BUREAU OF LAND MANAGEMENT
TESTING PROCEDURES and RECOMMENDATIONS[1]
FLOW CONDITIONER

PART 1: GENERAL

1. PURPOSE OF TESTING PROCEDURES

The Bureau of Land Management (BLM) measurement regulations for oil (43 CFR 3174) and gas (43 CFR 3175) establish a Production Measurement Team (PMT) that "reviews changes in industry measurement technology, methods, and standards to determine whether regulations should be updated, and provides guidance on measurement technologies and methods not addressed in current regulation. The purpose of the PMT is to act as a central advisory body to ensure that oil and gas produced from Federal and Indian leases is accurately measured and properly reported." 43 CFR 3170.3.

The PMT will review specific makes, models, and sizes of measurement equipment to verify device performance. The goals are to determine whether device performance meets a minimum requirement, confirm the absence of statistically significant bias, and ensure the verifiability of a metering system. These goals are based on requirements of the BLM's oil and gas measurement regulations. See 43 CFR 3175.31. If the PMT concludes that the use of the specific make, model, and size of the device meets these three goals, it will recommend the BLM approve this make, model, and size of device, subject to any appropriate restrictions (conditions of approval). Upon approval, the BLM will post the make, model, and size of device on the list of approved equipment at www.blm.gov, along with any conditions of approval. Any operator of any federal or Indian lease may then use a BLM-approved device without any further review or approval.

Performance Requirements

Volume Measurement Uncertainty

In order to ensure that a measurement system meets the required overall volume measurement uncertainty specified for the flow category, the Production Measurement Team (PMT) has set a Maximum Permissible Error (MPE) for each component of the system. This analysis is based on the sensitivity of the overall reported value to each component by modeling changes to each component over an expected range and calculating a maximum sensitivity for each component. The maximum sensitivities are then used to determine the MPE of each component. The overall system performance that the systems must meet are found in 43 CFR 3175.31.

[1] This is a guidance document. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. The document is intended only to provide clarity to the public regarding existing requirements under the law or agency regulations.

Statistically Significant Bias

The PMT will only recommend approval of those devices without statistically significant bias as determined by the Threshold of Significance as defined in 43 CFR 3170.3.

Verifiability

While the focus of the testing procedures is on device uncertainty, bias, and operating limitations, 3174.4(c) and 3175.31(d) also establish verifiability as one of the key performance requirements of any measurement device or procedure at an FMP. Verifiability includes the ability of the BLM to independently calculate the quantity and quality values reported to the federal government for oil and gas removed or sold from the lease based on source records and field observations.

If the PMT determines the BLM cannot independently verify the performance of the device, the PMT will not recommend approval of the device regardless of how well it may perform. An application for approval should contain a detailed description of how the device or method achieves the verifiability performance standard.

Conditions of Approval

Equipment will be approved for ranges of operation. These approvals are termed the Conditions of Approval (COA). The COAs state the ranges over which the approved device may operate in the field based on the PMT analysis of the results of this testing procedure.

The MPE may change based on the overall system performance levels indicated above. Therefore, the same device may be approved for a wider range for one level of system than another. Additionally, a device may not be approved for one level of system but may be approved for use on another level. For example, a meter might be approved for an operating range for the 3% uncertainty category that is much wider than the range it would be approved for in the 2% uncertainty category.

Special Considerations for Isolating Flow Conditioners

The performance of the metering system will be calculated as described in API MPMS 14.3.1 Subsection 12. See 43 C.F.R. § 3175.31(a)(4). The approved flow conditioner will not be included as a measurement component contributing to the overall measurement system uncertainty. Since flow conditioners passing the API 14.3.2, Annex D testing have been shown to create no additional uncertainty outside of the existing uncertainty in the discharge coefficient equation, the BLM will only use the test data to verify installation requirements and create conditions of approval. The BLM will not use results from these tests to determine a flow conditioner's uncertainty. No additional uncertainty contribution due to a flow conditioner will be included in the overall measurement uncertainty, as determined by the BLM's uncertainty calculation.

2. MODEL NUMBERS AND SOFTWARE VERSIONS

A model number should represent a unique design and manufacturing process at a manufacturing facility for which the performance outcomes derived by these testing procedures will apply. The device manufacturer should provide a way for the BLM to easily differentiate the new device from previous models in the field.

Model numbers can contain both critical and non-critical characters. A critical character is a part of the model number that indicates an aspect of the device that affects the performance of the device, whereas a non-critical character identifies a feature or add-on that does not affect the performance of the device. For example, the model number of "YRF-121A6S4" has the following meaning:

"YRF-121" is the base model number of the device

"A" represents the meter size

"6" represents the range

"S" represents the material of construction

"4" represents the type of connection to the process piping

In this example, the PMT would only recognize "YRF-121A6" as the model number if testing demonstrates that neither the material of construction nor the type of connection affects device performance. Therefore, all variations of material of construction or type of connection would be included in the PMT recommendation of device approval. It is critical that a device manufacturer indicate in the application the parts of the model number that have measurement implications. If non-metrological elements of the overall model number are not identified as part of the application, the PMT will assume the approval applies only to the complete model number provided, and therefore all model number variations will require a separate approval.

A software version, most commonly referred to as firmware version, must represent a unique computer code for which the performance of the software will apply. As with model numbers, the PMT is only concerned with software versions, or changes to software versions, that involve the calculation of quantity or quality or the BLM's ability to verify those calculations. If the manufacturer's testing indicates that an updated software version does not affect the calculation of quantity or quality, or the BLM's ability to verify those calculations, the manufacturer must notify the PMT of the new software version in order for the approval to be updated. Ideally, the critical characters of the software version would remain constant and maintain the approval with only non-critical characters changing in updates that do not affect the performance.

3. MODEL UPDATES OR CHANGES IN MANUFACTURING PROCESS

Any change in the design or manufacturing process that affects, or has the potential to affect, the performance of the device requires a new application to the PMT. For example, a manufacturer submits a differential pressure meter, with a model number of "YRF-121A6S4" to the PMT for testing and the BLM approves it. This particular model has a wetted-surface roughness of 50 micro-inches. At some point, the manufacturer changes the manufacturing process that results in a surface roughness of 100 micro-inches. Because the wetted surface roughness has the potential to alter the performance of this device, the device must be re-tested for PMT review and BLM approval. If it is determined that the device performance changes as a result of a design or manufacturing process change, the manufacturer should include a way to distinguish the modified device from the previously approved device. For example, the manufacturer could assign a new model number to the modified device.

4. APPROVAL OF A RANGE OF SIZES (FAMILY OF DEVICES)

The PMT will only consider recommending approval for the size of device which was submitted. The PMT may consider recommending a range of sizes for approval if test data demonstrates that the test results from two or more sample sizes can accurately indicate the performance of other sizes in the same model family. The PMT may consider other approaches for approval of a family of devices model. A manufacturer may contact the PMT for specific information how to seek a family of devices consideration. API 14.3.2, Annex D, and API 22.2 cover this concept for flow conditioners and differential meters other than flange-tapped orifice plates, respectively.

5. SELECTION OF DEVICES TO TEST

The following sample sizes are to be used based on annual production of devices for the intended use of liquid hydrocarbon measurement.

Units per Year	Minimum Number of Devices Tested
2 – 50	2
51 – 500	3
501 – 35,000	5
35,001+	8

If a device is manufactured at more than one facility, each facility's device shall be considered as a separate device for the purpose of this testing and shall be noted as such through the model number.

The manufacturer should provide the BLM with a method for selection of random samples for the testing. This methodology should be included in the test report as describe in Section 6.3.4 of Part 2.

6. MANNER IN WHICH DEVICE IS SUBMITTED TO THE TESTING FACILITY

Devices submitted to a test facility for testing under these procedures should be delivered in the same manner as if they were delivered to a customer in the field. For example, if the manufacturer determines and adjusts for the characteristics of each individual device that comes off the assembly line in normal practice, the same procedure should be used for the devices submitted to the test facility. If, on the other hand, the manufacturer applies default, generic, and/or normal configuration settings and/or adjustments for characteristics to the device in normal practice, those same characteristics and/or settings and adjustments should be used for this evaluation and testing.

7. DEVICES MARKETED UNDER A DIFFERENT NAME

In some cases, the make and model of a device that the BLM will encounter in the field may actually be manufactured by a different entity with a different make and model number (e.g., a device marketed by a different company under a private label with a different nameplate and model number). If either the original manufacturer or the private label submitted data for the device to the PMT for review, and the BLM approved it, the PMT may consider extending the approval recommendation to the other company, without requiring additional testing. The PMT would only consider this if:

7.1 An authorized representative of the manufacturer submits a letter to the PMT confirming the manufacturer manufactures the device and supplies it to the entity marketing the device;
Provides concurrence that the marketing company is licensed to market the device under a different name and model number; and
Includes the specific model number(s) and size(s) of devices the manufacturer supplies to the marketing company

7.2 - An authorized representative of the marketing company submits a notarized affidavit to the PMT listing <u>all</u> changes the marketing company make to the device; or
Certifying that the marketing company receives the device from the manufacturer and rebrands the device without making any changes to the device or its settings that would affect the performance of the device; and
Providing a cross reference between the model number provided by the manufacturer with the model number placed on the device by the marketing company, if applicable.

If the conditions of 7.1 and 7.2 are met, the alternate company can contact the PMT to have the equivalent model added to the list of approved equipment.

8. CHANGE OF COMPANY NAME

A company that has purchased the assets of a manufacturer whose device is covered by a BLM approval, or has changed the name of the manufacturer, and that wishes to transfer the original manufacturer's approval to the new name, should submit a request for an approval to the PMT.

9. PATENT ISSUES

If multiple manufacturers make and market a product from the same patent, each manufacturer must apply for a separate approval. The PMT will only consider the data submitted and whether or not the device can meet the performance standards of 43 CFR 3174 or 3175 when reviewing the device and making a recommendation to the BLM.

10. MULTIPLE APPLICATIONS FOR A SINGLE DEVICE

If the PMT receives more than one application for a single device, the PMT will consider the information in the following order of priority:

- (1) Data received from the primary equipment manufacturer conducted at qualified test facilities not affiliated with the applicant
- (2) Data received from parties other than the primary equipment manufacturer conducted at qualified test facilities not affiliated with the applicant; such data will have to be shown to have been submitted in good faith

11. DATA FORMAT

Raw test data should be submitted in a single electronic .xls, .csv, or .txt format and test results analysis or summary must be in a single format that does not require special software to review.

12. PROPRIETARY AND CONFIDENTIAL INFORMATION

The Freedom of Information Act ("FOIA") provides that any person may obtain records from a federal agency upon request. *See* 5 U.S.C 552(a)(3)(A). However, FOIA also provides that certain types of records are exempted from the agency's general obligation to release records in response to a request. 5 U.S.C § 552(b). Importantly, 5 U.S.C. § 552(b)(4) establishes an exemption for "trade secrets and commercial or financial information obtained from a person and privileged or confidential." This FOIA exemption is commonly referred to as "Exemption 4." When trade secrets and/or commercial or financial information is voluntarily provided to an agency, it is considered "confidential," and therefore protected from release under Exemption 4, when it is the kind of information that would customarily not be released to the public by the person or entity who submitted it to the agency. *See e.g.*, *Judicial Watch v. Department of the Army*, 466 F.Supp.2d 112, 125 (D.D.C. 2006).

The Department of the Interior (Department) has enacted regulations that establish the procedures the BLM will follow in handling confidential information that is requested under FOIA. *See* 43 C.F.R. § 2.26-2.36. The Department encourages submitters of confidential information to designate materials as confidential at the time of submission. *Id*. at § 2.26. This

assists the BLM in successfully identifying information that is potentially protected from release under Exemption 4. Marking materials as confidential also triggers a requirement that BLM notify the submitter of a FOIA request seeking those materials. *Id.* at § 2.27

The BLM will notify a submitter when it receives a FOIA request for information that has been designated as confidential or, though it has not been marked as confidential, is otherwise identified by the BLM as potentially confidential information. *Id.* The submitter will then have an opportunity to object to the release of the information. *Id.* §§ 2.28, 2.30. The necessary contents of an Exemption 4 objection statement are detailed at 43 C.F.R. § 2.31. If the submitter does not respond to the notice within the timeframe specified, the submitter will be considered to have no objection to disclosure of the information. *Id.* § 2.30(b).

The BLM, not the submitter, is ultimately responsible for deciding whether the information will be released. *Id.* § 2.32. If the BLM decides to disclose the information over the submitter's objections, the BLM will notify the submitter and provide an explanation of why the submitter's objections do not support withholding the information. *Id.* § 2.33. If the BLM decides to withhold the information and a lawsuit is filed seeking to compel disclosure of the information, the BLM will promptly notify the submitter of this development. *Id.* § 2.34.

If the BLM determines that the requested information is protected from release under Exemption 4, the BLM has no discretion to release that information. *Id.* § 2.36. Release of information protected from release by Exemption 4 is prohibited by the Trade Secrets Act (18 U.S.C. § 1905). 43 C.F.R. § 2.36.

Additional information on the Department's FOIA process can be found in the Department's Freedom of Information Act Handbook (383 DM 15) and in the Bureau of Land Management's FOIA Manual (1278 – External Access to BLM Information **)**

Part 2: Flow Conditioner Test Procedure (Gas)

43 C.F.R. § 3175.46 Isolating flow conditioners.

> The BLM will list on www.blm.gov the make, model, and size of isolating flow conditioner that is approved for use in conjunction with a flange-tapped orifice plate, so long as the isolating flow conditioner is installed, operated, and maintained in compliance with the requirements of this section. Approval of a particular make and model is obtained as prescribed in this section.
>
> (a) All testing required under this section must be performed at a qualified test facility not affiliated with the flow-conditioner manufacturer.
> (b) The operator or manufacturer must test the flow conditioner under API 14.3.2, Annex D (incorporated by reference, see § 3175.30) and submit all test data to the BLM.

(c) The PMT will review the test data to ensure that the device meets the requirements of API 14.3.2, Annex D (incorporated by reference, see § 3175.30) and make a recommendation to the BLM to either approve use of the device, disapprove use of the device, or approve it with conditions for its use.
(d) If approved, the BLM will add the approved make and model, and any applicable conditions of use, to the list maintained at www.blm.gov.

1. General Approval Process Statement

The PMT will only review the information provided by the testing facility that complies with the performance testing defined in API MPMS 14.3.2 Annex D. The results from this data will inform the COA for the device. If the testing is done in a limited number of conditions, it will result in a very narrow approval for use in the field. Testing that does not comply with API MPMS 14.3.2 Annex D will not be considered in the PMT review. The approval for flow conditioning devices will include flow conditions and installation configurations allowed for use at an FMP.

The performance of the metering system will be calculated as described in API MPMS 14.3.1 Subsection 12. See 43 C.F.R. § 3175.31(a)(4). The approved flow conditioner will not be included as a measurement component contributing to the overall measurement system uncertainty. The installation requirement will be part of the COAs.

2. Definitions

For the purpose of this testing procedure, the following definitions apply:

2.1 *Flow conditioner* means a device that redistributes the flow profile to one more closely resembling that of an ideal flow profile, and accurately replicates the orifice plate coefficient of discharge database values. A flow conditioner also effectively removes the swirl in the flow pattern.

2.2 *Flow straightener or straightening vane* means a device that effectively removes the swirl in the flow pattern, but generally has limited ability to produce a flow profile that closely resembles an ideal flow profile. The only acceptable flow straightener is the 1998 Uniform Concentric 19-Tube Bundle Flow Straightener built in accordance with API MPMS 14.3.2. The 1998 Uniform Concentric 19-Tube Bundle Flow Straighteners constructed in compliance with API 14.3.2, Subsections 5.5.2 through 5.5.4, and located on installation in compliance with API 14.3.2, Subsection 6.3, do not require BLM approval.

3. General Test

3.1 The flow conditioner testing procedure is contained in API 14.3.2 Annex D. API 14.3.2 and may be accessed at the API read-only site: https://www.api.org/products-and-services/standards/rights-and-usage-policy#tab-ibr-reading-room.

3.1.1 The PMT will only recommend approval of these devices under the installation parameters identified in this test procedure. The API 14.3.2, Annex D, test procedure has two tests: Test TD1, and Test TD2. Note: Test TD2 provides for a wider range of application.

3.1.2 Since flow conditioners passing the API 14.3.2, Annex D testing have been shown to create no additional uncertainty outside of the existing uncertainty in the discharge coefficient equation, the PMT will only use the test data to verify installation requirements and create conditions of approval. The PMT will not use results from these tests to determine a flow conditioner's uncertainty. No additional uncertainty contribution due to a flow conditioner will be included in the overall measurement uncertainty, as determined by the BLM's uncertainty calculation.

3.1.3 The orientation of the flow conditioner has the potential to impact performance. Therefore, the orientation and flow direction should be identified in the testing and will be part of any COA.

4. Test Facility and General Test Recommendations

4.1 Facility uncertainty: For each performance test, the test report should document the facility uncertainty associated with the test.

4.2 Reference ambient conditions should be within the following ranges:

Temperature (ambient): 60°F to 95°F.

Relative Humidity: 25% to 75%.

Atmospheric pressure: 11 PSI to 15 PSI.

Ambient conditions should be documented at the start and end of each performance test. During each test, the temperature should not vary more than ± 10°F, and relative humidity should not vary more than ± 10% within reference range.

4.3 No adjustments of the testing system, device, or any of its elements should be made during the course of any performance test. If adjustments are necessary, the adjustments should be documented and justified in the test report.

4.4 Test Fluid: The flow conditioner should be tested using the fluid to be measured in field use or a fluid whose flow characteristics are sufficiently similar to fulfill the test requirements without inducing bias. Fluid type should be documented in the test report.

4.5 If an applicant would like to submit existing data from a testing facility that does not conform to the recommendations of this section, the applicant should communicate with the PMT prior to submitting a test report.

5. Test Report Content

5.1. Summary of tests and results and conclusions
5.2. Test facility information
- 5.2.1. Name and location of the facility
- 5.2.2. A statement that the facility's measurement systems for mass, length, time, and temperature are traceable to NIST primary standards or other primary standards approved by the BLM.
- 5.2.3. The uncertainty determined at a 95% confidence level of each standard used in the testing. If the uncertainty of a standard is a function of the magnitude of the variable tested, the report should include the uncertainty of the standard at each test point. The report should include a complete description of how the uncertainty or uncertainties were determined.
- 5.2.4. Date and time of each test
- 5.2.5. Description of fluids used, including viscosity, composition, and density
- 5.2.6. Log of all required baseline conditions (temperature, humidity, atmospheric pressure, etc.) taken over the test periods.

5.3. Device information
- 5.3.1. Name of the device manufacturer
- 5.3.2. Type, name, and description of the device
- 5.3.3. Model number, size/range, and serial number of each device tested
  - 5.3.3.1. Identify critical and non-critical characters of the model number
  - 5.3.3.2. Provide description of what critical characters represent (See Part 1 Sec2 of this document)
  - 5.3.3.3. Provide description of what non-critical characters represent (See Part 1 Sec2 of this document)

- 5.3.4. Methodology used for random selection of devices
- 5.3.5. A description and drawing of the test facility piping for device testing
- 5.3.6. All configuration parameters for each meter tested

5.4. Device Specifications
- 5.4.1. The applicant should provide a detailed dimensional drawing of the device under test.
- 5.4.2. If the application is seeking approval for a family of devices, detailed dimensional drawings of each make, model, and size should be included in the application.

5.5. Test results
- 5.5.1. Clear indication of the test type (baseline, influence test: type of influence, etc.)
- 5.5.2. Clear indication of the make, model, size/range for which the results apply
- 5.5.3. Test parameters including flow rate, fluid properties, pressure, temperature, etc.
- 5.5.4. Table of the results of each test required in this procedure
- 5.5.5. Comments regarding any difficulties, upsets, or unexpected events

5.6. Data format

Raw test data should be submitted in a single electronic .xls, .csv, or .txt format and test results analysis or summary should be in a single format that does not require special software to review.

5.7. Statement of ambient conditions

Example: Ambient Conditions

	At start	At end
Temperature °F		
Relative humidity %		
Atmospheric pressure psia		
Time		

Notice to Applicants

Please direct any questions or concerns about the contents of these testing procedures to the PMT via the email PMT@blm.gov. Only questions or concerns directed to PMT@blm.gov email will be considered.