

Common Laboratory Equipment

VT WSMD Wastewater Program Lab Manual Section #4

COMMON LABORATORY EQUIPMENT

BALANCES

Different types of balances are available for various weighing tasks. It is important to use the correct type of balance for each task. Among the simplest, but also the least accurate type of balance, is the **beam balance**. This type usually has one or two pans and one to three beams on which weights are moved to reach the balance point. Some beam balances have a dial rather than a slide which "fine tunes" to the final balance point. A much more sensitive balance is the **four-place analytical balance**. These balances are capable of weighing to the nearest 0.0001 gram or 0.1 mg. Four-place analytical balances are available in many styles, with one or two pans and a variety of systems for adjusting the weights. The **electronic balances** offer features that can simplify things a great deal while maintaining an extraordinary degree of accuracy.

Beam Balances



Electronic Balances



Common Laboratory Equipment

As with liquid measurements, the degree of precision required is usually given by the number of decimal places in the weighing instructions. Crude weighings are done on the triple beam pan balance (e.g., 150 grams or 10 grams, etc.). Somewhat more precise weighings can be done on the **torsion balance** (e.g., 3.1 g or 11.5 g., etc.). For weighings to two or more decimal places, such as 11.06 grams or 600 milligrams (0.600 g), the **analytical balance** must be used. **Total suspended solids analyses must be done on an analytical balance capable of weighing to the nearest 0.0001 gram (four-place analytical balance).**

Balance Care

Balances must be kept clean, free of chemical residues, dust, etc. The actual moving parts - the pans, beams, and weights - should not be handled unless you are wearing gloves. Oils from your hands will be transferred to these parts, changing the weight.

These balances are very sensitive; it is important to locate them in the least disturbed area possible. All balances must be set up on a clean, hard, level surface. It is especially important that four-place analytical balances be set up on a separate, very heavy table and isolated from the vibration of pumps, hydraulic comminutors, blowers, etc.

Balances should ideally be in a temperature and humidity-controlled environment; however, this is usually not possible in the treatment plant. Avoid setting up the four-place balance near doorways or other sources of drafts, or in windows where sunlight will heat them up, or near ovens, furnaces, or other heat-producing appliances.

Follow the manufacturers' instructions for use.

Balance Servicing

Four-place analytical balances must be periodically serviced to maintain their accuracy. The absolute minimum recommended interval between servicing is one year, with six-month intervals being preferred. If the balance receives rough use or is in a location where it is subject to excessive dirt and fumes, it may require servicing more often. This servicing will include a complete cleaning of the actual moving parts, inspection and servicing of the knife edges, and calibration of the weights to be sure of the accuracy of the balance. This servicing should only be done by qualified professionals. A number of companies offer this service, and the prices vary depending on your location, the company doing the servicing, and what repairs, if any, are required. Contact service companies for rates and services provided. It is important to get on a schedule so that the servicing company can put you on the technician's route. Servicing can be obtained from the following companies, among others:

TMDE Calibration Labs, Inc. 839 River Road Richmond ME 04357 (877) 863-3522 TMDE.com	Alert Scientific, Inc. 469 School Street East Hartford, CT 06108-1138 1-800-872-2028 alertsscientific.com	MaineCal 42 Main Street Harrison, ME 04040 (207) 583-2500 mainecal.com
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pH Meters



Vermont regulations for wastewater analysis require the use of pH meters capable of delivering pH accuracy of plus or minus 0.1 unit. The meter must also be capable of TWO-POINT CALIBRATION and temperature compensation. A variety of pH probes are available for many different applications. Care should be taken when ordering probes to assure that the probe matches the application.

Dissolved Oxygen Meters



The dissolved oxygen meter is extremely useful in measuring dissolved oxygen levels in sludge, aeration tanks, and when equipped with a stirring probe, for BOD measurements.

Centrifuges



F-10300 6-place horizontal rotor at rest.

Interior Mechanism

Centrifuges are commonly used in wastewater treatment facilities to estimate the suspended solids concentration in the aeration tanks. It is important to treat the centrifuge with respect. For example, it is extremely important to always balance the load in the centrifuge. Failure to do so can cause serious difficulties resulting in broken test tubes or worse.

Drying Ovens



Drying ovens can serve many purposes in the laboratory. (One purpose they are **NOT** intended for is reheating food items!) A common use is in the drying of filtered samples for the analysis of Total Suspended Solids. Drying ovens used for this purpose must be capable of maintaining a constant temperature of 104°C, plus or minus only one (1) degree.

Vacuum Pumps



Most wastewater laboratories are equipped with vacuum pumps used for drawing samples through some filtration apparatus. Filtration is necessary when performing analyses such as Total Suspended Solids and Fecal Coliform.

Incubators

BOD INCUBATOR



The incubator used for five-day incubation of BOD samples must be capable of maintaining a constant temperature of 20° C plus or minus only one (1) degree. The number of BOD analyses to be performed must be carefully considered before determining the size of the incubator to be used. Incubators are not to be used as refrigerators to hold food!

DRY INCUBATOR



The Escherichia coli Bacteria analysis requires a two-hour "pre-incubation" period at 35°C. The incubator used for this purpose must be capable of maintaining a constant temperature of 35°C plus or minus 0.2 degrees.

Water Bath



After pre-incubation at 35°C, the E Coli sample must be transferred to a water bath capable of maintaining a constant temperature of 44.5°C plus or minus 0.2 degrees, for an additional 22 hours. The water bath is also used for the Fecal Coliform analysis and other bacteriological analyses.