Requirements for Certification

GS-ENG-03-06: Gas Measuring Apparatuses Containing Rotary Meters Used for the Purpose of Calibrating Diaphragm Meters

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RECORD OF CHANGE

Revision	Date	Description
0.1	2003-05-07	Original name GS-Eng-03-Nobell.rev3.wpd
0.2-0.3	2004-10-20	Section 8.2 and 9.0 revised to emphasize check meter usage
0.3-0.5	2004-11-02	Section 9.0 revised to add comments from PDD e-mail Dated Tue 2004-10-26 11:15
0.6	2006-09-26	Added discussion of control charting and measurement uncertainty
0.7	2006-09-26	Editorials
0.8	2007-01-12	Added section 11.0
0.9	2007-02-01	Clarification of use of level 1 & 2 Master Bell Provers, alternative check meters and expanded scope to include additional diaphragm meters
1.0	2007-02-02	Editorials
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3.1	2007-10-11	Title change
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4.1	2010-01-27	Editorials
4.2	2010-12-06	Editorials to match translated version

1.0 Scope

The purpose of this Instruction is to clarify the process of certification of a gas measuring apparatus containing rotary reference meter(s) used for the purpose of establishing the performance of diaphragm meters. This document must be read in conjunction with the references listed below.

2.0 Authorization

This Certification Requirement has been issued under the authority delegated to of the Senior Engineer – Gas Measurement, for the purpose of setting out requirements for the Certification of Gas Measuring Apparatuses Containing Rotary Meters Used for the Purpose of Calibrating Diaphragm Meters.

3.0 References

(a) *Electricity and Gas Inspection Act (R.S., 1985, c. E-4)*

(b) *Electricity and Gas Inspection Regulations (SOR/86-131)*

(c) S-G-01, *Specifications for the Calibration, Certification and Use of Gas Measuring Apparatus - Working Level Sonic Nozzle Provers,*

(d) S-S-02, *Measurement Uncertainty and Meter Conformity Evaluation Specification, Measurement Canada,*

(e) GS-ENG-02-10: *Evaluation Guidelines for the Certification of Reference Meters Used In Low Pressure Measuring Apparatus*,

(f) GS-ENG-04-01: *Gas Measuring Apparatus – Atmospheric Pressure Meter Proving Systems Containing Traceable Reference Standards*

(g) GS-ENG-06-01: *Recommendations for the Determination of Measurement Uncertainty, In Meter Inter-comparisons,*

(h) GS-ENG-07-02: *Temperature and Humidity Measurements in Prover Rooms,*

(i) GS-ENG-07-10: *The Selection, Calibration and Application of Working Level Direct Reading Pressure Measuring Instruments,*

(j) GS-ENG-08-03: *Exploration of the traceability chains used in the verification of domestic gas meters,*

(k) Bulletin G-16, *Recognition of Test Data from Gas Meter Test Facilities*, Measurement Canada,

(l) Bulletin GEN-09 (rev. 1*), Delegation of Authorities*, Measurement Canada,

(m) C-D-01:2006 - Conditions for the Delegation of Authorities for the Calibration and Certification of Standards, Measuring Apparatus and Test Equipment Pursuant to the Electricity and Gas Inspection Act,

(n) *Guide to the Expression of Uncertainty in Measurement (GUM)* ISO, 1993,

(o) ISO/IEC 17025:2005(E), General *Requirements for the Competence of Testing and Calibration Laboratories.*

4.0 Administrative Definitions

Applicant: Owner, operator or their representative, of the measuring apparatus.

Designating Authority: Individual delegated the authority under the Electricity and Gas Inspection Act and associated Measurement Canada policies the responsibility of certification of a measuring apparatus.

Technical Evaluator (Inspector): Individual appointed by the Designating Authority and delegated under the Electricity and Gas Inspection Act and associated Measurement Canada policies to perform certification testing of a Gas Measuring Apparatus.

5.0 Introduction and Background

Measurement Canada certification procedures for gas measuring apparatus can generally be divided into two basic types or categories. The first is based on a set of methods and philosophies presented in the current bell prover and sonic nozzle prover specifications. The second is based on common practices and experience with rotary meter transfer provers and large test facilities.

In the case of rotary meter provers used for the purpose of verifying diaphragm meters, an examination of the two methods reveals that there is no great compelling technical reason to choose one method over the next. This is not to suggest that neither method would need to be adapted to fit rotary meter based diaphragm meter provers. The purpose then of the remainder of the document is to help establish the differences between the present bell prover and sonic nozzle prover specifications and those which need to be considered as a result of the differing technology base. This document recognizes the traditional method of on-going measuring apparatus correlation with a master bell prover but, allows for reduced frequency of correlations provided that a continual system monitoring is conducted using stable check meters.

6.0 Process Overview

When a measuring apparatus is of a design or type that is described by a certification requirement or specification and the applicant or operator wishes to use this apparatus for the purpose of verification, re-verification or compliance sampling under the authority of the Electricity and Gas Inspection Act, the following process will be applied.

The applicant shall contact the local Designating Authority and provide the information as prescribed in this document.

Where the design or type of measuring apparatus is new, clarification or revision of the contents of this document is deemed appropriate, the Designating Authority shall seek and receive conformation from Measurement Canada's Senior Engineer Gas Measurement prior to commencing the evaluation.

The Technical Evaluator will perform the evaluation detailed in this document and prepare an evaluation report for submission to the Designating Authority. The content, form and format of this report will be approved by the Designating Authority prior to the evaluation.

The Technical Evaluator will make recommendations to the Designating Authority relating to the performance of the measuring apparatus.

Where a technical review of the report indicates that the measurement apparatus falls within the criteria set out in this document, the Designating Authority will issue a certificate of compliance.

6.1 Making Initial Application to Measurement Canada

The administrative processes described in appendix A is directly applicable where the Gas Measuring Apparatus is of a type or design which has been previously certified for use by Measurement Canada's

Senior Engineer Gas Measurement. For those measuring apparatus designs and types which have been not been previously certified the following additional requirements apply.

Piping and instrumentation drawings, component specifications and user manuals should be provided by the applicant for review. Block diagrams as well as explanations of controlling software should also be included. This information should be sent to and/or gathered by the Technical Evaluator. Once he/she is satisfied that the information is complete, it should be forwarded to the Designating Authority for review. Once this package of information has been reviewed and any modifications to the intended test plan determined, initial testing may commence.

At this time it is also recommended that the applicant provide a reference meter calibration test plan for pre-approval. The calibration test plan should be consistent with the document referenced in section 3(c). The purpose of this pre-review is to avoid any unnecessary duplication in testing or calibration.

This information should be sent to and/or gathered by the Technical Evaluator or Designated Authority. Once he/she is satisfied that the information is complete, it should be forwarded to Measurement Canada's Senior Gas Measurement Engineer for review. Once this package of information has been reviewed and any modifications to the intended test plan determined, initial testing may commence.

The reference meter test plan should be submitted to the Technical Evaluator along with the other required information. The Technical Evaluator will perform a preliminary review of the test plan and then forward it, with recommendations, to the Designated Authority for final review and acceptance.

6.2 Initial Testing and Review

Once the reference meter(s) has been calibrated in accordance with section 7.0 and a certificate of calibration issued by Measurement Canada's Engineering and Laboratory Services Directorate (ELSD), on-site evaluation may commence.

The on-site evaluation will be performed in accordance with the principles contained in the documents referenced in section 3(a) and (b). Once compliance with these requirements is demonstrated, the test data and reports will be sent by the Technical Evaluator to the Certifying Authority for review. Upon review and acceptance, a certificate of calibration for the measuring apparatus may then be issued by the Designating Authority.

6.3 Certification Periods

A measuring apparatus, complaint with these requirements, may receive a certification period equalling that indicated on the certificate of calibration for its reference meter. This period is subject to the conditions placed on the certificate of calibration.

When the reference meter(s) used in the measuring apparatus have been calibrated in accordance with section 6.0, these meter(s) will receive a separate five year certification period.

7.0 Certification of Measuring Apparatus' Reference Meter(s)

Once the applicant's reference meter test plan has been reviewed and accepted calibration testing may proceed.

When Measurement Canada is unable to perform the required reference meter calibration testing, laboratories recognized by Measurement Canada in bulletin G-16 shall be used instead. The permissible uncertainty, required number and distribution of test points and manner of handling data, is all described in the document referenced in section 3(c) (GS-ENG-02-10: *Evaluation Guidelines for the Certification of Reference Meters Used In Low Pressure Measuring Apparatus)* are satisfied and is applicable to this type of measuring apparatus.

In general, the following requirements shall apply:

- The calibration of the reference meter should be established at a Measurement Canada recognized test facility or using a certified measuring apparatus.

- The calibration of the reference meter should be established at a sufficient number (usually 15) of test flowrates distributed based on its characteristic operating curve and the intended range of use.

The reference meter's flow calibration test results, along with a request for calibration form, shall be provided to Measurement Canada's Engineering and Laboratory Services Directorate (ELSD). If the requirements of GS-ENG-02-10: *Evaluation Guidelines for the Certification of Reference Meters Used in Low Pressure Measuring Apparatus* are satisfied, ELSD will issue a certificate of certification.

8.0 Use of Reference Meter(s) Calibration Data in Measuring Apparatus' Controller

In order to use the reference meter's certificate of calibration data issued by Measurement Canada to its fullest potential, a linearization scheme will need to be employed in the measuring apparatus' controller. Where such a scheme is not employed, the measuring apparatus will be restricted to use in the linear portion of the reference meter's performance curve.

Where point-to-point linearization schemes are used, the values may be taken directly from the certificate provided by Measurement Canada and entered into the measuring apparatus' controller program. If additional values are needed they can be calculated from the best fit curve equation coefficients included on the calibration certificate.

9.0 Security of Measuring Apparatus' Calibration Data

In order to ensure that the integrity of the measuring apparatus is maintained throughout its certification period, the following information shall be included in the certification testing report submitted to the Senior Gas Engineer and will constitute part of the certificate issued for the measuring apparatus:

- All pressure, temperature, and reference meter calibration factors
- Any additional preset values determined during the initial verification of the apparatus

Records should be kept at the site such that:

- This data will be accessible for audit purposes
- Any changes to calibration data will be readily detectable under audit

10.0 Determination of Measurement Uncertainty

The measurement uncertainty of the meter-under-test (MUT) shall be determined in the manner prescribed in ISO Guide to the Expression of Uncertainty in Measurement and Measurement Canada Gas Engineering recommendations.

The applicant should provide a complete written Statement of Measurement Uncertainty using the methods prescribed in the ISO Guide to the Expression of Uncertainty in Measurement. Guidance on this determination can be found in the documents referenced in section 3(d) and (e). The Senior Gas Engineer can provide assistance in the application of these documents.

The measurement uncertainty should be determined for each class or type of meter, listed in the statement of intended use, in a manner that represents the intended use of the measuring apparatus. A statistical estimate of each MUT's repeatability should also be included.

A detailed copy of the completed analysis should be sent to the Technical Evaluator for initial review and forwarding to the Designating Authority for review and acceptance.

10.1 Environmental Conditions

Where the measuring apparatus could be subjected to environmental conditions which could influence the behavior of the system or the devices being verified, the influence shall be controlled, monitored or minimized such that:

- The measuring apparatus shall be supplied with clean, dry air (non-condensing) from within the proving room or area,
- The maximum contribution of any influence to the uncertainty of the apparatus shall not exceed that in the statement of uncertainty provided by the applicant,
- Provisions for the prevention and detection of such conditions shall be provided, and the appropriate action taken, if such conditions are detected.

10.2 Temperature Considerations

The Statement of Measurement Uncertainty should, specify the allowable limits of temperature variation of the measuring apparatus and meter under test, during the testing process, in order to maintain the accuracy requirements of the meter evaluation process.

These shall include:

- for the room containing the measuring apparatus, a temperature set point for the room and the maximum limits,
- for the room containing the measuring apparatus, the maximum rate of change of the ambient temperature prior to, and during the process of certification, testing, and meter verification operations,
- for the room containing the measuring apparatus, the method and frequency of ambient air temperature monitoring and/or recording,
- for the MUT, the time period and method of meter acclimatization required prior to the commencement of testing,
- for the measuring apparatus and the MUT, the limits in the variation between each of the ambient air, MUT flowing air and reference meter flowing air during testing.

10.3 Pressure Considerations

The Statement of Measurement Uncertainty should specify the allowable limits of pressure variation in the reference meter and meter under test~~,~~ during the testing process, in order to maintain the accuracy requirements of the meter evaluation process.

These shall include:

- for the room containing the measuring device, a temperature set point for the room and the maximum limits,
- for the Measuring Apparatus and the MUT, the limits in the variation between the MUT flowing air and reference meter flowing air pressures.

10.4 Test Protocol Considerations

The method to be used to assess meter compliance should be considered in the Statement of Measurement Uncertainty. Where a number of tests at each flowrate are conducted, the method for calculating the average error for multiple tests, and the method of comparison to calibration test certificate errors, should be considered in the Statement of Measurement Uncertainty. Where the measuring apparatus has the capability of operating in various configurations or uses various methods for communicating to the MUT, each of these methods shall be verified.

11.0 Additional Metrological Guidelines

11.1 Qualification Meters

The applicant should provide the qualification meters needed for completion of certification testing. These meters will be used to evaluate the overall system performance.

For the purposes of initial certification testing, qualification meters should be selected for each make and model of diaphragm meter included in the statement of intended use. The concept of meter classes represented by transfer meters, as specified in S-G-01, will not be applied. For the purposes of subsequent re-certification testing, diaphragm qualification meters may be selected based on meter classes where this can be supported by past performance results. The requirements for the performance of diaphragm type qualification meters should be consistent with the requirements for transfer meters given in section 5.4.2 of S-G-01.

Qualification meters selected by the applicant should:

- be Measurement Canada accepted
- have a rated flowrate capacity sufficient to provide for test flowrates within the intended range of use of the reference meter(s),
- provide for qualification of system performance in all intended modes of operation, i.e. optical sensor, ID mounted pulser, etc.
- have their calibration test results fully documented and include an associated statement of uncertainty.

11.2 Check Meters

The applicant is responsible for the provision of check meter(s) required for the routine monitoring of the calibration stability and overall performance of the measuring apparatus. The applicant may designate the diaphragm type qualification meters used during certification testing as check meters to satisfy the requirements of this section.

The applicant may select check meters of a differing principle of operation (alternative check metering) from those listed in the statement of intended use subject to the requirements of this section and the conditions given in section 11.2.

Check meters selected by the applicant should:

- be Measurement Canada verified and accepted,
- have a rated flowrate capacity sufficient to provide for test flowrates within the intended range of use of the associated reference meter(s),
- provide for monitoring of calibration stability and system performance of the measuring apparatus in all intended modes of operation, e.g. optical sensor, ID mounted pulser, etc.,
- be repeatable and have rated accuracy within applicable verification tolerances.

12.0 System Qualification Testing

Certification testing of the gas measuring apparatus shall be performed at a location mutually acceptable to all parties involved, and must be consistent with the above references such that the following can be performed. All ancillary components and functions which have a metrological impact on the performance accuracy of the measuring apparatus shall be inspected and certified to within the tolerances specified in this document.

12.1 System Leak Detection Test

Certification testing will include an assessment of the measuring apparatus' system leak detection capability.[1] The applicant will be required to provide any equipment needed to introduce the leak rate required for certification testing purposes. Further, the applicant should also provide documented details of the method and associated equipment used to establish the leak rate required for certification testing purposes. The agreed upon leak rate shall be considered in the Statement of Measurement Uncertainty.

The leak rate required for certification purposes shall be verified prior to commencing evaluation testing of the measuring apparatus' system leak detection capability.

12.2 System Flowrate Setting

The measuring apparatus shall have a flowrate setting mechanism capable of setting and maintaining the verification test flowrates applicable to each meter in the applicant's statement of intended use. The flowrate setting mechanism shall be capable of setting and maintaining the flowrates to within +/- 5% of the selected flowrate. The measuring apparatus shall provide for accurate determination of test flowrate using the applicable reference meter's calibrated and certified output.

The measuring apparatus shall make provision for displaying real-time test flowrates based on a sampling frequency sufficient to ensure accurate indications.

The flowrate setting mechanism shall be verified for performance and repeatability.

12.3 System Pressure Measurement

The pressure sensor(s) and associated electronics shall be calibrated and traceable to National Standards. The accuracy of the pressure sensors for each reference meter and each MUT position must be verified as specified, for each proving run configuration.

Test Points and Tolerances	Static Pressure Sensors (gauge and absolute)	Accuracy of registered reading at sufficient number (a minimum of three) of points over intended range of operation. Tolerance = +/- 0.2 in. w.c. or the uncertainty claimed in the Statement of Uncertainty for the Measuring apparatus at the 95% confidence interval.

Test Points and Tolerances	Barometric Pressure Sensors	Accuracy of registered reading. Tolerance = +/- 0.5 in. w.c. or the uncertainty claimed in the Statement of Uncertainty for the Measuring apparatus at the 95% confidence interval.

Test Points and Tolerances	Differential Pressure Sensors	Accuracy of registered reading at sufficient number (a minimum of three) of points over intended range of operation. Tolerance = +/- 0.2 in. w.c. or the uncertainty claimed in the Statement of Uncertainty for the Measuring apparatus at the 95% confidence interval.

12.4 System Temperature Measurement

[1] A system shall be capable of detecting a leak of 0.1% of the lowest expected test flowrate.

The temperature sensor(s) and associated electronics shall be calibrated and traceable to National Standards. The accuracy of the pressure sensors for each reference meter and each MUT position must be verified as specified, for each proving run configuration.

Test Points and Tolerances	Temperature Sensors	Accuracy of registered reading at sufficient number of points (minimum of three) over the controlled temperature range of the test environment. Tolerance = +/- 0.5°F or the uncertainty claimed in the Statement of Measurement Uncertainty for the measuring apparatus at the 95% confidence interval.

12.5 Metrological Calculations

The measuring apparatus shall provide for temperature and pressure differential corrections to account for differences in flowing pressures and temperatures between the reference meter and the MUT. In addition, the measuring apparatus should be capable of displaying, or providing access to pressure and temperature differential corrections or correction factors used in the establishment of the MUT error.

Programming of Measuring Apparatus Controller	Verification of pressure and temperature correction calculations using registered values. Verification of temperature conversion calculations using registered value of reference meter temperature and applicable MUT base temperature values. Tolerance: no error permitted
	Verification that the reference meter's certified calibration curve results, including any additional calculated values, are entered correctly into the measuring apparatus software.

12.6 System Meter Accuracy Measurement

A comparison of the measuring apparatus to the qualification meters, selected in accordance with section 9.1, is to be performed during the certification testing process. Generally the measuring apparatus' performance should be evaluated at the flowrates indicated for each meter in the statement of intended use.

The certification testing associated with this process should be consistent with the correlation process described in section 5.5.3 of S-G-01.

Acceptance criteria for this testing will be dependent on whether or not the applicant has opted to apply preset calibration values to the measuring apparatus.

12.6.1 Measuring Apparatus with Preset Calibration Values Applied

Present specifications for the certification and use of working level bell and sonic nozzle provers provide for the use of preset calibration values to eliminate any perceived bias between the local master bell prover and the measuring apparatus. This same provision is extended to a rotary based measuring apparatus used for testing diaphragm meters.

Preset calibration values can be established for classes of diaphragm meters or alternatively for each type or model of meter in the statement of intended use. In order to determine which option is acceptable, it is recommended that each type/model of meter be used and the results analyzed to determine if the concept of meter classes can be applied. The determination and application of preset calibration values should be

performed by the applicant, based on their documented procedures, prior to certification testing.

Preset calibration values will be recorded in the certification testing report forwarded to the Senior Gas Engineer for inclusion in the certificate of calibration of the measuring apparatus. These values should not be modified for the duration of the measuring apparatus' certification period. The maximum allowable difference between each qualification meter's calibration test results established on the master bell prover and the measuring apparatus is 0.3%.[2]

12.6.2 Measuring Apparatus without Preset Calibration Values Applied

If the difference between each qualification meter's calibration test results established on the master bell prover and the measuring apparatus is within the expected bounds of the individual measuring apparatus' uncertainty, then this difference can be considered as not significant and no preset correction values need to be applied.

This difference should not exceed the root sum squared of the uncertainty (k=2) of the measuring apparatus (±0.3%), the master bell prover (±0.2%) and an allowance for the variation in the qualification meter (±0.3%). Therefore a value of $\{(\pm 0.3\%)^2 + (\pm 0.2\%)^2 + (\pm 0.3\%)^2\}^{1/2} = \pm 0.5\%$ should be considered as a estimate of the maximum permissible value. Please note that this estimate allows for both bias and random errors.

12.7 Multiple Measuring Apparatus In a Single Location

Where the owner has multiple measuring apparatuses all in the same location, it is recommended that the same check meter(s) be used with each of the measuring apparatus. Further, provided that one of the measuring apparatus at the location has been previously certified and presently has a valid certificate of calibration, this apparatus may be used as a "local volumetric standard" for the purpose of diaphragm meter correlation.

13.0 Post-certification Usage Requirements

The certificate of calibration issued for the measuring apparatus will include conditions of use. These conditions will include a requirement that the applicant implement some means of post-certification monitoring of the long term stability and performance of the measuring apparatus. A number of options are available to satisfy this condition.

13.1 Weekly and Daily Volume Correlation

The applicant may choose to perform the daily and weekly correlation processes similar to that specified in 6.1 and 6.2 of S-G-01. This method is deemed acceptable, provided no changes are made to the measuring apparatus' preset calibration values.

The frequency of the comparison can be reassessed once a statistically significant number of comparisons have been completed. This information can then be used to determine the long-term standard deviation for each particular class of MUT and establish monitoring/correlating frequencies.

Provision should also be made to address the stability of the temperature and pressure measuring devices used in the measuring apparatus.

13.2 Check Metering using Statistical Process Control (SPC) Methods

The applicant may choose to utilize check metering based on statistical process control (SPC) procedures.

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[2] Note that the system and qualification meters will be used as the MUTs in the establishment of the measurement uncertainty for the measuring apparatus.

These procedures should form part of the information presented to the Gas Specialist with the initial documentation. The written SPC procedures should detail the SPC method, data handling, control limits and how it is to be updated. A sample spreadsheet for this purpose is available from Measurement Canada. Final review and acceptance of the applicant's SPC procedures shall be the responsibility of the Senior Gas Engineer.

These SPC procedures should also address the stability of the temperature and pressure measuring devices used in the measuring apparatus.

Diaphragm type check meters should be selected in accordance with section 9.2. The applicant may use check meters of a differing principle of operation (alternative check metering) from those listed in the statement of intended use. The use of alternative check metering requires a period of inter-comparison between the trends of results established on the measuring apparatus for the alternative check meter(s) and the diaphragm type check meter(s) results.

Where sufficient data has been collected and presented to demonstrate that the alternative check meter(s) provides the same level of confidence as diaphragm type check meters, the use of diaphragm type check meters may be suspended. Again, the frequency of the comparison can be reassessed once a statistically significant number of comparisons have been completed.

14.0 Re-certification Requirements

The certification period for the measuring apparatus is five years, provided the conditions listed on the Certificate of Calibration are met.

14.1 Annual Re-evaluation

On an annual basis, a re-evaluation of the gas measuring apparatus shall be performed, at a time mutually acceptable to all parties involved, and must be consistent with the above references such that the tests listed in the following table are performed.

Section number	Test Description
10.1	Environmental controls - The controls and their records should indicate the system has been capable of maintaining the values used in the Statement of Measurement Uncertainty
10.2	Temperature Considerations
12.1	Operational leak test - The system should demonstrate that it is capable of maintaining the values used in the Statement of Measurement Uncertainty
12.3	System Pressure Measurement
12.4	System Temperature Measurement
12.5	Metrological Calculations
12.6	System Meter Accuracy Measurement[3] and Modified correlation and preset value determination

[3] If a review of the validated the SPC procedure indicates that it has being properly implemented and the system is in control re-testing of the qualification meters is not required.

The SPC control charts shall also be reviewed to ascertain if the system is under control and that the Statement of Measurement Uncertainty determined at the time of initial calibration is still valid.

Any problems with the measuring apparatus or the applicant's failure to meet conditions on the certificate of calibration, etc. should be reported to ELSD.

14.2 Subsequent Recertification

Subsequent five year re-certification of the measuring apparatus and its reference meter(s) will be performed in accordance with the requirements of this document.

A review of the applicant's SPC procedures and data may be used in establishing the scope of the certification testing required.

Appendix A: Administrative Requirements

A.1 General Requirements

Certification will be considered for gas measuring apparatus that has been installed in accordance with the manufacturer's installation specifications and meets the requirements set out in this document.

Gas measuring apparatus shall only be certified for testing approved gas meters at flowrates that are within the certified range of the reference meter(s).

Where test results indicate that the measuring apparatus does not meet accuracy requirements over the reference meter's certified range, the measuring apparatus may be certified for a lesser range.

Modification to the measuring apparatus, relocation, or component replacements which affect the accuracy of the gas measuring apparatus shall be reported to Measurement Canada, and may require recertification testing of the gas measuring apparatus.

A.2 Requests for Certification

The applicant is responsible for providing a written request to the local Measurement Canada district or regional office for the certification of the measuring apparatus. The request shall include the following information:

- A full description of the gas measuring apparatus to be certified, including the manufacturer(s), model number(s), serial number(s), operating parameters, minimum and maximum test capacities, computer software and hardware versions / revisions, name of the applicant, and for the ancillary equipment, model number(s), serial number(s), and operating parameters,

- A complete description of each reference meter, qualification meter and check meter, including make, model, capacity, serial number and forms of metrological output such as a mechanical instrument drive, single rotor pulse output, or multiple rotor pulse output, etc.,

- Reference meter test plan for calibration testing.

- A statement of intended use as per section A.3,

- The SPC procedure(s) for the monitoring and control of reference meter, and ancillary device performance specific to the design of the gas measuring apparatus,

- An uncertainty statement, for each proving configuration and meter classification, and details of the uncertainty analysis and budget.

- Operating instruction manuals that provide detailed information pertaining to the installation, operation, maintenance, calibration and use of the gas measuring apparatus,

- A full set of completed worksheets showing that the gas measuring apparatus is fully compliant with all applicable requirements set out in these specifications, prior to onsite certification testing of the gas measuring apparatus by Measurement Canada.

- A maintained logbook or file which records the dates and details including the identification of the person or persons performing accuracy checks, adjustments, maintenance, repairs, statistical process controls and modifications to the gas measuring apparatus. The logbook for each gas measuring apparatus shall be made readily available to Measurement Canada upon request,

- Where the applicant seeks permission to make adjustments to ancillary equipment to maintain acceptable performance, the method, procedure and frequency of these adjustments together with the method of tracking these adjustments.[4]

- A statement or list identifying potential influence factors and the controls implemented, where necessary, to ensure that the uncertainties of the test results remain within defined limits.

A.3 Statement of intended Use

The applicant shall provide to Measurement Canada a statement of intended use of the gas measuring apparatus. The documentation provided shall be sufficient to determine the capabilities of the gas measuring apparatus, its intended uses, and all installation requirements. The documentation shall include:

- A statement indicating the limitations of each reference meter or the gas apparatus published by the manufacturer and set out in the certificate(s) of calibration,

- A description of the meters to be verified on the gas measuring apparatus, including each make, model or design of meter, and the forms of metrological output such as a register, instrument drive, single pulse output, etc.

- A statement indicating which reference meter is to be used for the verification of each of these meters,

- A description of each meter model or class to be represented by each check meter,

- A declaration of the mode of operation for which the gas measuring apparatus is to be utilized, i.e. T.C., Non-T.C., etc.

- A declaration of the method(s) of determining meter registration, i.e. optical sensor, mechanical instrument drive, pulse output, or any other gating method,

- The test duration and/or test volume selected for each meter listed.

[4] This activity will only be permitted when the reference standard used, is certified and traceable to Measurement Canada or the National Research Council of Canada.