

## **Overview of the Water Meter Test Project**

By Henry Oppermann, Weights and Measures Consulting  
For the California Agricultural Commissioners and Sealers Association  
October 17, 2012

**Objective:** Compare the accuracy and repeatability of test results for meter manufacturers, California DMS and participating county laboratories with the ultimate goal to improve agreement among all participants.

**Participants:** Five water meter manufacturers, California DMS, and California counties that choose to participate. DMS will provide the project coordinator who will facilitate adherence to the test and shipping schedule among the county laboratories. Henry Oppermann of Weights and Measures Consulting will witness testing at some laboratories and analyze the test results.

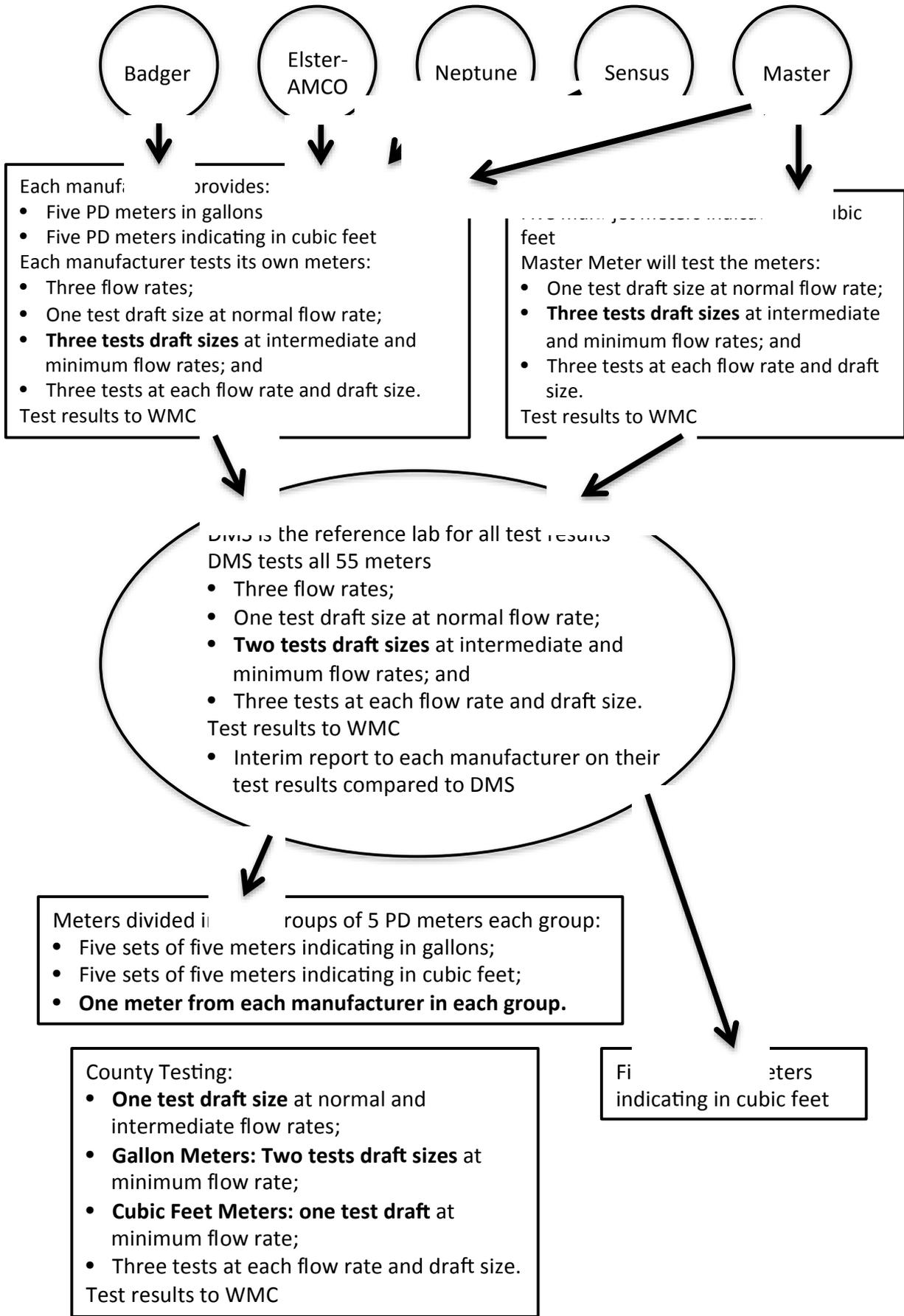
**Approach:** Each meter manufacturer will provide 10 PD meters; five with gallon registers and five with cubic feet registers. Additionally, one meter manufacturer will provide five multi-jet meters with cubic feet registers. Each manufacturer will test its own meters and send the meters to DMS, which will test all of the meters. DMS will be the reference laboratory for all test results.

After DMS testing, the PD meters will be divided into groups of five, with one PD meter from each manufacturer. The groups of five meters will be sent to the participating county laboratories based upon the type of reference standards in their laboratories, i.e., standards calibrated in gallons or cubic feet. County laboratories may participate in a round robin exercise or choose to run separate tests on one group of five PD meters. As an option in addition to testing the PD meters, county laboratories may choose to test the five multi-jet meters that indicate in cubic feet.

Henry Oppermann will witness some of the testing of water meters at DMS and for one day at each of up to 12 county laboratories to evaluate the standards, test setup and to see if there are any apparent differences in the test procedures. More than 12 county laboratories may participate in the project, but a DMS representative may witness tests at the laboratories in excess of 12. Any corrective actions will be up to DMS and the county laboratories.

**Analysis:** The project will focus on the accuracy and repeatability results for each laboratory. Weights and Measures Consulting will analyze the data for possible biases in test results and differences in the standard deviations from laboratory to laboratory for the different flow rates and the different sizes of test drafts. Additionally, round robin results will be evaluated with the Youden graphical analysis to further explore possible biases in test results.

**Test Report:** All data from the manufacturers and the participating county laboratories will be coded so that the test results by laboratory will be anonymous. Only Weights and Measures Consulting will have all of the codes for laboratories, manufacturers and meter test results. A final report will be issued and copies provided to all participants. Each participant will be provided the codes for its own test results so each laboratory can see how its results compare to the other laboratories.



## County Testing Options

Either

### Round Robin Tests

- Counties to test PD meters with gallon or cubic foot indicators that match their lab standards
- **Test two groups** of five meters at different time, i.e., as two independent sets of tests
- The same two groups of meters circulated to the other counties
- Read all meters in the normal manner
- **Option:** Additionally, read one or two meters in each group using an anti-parallax magnifier at the low and intermediate flow rates

Or

### Separate Tests

- Counties to test PD meters with indicators that match their lab standards
- **Test one group** of five meters
- Read all meters in the normal manner

### Optional Testing of Multi-Jet Meters

In addition to testing the PD meters, counties may test the five multi-jet meters that indicate in cubic feet.

## Draft of Data Sheet for County Laboratories: Round Robin Exercise

gd 23 may '12

(2012 Cal HB44 testing 0522)

Draft test program, 5/8" PD water meters to be tested by manufacturers, CalDMS, and multiple California County jurisdictions  
--Assessing meter performance and test capabilities of jurisdictions

**TAB 3: ROUND ROBIN GROUPS, GALLON REGISTRATION, MULTIPLE COUNTIES**

III. Two groups of meters, rotated separately between multiple counties with gallon volumetric standards

A. First group, meters with 10-gallon ("G") test circles (one from each of the five manufacturers -- A, B, C, D and E)

		15 gpm x following draft		
Meter		50 gal	50 gal	50 gal
Meter Accu- racy	AG-1			
	BG-1			
	CG-1			
	DG-1			
	EG-1			
Actual rate of flow				

(nom test time, mins:) 3.33 3.33 3.33

(comments:) draft size  
from HB 44

2 gpm x following draft		
10 gal	10 gal	10 gal

5 5 5

draft size  
from HB 44

1/4 gpm x following draft			1/4 gpm x following draft		
10 gal	10 gal	10 gal	5 gal	5 gal	5 gal

40 40 40 20 20 20

draft size from  
AWWA M6

draft size  
from HB 44

205.0 (cumulative test  
time, mins)

B. Second group, additional meters with 10-gallon ("G") test circles (one from each of the five manufacturers -- A, B, C, D and E)

		15 gpm x following draft		
Meter		50 gal	50 gal	50 gal
Meter Accu- racy	AG-2			
	BG-2			
	CG-2			
	DG-2			
	EG-2			
Actual rate of flow				

(nom test time, mins:) 3.33 3.33 3.33

(comments:) draft size  
from HB 44

2 gpm x following draft		
10 gal	10 gal	10 gal

5 5 5

draft size  
from HB 44

1/4 gpm x following draft			1/4 gpm x following draft		
10 gal	10 gal	10 gal	5 gal	5 gal	5 gal

40 40 40 20 20 20

draft size from  
AWWA M6

draft size  
from HB 44

205.0 (cumulative test  
time, mins)

C. Overview:

- Plan is to have third-party over-sight/witnessing for testing on one of the two groups, other group tested (on separate day?) with only county staff on-hand
- Test time for each group of five meters is roughly 3 1/2 hours, so a total of 7 hours for all ten meters, per county
- Total number of meters is ten, with same ten tested by all "gallon" round-robin participants
- Goal would be to have a total of 7-to-9 participating counties in total, distributed between "gallon" and "cubic foot" round-robin participants