

Maintenance for on laboratory support equipment

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Laboratory Support Equipment Maintenance Overview

- a) All support equipment needs be kept in working order by submitting it to routine and preventive maintenance. There are many ways meet this requirement of the revised code. The revised code (NR 149.44) goes into much more detail than the previous version. The old version just stated that the laboratory was to maintain "calibration and maintenance of all test instruments and equipment as necessary to maintain accuracy." Presented below are examples of means by which support equipment can be maintained in fulfillment of the revised code. All calibration procedures need to be established in a SOP and the maintenance performed must be documented.

- b) If any piece of laboratory support equipment is sent out to a vendor to be repaired the laboratory needs to verify that it is in proper working order before being put it back into service. One way to meet this end would be to submit the equipment to an accuracy check which would otherwise be routinely performed. For example, performing balance accuracy check, mechanical pipettor accuracy check, or ensuring an oven maintains accurate temperature.

Balance Calibration

- a) Before each use ensure the balance pan is free from debris and tare the pan.

- b) On a daily basis check that the spirit level is centered.

- c) At least monthly the accuracy of the balance needs to be verified using NIST traceable weights. One of the weights needs to be in the gram range and one must be in the mg range. The weights need to be within 0.5 mg of their true value. If not, take corrective action. Corrective actions could include performing the balance internal calibration sequence (if balance is so equipped) or sending the balance out for service.
- d) At least annually the balance needs to be serviced by an outside vendor.

Certified Weights

- a) The weights need to be Class 1 and recertified at least every five years by an outside vendor.
- b) Store set in case provided by the manufacturer and use forceps to handle weights to prevent damage

Glassware

- a) Volumetric glassware needs to be free of chips and cracks. Of particular importance is that volumetric pipettes with chipped tips must not be used.
- b) All volume indicating lines on volumetric glassware need to be clearly discernable.
- c) Unacceptable glassware should be discarded.
- d) All glassware must be thoroughly cleaned after use. Glassware should be washed with non-phosphate detergent and hot water, rinsed with tap water, triple rinsed with distilled water, allowed to dry, and stored in a cabinet. Glassware requiring occasional acid rinsing should be segregated from general-use glassware.

Mechanical Pipettors

- a) Mechanical Pipettors are calibrated at least quarterly. The pipettes are calibrated using procedures recommended by the Wisconsin State Lab of Hygiene (http://www.slh.wisc.edu/outreach/images/EHDPipette/WWOA_pipet_calibration.pdf)

Ovens, refrigerators, and incubators

- a) The temperature must be recorded each day when lab personnel are available and regulatory samples are present within the oven, refrigerator, or incubator. The thermostat must be adjusted as needed to keep unit within specified range. On days when adjustment is needed, the laboratory must demonstrate that the temp has been properly adjusted by recording a second reading later that day.
If the unit can no longer maintain consistent and accurate temperature it is replaced or serviced.
- b) The internal chamber of ovens, refrigerators, and incubators are kept clean.

Thermometers

- a) Each thermometer used in the lab must be assigned a unique identifier such as "BOD incubator thermometer". Alternatively, the lab can use the serial number etched in the thermometer by the manufacturer.
- b) Thermometers used in the laboratory are calibrated at least annually against a thermometer traceable to a NIST (National Institute of Standards and Technology) certified thermometer. The NIST thermometer must have been certified within the past five years. Any correction factors associated with the NIST certified thermometer are recorded on the thermometer calibration log sheet and any correction factors associated with the laboratory thermometer(s) are noted on a tag attached to the thermometer. If the liquid column in the thermometer becomes separated, the thermometer is no longer accurate and must be replaced.
- c) The actual calibration is performed by placing the NIST traceable thermometer and the thermometer to be calibrated within the same medium and at the same temperature which the thermometer being calibrated is normally used. Alternatively, the laboratory could use the boiling water/ice bath techniques- all thermometers can then be calibrated at the same time to absolute values. Allow the two thermometers to adjust to the test temperature and then read them at the same time. Document observations appropriately in a logbook indicating what was done and the temperatures recorded. The correction factor is tagged on the calibrated thermometer. For example, if during the calibration procedure within a drying oven the NIST thermometer read 103.5 °C and the thermometer under examination read 103.0 °C, the thermometer would be tagged in a manner indicating that 0.5°C needs to be added to the observed temperature.

- d) Alternatively, the laboratory may purchase factory certified thermometers traceable to NIST. Each thermometer comes with a unique serial number, a certificate of NIST traceability, and the required re-certification and/or expiration date.

Note: Thermometers are calibrated for total immersion or partial immersion. Those calibrated for partial immersion must be immersed only to the depth of the etched circle around the stem of the thermometer just below the thermometer scale readings. Those calibrated for total immersion must be completely immersed in the matrix being measured.

WWTP Composite Samplers

- a) The sampler tubing should be cleaned or replaced at least twice monthly or as needed. Action taken is documented in a logbook. When tubing is cleaned it is done so in the following fashion:

(1) Pump HOT tap water through the tubing and run the sampler for at least two (2) minutes.

(2) Rinse the tubing by pumping a 20% hydrochloric acid or a 20% nitric acid solution for two minutes. This acid rinse may be reused up to four (4) times before it is discarded. Safety precautions are used in the handling and disposal of these acid solutions (wear safety gloves and glasses).

(3) Re-rinse the tubing again: pump HOT tap water through it for at least two (2) minutes.

(4) Rinse the tubing by pumping distilled water through the system for at least one (1) minute. After one minute, stop the pump and allow the water to stand in the hose for an additional minute. After this minute, continue pumping the water for one (1) final minute. The distilled rinse is NOT re-circulated. To ensure the bottles are free of materials that may contribute to the BOD, a weak solution of household bleach (50 mL bleach per 2 L of deionized water) can be used as a final step in the cleaning procedure. *The final rinse, however, must be sufficient to eliminate any traces of the bleach, which may kill natural seed organisms, leading to low bias in BOD values.*

- b) At the time the tubing is cleansed the sampler itself is subjected to a general washing by cleaning the pump and any internal sampler parts which come into contact with the wastewater.

- c) Sample carboy containers are swapped out daily and are cleaned in the same manner as glassware.