

Thermometer Calibration

Background

Any thermometer is subject to loss of accuracy with time and use. Hand-held thermometers, such as bi-metal or certain liquid in glass models, which are subject to more mishandling should be calibrated more often (e.g. weekly, bi-monthly) than those that are fixed.

Methods of Calibration:

Thermometers may be calibrated using ice or boiling water, but whichever calibration method is chosen a steady reading is required. A steady reading means that there is no difference between two readings taken one minute apart. The thermometer should also be checked against a certified or reference thermometer having a "Certificate of Accuracy". The reference thermometer is to be used for calibration purposes only and should not be used as a working thermometer. A bi-metal thermometer is used for illustration purposes, but either method works for electronic or liquid filled glass thermometers. The ice and boiling point methods are not suitable for calibration of infrared thermometers.

1) Ice Point Method

Fill an insulated container with a mixture of $\frac{3}{4}$ potable crushed ice and $\frac{1}{4}$ water to provide an environment of 0°C (32°F). After 5 minutes, insert the thermometer to the appropriate immersion depth (see figure 1).

Be sure to hold the stem of the instrument away from the sides and bottom of the container (preferably 2.5 cm.) to avoid potential error.

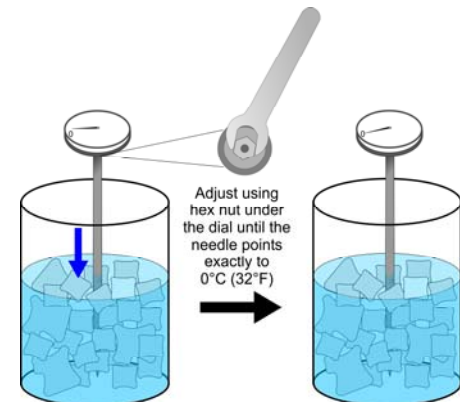


Figure 1. Ice Point Method

2) Boiling Point Method

Place a container of potable water on a heating element. After the water in the container has reached a complete "rolling" boil, insert the thermometer to the appropriate immersion depth.

Be sure there is at least 5 cm. clearance between the stem or sensing element and the bottom and sides of the container (see figure 2). The boiling point for the Edmonton region is 97.8°C (208°F) when factoring elevation above sea level.

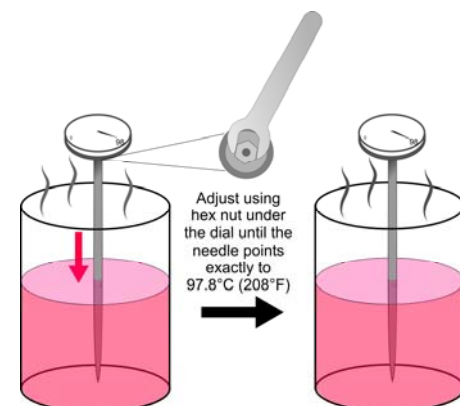


Figure 2. Boiling Point Method

The boiling point of water will differ depending on the region's elevation above sea level. As an example, Table 1 lists the temperature at which water boils based on the elevation for different cities in Alberta.

Table 1. Water Boiling Point For Some Alberta Cities

City	Temperature Water Boils*	Elevation (metres ASL)
Medicine Hat	97.7 °C	717m
Lethbridge	97.0 °C	929m
Calgary	96.6 °C	1048m
Edmonton	97.8 °C	668m
Grande Prairie	97.8 °C	669m
Red Deer	97.1 °C	905m
Fort McMurray	98.8 °C	369m

* Based on average barometric pressure.

If the working thermometer needs to be and can be adjusted or requires to be cleaned, then do so and wait for a steady reading. If the working thermometer can not be corrected or adjusted after a calibration method is applied, then it should be replaced. New thermometers are to be calibrated prior to usage.

Log Book

The following information should be present in your log book: date, time, thermometer identification, reference temperature, difference from reference, comments, and initials of person calibrating the equipment. Table 2 is a sample log sheet:

Table 2. Thermometer Calibration Log

Date	Time	Thermometer Identification	Reference Temperature	Difference from Reference	Comments	Initials
08/02/12	0900	1	0°C	+1	Adjusted; rechecked ok	VM
08/02/12	0900	2	0°C	-1	Adjusted; rechecked ok	VM
08/03/14	1000	3	97.8°C	+4	Rechecked; replaced with #4	VM
08/03/14	1000	4	97.8°C	0	New thermometer	VM

References:

1. Capital Health Environmental Public Health Services Operational Standards and Procedures SF24.
2. Flores, N., Boyle, E., *Thermometer Calibration Guide*, Kansas State University, January 2000.
3. National Institute of Standards and Technology Good Measurement Practice – 11, *Good Measurement Practice for Assignment and Adjustment of Calibration Intervals for Laboratory Standards*, March 2003.
4. Food Science Australia, *Calibration of thermometers and temperature loggers*, August 2006

For more information, please contact your nearest Environmental Public Health office.

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Calgary Main Office
Lethbridge Main Office

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Grande Prairie Main Office
Red Deer Main Office

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