Equipment Needs and Maintenance, What is Required in the Wet Chemistry Laboratory for Manual Method Testing

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Evaluation of Suppliers and Vendors

- Subject to the same review as performed for standards, reagents and reference materials
- Must be inspected or otherwise verified prior to use
- Records of the reviews and checks must be maintained
- Purchasing documentation must include data describing the services and supplies ordered

Equipment

- The lab shall ensure that all equipment used including equipment outside of its permanent control meets the requirements of the Standard
- Must be capable of meeting the accuracy required and the method or test being performed
- Must be operated by qualified (authorized) personnel
- Up to date instructions for the operation of the equipment must be available to personnel
- When practical, shall be uniquely identified

Equipment

- The following records must be maintained/retained at the laboratory:
  - Identity of equipment and its software if used and applicable
  - Manufacturer's name, type identification, serial number or other form of unique identification
  - Records of all checks performed
  - Current location in the laboratory, where appropriate
  - Manufacturer's instructions for use
  - Dates, results and copies of reports and certifications of all calibrations, adjustments, acceptance criteria, and the due date of the next calibration

Equipment Maintenance

- Procedures must be in place to protect the integrity of the equipment in use whether the equipment is under permanent control by the laboratory or not.
- Equipment that is not functioning properly must be take out of service, tagged accordingly and reevaluated before continued use
- Any potential problems with the use of defect detection shall be evaluated accordingly (non-conforming)
- Records of repairs and maintenance shall be kept including records of service calls.

Equipment Maintenance

- Whenever practical, all equipment requiring calibration shall be labeled with its current calibration status, due date of the next calibration and all applicable Correction Factors (CFs).
- All applicable CFs are applied and documentation exists to support the CFs.
- A defined procedure for intermediate checks when needed.
- Safeguarded from adjustments that would invalidate the test results.

Equipment

- Must be calibrated or verified at least annually bracketing the range of use
- Equipment shall be checked and documented each day of use or more often if required by method or program.
- Volumetric dispensing devices shall be checked for accuracy on a quarterly basis, where applicable.

Examples of Manual Equipment

- Titration, iodometric, argentometric, amperometric testing
- Gravimetric determinations
- Spectrophotometric/Colorimetric testing
- Demand Testing: Optical vs. Membrane
- Nephelometric/Turbidimetric Testing
- Ion Selective Electrode Testing
- Manual Sample Preparation Equipment: Distillations, Digestions and Separatory Funnel Extractions
- Conductance
- Equipment for Odor testing

Titration Equipment

- Amperometers
- Burettes (including micro where required) or Pipettors
- Pipets and other sample volume measurement devices
- Stirring Mechanisms
- pH meters (temperature compensated) or electrometric titrators if used as part of the analysis
- Magnetic stirrers
- Titration vessels (i.e. beakers, dishes, flasks) cleaned and treated where applicable, to prevent contamination

Gravimetric Equipment

- Balances
- Ovens
- Furnaces
- Evaporation dishes/vessels
- Steam or Water Bath
- Desiccators
- Stirring mechanisms
- Filters and filtration apparatus including vacuum pumps
- For volumetric testing for settleable solids, Imhoff cones

Spectrophotometric/Colorimetric

- Spectrophotometers used at the proper wavelength and path length
- Filter photometers with appropriate filters
- Cuvettes or absorption cells
- Nessler tubes or matched test tubes when needed
- Acid washed labware where required
- Reduction columns
- Filtration devices where needed

Dissolved Oxygen Testing: Optical vs. Membrane

- BOD/CBOD/DO testing requires the use of a membrane electrode or an approved optical probe (i.e. LDO, RDO) unless the DO is determined by the Winkler titration.
- Incubators
- Cleaned labware for dilution water prep, sample analysis (i.e. BOD bottles) and QC testing
- Thermometers/Temperature Measuring devices
- Supplies to check for chlorine residual
- Stirring mechanism

Nephelometric/Turbidimetric Testing

- Nephelometer or Turbidimeter
- Cleaned labware
- Stirring mechanism
- Cuvettes or sample cells

Ion Selective Electrode Testing

- Selective Ion Electrodes
- Stirring mechanism

Manual Sample Preparation Equipment: Distillations, Digestions and Separatory Funnel Extractions

- Hot blocks or hot plates, including turbo vaps
- Thermometers
- Distillation apparatus
- Digestion and distillation vessels
- Sep funnels, SPE devices

Specific Conductance/Conductivity

- Conductivity meter and probes
- Clean testing vessels
- Thermometer when needed

Equipment for Odor testing

- Odor free water generator
- Odor free glassware
- Constant temperature bath
- Thermometer