Sky Valley Education Center
Monroe School District
Test, Adjust, & Balance Report

MONROE, WA
APRIL 2016

Contents

SECTION	PAGE
SUMMARY	1
UNIT VENTILATOR	3
HVAHU & EXISTING EQUIPMENT	4
CO2 LOGGING	5
EF INLET READINGS	10
EF MAP	13

TAB Report Summary

Project: Sky Valley Education Center
351 Short Columbia Street
Monroe, WA 98272

Job Number: 201183-001

Date: April 21, 2016

TAB Tech: Dustin Entler

PROJECT SCOPE

Unit Ventilators: Reset minimum outside air DDC to value recorded in 2010 TAB Report.

POD Exhaust Fans EF 5, 6, & 7: Measure and record CFM at all exhaust inlets.

Gym Units HVAU-1, 2, 3 & 4: Reset minimum outside air DDC to value recorded in 2010 TAB Report.

Locker Room Unit VU-3 and VU-4: Confirm units are still operating at 2010 installed 100% OSA.

Existing AHU's not included in 2010 project: Measure current supply and outside air CFM.

Deploy CO2 loggers (3) in areas determined by owner.

TESTING SUMMARY

Unit Ventilators: Outside air measurements taken at intake louver with volumetric flow hood.

Exhaust Fans: Air velocity measurements taken at inlets and converted to CFM. Inlets were reset close to 2010 recorded values. Manual damper positions were physically marked.

Gym units: Air velocity measurements taken at OSA inlet and converted to CFM.

Existing AHU's: Air velocity measurements taken at OSA inlet and converted to CFM.

CO2 loggers manually calibrated against calibrated instrument (Fluke 975) prior to deployment.

Trend data from deployed loggers indicates actual CO2 levels within acceptable range. Spike in Room 3 CO2 level on two consecutive weekend days (Feb 13 & 14) from 1-6 pm. This spike is still within acceptable range.

All outside air quantities balanced to +/- 10% of design values.

OBSERVATIONS

Existing EF 5, 6, & 7: Operating at maximum capacity. Read and proportioned at available airflow total.

UV-14, 17, 22, & 26 had issues during initial testing. Issues have been addressed and specific details can be found on UV test report.

HVAHU-4: Outside air damper linkage is not connected and damper is fully closed. 100% Economizer condition will leave no path for supply fan to source air from. Repair has occurred and OSA will be reset in summer 2016 along with AHU 3 noted below.

Existing units not in 2010 Project:

AHU-3 and AHU-5: existing actuators have been condemned. Recommended replacement with BAS tie is ongoing.

HP 1-4 & VU-14: no DDC control for minimum OSA position. See test report for actual minimum OSA quantities.

Unit Ventilators Test Report

Project: Sky Valley Education Center
Project Number: 201183-001

Readings By: DE *Date:* 3/14/2016 *System:* Unit Ventilators

Test Conditions: Unit Ventilator on with outside air damper set to required minimum DDC signal.

Terminal Unit	UV - 1	UV - 2	UV - 3	UV - 4	UV - 5	UV - 6	UV - 7	UV - 8	UV - 9	UV - 10
Classroom Served	20	19	18	17	16	15	14	13	12	11
Design Supply CFM	1014	1014	1014	1014	1014	1014	1014	1014	1014	1014
Actual Supply CFM	998	926	1006	959	924	995	987	1029	1014	999
Design Minimum OSA CFM	450	450	450	450	450	450	450	450	450	450
As Found OSA CFM	284	169	206	254	171	425	224	292	179	50
New Minimum OSA CFM	466	461	458	484	457	469	467	473	460	453
DDC Minimum Damper %	30%	45%	35%	33%	43%	36%	35%	32%	37%	42%
As Found DDC %	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%

Terminal Unit	UV - 11	UV - 12	UV - 13	UV - 14	UV - 15	UV - 16	UV - 17	UV - 18	UV - 19	UV - 20
Classroom Served	10	9	8	7	6	5	4	3	2	1
Design Supply CFM	1014	1014	1014	1014	1014	1014	1014	1014	1014	1014
Actual Supply CFM	1029	952	1041	974	912	983	910	959	952	950
Design Minimum OSA CFM	450	450	450	450	450	450	450	450	450	450
As Found OSA CFM	223	214	232	141	227	230	40	208	208	77
New Minimum OSA CFM	486	458	484	483	472	455	465	483	475	450
DDC Minimum Damper %	40%	39%	40%	35%	35%	40%	45%	40%	28%	47%
As Found DDC %	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%

Terminal Unit	UV - 21	UV - 22	UV - 23	UV - 24	UV - 25	UV - 26				
Area Served	Library	Library	Science A	Science B	Computer	Science F				
Design Supply CFM	1256	1256	1256	1256	1256	1256				
Actual Supply CFM	1274	1298	1231	1255	1199	1233				
Design Minimum OSA CFM	450	450	450	450	450	450				
As Found OSA CFM	272	731	258	171	216	0				
New Minimum OSA CFM	492	473	491	455	481	480				
DDC Minimum Damper %	32%	36%	35%	40%	40%	38%				
As Found DDC %	20%	20%	20%	20%	20%	20%				

Remarks:

UV-14 Initial readings indicated issue. Intake louvers were found to be bent shut. Issue has been corrected.

UV-17 Initial readings indicated issue. Controls signal was not reaching economizer actuator. Issue has been corrected.
UV-22 During initial readings unit not in minimum OSA due to failed DAT sensor. Issue has been corrected.
UV-26 Initial readings indicated issue. Controls signal was not reaching economizer actuator. Issue has been corrected.

Project: Sky Valley Education Center
Project Number: 201183-001

Readings By: DE *Date:* 3/14/2016 *System:* Multiple Types

Test Conditions: Unit on with outside air damper at minimum DDC signal.

Unit	HVAHU-1	HVAHU-2	HVAHU-3	HVAHU-4						
Area Served	Gym	Gym	Gym	Gym						
Design Minimum OSA CFM	1950	1950	1510	1135						
As Found OSA CFM	0	Negligible	0	0						
Actual Minimum OSA CFM	1997	1811	1496	0 (1)						
DDC Minimum Damper %	25%	30%	40%	0%						
As Found DDC	0%	5%	0%	0%						
Remark				1						

Equipment not part of original scope: Measure and document current supply CFM and minimum outside air CFM

Unit	AHU-3	AHU/VU 5	HP-1	HP-2	HP-3	HP-4	VU-10	VU-14	AHU-4	
Area Served	Gathering	Cafeteria	Admin	Admin	Admin	Admin	Transition	Computer	Art Room	
Actual Supply CFM	1842	1871	1896	1552	1201	794	1487	2112	4212	
Design Minimum OSA CFM	1069	1069	400	400	400	400	560	135	814	
As Found OSA CFM	0	410	50	330	653	0	289	163	722	
DDC Minimum Damper %	No DDC	No DDC	No DDC	No DDC	No DDC	No DDC	7%	No DDC	No DDC	
As Found DDC	NA	NA	NA	NA	NA	NA	7%	NA	NA	
Remark	2,4,6	2,4,6	2,5	2,5	2,3,5	2,5		2	2	

Remarks:

1) Outside air damper disconnected from return damper and in closed position. Repairs have been completed and OSA will be reset summer 2016.

2) No design values available at time of testing. Listed values are ASHRAE recommended based on apparent occupany and sq footage.

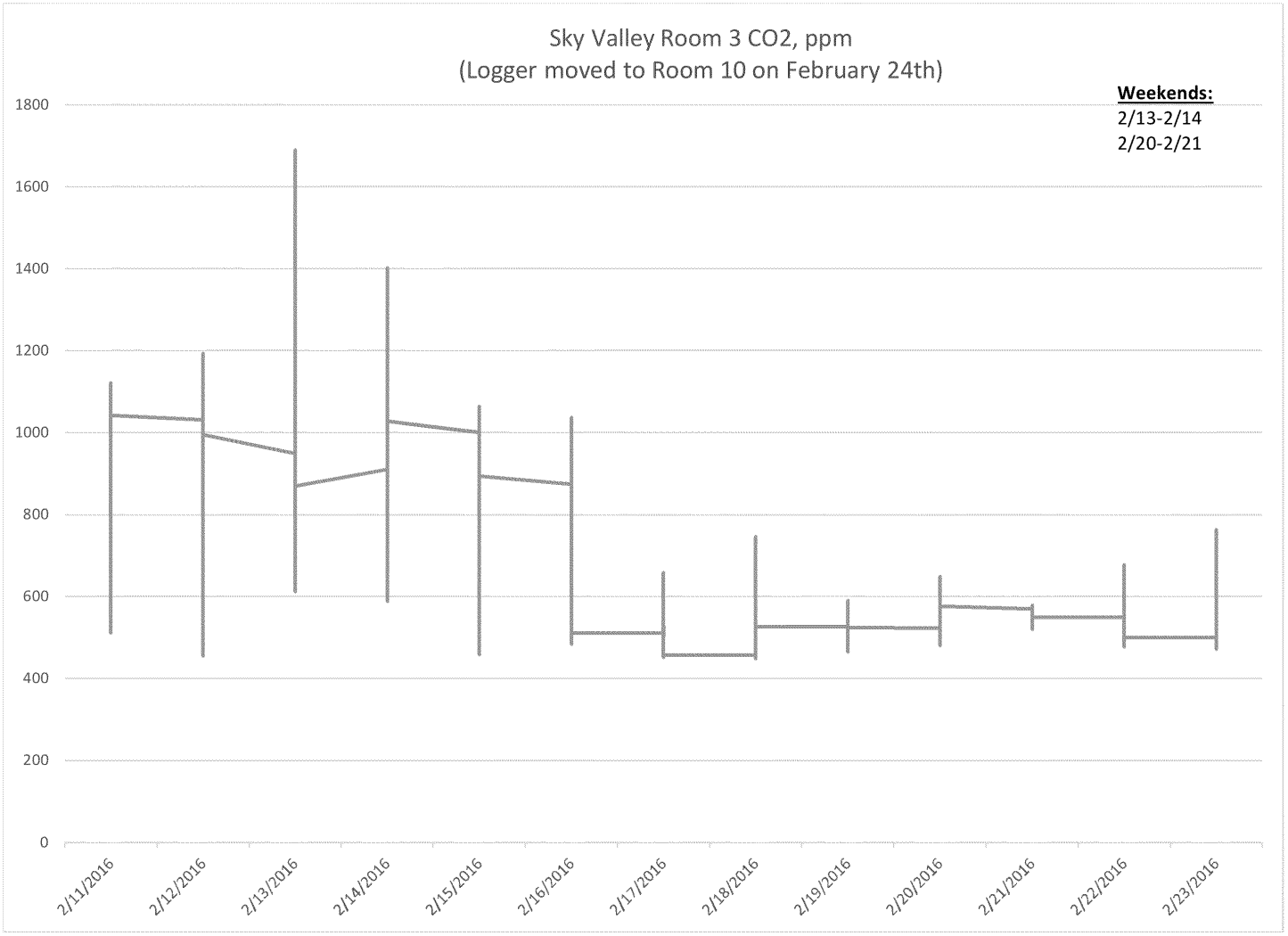
3) Found Unit off and covered by tarp due to leakage around curb. Temporarily removed tarp and turned unit on to meaure current OSA.

Quoted for replacment summer 2016.

4) Total oustide air between AHU-3 and 5 serving common space.

5) Total OSA between the 4 Heat Pumps.

6) Existing actuator condemned. Upgrade to new actuator and BAS control summer 2016.


Sky Valley Room 3 CO2, ppm
(Logger moved to Room 10 on February 24th)
Weekends:
2/13-2/14
2/20-2/21
1800
1600
1400
1200
1000
800
600
400
200
0
2/11/2016
2/12/2016
2/13/2016
2/14/2016
2/15/2016
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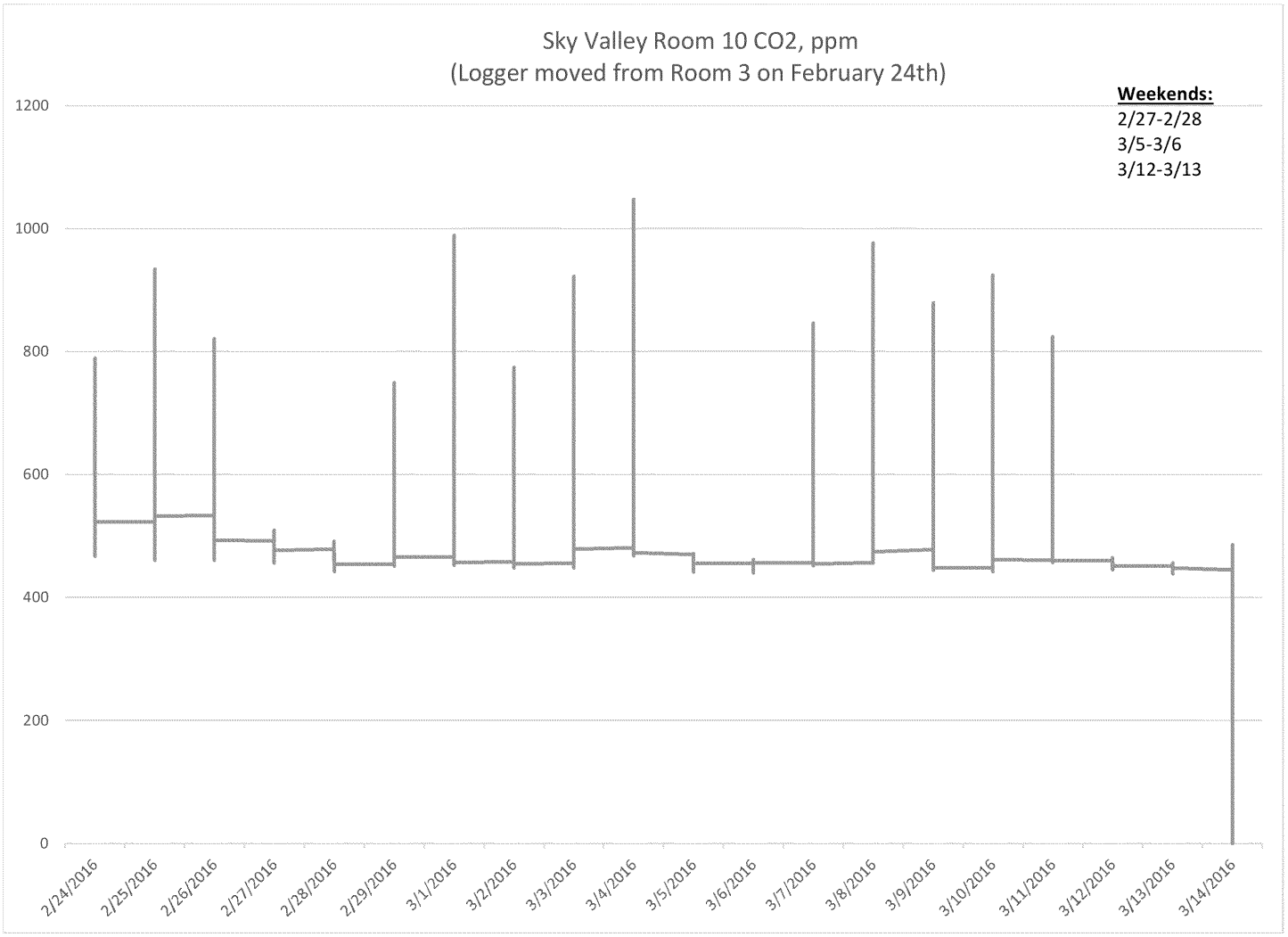
2/21/2016
2/22/2016
2/23/2016


Sky Valley Room 10 CO2, ppm
(Logger moved from Room 3 on February 24th)
Weekends:
2/27-2/28
3/5-3/6
3/12-3/13
1200
1000
800
600
400
200
0
2/24/2016
2/25/2016
2/26/2016
2/27/2016
2/28/2016
2/29/2016
3/1/2016
3/2/2016
3/3/2016
3/4/2016
3/5/2016
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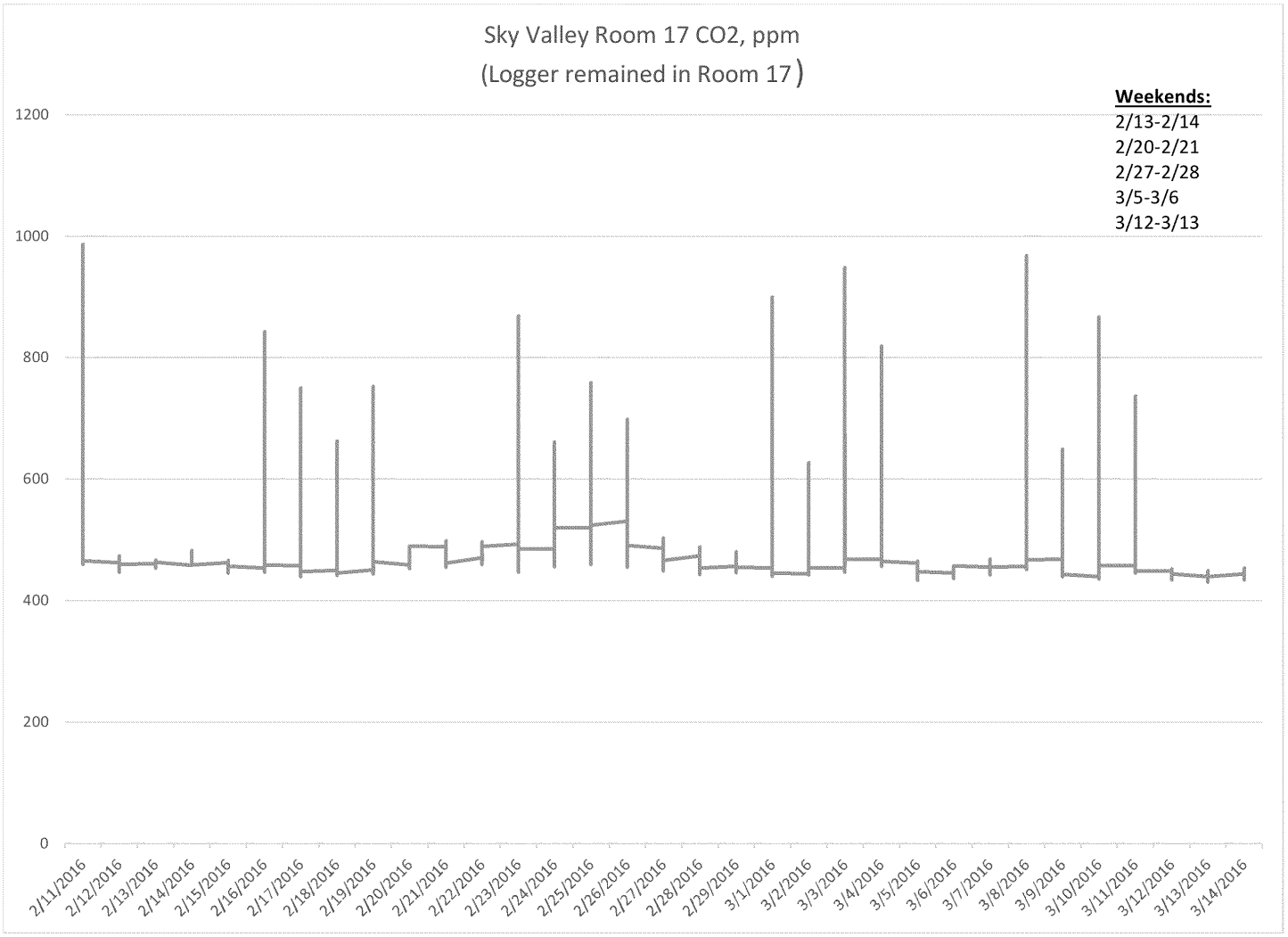
3/13/2016
3/14/2016


Sky Valley Room 17 CO2, ppm
(Logger remained in Room 17)
Weekends:
2/13-2/14
2/20-2/21
2/27-2/28
3/5-3/6
3/12-3/13
1200
1000
800
600
400
200
0
2/11/2016
2/12/2016
2/13/2016
2/14/2016
2/15/2016
2/16/2016
2/17/2016
2/18/2016
2/19/2016
2/20/2016
2/21/2016
2/22/2016
2/23/2016
2/24/2016
2/25/2016
2/26/2016
2/27/2016
2/28/2016
2/29/2016
3/1/2016
3/2/2016
3/3/2016
3/4/2016
3/5/2016
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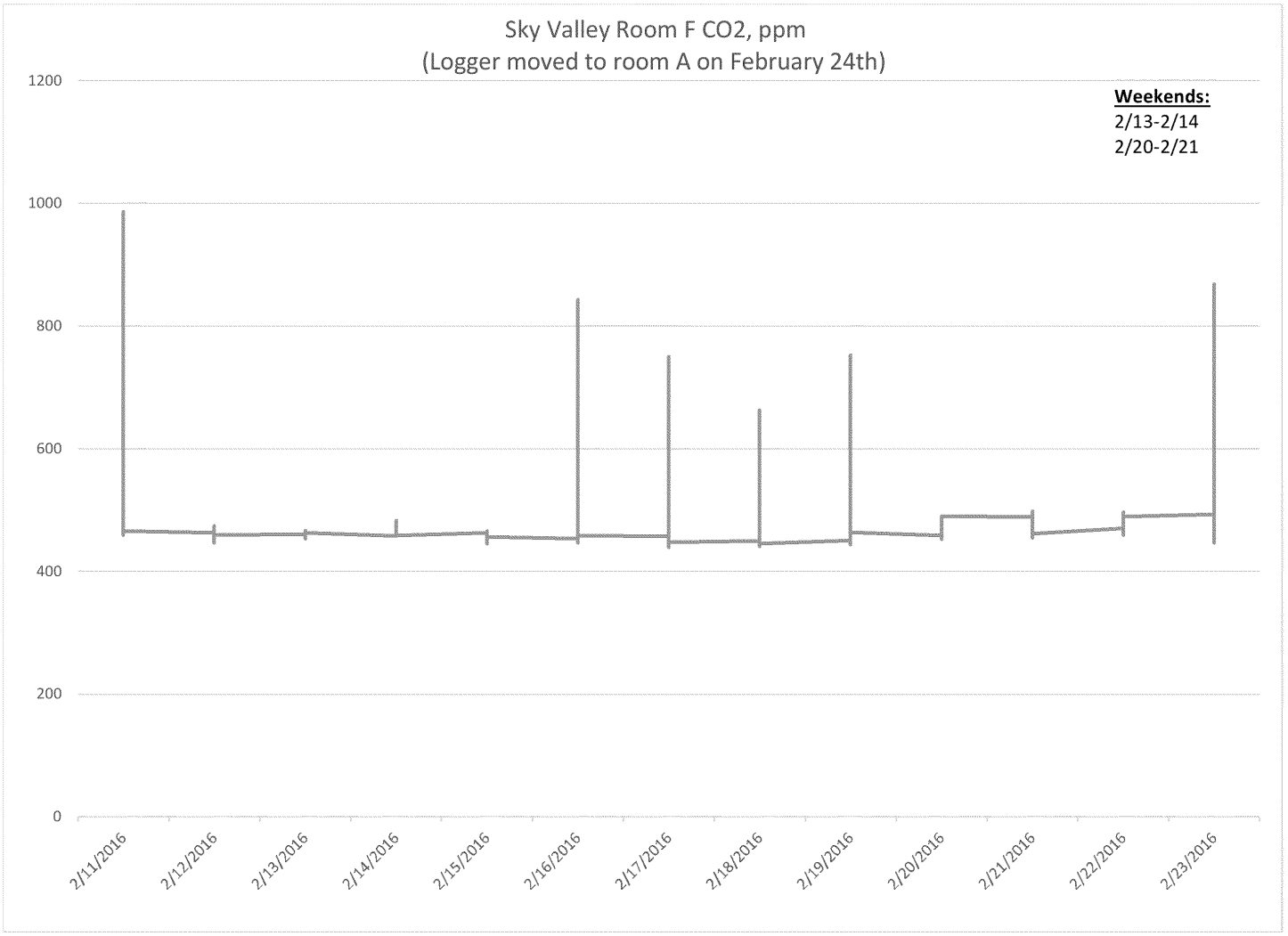
3/13/2016
3/14/2016


Sky Valley Room F CO2, ppm
(Logger moved to room A on February 24th)
Weekends:
2/13-2/14
2/20-2/21
1200
1000
800
600
400
200
0
2/11/2016
2/12/2016
2/13/2016
2/14/2016
2/15/2016
2/16/2016
2/17/2016
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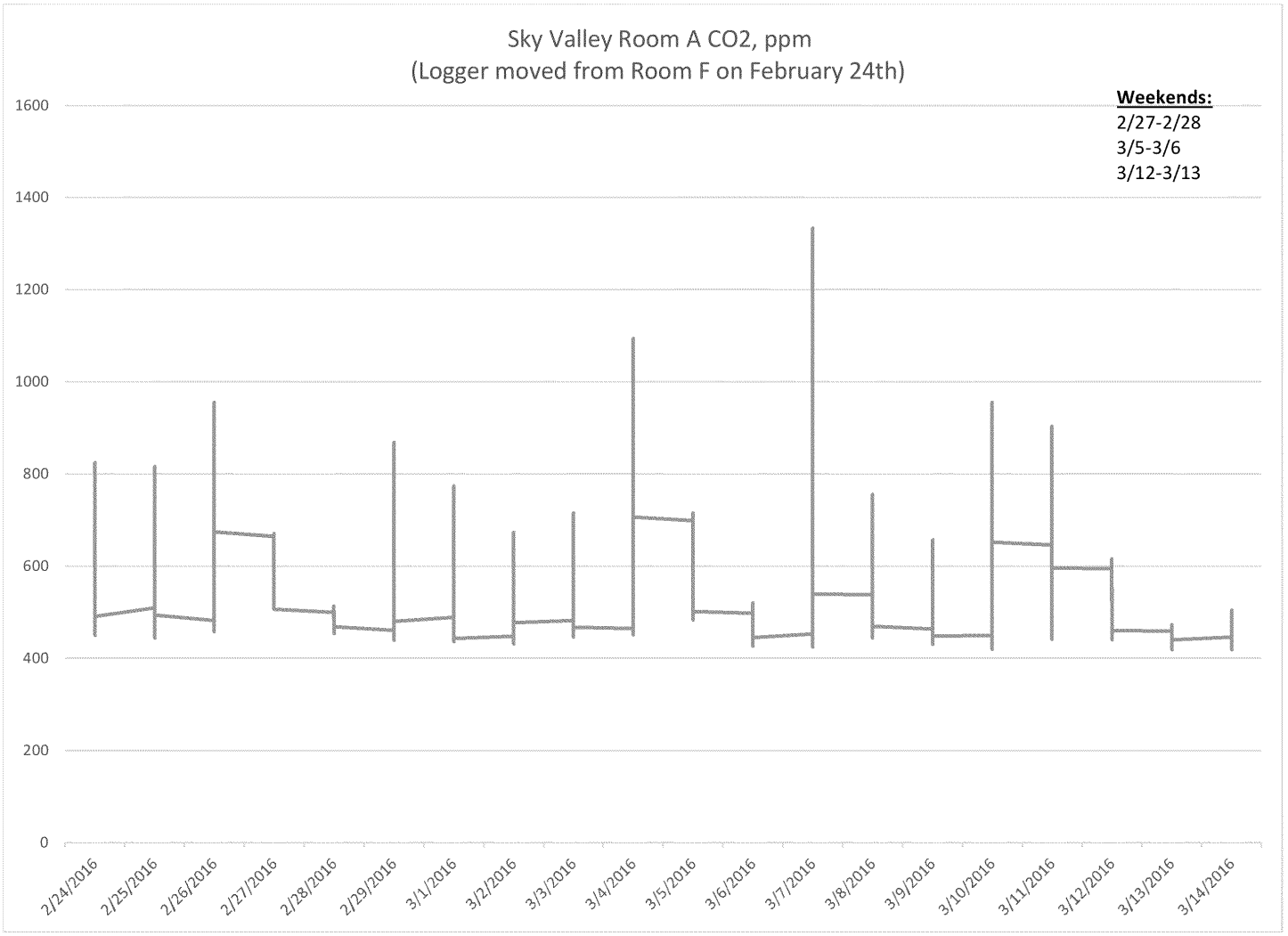
2/21/2016
2/22/2016
2/23/2016


Sky Valley Room A CO2, ppm
(Logger moved from Room F on February 24th)
Weekends:
2/27-2/28
3/5-3/6
3/12-3/13
1600
1400
1200
1000
800
600
400
200
0
2/24/2016
2/25/2016
2/26/2016
2/27/2016
2/28/2016
2/29/2016
3/1/2016
3/2/2016
3/3/2016
3/4/2016
3/5/2016
3/6/2016
3/7/2016
3/8/2016
3/9/2016
3/10/2016
3/11/2016
3/12/2016
3/13/2016
3/14/2016

AIR OUTLET / INLET TEST REPORT

Project: Sky Valley Education Center

Project Number: 201183-001

Project: Sky Valley Education Center *System:* EF-5

Test Conditions: See Below *Instrument:* Velgrid *Readings By:* DE *Date:* 1/13/16

Area Served	No.	Type	Size	AK	Design Cfm	Design Fpm	Preliminary				Final		% Design	Remarks
							Fpm	Cfm	Fpm	Cfm	Fpm	Cfm		
Class 7/UV-14	1	EG	12x12	0.703	450	640	246	173			573	403	90%	
Class 6/UV-15	2	EG	12x12	0.703	450	640	722	508			559	393	87%	
Class 5/UV-16	3	EG	12x12	0.703	450	640	607	427			520	366	81%	
Class 4/UV-17	4	EG	12x12	0.703	450	640	566	398			594	418	93%	
Interior Office	5	EG	12x12	0.703	450	640	666	468			576	405	90%	
Class 3/UV-18	6	EG	18x12	0.703	450	640	505	355			516	363	81%	
Class 2/UV-19	7	EG	18x12	0.703	450	640	599	421			513	361	80%	
Class 1/UV-20	8	EG	12x12	0.703	450	640	624	439			499	351	78%	
Library	9	EG	12x12	0.703	300	427	102	72			390	274	91%	
	10													
	11													
	12													
	13													
	14													
	15													
				TOTAL:	3900			3259.8			4740	3332	*85%*	

Remarks:

Constant volume fan on and all Unit Ventilators at minimum outside air condition.

AIR OUTLET / INLET TEST REPORT

Project: Sky Valley Education Center

Project Number: 201183-001

Project: Sky Valley Education Center *System:* EF-6

Test Conditions: See Below *Instrument:* Velgrid *Readings By:* DE *Date:* 1/14/16

Area Served	No.	Type	Size	AK	Design Cfm	Design Fpm	Preliminary				Final		% Design	Remarks
							Fpm	Cfm	Fpm	Cfm	Fpm	Cfm		
Class 8/UV-13	1	EG	12x12	0.703	450	640	292	205			671	472	105%	
Class 9/UV-12	2	EG	12x12	0.703	450	640	338	238			618	434	97%	
Class 10/UV-11	3	EG	12x12	0.703	450	640	256	180			631	444	99%	
Open Area Int.	4	EG	12x12	0.703	450	640	1291	908			577	406	90%	
Class 11/UV-10	5	EG	12x12	0.703	450	640	254	179			586	412	92%	
Class 12/UV-9	6	EG	12x12	0.703	450	640	232	163			589	414	92%	
Class 13/UV-8	7	EG	12x12	0.703	450	640	1197	841			707	497	110%	
	8													
	9													
	10													
	11													
	12													
	13													
	14													
	15													
				TOTAL:	3150			2713.6			4379	3078	*98%*	

Remarks:

Constant volume fan on and all Unit Ventilators at minimum outside air condition.

AIR OUTLET / INLET TEST REPORT

Project: Sky Valley Education Center

Project Number: 201183-001

Project: Sky Valley Education Center *System:* EF-7

Test Conditions: See Below *Instrument:* Velgrid *Readings By:* DE *Date:* 1/14/16

Area Served	No.	Type	Size	AK	Design Cfm	Design Fpm	Preliminary Fpm	Preliminary Cfm	Preliminary Fpm	Preliminary Cfm	Final Fpm	Final Cfm	% Design	Remarks
Class 20/UV-1	1	EG	12x12	0.703	450	640	615	432			523	368	82%	
Class 19/UV-2	2	EG	18x12	0.703	450	640	779	548			571	401	89%	
Class 18/UV-3	3	EG	12x12	0.703	450	640	175	123			536	377	84%	
Class 17/UV-4	4	EG	12x12	0.703	450	640	153	108			566	398	88%	
Class 16A	5	EG	12x12	0.703	450	640	600	422			537	378	84%	
Class 15/UV-6	6	EG	12x12	1.06	450	425	841	891			422	447	99%	
Class 17/UV-4	7	EG	12x12	0.703	450	640	153	108			566	398	88%	
Library	8	EG	12x12	0.703	300	427	105	74			404	284	95%	
	9													
	10													
	11													
	12													
	13													
	14													
	15													
				TOTAL:	3450			2705.2			4125	3051	*88%*	

Remarks:

Constant volume fan on and all Unit Ventilators at minimum outside air condition.

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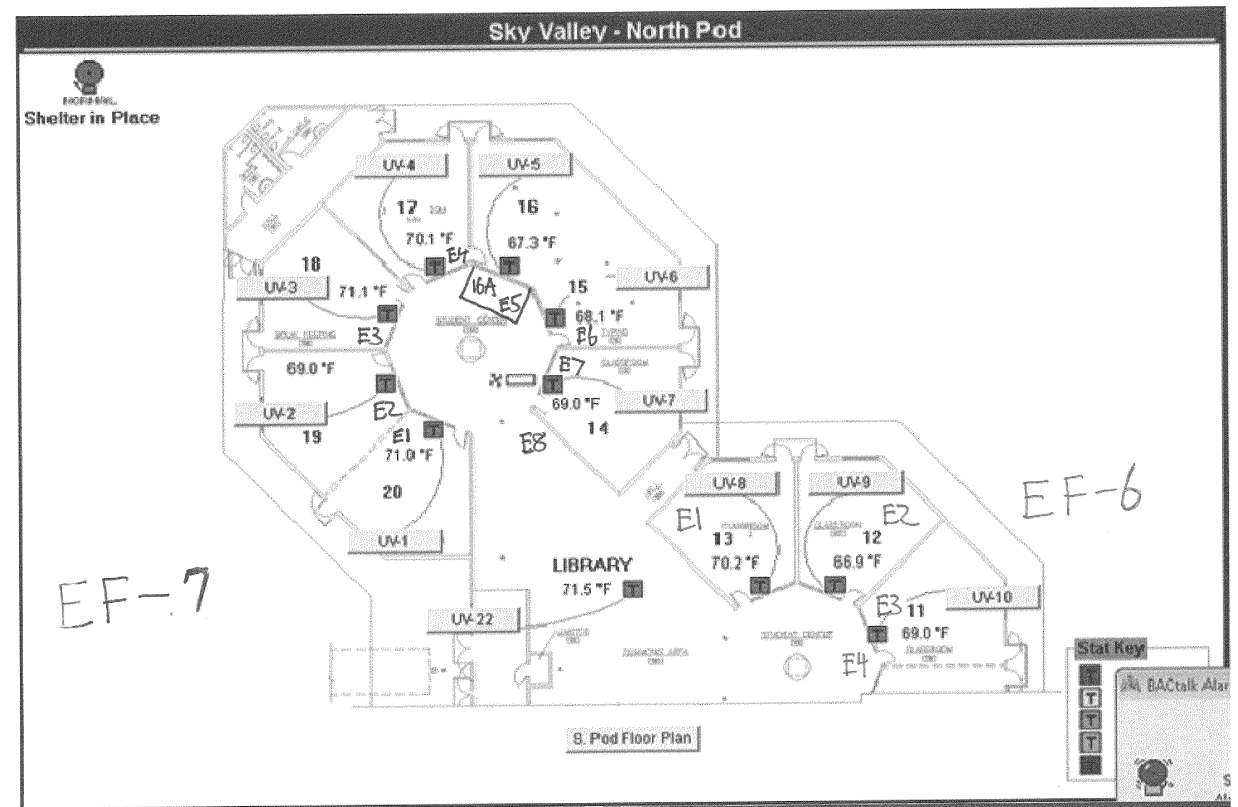

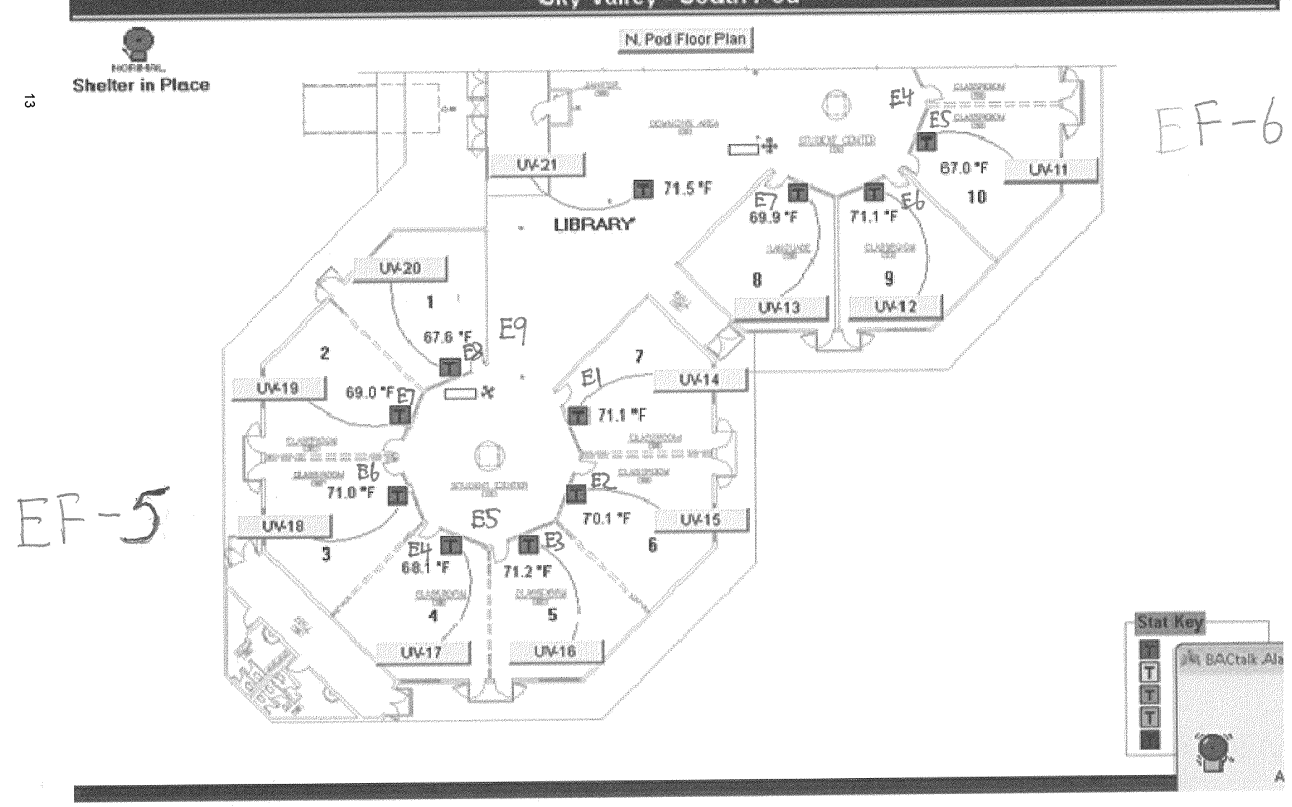

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