# US Environmental Protection Agency
# Office of Pesticide Programs

**Office of Pesticide Programs**
**Microbiology Laboratory**
**Environmental Science Center, Ft. Meade, MD**

**Standard Operating Procedure for**
**Calibration and Maintenance of Weigh Balances**

**SOP Number: EQ-03-08**

**Date Revised: 02-03-17**

| | |
|---|---|
| SOP Number | EQ-03-08 |
| Title | Calibration and Maintenance of Weigh Balances |
| Scope | Describes process for use, calibration, and quality control of weigh balances and reference weights. |
| Application | Weigh balances are used to measure the weight of objects in the laboratory, such as media and reagent ingredients and disinfectant containers. Reference weights are used as reference standards to verify the calibration of the weigh balances. |

| | Approval Date |
|---|---|
| SOP Developer: | _____<br>Print Name: _____ |
| SOP Reviewer | _____<br>Print Name: _____ |
| Quality Assurance Unit | _____<br>Print Name: _____ |
| Branch Chief | _____<br>Print Name: _____ |

| | |
|---|---|
| Date SOP issued: | |
| Controlled copy number: | |
| Date SOP withdrawn: | |

TABLE OF CONTENTS

| | |
|---|---|
| **1. Definitions** | 1. ISO = International Organization for Standardization<br>2. Tolerance for weigh balances = Acceptable limits or range in measurement (in grams) that the laboratory can tolerate. See 12.4. |
| **2. Health and Safety** | None |
| **3. Personnel Qualifications and Training** | Refer to SOP ADM-04, OPP Microbiology Laboratory Training. |
| **4. Instrument Calibration** | 1. Weigh balances are inspected, cleaned and calibrated annually by an ISO 17025 accredited vendor.<br>2. Perform accuracy check of weigh balances once per year, approximately six months after vendor calibration.<br>3. Calibration of the reference weights is performed every two years by an ISO 17025 accredited vendor. Weights may be calibrated more frequently if deemed necessary (e.g., weight is dropped, chipped, etc.). |
| **5. Sample Handling and Storage** | 1. Wear clean cotton gloves (supplied with reference weights) or use forceps while handling reference weights. To avoid depositing oil and dirt onto the surface of the weight, do not touch weights with bare hands.<br>2. Store reference weights in cases provided by the manufacturer. |
| **6. Quality Control** | For quality control purposes, the required information is documented on the appropriate form(s) (see section 14). |
| **7. Interferences** | 1. For optimal performance, place balance on a stable, even, horizontal surface with minimal vibration. Avoid areas with excessive heat and moisture, direct sunlight, aggressive chemical vapors, and drafts.<br>2. If a balance is transferred to a different location, perform the accuracy check (section 12.3) prior to use in the new location. |
| **8. Non-conforming Data** | 1. When verifying the calibration of weigh balances (section 12.3), confirm any discrepancies in weight measurements by repeating the operation. Notify a service representative, if necessary, to re-calibrate the instrument when the calibration check shows that the weigh balance is outside of the acceptable tolerance range (see section 12.4).<br>2. Replace the equipment if the vendor determines that a weigh balance or reference weight is out of tolerance and cannot be properly calibrated.<br>3. Procedures will be consistent with SOP ADM-07, Non-Conformance Reports. |
| **9. Data** | 1. Electronically maintain an inventory of weigh balances and reference |

| | |
|---|---|
| **Management** | weights requiring vendor calibration (see section 14). After each addition to or deletion from the inventory, file a hard copy of the inventory in the Weigh Balance Calibration Record book.<br>2. Data will be archived consistent with SOP ADM-03, Records and Archives. |
| **10. Cautions** | 1. Remove reference weights from service when the calibration expires (two years from the date of calibration). Return weights to service when recalibration is completed.<br>2. Perform annual calibration of weigh balances at approximately the same time each year.<br>3. See section 5 for guidance on proper handling of reference weights. |
| **11. Special Apparatus and Materials** | 1. *Weigh balances*. Used to measure the weight of objects in the laboratory, such as media and reagent ingredients and disinfectant containers.<br>2. *Reference weight set* (range of 1g to 50g) and *Individual reference weights* (1 mg, 10 mg, 100 mg, 100 g, 500 g, 1 kg, 2 kg). Used as reference standards to verify the calibration of the weigh balances. |
| **12. Procedure and Analysis** | Calibration certificates must contain the stamp of the accrediting body (e.g., A2LA, NVLAP) and the calibration vendor certificate number. |
| 12.1 Calibration of Weights | a. When the calibration of a weight or weigh set expires (two years from the date of calibration), remove it from service.<br>b. Consult ISO 17025 accredited vendor regarding quote for service, packing/shipping instructions, and completion of any required forms prior to shipping weights.<br>c. Pack and ship weights to vendor.<br>d. Once the weight or weight set has been recalibrated and shipped back to the laboratory, file the calibration certificate in the Weigh Balance Calibration Record book and return the weights to service. |
| 12.2 Daily Calibration and Use of Weigh Balances | a. Follow the instructions provided by the manufacturer for the operation of each weigh balance. See section 15.<br>b. Each balance has a built-in calibration system.<br>c. When weighing, apply load to center of balance. Close balance doors, if applicable, to reduce draft.<br>d. Clean balance pan after each use with a soft brush or damp towel. Allow the balance to dry before the next use. |

**12.3 Six Month Accuracy Check of Weigh Balances**

a. Perform accuracy check of weigh balances once a year, approximately six months after vendor calibration, using reference weights.

b. See the Reference Weight Selection for Sixth Month Accuracy Check (section 14) for guidance on which reference weights to use to verify the calibration of each weigh balance.

c. See section 5 for guidance on handling reference weights.

d. Tare or "zero" the weigh balance before the addition of each weight.

e. Add weights to center of balance and close balance doors, if applicable.

f. Record results for each reference weight on the Verification of Weigh Balance Calibration Record Form (section 14).

g. See section 12.4 for acceptable tolerances for weigh balances when conducting the accuracy check.

h. Note that the acceptable tolerance varies for the 10 and 100 mg reference weights, depending upon whether they are being weighed on a top loading balance that reads to 0.01g or a more sensitive analytical balance.

**12.4 Six Month Accuracy Check of Weigh Balances – Acceptable Tolerances**

| Total Load Applied to Weigh Balance | Acceptable Tolerance | Acceptable Range of Weigh Balance Readings |
|---|---|---|
| 1 mg | ± 0.00005 g | 0.00095 g to 0.00105 g |
| 10 mg[A] | ± 0.0005 g | 0.0095 g to 0.0105 g |
| 10 mg[B] | None[B] | 0.01 g |
| 100 mg[A] | ± 0.005 g | 0.095 g to 0.105 g |
| 100 mg[B] | ± 0.01 g | 0.09 g to 0.11 g |
| 1 g | ± 0.01 g | 0.99 g to 1.01 g |
| 2 g | ± 0.01 g | 1.99 g to 2.01 g |
| 5 g | ± 0.01 g | 4.99 g to 5.01 g |
| 10 g | ± 0.01 g | 9.99 g to 10.01 g |
| 20 g | ± 0.01 g | 19.99 g to 20.01 g |
| 50 g | ± 0.01 g | 49.99 g to 50.01 g |
| 100 g | ± 0.1 g | 99.9 g to 100.1 g |

| | | | |
|---|---|---|---|
| 150 g | ± 0.1 g | 149.9 g to 150.1 g |
| 500 g | ± 0.1 g | 499.9 g to 500.1 g |
| 1 kg | ± 1.0 g | 999 g to 1001 g |
| 2 kg | ± 1.0 g | 1999 g to 2001 g |
| 3 kg | ± 1.0 g | 2999 g to 3001 g |
| 4 kg | ± 1.0 g | 3999 g to 4001 g |
| 5 kg | ± 1.0 g | 4999 g to 5001 g |

[A]When weighed on an analytical balance.

[B]When weighed on a top loading balance that reads to 0.01g.

| | |
|---|---|
| 12.5 Annual Calibration of Weigh Balances | a. Contact ISO 17025 accredited vendor and schedule a date for calibration.<br>b. Weigh balances are not shipped out. The vendor inspects, cleans, and calibrates balances on site.<br>c. File the calibration certificate in the Weigh Balance Calibration Record book. |
| **13. Data Analysis/ Calculations** | None |
| **14. Forms and Data Sheets** | Forms are stored separately from the SOP under the following file names:<br>Sample Inventory of Weigh Balances and Reference Weights Requiring Vendor Calibration — EQ-03-08_F1.docx<br>Reference Weight Selection for Six Month Accuracy Check — EQ-03-08_F2.docx<br>Verification of Weigh Balance Calibration Record Form — EQ-03-08_F3.docx |
| **15. References** | Operation manuals for weigh balances located in file cabinet in D-wing. |