FIELD TESTING REPORT
CFIS System

Date:	**15 December 2016**
Operator:	**Zied Driss**
Lab File:	**1448-2016-1215 Princeton University_Tri-Dim**
Site:	***Princeton University, Princeton, NJ, USA***

Title:

Field testing per ISO 29462 of (20) MERV 15 (F9) air filters identified as Tri-Dim Syn-Pac filter at the Princeton University site in Princeton, NJ, USA. These air filters were installed on 09 June 2016 and tested in place on 15 December 2016.

Purpose:

This field test will evaluate the performance of an air filtration device in a "Real Life" environment when tested in accordance with ISO 29462, 2013 Field testing of general ventilation filtration devices and systems for in situ removal efficiency by particle size and resistance to airflow

Protocol:

The testing protocol outlined in the ISO 29462 2013, was followed throughout this field test. The equipment used during this testing consisted of a calibrated TSI-3330_CF11396, 1.0 lpm, 14-channel particle counter and an Alnor/TSI_EBT730 to measure the airflow velocity and resistance. Sampling probes used upstream and downstream of the test filter were sized for isokinetic air sampling and positioned in place using tripods. All particle sampling was completed within the prescribed requirements of the testing protocol.

Background:

A number of filter manufacturers are promoting filtration products that use filter media that will not perform in service as well as it performs in standard laboratory testing. Because of this discrepancy, filtration users think they are purchasing a product that will deliver level of filtration based on a laboratory test report. However, these products do not achieve the level of particle removal efficiency shown in the laboratory test report when the filters are installed in the users' system. This field test method will provide the filtration owner the reliable information they need to understand differences between "Real Life" filter efficiency and "Test Report" filter efficiency.

Test Conditions:

Filter Installation Date:	**09 June 2016**
Filter Test Date:	**15 December 2016**
Start of Test Time:	**10:09**
Location of Tested Filter:	**R2/C2**
Distance from Filter to:	
Up Stream Probe:	**12 (in)**
Down Stream Probe:	**12 (in)**
Air Make Up:	**100% Outdoor Air**

Site Contact:

Name:	**Art Murphy**
Position:	**Project Energy Engineer**
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Site Description:

Company:	**Princeton University**
Building:	**Lewis Thomas**
Air Handler	**3**
Miscellaneous Comments:	

Test Filter Description:

Filter Manufacturer:	**Tri-Dim**
Filter Type:	**Pocket Filter**
Filter Model:	**Syn-Pac**
Media Type:	**Coarse (Synthetic)**
Media Color:	**Purple/White**
Rated Efficiency:	**MERV 15 (F9)**
Total Filter Face Area (ft^2):	**80.1**

Part Number	Quantity	Filter Size(H x W x D x #Poc) (in)
302854422063	**20**	**24x24x22 x 6**

Comments	There are (20) Tri-Pleat 24x24x4 pleated prefilters installed in front of the final filters.

Test Equipment Description:

Equipment	Manufacturer / Model	Calibration Date	Other Information
Particle Counter	**TSI-3330_CF11396**	**29 Mar 2016**	**1.0 lpm; 14 channels; 5% Coincidence 3000000 (p/l)**
Temperature / RH AHU	**Omega UWRH-2-NEMA**	**15 Aug 2016**	**S/N 1403461**
Temperature / RH PC	**Omega UWRH-2**	**15 Aug 2016**	**S/N 1403546**
Air Velocity	**Alnor/TSI_EBT730**	**26 Apr 2016**	**N/A**
Differential Pressure	**Alnor/TSI_EBT730**	**26 Apr 2016**	**N/A**

All test equipment is calibrated per manufacturer recommendations and is checked for consistency before testing.

Temperature / RH Data:

Location	Temp (°F)	T Range (°F)	RH (%)	RH Range (%)
Air Handler	**10**	**32-100**	**9**	**10-80**
Particle Counter	**10**	**32-100**	**9**	**10-80**

The temperature and relative humidity measurements were not within acceptable ranges to conduct a successful test.

Particle Counter Zero Test (Total Counts in One Minute):

Measured Counts	Calculated Concentration (p/ft^3)	Maximum Concentration (p/ft^3)
4	**113**	**283**

The particle counter zero test calculated concentration is below the Maximum Concentration limit. The system PASSES the test.

System Zero Check:

Upstream Concentration (p/ft^3)	Measured Counts	Calculated Concentration (p/ft^3)	Allowable Concentration (p/ft^3)
862499	**9**	**255**	**424**

The system zero test calculated concentration is below the Allowable Concentration limit. The system PASSES the test.

Velocity and Resistance Data:

	Velocity Test Before (fpm)	Velocity Test After (fpm)	Overall Average Velocity (fpm)	Resistance to Air Flow (inWG)
Average	**489**	**487**	**488**	**0.69**
Standard Deviation	**141**	**179**		**0.00**
CV (%)	**29**	**37**		**0.25**
Maximum	**695**	**768**		**0.69**
Minimum	**268**	**197**		**0.00**

The average velocity readings taken before and after the efficiency measurements were consistent indicating that the velocity through the air handling unit was stable during testing. The air velocity traverse individual readings are shown in Appendix 1 of this report. The coefficient of variation indicates velocity gradient or turbulence in the air handling unit. Profile Data is shown below and data is looking at the up-stream side of the filter bank.

Velocity Profile Test Data BEFORE Efficiency Testing: (fpm)

	C1	C2	C3	C4	C5
R1	**688**	**521**	**529**	**563**	**616**
R2	**695**	**408**	**494**	**275**	**535**
R3	**663**	**324**	**461**	**271**	**544**
R4	**639**	**515**	**268**	**305**	**478**

Velocity Profile Test Data AFTER Efficiency Testing: (fpm)

	C1	C2	C3	C4	C5
R1	**743**	**517**	**501**	**634**	**659**
R2	**768**	**405**	**448**	**255**	**658**
R3	**703**	**286**	**398**	**237**	**519**
R4	**634**	**523**	**197**	**268**	**396**

Pre-Screening of Particle Concentration - Up-Stream Variation with Time:

Size Range (µm)	Differential Data, 20-sec count at: R2/C2)					Average	Standard Deviation	CV (%)	Max CV (%)	Pass / Fail
	1	2	3	4	5					
0.30 - 0.35	6206	6091	6015	6001	5798	6022	149	2	25	Pass
0.35 - 0.40	2292	2393	2319	2404	2312	2344	51	2	25	Pass
0.40 - 0.45	708	782	767	757	802	763	35	5	25	Pass
0.45 - 0.55	435	428	429	447	399	428	18	4	25	Pass
0.55 - 0.70	129	152	155	144	163	149	13	9	25	Pass
0.70 - 1.00	84	78	80	90	81	83	5	6	25	Pass
1.00 - 1.30	19	17	16	21	17	18	2	11	50	Pass
1.30 - 1.60	5	9	9	5	11	8	3	34	50	Pass
1.60 - 2.20	19	14	22	21	24	20	4	19	50	Pass
2.20 - 3.00	13	6	7	6	12	9	3	39	50	Pass
3.00 - 4.00	2	0	2	2	3	2	1	61	50	Fail
4.00 - 5.50	3	0	0	1	1	1	1	122	50	Fail
5.50 - 7.00	0	0	0	0	0	0	0	N/A	50	Fail
7.00 - 10.00	0	0	1	1	1	1	1	91	50	Fail

The variation of upstream particulate in time is acceptable to conduct a successful test. The variability of upstream particulates above the 2.20 - 3.00 channel did not meet the statistical variability.

Minimum Upstream Concentration:

Size Range (µm)	Average (p)	Measured Particle Concentration (p/ft³)	Minimum Particle Concentration (p/ft³)	Pass / Fail
0.30 - 0.35	6022	511572	1047	Pass
0.35 - 0.40	2344	199124	1047	Pass
0.40 - 0.45	763	64817	1047	Pass
0.45 - 0.55	428	36359	1047	Pass
0.55 - 0.70	149	12658	1047	Pass
0.70 - 1.00	83	7051	1047	Pass
1.00 - 1.30	18	1529	1047	Pass
1.30 - 1.60	8	680	1047	Fail
1.60 - 2.20	20	1699	1047	Pass
2.20 - 3.00	9	765	1047	Fail
3.00 - 4.00	2	170	1047	Fail
4.00 - 5.50	1	85	1047	Fail
5.50 - 7.00	0	0	1047	Fail
7.00 - 10.00	1	85	1047	Fail

The minimum upstream particulate concentration is acceptable to conduct a successful test. The number of particulates above the 1.00 - 1.30 µm channel were too low to achieve statistically valid count data. Thus, the calculation for particulates above the 1.00 - 1.30 µm channel and larger will not be reported.

Pre-Screening of Particle Concentration - Up-Stream Variation with Location:

Size Range (µm)	Differential Data, 20-sec count at:					Average	Standard Deviation	CV (%)	Max CV (%)	Pass / Fail
	R2-C1	R2-C3	R3-C2	R4-C1	R4-C3					
0.30 - 0.35	5799	5842	5716	5930	5707	5799	93	2	25	Pass
0.35 - 0.40	2247	2258	2349	2267	2154	2255	69	3	25	Pass
0.40 - 0.45	692	767	762	728	696	729	35	5	25	Pass
0.45 - 0.55	400	399	413	399	428	408	13	3	25	Pass
0.55 - 0.70	161	158	142	146	161	154	9	6	25	Pass
0.70 - 1.00	88	87	76	86	75	82	6	8	25	Pass
1.00 - 1.30	20	16	11	18	25	18	5	29	50	Pass
1.30 - 1.60	16	5	5	5	6	7	5	65	50	Fail
1.60 - 2.20	27	23	12	27	28	23	7	28	50	Pass
2.20 - 3.00	17	9	9	10	8	11	4	34	50	Pass
3.00 - 4.00	3	1	1	1	6	2	2	91	50	Fail
4.00 - 5.50	4	1	2	0	0	1	2	120	50	Fail
5.50 - 7.00	1	0	0	0	1	0	1	137	50	Fail
7.00 - 10.00	0	0	0	1	0	0	0	224	50	Fail

There are variation of space failures in the data. Care must be taken to choose a test location that is representative of the AHU and not necessarily the highest or lowest count location.

Particle Concentration Limit:

Count Number	Cumulative Data, (20-sec Sample)	Upstream Concentration (p/ft³)	Max Concentration (p/ft³)
1	9915	842285	
2	9970	846957	
3	9822	834384	
4	9900	841010	
5	9624	817564	
Average		836440	42450000

The average upstream concentration is less than the maximum acceptable concentration of the particle counter.

No dilution system was necessary for this test.

Down-Stream Particle Count Data (Average of 6 counts per data set):

Size Range (µm)	DS1	DS2	DS3	DS4	Average
0.30 - 0.35	**705**	**687**	**649**	**660**	**675**
0.35 - 0.40	**164**	**154**	**150**	**142**	**152**
0.40 - 0.45	**34**	**36**	**34**	**35**	**35**
0.45 - 0.55	**13**	**14**	**11**	**10**	**12**
0.55 - 0.70	**2**	**2**	**2**	**2**	**2**
0.70 - 1.00	**1**	**1**	**0**	**1**	**1**
1.00 - 1.30	**0**	**0**	**0**	**0**	**0**
1.30 - 1.60	**0**	**0**	**0**	**0**	**0**
1.60 - 2.20	**0**	**0**	**0**	**0**	**0**
2.20 - 3.00	**0**	**0**	**0**	**0**	**0**
3.00 - 4.00	**0**	**0**	**0**	**0**	**0**
4.00 - 5.50	**0**	**0**	**0**	**0**	**0**
5.50 - 7.00	**0**	**0**	**0**	**0**	**0**
7.00 - 10.00	**0**	**0**	**0**	**0**	**0**
Totals	**919**	**894**	**846**	**850**	**877**

Appendix 2 - Upstream and Downstream Count Data

Up-Stream Particle Count Data (Average of 6 counts per data set):

Size Range (µm)	US1	US2	US3	Average
0.30 - 0.35	**5733**	**5638**	**5525**	**5632**
0.35 - 0.40	**2177**	**2166**	**2117**	**2153**
0.40 - 0.45	**741**	**726**	**734**	**734**
0.45 - 0.55	**402**	**417**	**390**	**403**
0.55 - 0.70	**147**	**149**	**153**	**150**
0.70 - 1.00	**79**	**78**	**77**	**78**
1.00 - 1.30	**19**	**21**	**17**	**19**
1.30 - 1.60	**7**	**6**	**10**	**8**
1.60 - 2.20	**19**	**21**	**18**	**19**
2.20 - 3.00	**6**	**8**	**8**	**7**
3.00 - 4.00	**1**	**2**	**2**	**2**
4.00 - 5.50	**0**	**1**	**0**	**0**
5.50 - 7.00	**0**	**0**	**0**	**0**
7.00 - 10.00	**0**	**0**	**0**	**0**
Totals	**9331**	**9233**	**9051**	**9205**

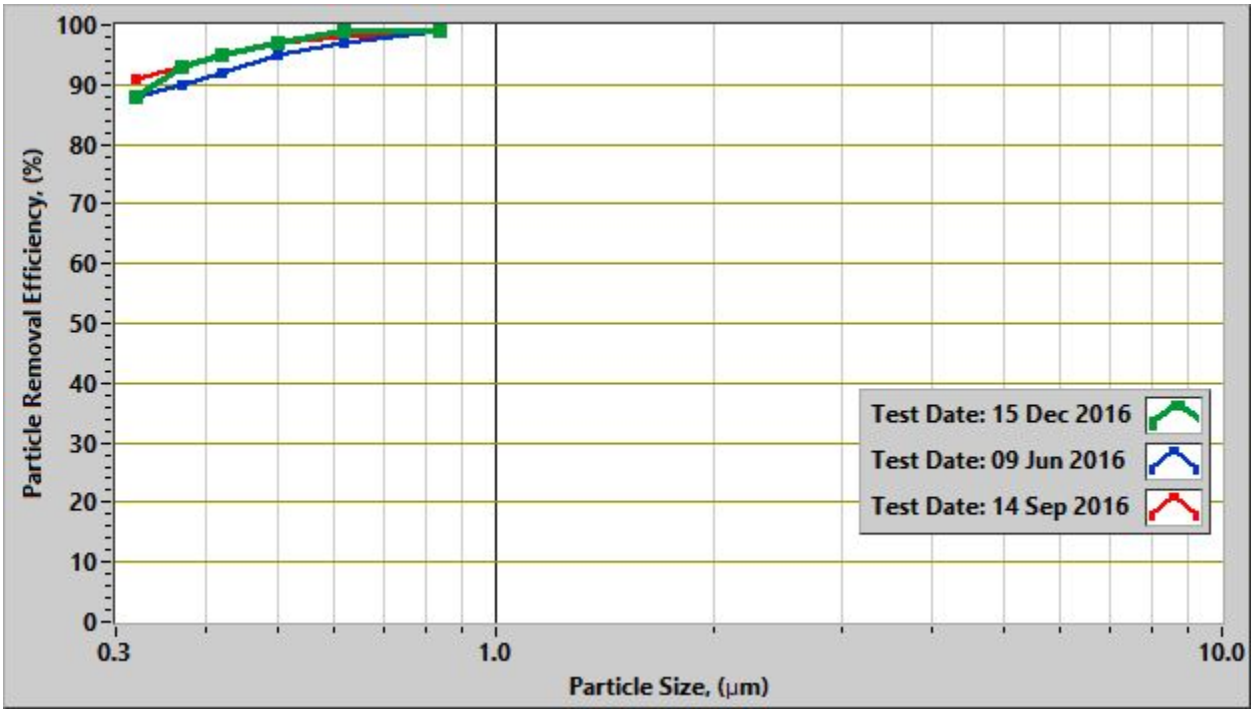
Appendix 2 - Upstream and Downstream Count Data

Filter Efficiency Calculations:

Size Range (µm)	Eff-1 (%)	Eff-2 (%)	Eff-3 (%)	Average Efficiency (%)	Standard Deviation	95% Upper Confidence Limit	95% Lower Confidence Limit	CV (%)
0.30 - 0.35	88	88	88	88	0.20	88	88	0.2
0.35 - 0.40	93	93	93	93	0.20	93	92	0.2
0.40 - 0.45	95	95	95	95	0.10	95	95	0.1
0.45 - 0.55	97	97	97	97	0.30	98	96	0.3
0.55 - 0.70	99	99	99	99	0.00	99	99	0.0
0.70 - 1.00	99	99	99	99	0.40	100	98	0.4
1.00 - 1.30	100	100	100	100	0.00	100	100	0.0
1.30 - 1.60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1.60 - 2.20	100	100	100	100	0.00	100	100	0.0
2.20 - 3.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.00 - 4.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4.00 - 5.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5.50 - 7.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7.00 - 10.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The statistically valid particle removal efficiency data is shown in the table above. The data which does NOT meet the statistical requirements as set forth in the test protocol are shown as "N/A".

Graphical Results, Tri-Dim Syn-Pac Particle Removal Efficiency vs Size Graph:



The particulate removal efficiency for the Tri-Dim Syn-Pac filter is shown above in the statistically valid ranges.

Filter installation date: 09 June 2016

Conclusion / Comments:

This is the final testing of the Tri-Dim Syn-Pac MERV 15 pocket filter at Princeton University. Given that for some of the time between June 9 and September 14, one of the Tri-Dim pre-filters and its associated Syn-Pac pocket filter fell out of the rack on air handler #3. It was not apparent how long the unit had been running in this condition, but the Energy team was trying to determine a time by reviewing the BMS data. The filters were replaced on September 14 so the testing could proceed and it appears they remained in place throughout the rest of the test cycle. However, operating in this condition will allow the majority of the air and particulate to bypass the other installed Tri-Dim filters for a period of time. The airflow will follow the path of least resistance. This means the loss of charge seen in the last test between the new and used filters will be reduced as the loss is due to the fine particulate in the air that was now flowing through the open hole in the filter bank. In addition, the hole in the filter bank will allow the measured resistance to airflow to remain lower than it would have been if the filter remained in place throughout the test.

The measured particle removal efficiency of the Tri-Dim Syn-Pac is typical of a filter that would meet ASHRAE 52.2 MERV 15 performance in the laboratory. This measured level of particle removal exceeds the customer requirement for filter efficiency.

The resistance to airflow of the Tri-Dim Syn-Pac MERV 15 pocket filter (0.69 in WG) is now 200% higher than the Camfil solution (0.23 in WG) that also meets the particle removal requirements of the customer. Exceeding the required efficiency can be a benefit, but not when it is achieved by raising the owners cost to move the air through the filter due to the very high static pressure of the Tri-Dim air filters.

Filter Performance While in Service:

	15 Dec 2016	14 Sep 2016	09 Jun 2016
Eff - Particle Size, 0.30 - 0.35 µm	**88**	**91**	**88**
Eff - Particle Size, 0.35 - 0.40 µm	**93**	**93**	**90**
Eff - Particle Size, 0.40 - 0.45 µm	**95**	**95**	**92**
Eff - Particle Size, 0.45 - 0.55 µm	**97**	**97**	**95**
Eff - Particle Size, 0.55 - 0.70 µm	**99**	**98**	**97**
Eff - Particle Size, 0.70 - 1.00 µm	**99**	**99**	**99**
Eff - Particle Size, 1.00 - 1.30 µm	**100**	**100**	**N/A**
Eff - Particle Size, 1.30 - 1.60 µm	**N/A**	**100**	**N/A**
Eff - Particle Size, 1.60 - 2.20 µm	**100**	**100**	**N/A**
Eff - Particle Size, 2.20 - 3.00 µm	**N/A**	**100**	**N/A**
Eff - Particle Size, 3.00 - 4.00 µm	**N/A**	**N/A**	**N/A**
Eff - Particle Size, 4.00 - 5.50 µm	**N/A**	**N/A**	**N/A**
Eff - Particle Size, 5.50 - 7.00 µm	**N/A**	**N/A**	**N/A**
Eff - Particle Size, 7.00 - 10.00 µm	**N/A**	**N/A**	**N/A**
Resistance to Air Flow (inWG)	**0.69**	**0.62**	**0.61**
Air Velocity (fpm)	**488**	**482**	**481**
Temp (°F)	**10**	**80**	**63**
RH (%)	**9**	**42**	**44**

Photos:

Up Stream Photo:

Down Stream Photo:

Acknowledgements:

Camfil would like to thank the facility owners for the opportunity to conduct this field-testing. This testing has closely followed the industry standard protocol for testing, but, as with all field study data, changes in test conditions can have a significant effect on the results. Great care has been taken to minimize these effects, but they cannot be totally eliminated. If there are any questions with this data or the procedure, please contact the Camfil R&D department.

End of Report

Appendix Data

Appendix 1 - Velocity and Resistance to Airflow Data:

Initial Velocity Readings (fpm)	Final Velocity Readings (fpm)		Resistance to Air Flow Readings (inWG)
696	725		0.68
680	761		0.68
718	815		0.68
671	720		0.68
660	683		0.69
666	723		0.69
624	644		0.69
653	623		0.68
624	625		0.68
406	420		0.69
348	253		0.69
300	319		0.69
363	386		0.69
452	424		0.69
517	501		0.68
525	532		0.69
577	524		0.68
481	478		0.69
499	395		0.68
489	500		0.69
492	453		0.69
429	343		0.69
261	251		0.68
274	143		0.69
303	220		0.69
307	315		0.69
297	268		
245	206		
193	151		
356	358		
485	541		
641	727		
640	650		
591	667		
500	635		
570	681		
538	518		
549	519		
495	426		
460	365		

Appendix 2 - Upstream and Downstream Count Data:

Count ID	0.30 - 0.35	0.35 - 0.40	0.40 - 0.45	0.45 - 0.55	0.55 - 0.70	0.70 - 1.00	1.00 - 1.30	1.30 - 1.60	1.60 - 2.20	2.20 - 3.00	3.00 - 4.00	4.00 - 5.50	5.50 - 7.00	7.00 - 10.00
Z-System	0	2	1	0	2	3	1	0	0	0	0	0	0	0
Z-PC	0	1	1	0	0	1	0	0	0	0	1	0	0	0
US-Time	6206	2292	708	435	129	84	19	5	19	13	2	3	0	0
US-Time	6091	2393	782	428	152	78	17	9	14	6	0	0	0	0
US-Time	6015	2319	767	429	155	80	16	9	22	7	2	0	0	1
US-Time	6001	2404	757	447	144	90	21	5	21	6	2	1	0	1
US-Time	5798	2312	802	399	163	81	17	11	24	12	3	1	0	1
US-Space	5799	2247	692	400	161	88	20	16	27	17	3	4	1	0
US-Space	5842	2258	767	399	158	87	16	5	23	9	1	1	0	0
US-Space	5716	2349	762	413	142	76	11	5	12	9	1	2	0	0
US-Space	5930	2267	728	399	146	86	18	5	27	10	1	0	0	1
US-Space	5707	2154	696	428	161	75	25	6	28	8	6	0	1	0
DS1	709	171	35	8	3	0	0	0	1	0	0	0	0	0
DS1	692	155	35	18	1	3	0	0	1	0	0	1	0	0
DS1	665	173	34	16	2	1	0	0	0	0	0	0	0	0
DS1	753	163	34	8	4	0	0	0	0	0	0	0	0	0
DS1	708	156	32	12	2	3	0	0	0	0	0	0	0	0
DS1	703	163	35	18	2	0	0	0	0	0	0	0	0	0
US1	5730	2167	700	384	156	79	18	7	16	7	1	0	0	0
US1	5701	2158	754	423	150	82	26	8	23	9	0	1	0	0
US1	5679	2153	755	445	142	93	19	8	21	5	0	1	0	0
US1	5757	2226	762	377	130	75	24	5	19	6	2	1	0	0
US1	5835	2164	721	393	161	71	15	11	20	7	2	0	1	0
US1	5696	2195	752	389	144	76	11	5	13	4	3	0	0	0
DS2	672	148	41	17	3	1	0	0	0	0	0	0	0	0
DS2	704	167	37	10	4	0	1	0	0	0	0	0	1	0
DS2	706	130	42	22	1	1	0	0	0	0	0	0	0	0
DS2	685	151	31	12	2	0	0	0	0	0	0	0	0	0
DS2	687	177	35	9	0	0	0	0	0	0	0	0	0	0
DS2	667	148	31	11	3	2	0	0	0	0	0	0	0	0
US2	5766	2115	670	428	159	86	19	6	14	7	1	2	0	0
US2	5624	2186	783	465	165	82	18	5	20	7	4	0	0	0
US2	5599	2137	736	396	142	59	24	9	27	7	1	0	0	0
US2	5494	2282	740	406	144	85	16	6	22	14	3	2	0	0
US2	5648	2071	693	409	132	68	24	10	26	4	1	1	0	0
US2	5694	2206	733	397	153	88	25	2	19	7	2	1	0	0
DS3	652	155	43	9	2	0	0	0	0	0	0	0	0	0
DS3	689	162	33	9	5	1	0	0	0	0	0	0	0	0
DS3	646	167	34	19	1	0	0	0	0	0	0	0	0	0
DS3	626	130	43	7	1	0	0	0	0	0	0	0	0	0
DS3	660	134	28	11	2	1	0	0	0	0	0	0	0	0
DS3	623	155	24	9	1	0	0	0	0	0	0	0	0	0
US3	5361	2105	739	388	147	71	20	9	23	10	2	0	1	0
US3	5526	2054	710	361	165	96	19	9	16	5	2	0	0	0
US3	5594	2118	760	347	168	75	21	6	12	9	2	1	0	0
US3	5516	2110	728	440	154	75	15	6	16	6	0	0	0	1
US3	5546	2120	748	412	145	78	10	16	22	10	6	0	0	0
US3	5606	2194	719	389	138	69	18	13	16	5	1	0	0	0
DS4	647	147	42	9	1	1	0	0	0	0	0	0	0	0
DS4	697	144	31	8	3	1	0	0	0	0	0	0	0	0
DS4	705	131	37	12	4	0	0	0	0	0	0	0	0	0
DS4	659	140	34	10	0	3	0	0	0	0	0	0	0	0
DS4	641	138	30	12	2	0	0	0	0	0	0	0	0	0
DS4	614	154	36	12	3	0	0	0	0	0	0	0	0	0

Appendix 3 - Pre-Testing Inspection Report:

Filter Installation Pre-testing Inspection Form						
1. Air Handling Unit		**AHU1**	**AHU2**	**AHU3**	**AHU4**	**Comments**
a.	Adequate overall air tightness?	Yes	Yes	Yes		
b.	Doors have adequate seals (very little air leakage)?	No	No	No		
c.	Doors available on both sides of air filter banks?	No	No	No		
d.	Doors have provision for opening / closing from inside AHU?	No	No	No		
e.	Minimum of 24" (u/s, d/s) of filter banks for probe placement for probe placement & measurement?	No	No	No		Downstream is approximately 5in
f.	Minimum of 24" (u/s, d/s) of equipment (i.e. coils, fan, etc.) for probe placement?	Yes	Yes	Yes		
g.	Sample ports located & labeled (up/down stream) of filter banks?	No	No	No		Need to drill holes for probes
h.	Adequate overall interior cleanliness?	Yes	Yes	Yes		
i.	Adequate overall exterior access to AHU?	Yes	Yes	Yes		
j.	Any hazardous conditions (i.e. slip, head knockers, standing water, or chemical)?	No	No	No		
k.	Adequate guards provided on the fans & motors?	Yes	Yes	Yes		
l.	Can the airflow through the filters be set to a constant value for the duration of the test?	Yes	Yes	Yes		
m.	Are there any restrictions on AHU access (time, confined spaces, training, etc.)?	No	No	No		
2. Local instrumentation		**AHU1**	**AHU2**	**AHU3**	**AHU4**	**Comments**
a.	Are differential pressure gauges working properly & calibrated?	No	No	No		We have not seen any
b.	Are pressure taps properly aligned (no bends, breaks, or clogs)?	No	No	No		We have not seen any
c.	Is there a velocity gauge working properly & calibrated?	No	No	No		We have not seen any
d.	Is there a Temperature gauge working properly & calibrated?	No	No	No		We have not seen any
e.	Is there a RH gauge working properly & calibrated?	No	No	No		We have not seen any
3. Filter / Frames		**AHU1**	**AHU2**	**AHU3**	**AHU4**	**Comments**
a.	Proper seating/sealing of test filters?	Yes	Yes	Yes		
b.	Clamping hardware in place?	Yes	Yes	Yes		
c.	Filters free of damage?	Yes	Yes	Yes		
4. Utilities		**AHU1**	**AHU2**	**AHU3**	**AHU4**	**Comments**
a.	Available electric outlet for instrument power?	Yes	Yes	Yes		
b.	Adequate working internal lighting?	Yes	Yes	Yes		

