



DIVISION OF WATER RESOURCES

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June 1, 2009

TO: APPROVED WELL TESTERS

FROM: COREY T. DEANGELIS, CHIEF – WATER MEASUREMENT BRANCH
DIVISION OF WATER RESOURCES, **DIVISION 3**

SUBJECT: MEASUREMENT RULE POLICY 2008-3.1.C (AMENDED 06012009)

- **CLARIFICATION AND MINIMUM REQUIREMENTS FOR FIELD VERIFICATION PROCEDURES AND FIELD CALIBRATIONS OF TOTALIZING FLOW METERS**
 - VERIFICATION MINIMUM REQUIREMENTS
 - EXISTING TFM
 - VERIFICATION TEST METERS
 - REQUIRED REPORTING – FORM 3.1

EFFECTIVE DATE: June 1, 2009

Ammendments to POLICY 2008-3.1.C (AMENDED 06012009) are noted below. Additions are noted in italics and deletions are noted with a strikethrough, as follows:

1. Modified requirements regarding the testing/certification of Mechanical Type Flow Meters, as follows (page 3):
 - MECHANICAL TYPE (i.e. propeller) FLOW METERS:
 - A MINIMUM of three separate volume readings, each spanning a minimum of 5 minutes, OR a single volume reading spanning a minimum of 15 minutes, from **BOTH** the **INSTALLED AND TEST** flow meterS totalizing feature must be obtained for a test to be considered valid.
2. Modified requirements regarding the testing/certification of Magnetic or Ultrasonic Type Flow Meters, as follows (page 3):
 - MAGNETIC OR ULTRASONIC TYPE FLOW METERS:
 - A minimum of three separate volume readings from **BOTH** the **INSTALLED AND TEST** flow meterS totalizing feature must be obtained, each spanning a minimum of 5 minutes, OR a single volume reading spanning a minimum of 15 minutes, UNLESS the time for the totalizing feature on the installed flow meter to advance the smallest recording digit (one increment) EXCEEDS 15 minutes.

PURPOSE:

This MEASUREMENT RULE POLICY pertains to RULE 3.1 of the **RULES GOVERNING THE MEASUREMENT OF GROUND WATER DIVERSIONS LOCATED IN WATER DIVISION NO. 3, THE RIO GRANDE BASIN (RULES)**.

- Rule 3.1.1 of the Rules states that “an installed flow meter shall be deemed to be in accurate operating condition when the flow measured by the meter is within plus or minus 5% of an independent field measurement made using calibrated test equipment. The Division Engineer shall order any meter that fails to meet this standard to be recalibrated or replaced.
 - Rule 3.1.2 of the Rules states “Totalizing flow meters shall be: properly verified in the field to be in accurate working condition by.....A Qualified Well Tester. Totalizing flow meters are required to be reverified in the field to be in accurate working condition by a Qualified Well Tester every four years after....” Initial verification.
 - This POLICY addresses the REQUIRED MINIMUM REQUIREMENTS FOR FIELD VERIFICATION OF FLOW METERS.
 - This POLICY addresses the REQUIRED PROCEDURES and ALLOWABLE CIRCUMSTANCES for the FIELD CALIBRATION OF EXISTING FLOW METERS.
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POLICY FOR MINIMUM REQUIREMENTS FOR FIELD VERIFICATION (TESTING) OF EXISTING FLOW METERS:

- Division of Water Resources, Division 3 REQUIRES that for a Totalizing Flow Meter (TFM) Verification to be considered acceptable, the following outlined MINIMUM requirements MUST be accomplished and adequately documented during the field verification of a flow meter. In addition, all work must be clearly documented and correct on Form 3.1 submitted to our office.
- All wells shall be pumped continuously a minimum of 15 minutes before any TFM verification measurement readings are recorded (“start-up” time).
- Wells shall be verified accurate under all working conditions. This may require more than one test or numerous documented visual observations for a single TFM under differing operating discharge conditions. For example:
 - Wells that flow artesian (divert water without the use of mechanical device – pump) and are pumped. It is necessary to confirm that a full-pipe condition at the TFM is maintained under all conditions. Also, it is necessary to confirm that the TFM is accurate under both the pumped and artesian flow conditions, separately.
 - It is necessary to Visually Confirm that Wells with multiple discharge conditions, such as a pressurized discharge to a pond or sprinkler system as well as an open discharge, always maintain a full-pipe condition at the TFM. Also, it is necessary to confirm that the TFM is accurate under ALL discharge conditions.
 - A TFM that measures the flow from more than one well must be accurate under ALL OPERATING CONDITIONS. Therefore, it may be necessary to provide more than one test or observation including all possible flow conditions. For example: one well on and one well off, then both wells running simultaneously, etc.

- If multiple wells equipped with a single flow meter are tested individually, not simultaneously, then observations of the installed flow meter shall be made separately during each individual well test.

➤ **Instantaneous readings from a Mechanical type flow meter ARE NOT ALLOWED FOR VERIFICATION PURPOSES.**

➤ **MECHANICAL TYPE (i.e. propeller) FLOW METERS:**

- A MINIMUM of three separate volume readings, each spanning a minimum of 5 minutes, OR a single volume reading spanning a minimum of 15 minutes, from **BOTH** the **INSTALLED AND TEST** flow meterS totalizing feature must be obtained for a test to be considered valid.
- The smallest allowable increment for the readings from the totalizing feature is at least one revolution of the smallest moveable digit. (For example: if the smallest digit recorded by the totalizing feature is 0.1 acre-feet, the smallest allowable volume reading for each of the three separate readings is the time for 0.1 acre-feet to be recorded.)
- The calculated flow rate (volume/time) shall not change more than 2.5% between any readings.
- NO Instantaneous readings are allowed for Mechanical type flow meters.

➤ **MAGNETIC OR ULTRASONIC TYPE FLOW METERS:**

- The Totalizing feature of the flow meter MUST be used for flow meter verification on both the installed and test meters.
- The well shall be pumped continuously a minimum of 15 minutes before any observations (readings) are recorded (“start-up” time).
- A minimum of three separate volume readings from **BOTH** the **INSTALLED AND TEST** flow meterS totalizing feature must be obtained, each spanning a minimum of 5 minutes, OR a single volume reading spanning a minimum of 15 minutes, UNLESS the time for the totalizing feature on the installed flow meter to advance the smallest recording digit (one increment) EXCEEDS 15 minutes.
- If the time for the totalizing feature on the installed flow meter to advance the smallest increment exceeds 15 minutes, instantaneous flow meter readings of the installed flow meter may be allowed in-lieu of the totalizing feature readings. The instantaneous flow readings MUST consist of a minimum of 10 separate instantaneous readings taken over a minimum time period of 15 minutes, not including the ‘start-up’ time. The instantaneous flow rates taken shall not vary by more than 2.5% between any readings or more than 2.5% from the totalized reading from the test meter. The Totalizing feature of the test meter MUST be used (no instantaneous observations will be allowed).
- All time increments, including start-up, must be documented on Form 3.1 for test to be considered valid.

➤ TEST METER – COLLINS-TYPE FLOW METERS:

- The well shall be pumped continuously a minimum of 15 minutes before any readings are taken with the COLLINS-TYPE TEST METER.
- A TWO-POINT TEST shall be accomplished by taking a front and back reading on both sides of the pipe at a distance equal to 0.353*I.D (inside diameter) from the center of the pipe. The reading from each side of the pipe shall be averaged separately. If the difference between the average velocities from each side of the pipe is more than 1 foot difference, a 10-POINT TEST MUST be performed. A 2-POINT TEST WILL NOT be accepted.
- If the Collins Tube TEST METER is located less than 3 pipe diameters from any obstruction such as a flow meter, bend, valve, reduction, etc., a 10-POINT TEST IS REQUIRED.
- Collins Tube test shall be accomplished a minimum of 3 pipe diameters upstream or 1 pipe diameter downstream of the existing installed flow meter. Written documentation (on Form 3.1) of flow rate recorded by the existing flow meter should be made after the removal of the Collins Tube to confirm that the Collins Tube obstruction during the test does not cause inaccuracies to the installed flow meter.
- For **Flow Constants (Gallons/minute/foot/seconds)** not listed on the Collins Tube Chart the following equation(s) should be used (The following equations can ALWAYS BE USED):

→ Pipe sizes up to 10-inch NPS:

$$(2.55 * D^2) - D$$

→ Pipe sizes over 10-inch NPS:

$$(D^2 * 2.45)$$

Where D = Inside Diameter (inches)

➤ FORM 3.1 – Totalizing Flow Meter Verification FORMS:

- All fields that are applicable to the subject well being tested must be completed and correct on Form 3.1 to be considered a valid verification test.
- If a test fails and the Flow Meter is recalibrated in the field, the failing and passing test MUST both be submitted together. If applicable, the k-factor setting for both the failing and passing test MUST be included at the bottom right-hand side of page 3 of Form 3.1.
- All work must be documented on the form and correct for the verification test to be considered acceptable. Any incomplete or incorrect Forms will be returned to the tester for corrections.
- ALL Programmable Flow Meters must at all times be securely equipped with a tamper resistant cover. The tamper resistant cover shall be “sealed” in place with the use of a wire cable that is secured in place by a clamp or other mechanism. The clamp or “seal” shall contain a number or other identifying mechanism, which is recorded on Form 3.1. In order for the cover and seal to be considered adequate (tamper resistant) by the Division of Water Resources, it must not allow any modifications to the programmable functions of the flow meter without the breakage of the seal during access to the programmable functions of the flow meter.
- A meter verification (Form 3.1) will NOT be considered complete by the Division of Water Resources unless the new and removed Seal Number are provided on Page 3 of the Form, verifying that the flow meter was “re-programmed”.
- All tests completed after April 10, 2008 must be submitted on Form 3.1 with the text Updated 04/01/08 located in the lower right-hand corner of Form 3.1.

If you have any questions regarding this MEASUREMENT POLICY, contact DIVISION 3 GROUND WATER MEASUREMENT BRANCH at 719-589-6683: Corey T. DeAngelis (Ext. 3105).