

DOCUMENTATION OF CONCRETE MIX PERFORMANCE

AMT Engineers

Project Information

PROJECT NUMBER: DEMO1

PROJECT: Williamsburg Water and Sanitation District
Williamsburg, CO 80123

ARCHITECT: Jorgenson, Hendrickson & Close
Denver, CO

ENGINEER: Wright-McLaughlin Water Engineers
Williamsburg, CO

CONTRACTOR: Western Colorado Constructors

CONCRETE
SUPPLIER Mountain Concrete
Williamsburg, CO

REMARKS: Concrete delivered out of Williamsburg
batch plant of Mountain Concrete

Mix Information

Mix ID: 4405

Design Strength: 4000

Design Age: 28

Supplier: Mile High Redi-Mix Co.

Cement - Martin Marietta Type II 522 lbs

Fly Ash - Craig class F 105 lbs

Sand - Zemlock & Sons C33 1327 lbs

#67 Agg - Zemlock & Sons C33 1620 lbs

AEA - MB AE-10 as required

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SR5 TEST NUMBER	DATE OF TEST	CYLINDER STRENGTHS, psi			Slump in.	Air Content %	Conc Temp	Ave Test Value	Cumul Ave	Cumul S D	Cumul C V	Move 3 S D	Move 3 C V	Move 3 Ave	Range of Test	Cumul Ave Range	Mov Ave Range	W/In Test C V	CYLINDER STRENGTHS, psi			Ave Test Value	Cumul Ave	Cumul S D	Cumul C V	Move 3 S D	Move 3 C V	Move 3 Ave	Range of Test	Cumul Ave Range	Mov Ave Range	W/In Test C V
		28	28	28															56	56	56											
1	8/24/2007	6810	6770	6800	4.50	3.5	70	6793	6793	---	---	---	---	---	40	40	---	0.35	8280	7860	----	8070	8070	---	---	---	---	---	420	420	---	4.61
2	8/24/2007	6050	6100	6070	5.50	6.5	77	6073	6433	509	7.9	---	---	---	50	45	---	0.41	7500	7860	8215	7858	7964	150	1.9	---	---	---	715	568	---	5.05
3	8/24/2007	6000	5840	6100	6.30	7.3	68	5980	6282	445	7.1	445	7.1	6282	260	117	117	1.10	7500	8570	----	8035	7988	113	1.4	113	1.4	7988	1070	735	735	6.99
4	8/24/2007	6870	6820	6260	5.50	4.5	71	6650	6374	407	6.4	363	5.8	6234	610	240	307	2.22	8930	8570	----	8750	8178	392	4.8	472	5.7	8214	360	641	715	6.18
5	8/24/2007	6340	6380	----	4.80	5.2	75	6360	6371	353	5.5	336	5.3	6330	40	200	303	1.99	8295	7895	----	8095	8162	342	4.2	397	4.8	8293	400	593	610	5.85
6	8/27/2007	5230	5730	6180	5.00	4.9	77	5713	6262	414	6.6	480	7.7	6241	950	325	533	3.25	7860	----	----	7860	8111	330	4.1	461	5.6	8235	---	---	---	---
7	8/27/2007	6720	5380	4546	5.80	4.2	80	5549	6160	464	7.5	429	7.3	5874	2174	589	1055	5.93	8215	7500	----	7858	8075	316	3.9	136	1.7	7938	715	613	492	6.21
8	8/27/2007	6200	6320	5450	3.30	3.7	88	5990	6139	434	7.1	223	3.9	5751	870	624	1331	6.27	7855	----	----	7855	8048	302	3.8	3	0.0	7858	---	---	---	---
9	8/27/2007	5450	5460	5590	4.80	5.5	79	5500	6068	459	7.6	270	4.8	5680	140	570	1061	5.77	7470	----	----	7470	7983	342	4.3	223	2.9	7728	---	---	---	---
10	8/28/2007	6200	6010	6080	6.00	5.3	69	6097	6071	432	7.1	318	5.4	5862	190	532	400	5.36	8290	9030	----	8660	8051	387	4.8	607	7.6	7995	740	631	618	6.49
11	8/29/2007	6400	----	----	6.50	5.7	82	6400	6100	422	6.9	458	7.6	5999	---	---	---	---	7900	8730	7550	8060	8052	367	4.6	595	7.4	8063	1180	700	878	6.85
12	9/1/2007	6120	6430	6000	6.30	6.1	77	6183	6107	403	6.6	156	2.5	6227	430	523	253	5.22	7890	8270	8660	8273	8070	356	4.4	304	3.7	8331	770	708	897	6.66
13	9/1/2007	6120	6120	6210	4.80	6.7	73	6150	6111	386	6.3	136	2.2	6244	90	487	237	4.84	10570	10250	----	10410	8250	733	8.9	1300	14.6	8914	320	669	757	6.25
14	9/1/2007	6320	5910	6430	6.00	5.5	72	6220	6118	372	6.1	35	0.6	6184	520	490	347	4.85	7070	7860	----	7465	8194	735	9.0	1522	17.5	8716	790	680	627	6.47
15	9/1/2007	6120	6070	6250	5.50	6.0	66	6147	6120	359	5.9	41	0.7	6172	180	467	263	4.62	8180	7430	----	7805	8168	715	8.8	1611	18.8	8560	750	686	620	6.62
16	9/1/2007	6085	6160	5660	5.30	6.2	68	5968	6111	349	5.7	129	2.1	6112	500	470	400	4.64	8140	8500	----	8320	8178	692	8.5	430	5.5	7863	360	661	633	6.42
17	9/1/2007	5850	6100	6070	4.80	6.1	74	6007	6105	338	5.5	94	1.6	6041	250	456	310	4.50	7820	10070	----	8945	8223	695	8.5	571	6.8	8357	2250	774	1120	7.54
18	9/7/2007	5690	5730	5920	5.50	5.5	75	5780	6087	337	5.5	121	2.0	5918	230	443	327	4.38	7460	9140	----	8300	8227	675	8.2	367	4.3	8522	1680	835	1430	8.18
19	9/7/2007	6050	5840	6000	6.30	7.3	66	5963	6080	329	5.4	120	2.0	5917	210	430	230	4.25	8250	8730	----	8490	8241	659	8.0	331	3.9	8578	480	813	1470	7.99
20	9/7/2007	5310	5380	5620	6.00	7.1	68	5437	6048	351	5.8	267	4.7	5727	310	423	250	4.21	7820	7500	8300	7873	8223	646	7.9	316	3.8	8221	800	812	987	7.83

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SR5 TEST NUMBER	DATE OF TEST	CYLINDER STRENGTHS, psi			Slump in.	Air Content %	Conc Temp	Ave Test Value	Cumul Ave	Cumul S D	Cumul C V	Move 3 S D	Move 3 C V	Move 3 Ave	Range of Test	Cumul Ave Range	Mov Ave Range	W/in Test C V	CYLINDER STRENGTHS, psi			Ave Test Value	Cumul Ave	Cumul S D	Cumul C V	Move 3 S D	Move 3 C V	Move 3 Ave	Range of Test	Cumul Ave Range	Mov Ave Range	W/in Test C V
		28	28	28															56	56	56											
21	9/7/2007	5690	5540	5540	5.50	4.9	79	5590	6026	356	5.9	271	4.8	5663	150	410	223	4.08	7900	8810	8190	8300	8226	630	7.7	316	3.8	8221	910	817	730	7.73
22	9/7/2007	5750	5750	-----	5.30	5.7	76	5750	6014	353	5.9	157	2.8	5592	0	390	153	3.96	9950	-----	-----	9950	8305	716	8.6	1097	12.6	8708	---	---	---	---
23	9/9/2007	5590	5480	-----	6.50	6.6	59	5535	5993	359	6.0	112	2.0	5625	110	377	87	3.90	7850	7780	-----	7815	8283	707	8.5	1119	12.9	8688	70	778	593	7.36
24	9/13/2007	5500	5520	-----	5.20	5.0	65	5510	5973	365	6.1	132	2.4	5598	20	362	43	3.80	7740	9600	-----	8670	8299	696	8.4	1075	12.2	8812	1860	832	947	7.90

DOCUMENTATION OF CONCRETE MIX PERFORMANCE

AMT Engineers

Report Name: DEMO1
 Report Description: Sample data set
 Report File: DEMO1.SRC

Project(s): DEMO1
 Mix(es): 4405
 Supplier: use all
 Technician: use all
 Slump filter: No lower limit to no upper limit
 Air Content filter: No lower limit to no upper limit
 Temperature filter: No lower limit to no upper limit
 Test dates: 1/1/1900 to : 10/23/2013
 Specimen age: 28 days

Analysis Criteria

Analysis Results (28 days)

Number of tests -----	24	
Standard Deviation Adjustment Factor (ACI 301-05) -----	1.040	per Table 4.2.3.3.b
Average strength -----	5973 psi	
Standard deviation -----	365 psi	
Adjusted standard deviation (ACI 301-05) -----	379 psi	per Table 4.2.3.3.b
1.040 x 365 = 379 psi		
Design strength (28 days) -----	4000 psi	
Minimum required average strength (ACI 301-05) -----	4510 psi	per Table 4.2.3.3.c
1.34 x 379 + 4000 = 4508 psi		
2.33 x 379 + 4000 - 500 = 4383 psi		
Margin of extra performance -----	1463 psi	
(Average strength - minimum required average strength)		
Probability of a test below 4000 based on normal distribution is 0.00%		
Probability of a test below 3500 based on normal distribution is 0.00%		
Concrete performance (ACI 214R-02) -----	Excellent	per Table 3.2
Based on standard deviation of 365 psi		
Using general construction testing rating system		
Laboratory testing proficiency (ACI 214R-02) -----	Very good	per Table 3.2
Within test coefficient of variation -----	3.80	
Using general construction testing rating system		
Average range -----	362 psi	
Maximum 2 specimen range permitted to attain a rating of good: ---	254 psi	
Maximum 3 specimen range permitted to attain a rating of good: ---	382 psi	

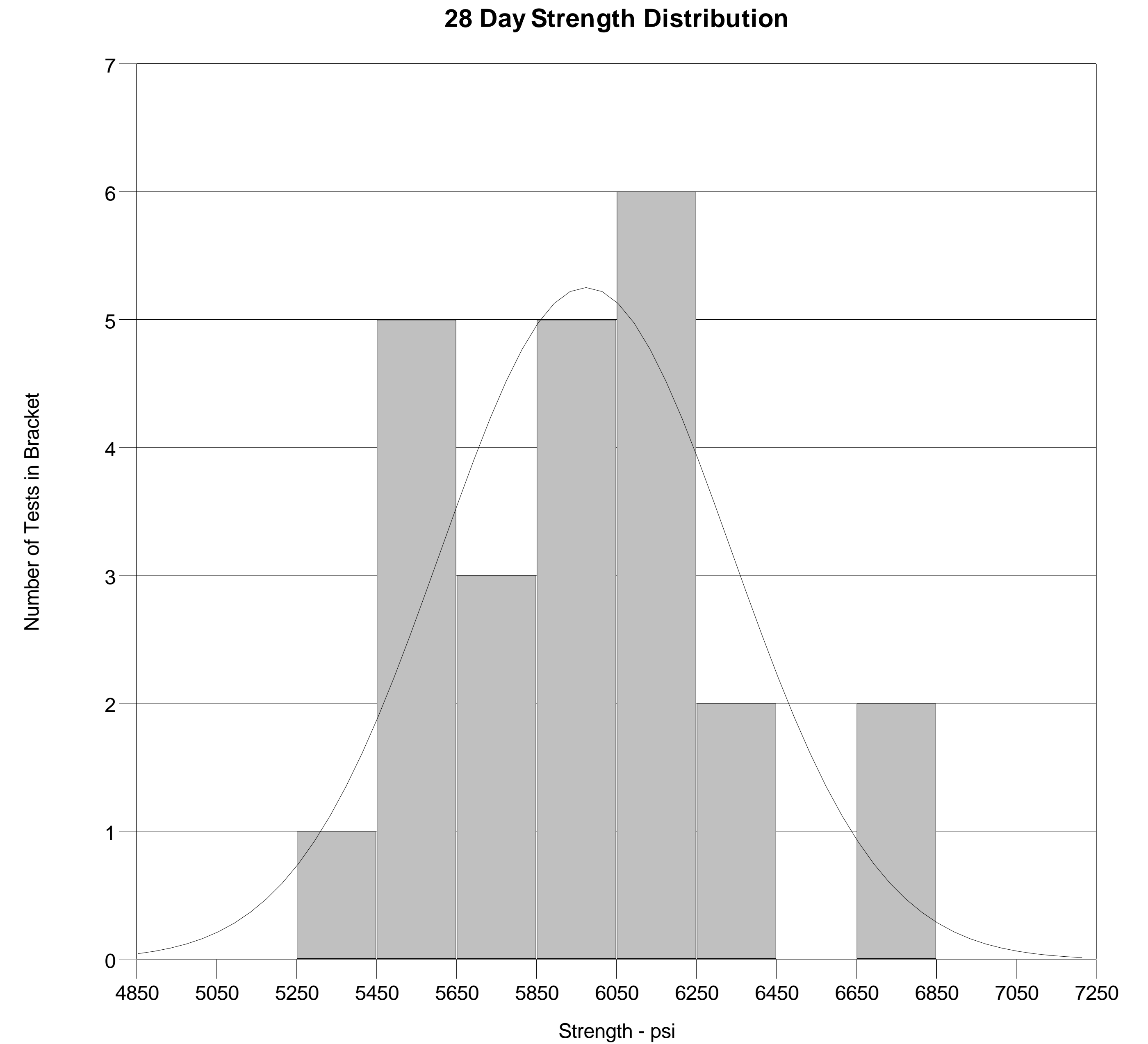
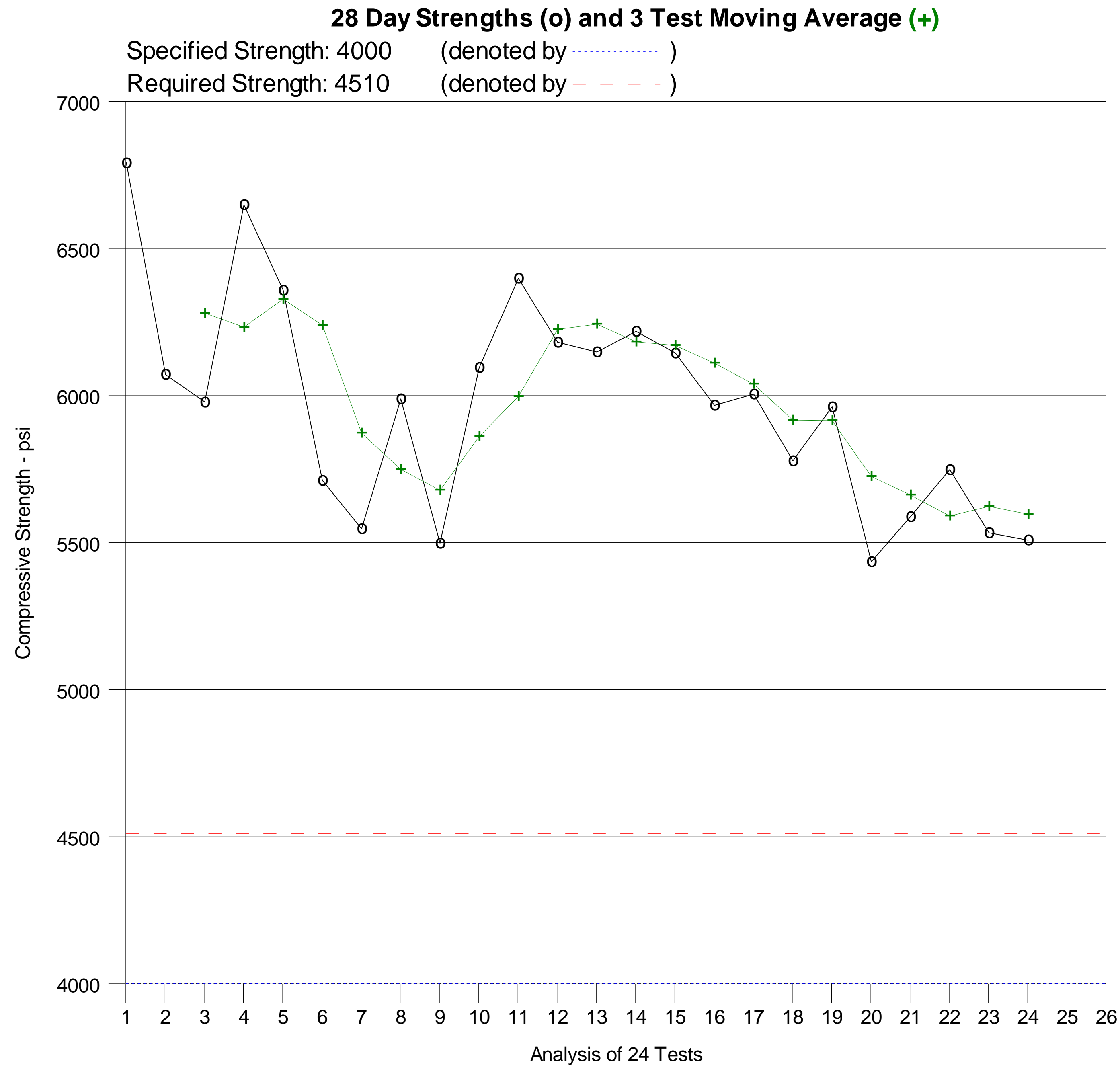
The above statistical analysis will also qualify mixes

Mix ID: <u>abc</u>	<u>123</u>	<u>ABC</u>	<u>{[]}</u>
Strength: <u>1234</u>	<u>2345</u>	<u>3456</u>	<u>4567</u>

DOCUMENTATION OF CONCRETE MIX PERFORMANCE

AMT Engineers

Report Name: DEMO1
 Report Description: Sample data set
 Report File: DEMO1.SRC



99% Confidence value = 5125 psi

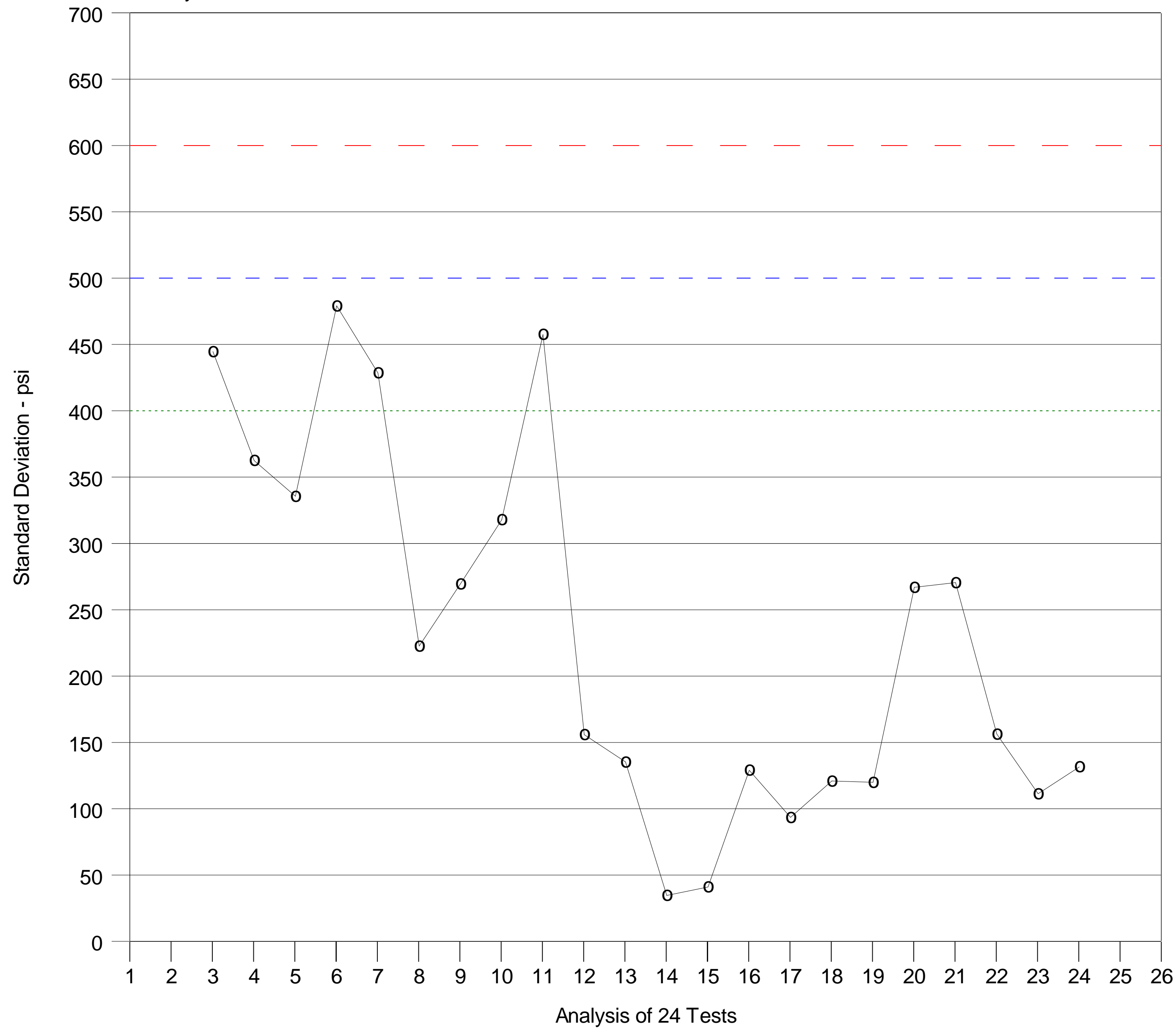
DOCUMENTATION OF CONCRETE MIX PERFORMANCE

AMT Engineers

Report Name: DEMO1
 Report Description: Sample data set
 Report File: DEMO1.SRC

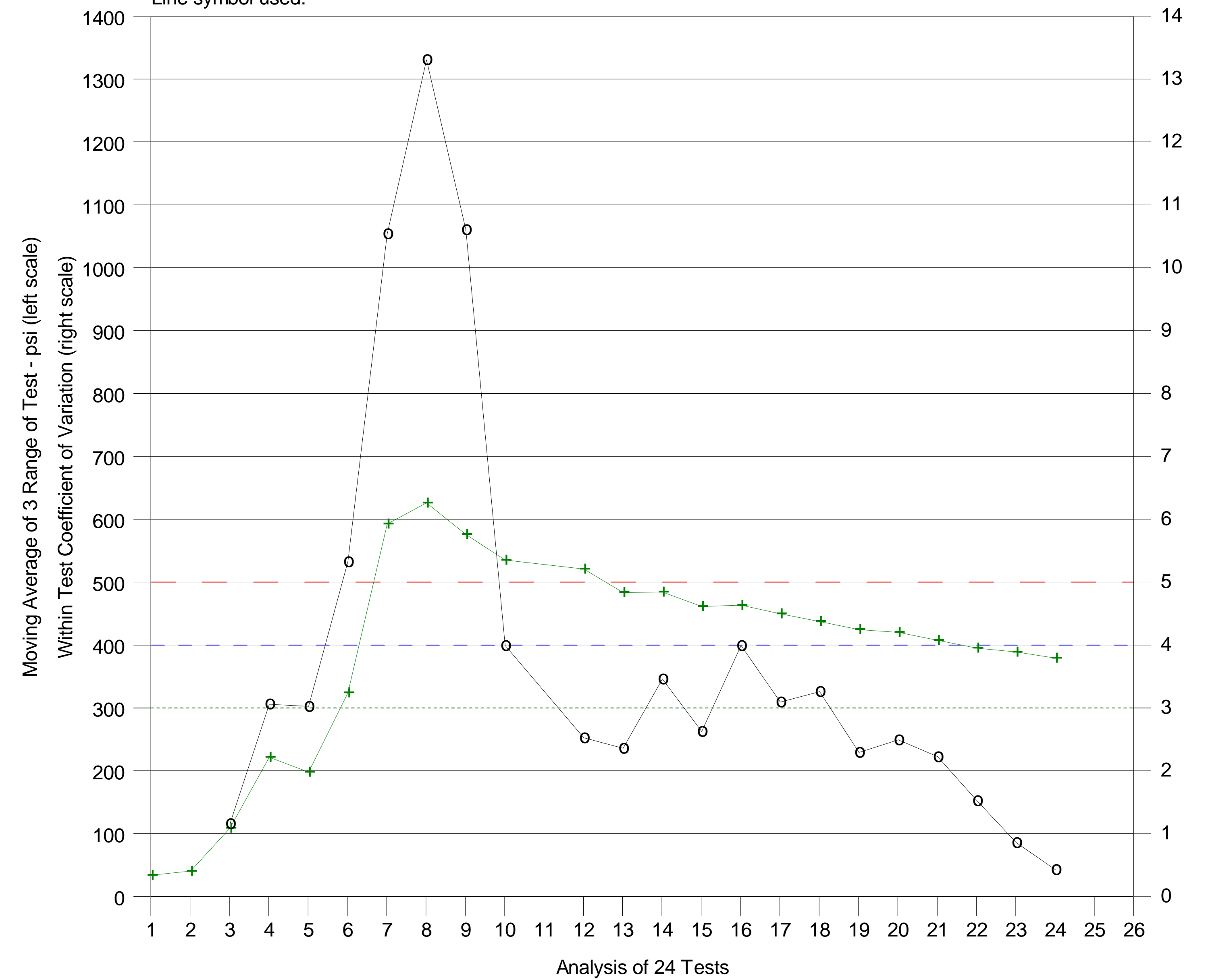
3 Test Moving Standard Deviation - 28 Day Test Strength

Standard Deviation:	Below 400	400-500	500-600
ACI 214R-02 Rating:	Excellent	Very good	Good
Line symbol used:	- - - - -	- - - - -	- - - - -



Estimated 28 Day Within Batch Coefficient of Variation (+) Moving Average Range of 3 28 Day Tests (o)

Within Batch Coefficient of Variation:	Below 3	3-4	4-5
ACI 214R-02 Rating:	Excellent	Very good	Good
Line symbol used:	- - - - -	- - - - -	- - - - -



DOCUMENTATION OF CONCRETE MIX PERFORMANCE

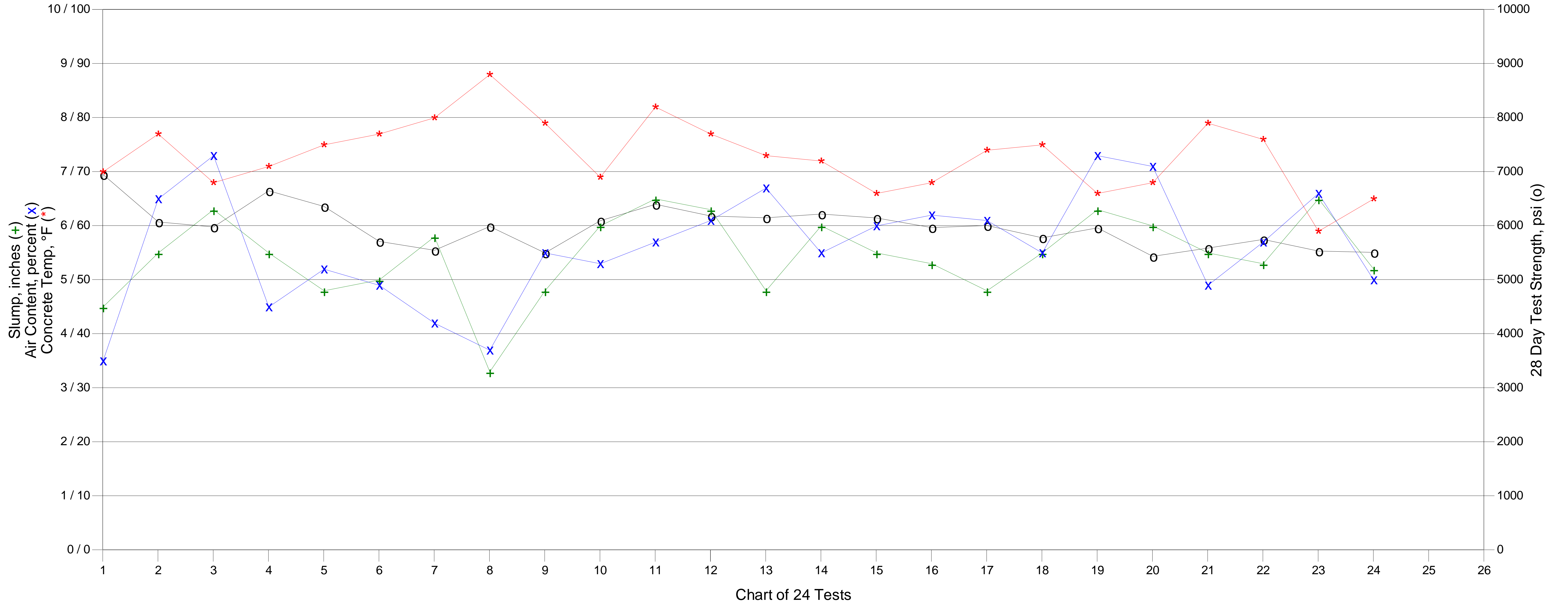
AMT Engineers

Report Name: DEMO1

Report Description: Sample data set

Report File: DEMO1.SRC

28 Day Strength (o) - Slump (+) - Air Content (x) - Concrete Temp (*)



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AMT Engineers

Analysis Criteria

Report Name: DEMO1
 Report Description: Sample data set
 Report File: DEMO1.SRC

Project(s): DEMO1
 Mix(es): 4405
 Supplier: use all
 Technician: use all
 Slump filter: No lower limit to no upper limit
 Air Content filter: No lower limit to no upper limit
 Temperature filter: No lower limit to no upper limit
 Test dates: 1/1/1900 to : 10/23/2013
 Specimen age: 56 days

Analysis Results (56 days)

Number of tests -----	24	
Standard Deviation Adjustment Factor (ACI 301-05) -----	1.040	per Table 4.2.3.3.b
Average strength -----	8299 psi	
Standard deviation -----	696 psi	
Adjusted standard deviation (ACI 301-05) -----	724 psi	per Table 4.2.3.3.b
1.040 x 696 = 724 psi		
Design strength (56 days) -----	5000 psi	
Minimum required average strength (ACI 301-05) -----	6190 psi	per Table 4.2.3.3.c
1.34 x 724 + 5000 = 5970 psi		
2.33 x 724 + 5000 - 500 = 6187 psi		
Margin of extra performance -----	2109 psi	
(Average strength - minimum required average strength)		
Probability of a test below 5000 based on normal distribution is 0.00%		
Probability of a test below 4500 based on normal distribution is 0.00%		
Concrete performance (ACI 214R-02) -----	Fair	per Table 3.2
Based on standard deviation of 696 psi		
Using general construction testing rating system		
Laboratory testing proficiency (ACI 214R-02) -----	Poor	per Table 3.2
Within test coefficient of variation -----	7.90	
Using general construction testing rating system		
Average range -----	832 psi	
Maximum 2 specimen range permitted to attain a rating of good: ---	349 psi	
Maximum 3 specimen range permitted to attain a rating of good: ---	524 psi	

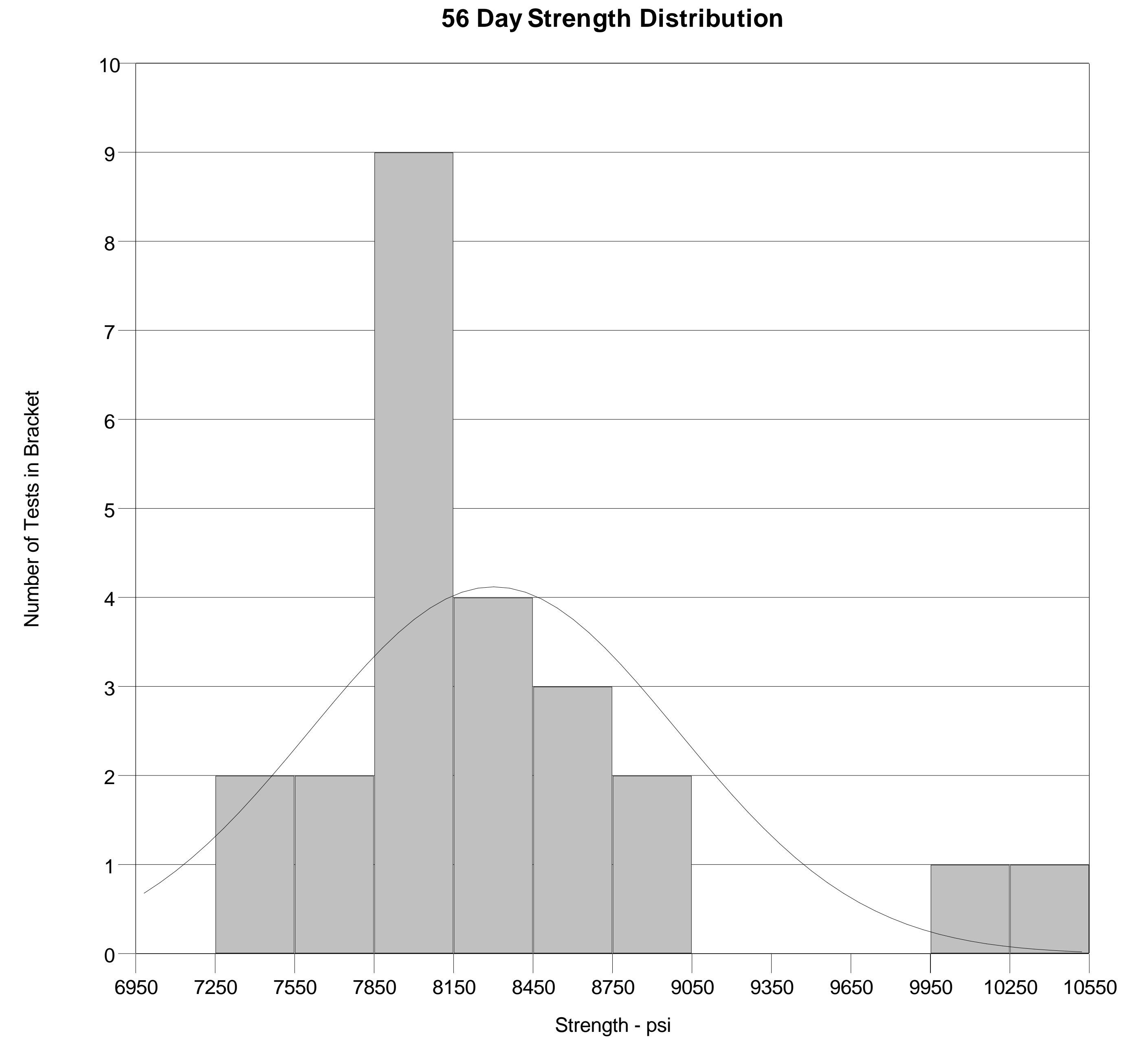
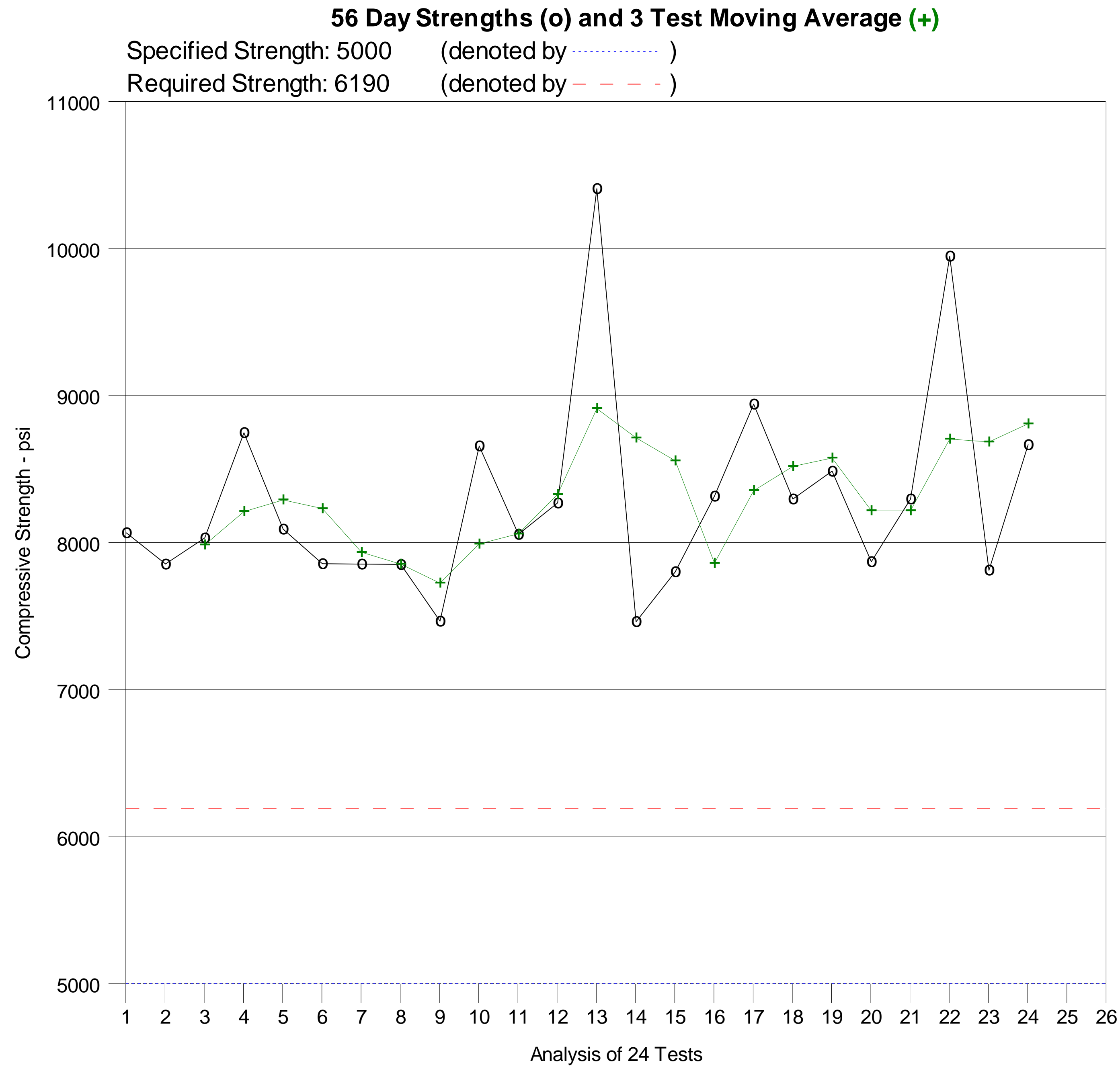
The above statistical analysis will also qualify mixes

Mix ID: <u>abc</u>	<u>123</u>	<u>ABC</u>	<u>{[]}</u>
Strength: <u>1234</u>	<u>2345</u>	<u>3456</u>	<u>4567</u>

DOCUMENTATION OF CONCRETE MIX PERFORMANCE

AMT Engineers

Report Name: DEMO1
 Report Description: Sample data set
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99% Confidence value = 6680 psi

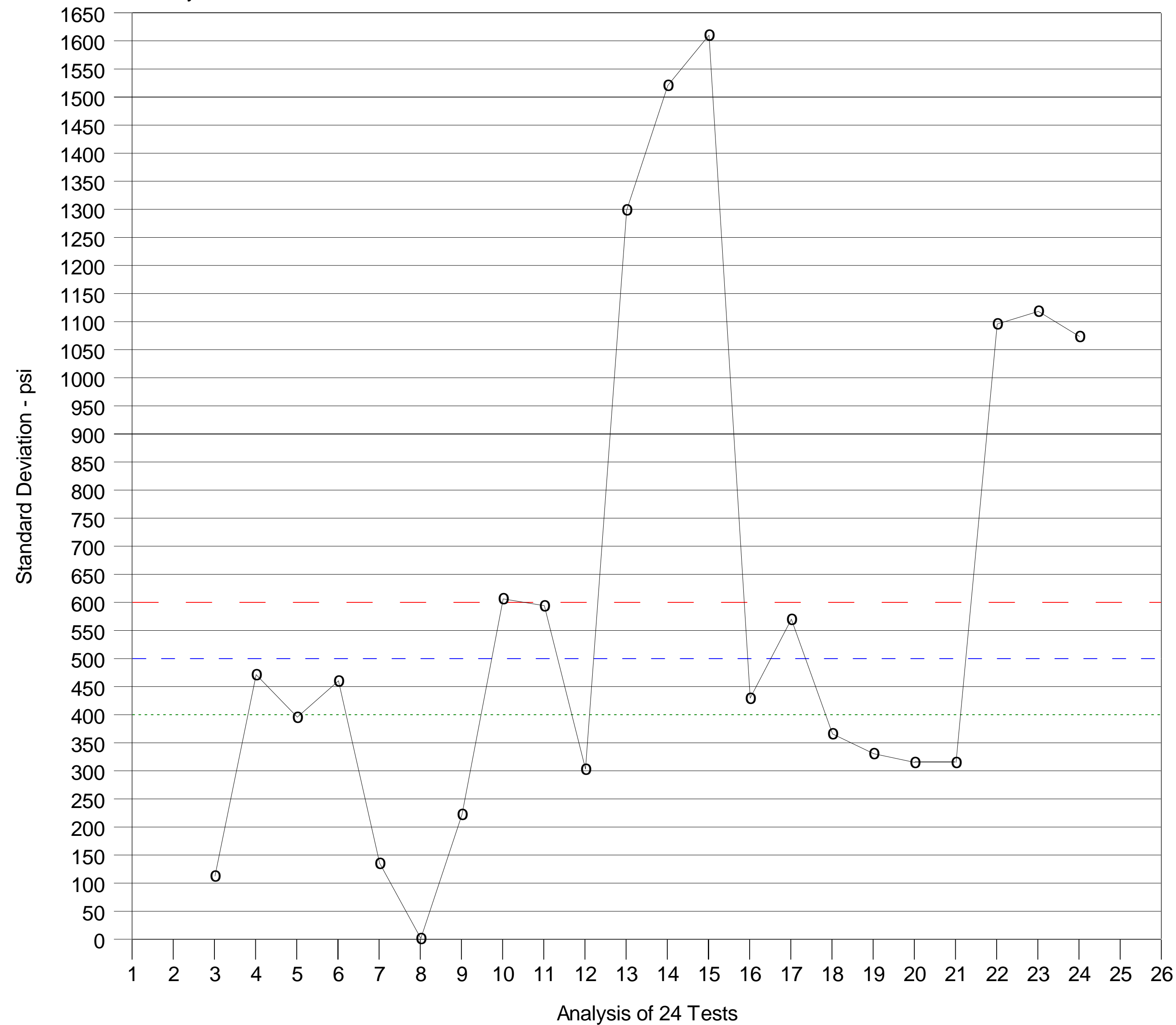
DOCUMENTATION OF CONCRETE MIX PERFORMANCE

AMT Engineers

Report Name: DEMO1
 Report Description: Sample data set
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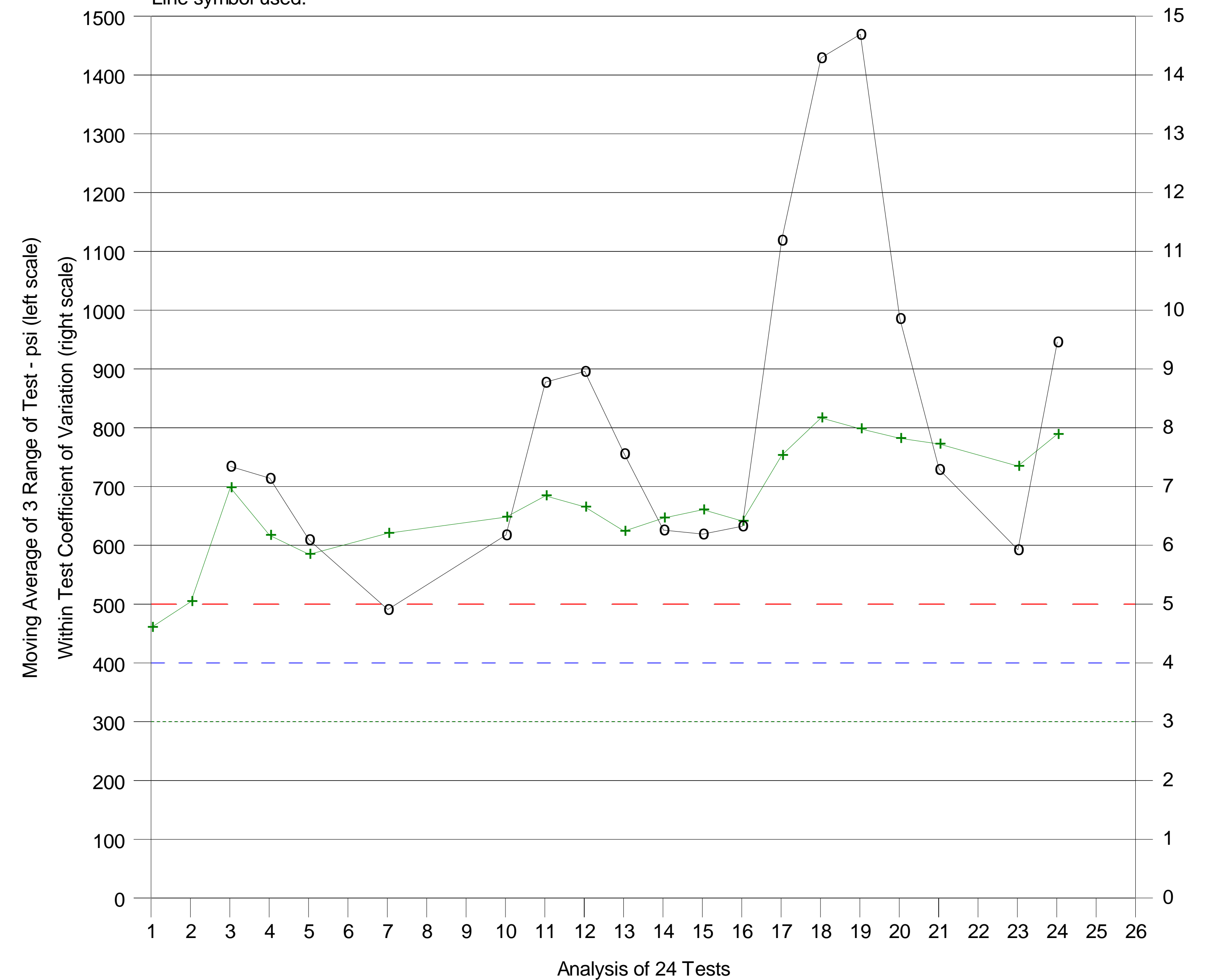
3 Test Moving Standard Deviation - 56 Day Test Strength

Standard Deviation:	Below 400	400-500	500-600
ACI 214R-02 Rating:	Excellent	Very good	Good
Line symbol used:	-----	- - - - -	- - - - -



Estimated 56 Day Within Batch Coefficient of Variation (+) Moving Average Range of 3 56 Day Tests (o)

Within Batch Coefficient of Variation:	Below 3	3-4	4-5
ACI 214R-02 Rating:	Excellent	Very good	Good
Line symbol used:	-----	- - - - -	- - - - -



DOCUMENTATION OF CONCRETE MIX PERFORMANCE

AMT Engineers

Report Name: DEMO1

Report Description: Sample data set

Report File: DEMO1.SRC

56 Day Strength (o) - Slump (+) - Air Content (x) - Concrete Temp (*)

