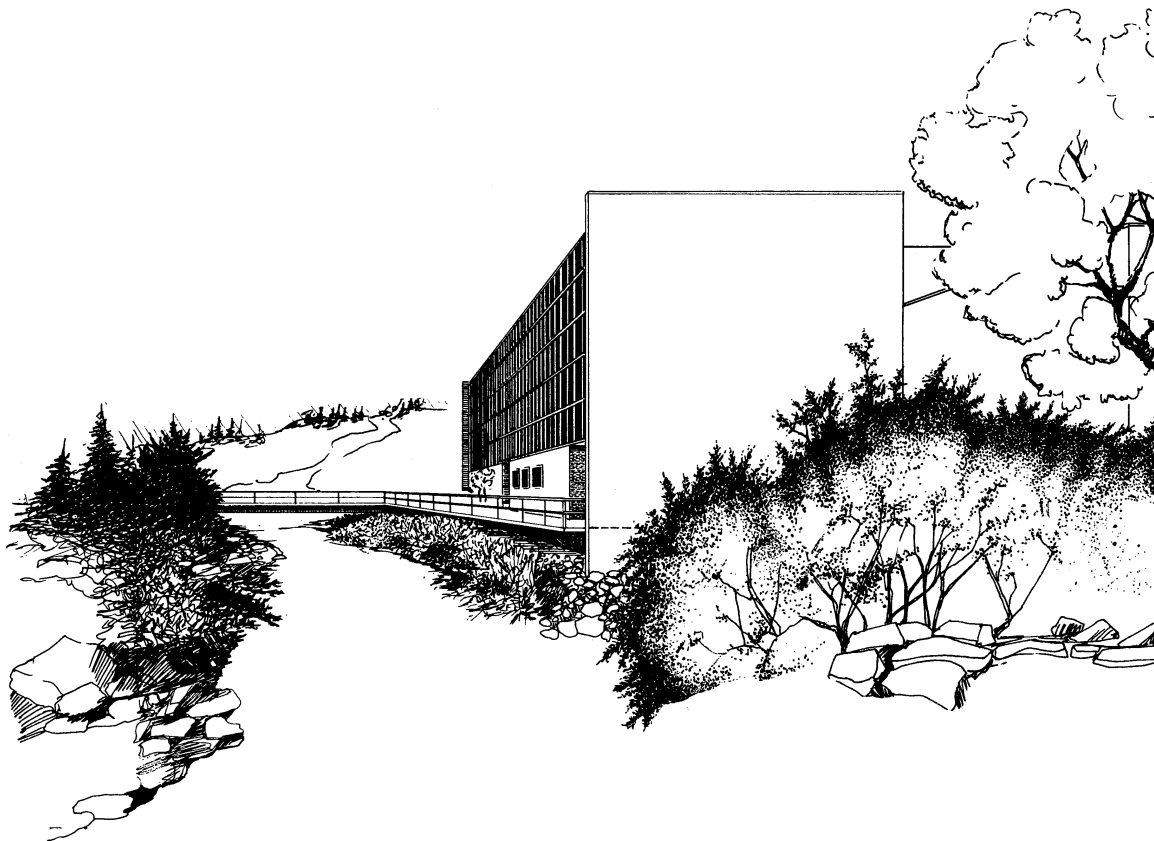


**5/8x3/4-inch Sonata
Accuracy Testing**

Prepared for

Master Meter

December 2018



UTAH WATER RESEARCH LABORATORY

**Utah State University
Logan, Utah**

Report No. 4109

5/8x3/4-inch Sonata Accuracy Testing

Submitted to:

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INTRODUCTION

Utah State University was contracted by Master Meter to perform flow calibrations at the Utah Water Research Laboratory (UWRL) in Logan, Utah on six 5/8x3/4-inch Sonata flow meters. The testing required that the new meters be tested for registry accuracy using cold water (water less than 80 degrees Fahrenheit). Each meter was tested at a variety of flow rates specified by Master Meter with a single reading at each flow rate. The readings from the meters were then compared to the volume of water collected during the test runs in a calibrated weight tank.

TEST SETUP

Each 5/8-inch meter was installed in series using adaptors that provided approximately 7 inches between each meter. Potable water from the City of Logan was used for the testing with temperatures maintained at less than 80 degrees. Upstream from the meters were filters to prevent any debris from getting into the meters. Figure 1 shows a sample of the meters tested.



Figure 1. Flow meter installation.

ACCURACY TESTING

Upon receipt of the flow meters from Master Meter, the meters were installed and tested. Table 1 shows the conditions under which each of the meter sizes were tested. The typical draft size for each meter at each flow rate is shown in Table 2.

Table 1. Flow conditions tested and drafts collected.

Target Flow Rate (gpm)	Draft Collected (gallons)
25	200
20	100
15	20
10	10
2	10
0.4	10
0.13	10
0.10	10
0.05	10

The meters were tested using a gravimetric bench that was certified using NIST traceable weights. The weight of each draft and the temperature were measured for each run.

Through an oversight in setting up the test, runs of 10 and 15 gpm were supposed to have drafts of 100 gallons. However that did not occur. It is always preferable to have larger drafts which are defined in the AWWA standards for testing meters. The results of this calibration demonstrate the robustness of the Sonata meters to accurately meters large flow rates over relatively short durations. As one can readily observe, the 15 gpm flow rate over 20 minutes resulted in a test duration of 1.36 minutes while the 10 gpm test duration was 1.02 minutes.

RESULTS

Tables 1 and 2 show the results of the testing in terms of actual meter registry. The results demonstrate impressive registry performance which is to be interpreted by personnel from Master Meter.

**Table 1. Utah Water Research Laboratory Flow Meter Evaluation
Master Meter 3/4" Sonata Meters**

Date: 11/20/18 - 11/21/18
By: M. Day, E. Naulu
Witness: -

Certified by: *Michael Johnson*

Time (min) = **8.01** Flow (gpm) = **24.47**

25 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H ₂ O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4213.56	4410.31	196.75	4.00	1638.50	1634.50	49.50	8.3431	195.91	100.43%
2	17M000375	4154.98	4350.34	195.36	4.00	1638.50	1634.50	49.50	8.3431	195.91	99.72%
3	17M000388	3236.84	3434.03	197.19	4.00	1638.50	1634.50	49.50	8.3431	195.91	100.65%
4	17M000390	4181.32	4376.94	195.62	4.00	1638.50	1634.50	49.50	8.3431	195.91	99.85%
5	17M000392	4198.78	4393.98	195.20	4.00	1638.50	1634.50	49.50	8.3431	195.91	99.64%
6	17M000553	4354.18	4548.70	194.52	4.00	1638.50	1634.50	49.50	8.3431	195.91	99.29%

Time (min) = **5.01** Flow (gpm) = **23.20**

20 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H ₂ O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4461.54	4578.33	116.79	172.00	1141.00	969.00	49.20	8.3432	116.14	100.56%
2	17M000375	4401.17	4517.21	116.04	172.00	1141.00	969.00	49.20	8.3432	116.14	99.91%
3	17M000388	3485.29	3602.25	116.96	172.00	1141.00	969.00	49.20	8.3432	116.14	100.70%
4	17M000390	4427.81	4543.85	116.04	172.00	1141.00	969.00	49.20	8.3432	116.14	99.91%
5	17M000392	4444.70	4560.46	115.76	172.00	1141.00	969.00	49.20	8.3432	116.14	99.67%
6	17M000553	4599.22	4714.54	115.32	172.00	1141.00	969.00	49.20	8.3432	116.14	99.29%

Time (min) = **1.36** Flow (gpm) = **14.46**

15 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H ₂ O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4600.95	4620.73	19.78	22.80	187.00	164.20	49.30	8.3432	19.68	100.50%
2	17M000375	4539.75	4559.39	19.64	22.80	187.00	164.20	49.30	8.3432	19.68	99.79%
3	17M000388	3624.93	3644.71	19.78	22.80	187.00	164.20	49.30	8.3432	19.68	100.50%
4	17M000390	4566.37	4586.04	19.67	22.80	187.00	164.20	49.30	8.3432	19.68	99.95%
5	17M000392	4582.92	4602.53	19.61	22.80	187.00	164.20	49.30	8.3432	19.68	99.64%
6	17M000553	4736.99	4756.55	19.56	22.80	187.00	164.20	49.30	8.3432	19.68	99.39%

Time (min) = **1.02** Flow (gpm) = **9.43**


10 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H ₂ O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4627.70	4637.34	9.64	30.30	110.25	79.95	49.40	8.3431	9.58	100.60%
2	17M000375	4566.31	4575.83	9.52	30.30	110.25	79.95	49.40	8.3431	9.58	99.35%
3	17M000388	3651.68	3661.24	9.56	30.30	110.25	79.95	49.40	8.3431	9.58	99.76%
4	17M000390	4593.00	4602.61	9.61	30.30	110.25	79.95	49.40	8.3431	9.58	100.28%
5	17M000392	4609.48	4619.05	9.57	30.30	110.25	79.95	49.40	8.3431	9.58	99.87%
6	17M000553	4763.48	4773.00	9.52	30.30	110.25	79.95	49.40	8.3431	9.58	99.35%

Time (min) = **5.02** Flow (gpm) = **1.96**

2 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H ₂ O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4642.48	4652.30	9.82	4.20	86.25	82.05	49.80	8.3430	9.83	99.85%
2	17M000375	4580.83	4590.60	9.77	4.20	86.25	82.05	49.80	8.3430	9.83	99.34%
3	17M000388	3666.36	3676.14	9.78	4.20	86.25	82.05	49.80	8.3430	9.83	99.44%
4	17M000390	4607.63	4617.47	9.84	4.20	86.25	82.05	49.80	8.3430	9.83	100.05%
5	17M000392	4624.17	4633.91	9.74	4.20	86.25	82.05	49.80	8.3430	9.83	99.04%
6	17M000553	4778.12	4787.83	9.71	4.20	86.25	82.05	49.80	8.3430	9.83	98.73%

**Table 2. Utah Water Research Laboratory Flow Meter Evaluation
Master Meter 3/4" Sonata Meters**

Date: 11/20/18 - 11/21/18
By: M. Day, E. Naulu
Witness: -

Certified by: 

Time (min) = **25.03** Flow (gpm) = **0.40**

0.4 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H2O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4663.51	4673.57	10.06	129.50	213.65	84.15	52.45	8.3418	10.09	99.72%
2	17M000375	4601.76	4611.82	10.06	129.50	213.65	84.15	52.45	8.3418	10.09	99.72%
3	17M000388	3687.33	3697.32	9.99	129.50	213.65	84.15	52.45	8.3418	10.09	99.03%
4	17M000390	4628.66	4638.64	9.98	129.50	213.65	84.15	52.45	8.3418	10.09	98.93%
5	17M000392	4645.08	4655.04	9.96	129.50	213.65	84.15	52.45	8.3418	10.09	98.73%
6	17M000392	4798.99	4808.95	9.96	129.50	213.65	84.15	52.45	8.3418	10.09	98.73%

Time (min) = **75.03** Flow (gpm) = **0.15**

0.13 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H2O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4674.43	4685.38	10.95	31.90	123.75	91.85	55.00	8.3404	11.01	99.43%
2	17M000375	4612.69	4623.69	11.00	31.90	123.75	91.85	55.00	8.3404	11.01	99.83%
3	17M000388	3698.18	3709.12	10.94	31.90	123.75	91.85	55.00	8.3404	11.01	99.34%
4	17M000390	4639.50	4650.41	10.91	31.90	123.75	91.85	55.00	8.3404	11.01	99.07%
5	17M000392	4655.90	4666.86	10.96	31.90	123.75	91.85	55.00	8.3404	11.01	99.52%
6	17M000553	4809.80	4820.67	10.87	31.90	123.75	91.85	55.00	8.3404	11.01	98.70%

Time (min) = **101.77** Flow (gpm) = **0.11**

0.1 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H2O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4685.51	4696.92	11.41	124.85	220.60	95.75	53.60	8.3412	11.48	99.40%
2	17M000375	4623.83	4635.32	11.49	124.85	220.60	95.75	53.60	8.3412	11.48	100.09%
3	17M000388	3709.25	3720.70	11.45	124.85	220.60	95.75	53.60	8.3412	11.48	99.75%
4	17M000390	4650.55	4661.95	11.40	124.85	220.60	95.75	53.60	8.3412	11.48	99.31%
5	17M000392	4666.97	4678.37	11.40	124.85	220.60	95.75	53.60	8.3412	11.48	99.31%
6	17M000553	4820.80	4832.16	11.36	124.85	220.60	95.75	53.60	8.3412	11.48	98.96%

Time (min) = **200.00** Flow (gpm) = **0.07**

0.05 gpm tests											
Meter #	Meter S/N	Initial Reading	Final Reading	Indicated Volume	Initial Weight	Final Weight	Net Weight	Water Temp.	H2O Unit Weight	Actual Volume	Registry
(#)	(#)	(gal)	(gal)	(gal)	(lbs)	(lbs)	(lbs)	(deg F)	(lb/gal)	(gal)	(%)
1	17M000368	4697.03	4710.03	13.00	162.30	271.35	109.05	56.80	8.3393	13.08	99.41%
2	17M000375	4635.42	4648.50	13.08	162.30	271.35	109.05	56.80	8.3393	13.08	100.03%
3	17M000388	3720.80	3733.85	13.05	162.30	271.35	109.05	56.80	8.3393	13.08	99.80%
4	17M000390	4662.05	4675.06	13.01	162.30	271.35	109.05	56.80	8.3393	13.08	99.49%
5	17M000392	4678.48	4691.48	13.00	162.30	271.35	109.05	56.80	8.3393	13.08	99.41%
6	17M000553	4832.26	4845.18	12.92	162.30	271.35	109.05	56.80	8.3393	13.08	98.80%