

Information et
Télécommunications Canada

SPG-250

Direction générale
des services

OTTAWA, Ontario
K1A 0C9

February 19, 1980

Numéro de référence

Date de référence

6635-C641

SPECIAL APPROVAL

Gracieusement
Western Natural Gas Company Limited
140 - 6th Avenue S.W.
Calgary, Alberta
T2P 0P6

Attention: Mr. P.K. Pas
Supervisor-Measurement Engineer

Subject: Method of Determining Heating Value of
Gas for Energy Billing

Temporary Special Approval has been granted by the Legal Metrology Branch to Canadian Western Natural Gas Company Limited for a method of establishing the heating value of gas in designated "heat areas" for billing purposes by means of collecting automatically and continuously samples of gas from pipe lines in the distribution system over periods not greater than one (1) month which is to be correlated to meter volumetric reading over the same period.

Each sample of gas shall be subjected to tests by the utility using an approved Cutler-Hammer recording calorimeter and an approved Kimray gravimeter. In addition, each sample of gas shall be analyzed by an approved chromatograph and the heating value and relative density of gas shall be calculated and the average shall be used for billing.

Overview of the Energy Billing System

The entire system served by the utility is divided into zones called heat areas. A heat area is a zone which predominantly receives its gas from a particular gate station (direct area) or its gas is a mixture of that supplied by two or more gate stations (mix area). Heat area boundaries are determined by pipeline geometry of the system and elevation levels which must not vary in excess of ± 150 feet from the average elevation determined for that heat area.

Each heat area is referenced to an energy check point which is called a sampling station. The sampling station is the location where continuous gas samplers are used to obtain a representative gas sample of the gas source. These samples are then analyzed to

determine the heating value of the gas. Direct areas are always referenced to a single sampling station. Mix areas, which have several possible sources of natural gas, are referenced to more than one sampling station, with each located where a gas source supplies a heat area. A mix heat area is selectively assigned for billing purposes to that sampling station which has the lowest thirty day average heating value.

At the sampling stations gas samples are taken by Arcco-Anubis continuous gas samplers and are stored in sample bottles. The sample bottles are removed from the sampling stations for analysis and determination of energy content.

The BTU content for a given heat area is correlated to the volumetric reading over the same period of time where the gas sample is taken to determine the energy consumed by a customer over that period of time.

1. Information on Sampling Stations

The utility shall supply to the Legal Metrology Branch and District Office the following information on the existing heat areas and sampling stations and any additions or revisions to them:

- (a) Heat area maps indicating:
 - (i) locations of the sampling stations;
 - (ii) their reference numbers;
 - (iii) maximum, minimum and mean elevation of each heat area.
- (b) List of heat areas with corresponding sampling stations associated with each area and mean elevation.
- (c) Details of the Arcco-Anubis samplers at the stations:
 - (i) model
 - (ii) serial no.
 - (iii) operating pressure range
 - (iv) sampling period
 - (v) chart rotational period
 - (vi) operation and maintenance manual
- (d) Maximum and minimum heating values of gas sources expected at sample stations serving heat areas.

2. Utility's Records

The utility shall maintain at each sampling station a log book(s) in which the following information shall be recorded and be available for inspection:

- (a) Station location and reference number;
- (b) A map showing the heat area referenced to the sampling station;
- (c) Details of the Arcco-Anubis sampler at the station (i.e. model, serial no., operating pressure range, sampling period, chart rotational period, etc.);
- (d) Date of sampler installation and dates of inspections and maintenance performed by the utility's personnel.
- (e) Details of repairs and adjustments performed on the sampler with stated reasons for the actions;
- (f) The date and time of day when the sample container, identified by serial no., is connected to and disconnected from the sample;
- (g) Gas samplers' recording charts, marked to show sample container's serial no., date and time of day of connection and disconnection, and initial and final gauge pressures. Charts are to be retained for record for a period of two (2) years.
- (h) Each sample container is to have a permanent durable tag attached to it showing the container's serial no., and the identification number of the sampling station from which the gas sample was collected.

3. Utility's Security Responsibility

It shall be the responsibility of the utility to assure that each sampling station is securely locked and that only authorized personnel have access to the station and custody of the sample containers.

4. Sampling Procedure

The method adopted by Canadian Western Natural Gas for natural gas sampling is a procedure derived from the AGA Gas Measurement Manual: Field Sampling, 1963 edition.

This adopted continuous sampling procedure is outlined in the APPENDIX.

In case of failure or malfunction of the continuous sampler, a Spot Sample has to be taken, the derived heating value of which shall be used as a replacement for the heating value obtained from the continuous sampler. Where a gap in time occurs between the continuous sampler failure and its detection (at which point in time Spot Sampling would commence until the failure is corrected), the heating value to be entered on the thirty day heat value table shall be the value derived from the partially collected continuous sample and shall cover the period of "down" time of the continuous sampler. Upon detection of the failure, immediate corrective action shall be taken to alleviate the situation.

The gas sampling procedure is handled in the following way:

Length of a sampling period can either be of one (1) or two (2) week duration, depending on the gas BTU content fluctuations. Where BTU fluctuations are expected, one (1) week sampling period is used; otherwise, two (2) week sampling period is considered sufficient.

Since the volumetric readings of meters and the billing of customers is a continuous, daily process, a thirty (30) day heat value table is necessary to be maintained for each sampling station. The heating values obtained from the weekly or bi-weekly samples, are entered on the 30-day heat value table. The number of days on the 30-day table that a sample's BTU value will cover corresponds with the length of the sampling period. This of course, means that on the table, the entered daily heating values for any one sampling period will be identical.

5. Application of Heating Value of Gas for Energy Billing

- (a) A 30-day period heat value table shall be maintained for each sampling station and the table shall be continuously updated as soon as the collected gas sample has been analyzed and heating value determined;
- (b) Heat quantity of the volume passed shall be determined using the 30-day average heating value @ 14.65 psia (base pressure adopted by the Alberta Government) and 60°F, and be referenced to the heat area average atmospheric pressure, as expressed by the following energy equation in Giga joules:

Energy Consumed(GJ) = 30 day average Heating Value in Btu per cubic foot of dry gas at 14.65 psia & 60°F X

Average absolute metering pressure (psia)
14.65 (psia)

Metered volume (cu. ft.) X 1.054615 X 10⁻⁶

NOTE: The heat area average atmospheric pressure is a pre-determined average value for an elevation which varies no more than ±150 feet from the average elevation determined for that heat area.

- (c) In heat energy determination, the average heat value for a specific time period shall be used which coincides with the same period of time over which the metered volume is determined. This volume may be established either by direct reading or estimated based on previous history of consumption.
- (d) In mix heat areas where more than one sampling station monitors the gas heating value, the minimum average heating value shall be used for billing purposes.

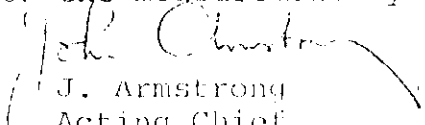
6. Records of Measurements

- (a) The utility shall maintain records of all determinations of heating value, relative density and analysis of all gas samples from each sampling station and shall make these records available for inspection upon request by the Department;
- (b) Each month, the utility shall prepare a listing showing the heating value and relative density of gas used for energy billing in each designated heat area and have it available to the District Manager upon request.

The Department reserves the right to periodically verify the operation of a sampling station and equipment used for heating value determination.

This approval is temporary until such time when permanent regulations pertaining to requirements for energy billing are put into effect.

If as a result of permanent regulations, additional requirements, not delineated in this approval are mandatory, such requirements shall apply retroactively to the measurement systems introduced as a result of this approval.


J. Armstrong
Acting Chief
Electricity and Gas

APPENDIX

The gas sampling procedure as adopted by Canadian Western Natural Gas:

(1) Choosing a Sample Point:

The sample point should be located on the top of a horizontal line or, better, on a vertical flow line. This will minimize entry of oil, water, or condensate, that might be lying in the bottom of the line. Connections for sampling should not be located immediately downstream from a major disturbance such as a regulator or partially closed valve. Connections on an "ell", a "dead" branch line, dead end of a header, on the top of a transmission line blow-down extension, should be avoided.

(2) Connecting to Gas Supply:

Remove plugs from sample source valve and remove all excess grease, oil, etc., from valve by cleaning and/or blowing. Attach hose to gas supply valve. Purge the hose and attach the sampling cylinder.

NOTE: If inside a building, vent any purged gas outside.

(3) Purging the Cylinder:

- (a) with the gas supply valve and cylinder inlet valve closed, slowly open the purge valve and vent the gas slowly to a pressure just above atmospheric;
- (b) close purge valve;
- (c) open gas supply valve slowly to fully open;
- (d) open cylinder inlet valve slowly and fill the cylinder slowly to a pressure lower than that of pipeline;
- (e) close cylinder inlet valve;
- (f) slowly open purge valve and vent slowly to a pressure just above atmospheric;
- (g) repeat steps (b) through (f) eight times;
- (h) close purge valve.

(4) Taking a Continuous Sample:

Purge cylinder on sampler according to the procedure outlined in (3). Put the sampler in operation. To remove the cylinder,

-2-

close the cylinder inlet valve; close the gas supply valve, and slowly loosen sample hose on cylinder to allow the pressure to slowly bleed down to atmospheric pressure in case no drain valve is present in hose. Remove the sampling hose and plug sample valve.

(5) Taking a Spot Sample:

Purge cylinder on spot sampler according to the procedure outlined in (3). Slowly fill up cylinder to line pressure and allow to equalize to line pressure (five minutes with cylinder inlet valve fully open - good time to fill out the sample tag). Close the cylinder inlet valve; close the gas supply valve, and slowly loosen sample hose on cylinder to allow the pressure to slowly bleed down to atmospheric pressure in case no drain valve is present in hose. Remove the sampling hose and plug sample valve.