MEMORANDUM

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THROUGH: Eric H. Bartsch, P.E., Director
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SUBJECT: Plants - Procedure - Thermometer calibration guidelines.

The purpose of this memo is to establish acceptable guidelines for the use and calibration of thermometers in shellfish or crab processing plants.

Definitions:

Reference thermometer: A thermometer calibrated to *National Institute of Standards and Technology* (NIST) traceable standards and certified by the manufacturer to be accurate within the operating range.

Working thermometer: The thermometer used in day-to-day operations for recording temperatures within a particular plant process.

General Guidelines:

1.) All thermometers must be accurate to ± 2°F.

2.) All thermometers must be gauged in at least 2° increments.

3.) All working thermometers should be adjustable. Otherwise, the plant owner must be willing to replace them if they are inaccurate.

4.) Only a reference thermometer as defined above may be used as a comparison thermometer for calibration of other thermometers.

5.) Thermometers used in cooking / heat treatment of must be calibrated by comparison with a standard reference thermometer, or must be a reference thermometer.

Guidelines for thermometers used in refrigeration units:

Option 1 - The plant may use a reference thermometer as a working thermometer.

Option 2 - The plant may use any thermometer meeting the general guidelines above and capable of being removed from the cooler and calibrated using the Ice bath method or comparison method as described below.

Option 3 - Plants which choose to use thermometers permanently mounted in a cooler may do so provided the thermometer meets the general guidelines, and the plant has a reference thermometer which can be used for an in-place comparison with the fixed thermometer.

Guidelines for thermometers used in cooking / heat treatment operations:

Option 1 -The plant may use a reference thermometer as a working thermometer.

Option 2 - The plant may use any thermometer meeting the general guidelines above and capable of being removed from the unit and calibrated using the comparison method (at 212°F or 250°F depending on their operation) as described below.

Option 3 - Plants which choose to use thermometers permanently mounted may do so provided the thermometer meets the general guidelines, and the plant has a reference thermometer which can be used for an in-place comparison with the fixed thermometer.

Calibration Guidelines:

! The plant management will be responsible for determining the frequency of thermometer calibration. In most cases, however, the frequency should be no less than monthly.

! All working thermometers must be tested for accuracy at 32°F for refrigeration units, 212°F for atmospheric steamers and 250°F for steam retorts.

Calibration Methods:

<u>Ice bath method test for accuracy (calibrating refrigeration unit thermometers)</u>

! Fill a clean beaker halfway with ice, add water to the beaker until the level of the water and ice is α of the way to the top of the beaker.

! Immerse the thermometer in the beaker and stir the ice bath for 4 minutes.

! Record the temperature on the thermometer at the end of four minutes.

! Adjust the thermometer based upon the difference between the recording and 32°F. For example if the recorded reading were 36°F you would adjust the thermometer down decreasing the temperature reading 4°F and if the recorded reading were 28°F you adjust the temperature up increasing the temperature reading 4°F.

Comparison method test for accuracy (calibrating refrigeration unit thermometers)

! Fill a clean beaker halfway with ice, add water to the beaker until the level of the water and ice is : of the way to the top of the beaker.

! Immerse the both the working and reference thermometers in the beaker and stir the ice bath for 4 minutes.

! When the reference thermometer is at 32°F record the temperature of the thermometer to be calibrated. Also record the readings of the two thermometers. Adjust the thermometer based upon the difference between the recording and 32°F. For example if the recorded reading were 36°F you would adjust the thermometer down decreasing the temperature reading 4°F and if the recorded reading were 28°F you adjust the temperature up increasing the temperature reading 4°F.

Comparison test for accuracy at 212°F (calibrating atmospheric steam cooker thermometers)

! Fill three-quarters of a clean, dry beaker with a silicon oil solution.

! Place the beaker on a magnetic plate stirrer, insert the magnet and begin stirring solution.

! Turn on the heater.

! Clamp the reference thermometer and the working thermometer to a clamp stand.

! Immerse the thermometers in the silicon oil solution. (Note: the reference thermometer has a mark showing how deep it is to be immersed.) Increase the heat to the constantly stirred solution until the temperature reaches 212°F on the reference thermometer. Record the temperature of the thermometer being calibrated. Note the difference in readings of the two thermometers. Adjust the thermometer based upon the difference between the recording and 212°F. For example if the recorded reading were 216°F you would adjust the thermometer down decreasing the temperature reading 4°F and if the recorded reading were 208°F you adjust the temperature up increasing the temperature reading 4°F.

! Turn off heater and stirrer; remove thermometers from clamp. Use care in cleaning and returning each thermometer to its location as sudden jarring or dropping will affect their calibration and accuracy.

Comparison test for accuracy at 250°F (calibrating pressure retort cookers)

- Fill three-quarters of a clean, dry beaker with a silicon oil solution

- Place the beaker on a magnetic plate stirrer, insert the magnet and begin stirring solution.

- Turn on the heater.

- Clamp the reference thermometer and the working thermometer to a clamp stand.

- Add heat to the silicon oil solution until the temperature on the reference thermometer is 250°F.

- Record the temperature of the thermometer to be calibrated and the difference of that temperature from 250°F. Adjust the thermometer based upon the difference between the recording and 250°F. For example if the recorded reading were 254°F you would adjust the thermometer down decreasing the temperature reading 4°F and if the recorded reading were 246°F you adjust the temperature up increasing the temperature reading 4°F.

- Turn off heater and stirrer; remove thermometers from clamp. Use care in cleaning and returning each thermometer to its location as sudden jarring or dropping will affect their calibration and accuracy.