FCS07 - SOP for Operating and Maintaining Analytical Balances

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1. Scope

1.1. This document establishes the procedures for operation, preventative maintenance, and quality control that apply to analytical balances. The purpose of these maintenance and quality control (QC) procedures is to ensure that analytical balances within the Forensic Chemistry Unit (FCU) are working properly and are free of contaminants before processing casework.

2. Background

2.1. To establish a procedure for regular balance operation, maintenance, and QC to ensure quality and accuracy of reported casework results.

3. Safety

3.1. Reagent Toxicity:

3.1.1. Personnel should refer to the appropriate SDS for solvents and reagents used during analysis for any specific safety requirements.

3.1.2. For a complete review of required Health and Safety regulations of the Forensic Science Laboratory (FSL), see *DOM13 - DFS Health and Safety Manual.*

3.2. Protective Equipment:

3.2.1. Personnel should wear personal protective equipment (PPE) including: lab coat, gloves, and safety goggles when carrying out standard operating procedures.

3.2.2. Wear vinyl or nitrile gloves when handling these chemicals to prevent absorption through the skin. If any chemicals are spilled onto gloves, discard gloves into hazardous waste.

3.3. Training:

3.3.1. Formal training in use of balances is necessary.

3.4. Personal Hygiene:

3.4.1. Universal Precautions must be followed. Care should be taken when handling chemicals or any biological specimen. Routine use of gloves and proper hand washing should be practiced.

3.4.2. Refer to *DOM13 – DFS Health and Safety Manual*.

3.5. Disposal of Waste:

3.5.1. Waste materials must be disposed of in compliance with laboratory, Federal, state, and local regulations. Solvents and reagents should always be disposed of in an appropriate container clearly marked for waste products and temporarily stored in a chemical fume hood.

3.5.2. Consult DFS Safety Officer for proper procedures.

4. Materials Required

4.1. Cleaning solvent (e.g., Ethanol)

4.2. Analytical balances

4.3. QA Log(s) and Control Chart(s)

5. Standards and Controls

5.1. Certified Standard Weights

6. Calibration

6.1. Not applicable

7. Procedures

7.1. General Operational Procedures

7.1.1. Prior to each use:

7.1.1.1. Ensure balance is level

7.1.1.2. Ensure balance is free of debris or contaminants (clean with Ethanol and/or brush if necessary)

7.1.2. Tare the balance, with all doors closed (if applicable)

7.1.3. Place the item on the balance, close all doors (if applicable), record weight when balance is stable.

7.1.3.1. Note: For specific procedures relating to weighing evidence in casework, refer to *FCS01 – SOP for Detecting Controlled Dangerous Substances.*

7.2. Weekly Maintenance

7.2.1. Weekly Maintenance must be carried out each week on each balance used for casework and must be performed prior to any other casework. Only the balances being used for active casework must undergo this weekly maintenance.

7.2.2. Each Monday is considered the start of a new week for weekly maintenance purposes.

7.2.3. Procedure

7.2.3.1. Don appropriate PPE (gloves)

7.2.3.2. Visually inspect balance to ensure clean; clean, if necessary, with a wipe or brush and let dry prior to use.

7.2.3.3. Press internal calibration button, if applicable.

7.2.3.4. Tare the balance.

7.2.3.5. Performance check:

7.2.3.5.1. Perform a weight test on three weights appropriate for the weighing range of the balance used (one low, one medium, and one high).

7.2.3.5.2. Record test weights in the corresponding Balance QA Log (Document Control Number 4380).

7.2.3.5.3. Test weights must be no more than the below mentioned specifications:

Balance Class	Weights	Acceptable Range
Analytical	200g	199.9-200.1g
	10g	9.95-10.05g
	2g	1.95-2.05g
	0.1g	0.09-0.11g
	0.01g	0.009-0.011g
Top Loading	10,000g	9,995-10,005
	2,000g	1999-2001g
	200g	199-201g
	10g	9.9-10.1g
	2g	1.9-2.1g

7.2.3.6. Acceptable performance specifications will be assessed prior to use of the balance. Records shall be maintained in a Balance Control Chart.

7.2.3.7. If the test weights are outside the acceptance specifications of a test mass, the analyst shall follow Section 5.8 Malfunctioning Equipment of *DOM05 – Procedures for Instrument Checks and Maintenance.*

7.2.3.7.1. The balance shall be put back into service upon subsequent demonstration of measuring weights within acceptance range (i.e., by performing weekly maintenance and performance check)

7.2.3.8. Note: A weekly maintenance and performance check must also be completed after any service interruption that may modify the function of the equipment (i.e., movement of location).

7.3. Preventative Maintenance Schedule

7.3.1. An external preventative maintenance must be performed as per manufacturer recommendations, or annually at minimum (i.e., once per calendar year).

8. Sampling

8.1. Not applicable

9. Calculations

9.1. Not applicable

10. Uncertainty of Measurement

10.1. Reportable uncertainty range will be assessed based on the type of balance.

10.2. Test weight values are used to assess the annual uncertainty of measurement

10.3. Uncertainty in measurement is assessed using Process Uncertainty, i.e., the balance plus human error, recorded over the year to include temperature and user variations.

10.4. See *FCS21 – Procedure for Uncertainty in Measurement*

11. Limitations

11.1. Not applicable

12. Documentation

12.1. Balance QA Log (Document Control Number 4380)

12.2. Balance Control Charts

13. References

13.1. DFS Departmental Operations Manuals, (current revisions).

13.2. Forensic Chemistry Unit SOPs, (current revisions).