**Section 465.330 Laboratory Equipment**

Only those instruments that are needed to analyze for the parameters for which the laboratory is being certified are required, but those instruments shall meet the following minimum specifications. A laboratory performing all of the analyses described in Section 465.360 shall have, or have access to, within the same building, all of the equipment listed in this Section with the minimum specifications cited.

a) A top loading or trip pan balance shall be clean, not corroded.

1) A torsion or trip pan balance used for weighing materials of 2 grams or more shall detect 100 mg of weight accurately at a 150 gram load.

2) An analytical balance used for weighing quantities of less than 2 grams shall be sensitive to 1 mg at a 10 gram load.

b) A magnetic stirrer shall be capable of achieving variable speeds and shall be used with a Teflon-coated stirring bar. The magnetic stirrer may be equipped with a heating element.

c) A pH meter shall have an accuracy of at least ± 0.1 units and a scale readability of at least ± 0.1 units. The pH meter may be either line/bench or battery/portable operated. pH meter must be able to calculate slope.

d) A conductivity meter and cell combination, suitable for checking laboratory pure water quality, shall be readable in ohms or mhos, and have a range capable of determining the conductivity or resistivity of laboratory pure water as described in Section 465.380(a). The conductivity meter may be either line/bench or battery/portable operated.

e) An autoclave shall be horizontal-chambered and shall meet all of the following specifications:

1) When observed during the operational cycle or when time-temperature charts are read, the autoclave shall be in good operating condition;

2) An operating safety valve shall be included;

3) Separate temperature and pressure gauges shall be located on the exhaust side;

4) The autoclave shall reach and maintain a temperature of 121º ± 1º C during the sterilization cycle, and no more than 45 minutes shall be required for a complete cycle of carbohydrate media;

5) Depressurization shall not produce gas bubbles in fermentation media; and

6) Pressure cookers shall not be used.

f) A hot-air sterilization oven shall operate at a minimum of 175º C, shall be equipped with a thermometer inserted through the top porthole or be equipped with a temperature-recording device, and shall be equipped with a thermostatic control that will not allow the temperature to deviate by more than ± 5º C from the temperature setting.

g) An incubation unit shall maintain an internal temperature of 35º ± 0.5º C or 44.5º ± 0.2º C and shall be of the following type: air or water jacketed incubator, incubator room, water bath, or aluminum block incubator. Incubation units of the aluminum block type shall have culture dishes and tubes that are snug fitting in the block. Water baths shall be circulating with covers. Laboratories that use the enzyme substrate tests with air-type incubators shall note the product incubation details indicated in Section 465.360(j)(7).

h) An ultraviolet (UV) sterilizer shall be free from radiation leaks and shall be UV efficiency tested quarterly as described in "Standard Methods for the Examination of Water and Wastewater." Proper eye protection shall be available for users of the ultraviolet sterilizer. The ultraviolet sterilizer shall not be used as a substitute for an autoclave. The unit shall be disconnected monthly and the lamps cleaned by wiping with a soft cloth moistened with ethanol.

i) A refrigerator shall maintain a temperature of between 1º and 5º C and shall be equipped with a thermometer located on the top shelf. The thermometer shall be graduated in not greater than 1º C increments, and the thermometer bulb shall be immersed in liquid unless otherwise specified by the manufacturer of the temperature monitoring system.

j) An agar tempering water bath shall be of appropriate size for holding melted medium and shall be thermostatically controlled at 45º ± 1º C.

k) The following standards shall apply to temperature-monitoring devices:

1) Glass or electronic thermometers shall be graduated in not greater than 0.5º C units for use in 35º C incubators.

2) Glass or electronic thermometers shall be graduated in not greater than 0.2º C units for use in 44.5º C water baths or aluminum block type incubators.

3) Glass or electronic thermometers shall be graduated in not greater than 1.0º C units for use in spore incubators required for autoclave quality control.

4) Electronic thermometers with thermocouplings and continuous temperature-recording devices shall be sensitive to not greater than 0.5º C when used in 35° C incubators, shall be sensitive to not greater than 0.2º C when used for 44.5º C water baths or aluminum block type incubators, and shall be sensitive to not greater than 1º C when used in spore incubators required for autoclave quality control.

5) An NIST certified thermometer, or one of equivalent accuracy graduated in 0.2º C or less, shall be available for calibration use and shall be accompanied by its certification papers and procedures for use. All thermometers and temperature-recording devices shall be calibrated annually at temperature of use against the certified thermometer to within ± 1.0º C.

6) Each laboratory operating an autoclave shall have either a maximum registering thermometer, an autoclave with an internal digital temperature record, or a datalogger in the range of 80º to 200º C graduated in increments no greater than 1º C.

7) Each laboratory shall use separate thermometers for determining the temperatures of water baths, ovens, autoclaves, samples, refrigerators, storage areas, etc.

8) The liquid column of glass thermometers shall have no separations.

9) Dial and infrared thermometers are not permitted.

l) Optical counting equipment shall include a low-power magnification device of the dissecting or stereomicroscope type with a magnification power of 10 to 15 diameters, and an external daylight fluorescent light source for sheen discernment at an angle of 60º to 80º above the colonies.

m) A mechanical hand tally shall be available for counting colonies on membrane filters or agar pour plates.

n) Where metal inoculation loops are used, loops shall be of 22 to 24 gauge chrome, or platinum-iridium wire, with loop diameters of at least 3 mm. Hot-air sterilized wooden applicator sticks, pre-sterilized cotton swabs or pre-sterilized plastic loops may be used.

o) Membrane filter equipment shall be non-leaking, uncorroded, and made of stainless steel, glass, or autoclavable plastic. Disposable single-use equipment made of plastic is also acceptable. Metal plating on membrane filter equipment shall not be worn so as to expose base metal.

p) Membrane filters shall be white, grid marked, 47 mm diameter, with 0.45 micron pore size, and made from cellulose ester materials. Another pore size may be used if the manufacturer gives performance data equal to or better than the 0.45 micron membrane filter. Membrane filters shall be autoclavable or presterilized.

q) Absorbent pads shall be of uniform thickness to permit 1.8 to 2.2 mL media absorption and shall be autoclavable or presterilized. Filter paper shall be free from growth-inhibiting substances.

r) Forceps used to handle membrane filters and absorbent pads shall have a round tip without corrugations.

(Source: Amended at 46 Ill. Reg. 19150, effective November 17, 2022)