermistor • (For use with Siemens TEC only)
Probe Material	0.028 Wall SAE J526 ZTEW or Galfan steel tubing
Housing*	Standard NEC approved 2 × 4 inch (5 × 10 cm) utility box with 1/2-inch (13 mm) knockouts
Screw Head Type	Standard slotted

* Bracket-mounted units do not include housing.

Product Ordering Information

Output Signal	Type	Probe Length	Measuring Range	Accuracy	PN
100K Ω Thermistor	Point	18 inches (rigid)	-40°F to 180°F (-40°C to 82°C)	±0.50°F (±0.28°C) @ 77°F (25°C)	535-741-18
		4 inches (rigid)			535-741-4
		8 inches (rigid)			535-741-8
		4 inches (rigid), Bracket			536-811
	Averaging	18 inches (rigid)		±0.36°F (±0.2°C) @ 77°F (25°C)	540-244-18
		36 inches (flexible)			540-245-36
		72 inches (flexible)			540-246-72
10K Ω Type II Thermistor	Point	4 inches (rigid)		±0.4°F (±0.2°C) @ 77°F (25°C)	QAM2030.010
		8 inches (rigid)			QAM2030.020
		18 inches (rigid)			QAM2030.045
	Averaging	8 feet (flexible)			QAM2030.250
		16 feet (flexible)			QAM2030.500
		24 feet (flexible)			QAM2030.750
10K Ω Type III Thermistor	Point	4 inches (rigid)			QAM2032.010
		8 inches (rigid)			QAM2032.020
		18 inches (rigid)			QAM2032.045
	Averaging	8 feet (flexible)			QAM2032.250
		16 feet (flexible)			QAM2032.500
		24 feet (flexible)			QAM2032.750
1K Ω @ 32F Ni RTD	Point	4 inches (rigid)		±0.72°F (±0.4°C) @ 32°F (0°C)	QAM2020.010
		8 inches (rigid)			QAM2020.020
		18 inches (rigid)			QAM2020.045
	Averaging	16 feet (flexible)		±0.75°F (±0.4°C) @ 75°F (24°C)	QAM2020.500
		24 feet (flexible)			QAM2020.750
1K Ω @ 70°F Ni RTD	Point	8 inches (rigid)		±0.72°F (±0.4°C) @ 32°F (0°C)	QAM2021.020
		18 inches (rigid)			QAM2021.045
	Averaging	24 feet (flexible)			QAM2021.750
1K Ω Pt RTD (375a)	Point	18 inches (rigid)		±0.54°F (±0.3°C) @ 32°F (0°C)	544-339-18
		4 inches (rigid)			544-339-4
		8 inches (rigid)			544-339-8
	Averaging	16 feet (flexible)			544-342-16
		24 feet (flexible)			544-342-24
		8 feet (flexible)			544-342-8
		18 inches (rigid)			544-343-18
		24 inches (rigid)			544-343-24
		36 inches (rigid)			544-343-36
		48 inches (rigid)			544-343-48
1K Ω Pt RTD (385a)	Point	4 inches (rigid)			QAM2012.010
		8 inches (rigid)			QAM2012.020
		18 inches (rigid)			QAM2012.045
	Averaging	8 feet (flexible)		±0.75°F (±0.4°C) @ 75°F (24°C)	QAM2012.250
		16 feet (flexible)			QAM2012.500
		24 feet (flexible)			QAM2012.750
4 to 20 mA	Point	18 inches (rigid)	-4°F to 122°F (-20°C to 50°C)	±0.54°F (±0.3°C) @ 32°F (0°C)	544-560-18
		4 inches (rigid)			544-560-4
		8 inches (rigid)			544-560-8
		18 inches (rigid)	20°F to 120°F (-7°C to 49°C)		533-376-18
		4 inches (rigid)			533-376-4
		8 inches (rigid)			533-376-8
	Averaging	16 feet (flexible)			533-380-16
		24 feet (flexible)			533-380-24
		8 feet (flexible)			533-380-8
		18 inches (rigid)			535-490-18
		24 inches (rigid)			535-490-24
		36 inches (rigid)			535-490-36
		48 inches (rigid)			535-490-48
	Point	18 inches (rigid)	30°F to 250°F (-1°C to 121°C)		533-377-18
		4 inches (rigid)			533-377-4
		8 inches (rigid)			533-377-8
For Use with Siemens TEC Only	Point	4 inches (rigid)	-40°F to 180°F (-40°C to 82°C)	± 0.50°F (± 0.28°C) @ 77°F (25°C)	538-871
		4 inches (rigid), Bracket			540-128
		18 inches (rigid)			540-739

Accessories

Flange and Gasket Kit for Variable Insertion Depth of Rigid Point Sensors	AQM2000

Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
USA
+ 1 847-215-1000

Your feedback is important to us. If you have comments about this document, please send them to SBT_technical.editor.us.sbt@siemens.com

Document No. 149-915
Printed in the USA

SIEMENS

Technical Specification Sheet
Document No. 149-919
December 12, 2017

Immersion Well Temperature Sensors

Thermistor/RTD

4 to 20 mA

Description

Siemens Immersion Well Temperature Sensors monitor and transmit changes in liquid temperature to the HVAC control system. The sensor resistance varies proportionally to the actual temperature being measured.

All sensors are fully assembled with stainless steel thermowells, and are available in 2.5-inch, 4-inch and 6-inch insertion depths.

Multiple output signals are available to ensure compatibility with most common HVAC control systems.

Features

- Variety of sensing elements.
- Suitable for hot or chilled fluids.
- Responsive to temperature changes.
- Accurate and reliable indication of temperature.
- Familiar installation requires no special tools.

Specifications

Output Signals	100k Ω Thermistor 10k Ω Type 2 Thermistor 10k Ω Type 3 Thermistor 1k Ω @ 32°F Ni RTD 1k Ω @ 70°F Ni RTD 1k Ω Pt RTD (375a) 1k Ω Pt RTD (385a) 4 to 20 mA · 20°F to 70°F · 30°F to 250°F · 32°F to 212°F
Well Material	300 Series Stainless Steel Lead-free
External Connection Threads	1/2-inch – 14 NPT
Conduit Connection Threads	1/2-inch – 14 NPSMI

NOTE: Not for use in potable water systems.

Table 1. Product Ordering Information.

Output Signal	Insertion Depth	Measuring Range	Accuracy	Product Number
100K Ω Thermistor	2.5 inches	0°F to 250°F (-18°C to 121°C)	±0.50°F (±0.28°C) @ 77°F (25°C)	536-777-25
	4 inches			536-777-40
	6 inches			536-777-60
10K Ω Type II Thermistor	2.5 inches		±0.4°F (±0.22°C) @ 77°F (25°C)	QAE2030.005
	4 inches			QAE2030.010
	6 inches			QAE2030.015
10K Ω Type III Thermistor	2.5 inches			QAE2032.005
	4 inches			QAE2032.010
	6 inches			QAE2032.015
1K Ω @ 32°F Ni RTD	2.5 inches		±0.72°F (±0.4°C) @ 32°F (0°C)	QAE2020.005
	4 inches			QAE2020.010
	6 inches			QAE2020.015
1K Ω @ 70°F Ni RTD	2.5 inches			QAE2021.005
	4 inches			QAE2021.010
	6 inches			QAE2021.015
1K Ω Pt RTD (375a)	2.5 inches		±0.54°F (±0.3°C) @ 32°F (0°C)	544-577-25
	4 inches			544-577-40
	6 inches			544-577-60
1K Ω Pt RTD (385a)	2.5 inches			QAE2012.005
	4 inches			QAE2012.010
	6 inches			QAE2012.015
4 to 20 mA	2.5 inches	20°F to 70°F (-7° to 21°C)		536-774-25
	4 inches			536-774-40
	6 inches			536-774-60
	2.5 inches	30°F to 250°F (-1°C to 121°C)		536-767-25
	4 inches			536-767-40
	6 inches			536-767-60
	2.5 inches	32°F to 212°F (0°C to 100°C)		544-562-25
	4 inches			544-562-40
	6 inches			544-562-60

Table 2. Accessories Information.

Description		Part Number
Repair Kits*	Repair Kit, 4 to 20 mA, 30°F to 250°F	536-767-RK
	Repair Kit, 4 to 20m A, 20°F to 70°F	536-774-RK
	Repair Kit, 100k ohm Thermistor	536-777-RK
	Repair Kit, 4 to 20 mA, 32°F to 212°F	544-562-RK
	Repair Kit, PT 1k Ohm RTD (375)	544-577-RK
	Repair Kit, PT 1k Ohm RTD (385)	AQE2012
	Repair Kit, NI 1k Ohm @ 32°F RTD	AQE2020
	Repair Kit, 10k Ohm Type 2 Thermistor	AQE2030
	Repair Kit, 10k Ohm Type 3 Thermistor	AQE2032
Thermowells	Immersion Well, 2.5-inch	AQE2000.005
	Immersion Well, 4-inch	AQE2000.010
	Immersion Well, 6-inch	AQE2000.015

* Repair kits include replacement sensing element, temperature transmitter (4 to 20 mA models only), and related hardware.

Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
USA
Tel. +1-847-215-1000

Your feedback is important to us. If you have comments about this document, please send them to SBT_technical.editor.us.sbt@siemens.com

KELE WATER DETECTOR

WD-1B

DESCRIPTION

The **Kele WD-1B** water detector features gold-plated probes and microchip technology for dependable detection of conductive liquids. The **Model WD-1B** can be operated from 11-27 VAC/VDC. For application flexibility, SPDT contacts are provided to connect to a monitoring system. A height-adjustable, cast-aluminum, weatherproof enclosure is standard. A green LED visible outside the box indicates power. A red LED indicates water detected. The **Model WD-1B** is also available with an external tape style sensor, the Model WD-2-T.

WD-1B

FEATURES

- ***Weather resistant enclosure***
- ***Easy to install***
- ***SPDT alarm contacts***
- ***11-27 VAC/DC(50/60 Hz)***
- ***Reliable operation***
- ***LEDs for power and alarm indication (green, red)***
- ***Adjustable detection level***

OPERATION

The **Model WD-1B** can be used with any contact-closure monitoring panel. The SPDT contacts may be wired normally open or normally closed, allowing wiring flexibility to handle most installations.

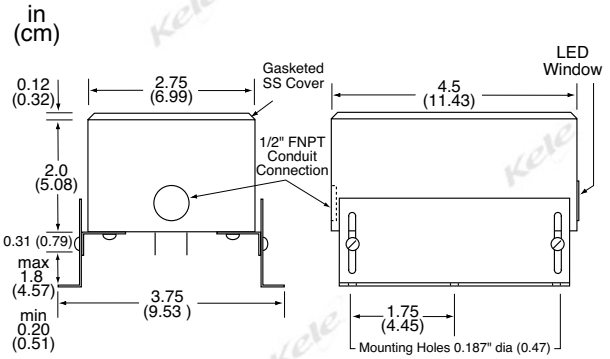
MOUNTING

Secure by applying a silicone adhesive to the mounting feet and placing the sensor in the area to be protected. For more permanent installations, fasten the sensor using the 0.19" (0.48 cm) holes provided in the mounting feet with #6 or #8 screws. The legs are adjustable 1.5" (3.81 cm) for precise water level signaling.

SPECIFICATIONS

Supply Voltage	11-27 VAC @ 1.7 VA; 11-27 VDC @ 30 mA
Relay Type	SPDT
Relay Rating	1 A @ 24 VAC/VDC, 1/2 A @ 120 VAC
Display	Green LED = Power Red LED = Alarm
Probe	Gold plated, 1.5" adjustable
Operating Temperature	32° to 158°F (0° to 70°C)
Enclosure Rating	NEMA 4, Cast aluminum, weather resistant with adjustable legs
Dimensions	4.3"H X 3.75"W X 4.5"L (10.7 X 9.5 X 11.4 cm)
Weight	0.98 lb (0.4445 Kg)
Approvals	CE
Warranty	1 year

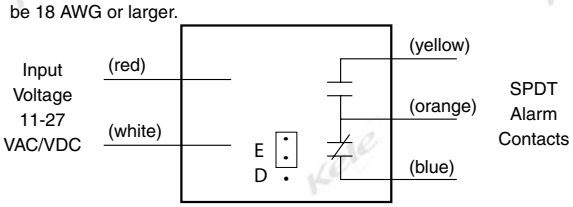
DIMENSIONS



Probe height adjustable 0" to 1.5" (0 to 3.8 cm)

WIRING

The **WD-1B** is provided with a 1/2" FNPT conduit connection in the end of the enclosure. Terminations are made to the color-coded wires with field-supplied connectors. All interconnect wiring should be 18 AWG or larger.



E/D Option Jumper*

If grounded AC power is used, the grounded power supply lead must be connected to the white lead on the **WD-1B**, or the unit may fail to operate.

*E/D Option Jumper:

E = Output relay is energized when water is detected. (No alarm on power loss)

D = Output relay is de-energized when water is detected or when power is lost. (Alarm on when water is present or power loss)

ORDERING INFORMATION

MODEL	DESCRIPTION
WD-1B	Water detector
WD-1B-C	Water detector with normally-energized relay (alarms when power is lost or water is detected)

RELATED PRODUCTS

WD-2-T	Water detector (tape style sensor)