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WEIGHT CLEANING PROCEDURES

by

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U.S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

Weight Cleaning Procedures

by

H. E. Almer

It is essential that weights being calibrated as well as the standards used be clean if the calibration is to be accurate and meaningful. Therefore, a cleaning procedure should be a part of every calibration.

A. Categories of Weights

For cleaning purposes, weights may be divided into four categories.

1. One-piece weights.

This category will include all one-piece weights except lacquered weights, sheet metal weights and small wire weights.

2. Screw-knob weights.

This category will include all weights with adjusting cavities except lacquered weights.

3. Lacquered weights.

This category includes all lacquered or painted weights.

4. Sheet metal weights and wire weights.

B. Cleaning Procedures

1. One-piece weights.

One-piece weights, one gram and larger, are steam cleaned. The weights are either held or placed in a jet of steam and manipulated so that the entire surface of the weight is subjected to the cleaning action of the steam long enough to clean it. A superficial steaming is not enough. The

weight is then dried, either by evaporation or careful wiping with a soft non-abrasive material free from oil and other substances that will leave a residue on the weights, such as high grade cheesecloth. Care must be exercised that no water spots are left on the weights as they dry. Visible particles on the weights should be brushed or wiped off before steam cleaning them. If a steam generator is not available, one-piece weights may be cleaned either by immersing them in a hot or boiling distilled water bath in a non-metallic container or according to the procedures for screw-knob weights.

Occasionally, a weight will have foreign material adhering to it that requires the use of solvents. Ethyl alcohol is a good general solvent. If alcohol does not remove the material, other solvents may be used, such as benzene, trichloroethane 111, etc. Alcohol is then used to remove any film left by the other solvents. The weights are then steam cleaned as outlined above.

2. Screw-knob weights.

Weights in this category are usually cleaned by wiping with a soft non-abrasive material free from oils or other substances that will leave a residue of any kind on the weights, such as high grade cheesecloth. Occasionally, a weight will have foreign matter adhering to it that requires the use of solvents, applied with a cloth. Ethyl alcohol is a good general solvent. If alcohol does not remove the foreign material, other solvents may be used. Alcohol is then used to remove any film left by the other solvents.

To prevent spotting the weights when using solvents, the weights should be wiped dry. Care must be taken that no liquid gets under the knobs or especially into the adjusting cavity.

A modified steam cleaning procedure may be used on screw-knob weights. The bottoms and sides are steam cleaned, care being taken that no liquid or vapor gets under the knob or into the adjusting cavity.

3. Laquered weights.

The cleaning of lacquered weights requires special care because their protective lacquer coating is soluble in most solvents. Lacquered weights are cleaned by wiping with a soft non-abrasive material free from oils and other substances that will contaminate the weights, or by brushing with a soft brush such as a camel hair brush or both. A rubber bulb type syringe may be used to blow off lint or other small particles, however, be careful not to touch the weights with the nozzle. An electro-static charge may be placed on the surfaces of the weights during the cleaning process or while handling them. This will be especially troublesome in a very dry atmosphere. If reliable mass values are to be obtained, the charge must be bled off of the weights before calibration.

4. Sheet metal weights.

Either of the following two procedures may be used in cleaning sheet metal and other small one-piece weights.

a. Two step method.

First, the weights are placed in an acetone bath agitated to help loosen any foreign material. A soft brush, such as a camel hair brush, may be used to agitate the weights. The weights are removed from the acetone, allowed to dry and then steam cleaned. For steam cleaning, the weights are held in front of a jet of steam with forceps until the entire surface has been covered with steam. (See Note on next page). In order that the portion of the surface under the forceps may be steamed, the weight is set down and picked up again with the forceps holding the weight at a different spot than the first time; the weight is again steamed. Do not allow the weights to touch the steam nozzle. Only a low ash filter paper is used for drying the sheet metal weights. A circular disk is

folded unsymmetrically (see figure 1). The main body of the weight is placed between the folds of the paper with the turned up edge of the weight protruding. The main body of the weight is dried by pressing lightly on the top of the paper. The turned up edge is brushed lightly with a piece of filter paper. In some cases, it may be necessary to brush the body of the weight with filter paper to remove drops of water. Care must be exercised that no water spots are left on the weights as they dry.

b. Three step method.

First, the weights are placed in an ether bath and agitated with a soft brush to help loosen any foreign material adhering to the weights. The weights are removed from the ether, allowed to dry, then placed in an ethyl alcohol bath and agitated. The weights are removed from the alcohol bath, allowed to dry, and then steam cleaned and dried as outlined in the two step procedure.

Note: The smaller fractional weights, say smaller than 5mg, may be placed in a hot or boiling distilled water bath for the final cleaning instead of steam cleaning them. A hot or boiling distilled water bath may also be used for the final cleaning of all sheet metal weights when a steam generator is not available.

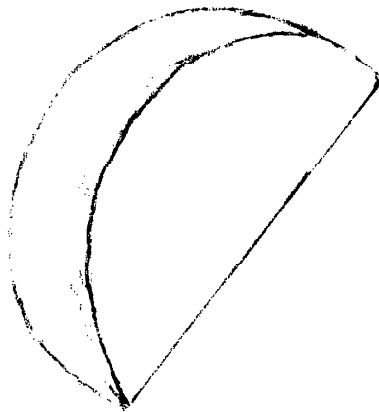


FIGURE 1

C. Cleaning Interval

1. Weights under test.

The weights under test are cleaned before calibration.

2. Standards.

Standards need not be cleaned every time they are used. If the standards are handled carefully, and kept under a reasonably dust tight cover, when not in use, in a clean atmosphere, the interval between cleanings may be several months, or until the calibration procedure checks indicate that the standards are changing and may need cleaning. Under less favorable conditions the interval may be only a few weeks.

D. Temperature Equilibrium

Newly cleaned weights should be allowed to come to temperature equilibrium before they are calibrated. This may take several hours for the larger weights that have been steam cleaned.

Generally, laboratory weights will come to temperature equilibrium over night.

E. Storage

Usually, weights are not placed in the balance immediately after cleaning, but are stored for varying periods. The weights should be stored under cover so that they will stay clean. Weights, one gram and larger, may be stored on a tray lined with filter paper and covered with an inverted glass dish. The smaller weights may be stored in a small glass dish covered with a watch glass. In both cases, the container should be labeled with the weight identification. When the weights are to be moved, carry the tray or dish in a level position so that the weights do not slide around.

When the weights are placed in the balance, they should be carefully brushed to remove any particles that may be on them. A small bulb type rubber

syringe is useful in removing lint and other small particles from weights. The particles are blown off the weights. Therefore, neither the nozzle nor any other part of the syringe need touch the weights, and care must be taken that they do not.

F. Brushes

All of the equipment used in cleaning and handling weights should, of course, be clean. But, brushes require special attention because they are easily contaminated and often are the last cleaning instrument used before the weights are calibrated. Only soft brushes, such as camel hair brushes should be used on weights.

The brushes are cleaned by washing with soap and water, then rinsing in ethyl alcohol and allowed to dry in air. When drying the brushes, place them so that the bristles do not touch anything. New brushes are cleaned before using to remove any oil or other matter that might contaminate the weights. Used brushes are cleaned as often as necessary to be sure that the brushes themselves do not contaminate the weights. Store cleaned brushes in containers that will keep them clean until needed. When handling the brushes do not touch the bristles, as oil from the skin will contaminate them. When the brushes are laid down, place them so that the bristles do not touch anything.

G. Steam Generator

The steam generator may be purchased from a laboratory supply house or one can be constructed.

A simple steam generator may be constructed from a 500ml wash-flask, a two hole stopper, some glass tubing, hot plate for the heat source, a large graduate, and some flexible tubing.

STEAM GENERATOR

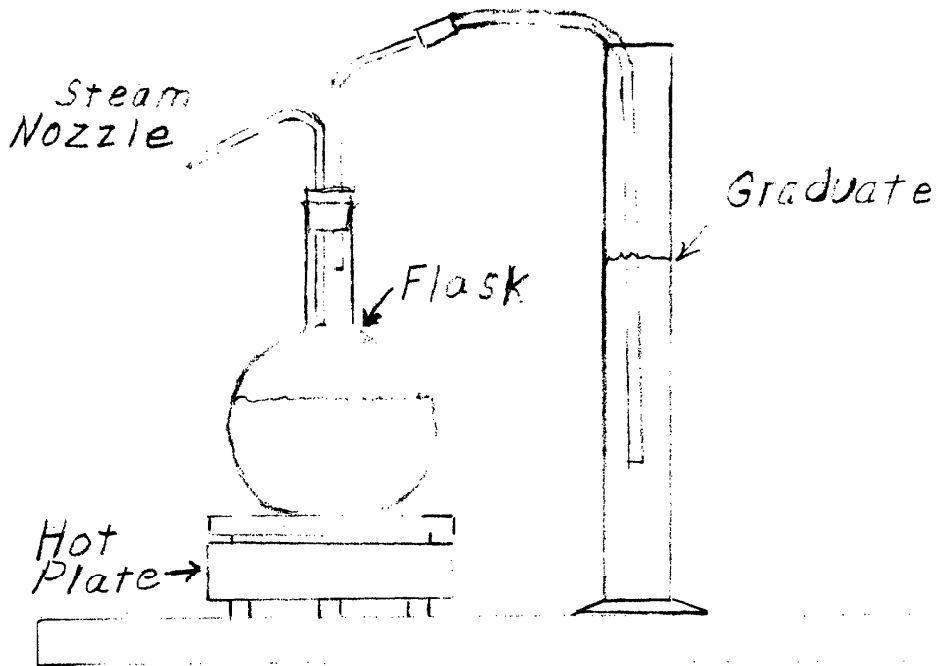


FIGURE 2

A piece of glass tubing is bent, as shown in the illustration, with one end drawn to form a nozzle and the other end is inserted in one of the holes in the stopper. Another piece of glass tubing with a piece of flexible tubing attached to it is inserted in the other hole of the stopper. The other end of this flexible tube is placed in water in the large graduate. This acts to provide some pressure inside the wash-flask and also acts as a safety valve. The wash-flask is partially filled with distilled water, about two-thirds full, then the stopper is put in place and the flask placed on the hot plate. It may be necessary to insulate the neck and the tube with the nozzle.