1. Introduction

Evidence that is in the form of powder, solid (e.g., rock-like), or plant material is usually weighed as part of the general scheme of controlled substance analyses. Analysts need to evaluate materials within case submissions in order to determine if criteria weights found within Connecticut (CT) statutes will be exceeded. Cases submitted for federal prosecution will be evaluated based on federal weight criteria.

If the amount of evidence to be weighed, including the weight of the packaging material, does not meet or exceed criteria weight, the item's weight (both evidence and packaging) can be obtained by directly measuring the mass of all evidentiary material. In the case of multiple items wherein all items are visually indistinguishable, taking a gross weight of the evidence and subtracting-out the weight of packaging material is acceptable.

Uncertainty measurements are considered for all cases where weights are taken and reported.

2. Scope

This procedure describes the weighing process and reporting criteria for controlled substances and related evidence. This procedure can also be used when weight measurements on evidence will not be reported but when they are simply listed within case notes. This procedure is designed for analysts who determine weights for evidentiary material.

3. Principle

This procedure involves the weighing of evidentiary specimens using electronic analytical balances. The following definitions will be helpful when following this procedure:

Calculated Net Weight: A measurement resulting from a calculation which is determined by subtracting two measured values (e.g., weights from item(s) with packaging and weights from packaging). This is often used within cases that have multiple like-items and criteria weights may be exceeded. Calculated net weight may be synonymous with the term "net weight" on forms or worksheets.

Criteria Weight: a measurement that, when reached or exceeded, may influence the penalty imposed during sentencing (state or federal) for controlled substances.

Direct Weight: A measurement determined by weighing an item(s) without packaging.

Dynamic Weight: a measurement obtained by placing a weighing container on a balance, taring the balance to zero, and then placing the item(s) to be weighed within the weighing container. The weighing container need not remain on the balance during transfer of items onto the container. Dynamic weight measurements are considered one weighing event.

Gross Weight (aka. Weight with Packaging): a measurement where samples are weighed with their primary packaging.

Like-items: Materials within submissions which are, in a general sense, visually indistinguishable from one another.

Measurement Uncertainty (of reported weight(s)): a value which is associated with a particular balance and which describes the dispersion (or uncertainty) of the weight value(s) being reported. When measurements are reported, measurement uncertainty values associated with such weight values will also be reported.

Minimum Weight: the minimum quantity of a sample to be weighed when the measurement uncertainty of the balance used is taken into account. If the sample quantity to be weighed is too small, the uncertainty may take up too large of a portion of the weighed value and consequently make the result unreliable. The analyst must take this into account when selecting a balance for casework.

Primary packaging: Material directly containing evidence to be analyzed (e.g., plastic bags that contain drugs).

4. Specimens

Any solid or liquid can be used in this procedure. (Evidence in liquid form are not routinely weighed unless specifically requested.) Weighing techniques can either be direct or indirect depending on the sample submission and the information required to be reported.

5. Equipment/Materials/Reagents

5.1 Analytical balances (top-loading, analytical or equivalent)

5.2 Masses (Troemner or equivalent)

5.3 Weigh paper/boats (or equivalent)

5.4 Other common laboratory equipment (e.g., tweezers, spatulas, etc.)

6. Calibrators and Controls

Certified weights will be used when performing weight measurement checks for the analytical balances. All items being weighed will be handled using appropriate utensils or gloved hands. When using gloves to directly handle weights, cotton (not polymeric) gloves should be used.

Masses used for checking balances (e.g., daily balance checks) will have been certified according to applicable policy (i.e., General Lab (GL)).

7. Procedure

7.1 Daily checks

7.1.1 Balances will be checked for accuracy prior to daily use.

Note: The term 'daily' refers to the day a balance is actually used for collecting a measurement associated with casework.

7.1.2 Each day a balance is used it is checked with at least one certified mass.

7.1.2.1 Analysts should select masses that are close to the approximate weight of the material to be weighed. It is not unreasonable for an analyst to check several masses.

7.1.3 The check is documented on the Analytical Balance Check Sheet (CS-5.4).

7.1.4 The acceptable range for each certified mass is ±5% of the true value.

7.2 Balance Use

7.2.1 It is preferred to use balances that capture data directly onto an electronic device so as to avoid transcription errors.

7.2.2 Each balance has on/off and tare function keys.

7.2.3 Use appropriately sized weigh paper/boat on the balance platform. Tare/zero using the function key.

7.2.4 If there is drift (i.e., the instrument is unstable and will not zero or maintain a zero reading) and a simple fix can't be performed (e.g., airflow, abnormal vibrations), the analyst will not use the balance. The appropriate Lead Examiner (or higher) will be notified and the balance may need to be placed out-of-service.

7.2.5 If the balance has been moved (either accidentally or deliberately), the instrument should be checked against certified masses. Follow the procedure as outlined in GL 21. Balances should not be moved without prior authorization from the appropriate Lead Examiner (or higher).

7.2.6 Analysts using balances will ensure that they are clean before and after each use as well as in-between sample weighing events. Methanol or similar solvent can be used for cleaning purposes. The analyst will ensure that all solvents used for cleaning will have thoroughly evaporated prior to taking measurements.

7.2.7 Analysts should not place any evidentiary items directly on the weighing pan. Clean weigh paper, weighing boat, or other clean container will be used for each weighing measurement.

Note: Weigh paper/boats are not used when using certified weights.

7.3 Weighing Considerations

7.3.1 Analysts will select a balance appropriate to the task being performed. The basis of this selection should include range of the balance and relative weights of sample materials.

7.3.1.1 Minimum weight must be taken into consideration when selecting the balance.

7.3.2 Analysts will determine the best approach for obtaining weight(s) of evidence (i.e., direct weights, net weights, gross weights).

7.3.3 If specifically requested by the customer and/or necessary, net weights for evidence will be obtained.

7.3.4 Direct weights for evidence involving overdose-type cases are not required and gross weights may be reported in those situations. If there are any questions, consult the appropriate Lead Examiner (or higher).

7.3.5 If a criteria weight won't be met or exceeded then a gross weight can be taken.

7.3.6 If a criteria weight is reached and exceeded by 20%, then a gross weight may be obtained at that point for any additional units of the same type.

7.3.7 If the item is reported with packaging, then any sub-items can be reported with packaging. If the item is reported without packaging (net/direct weight), then any sub-items should be reported using net/direct weight.

7.3.8 Uncertainty must also be taken into account when determining how to approach weighing the items in a case.

7.3.8.1 Uncertainty information/values are available for each balance.

7.3.9 In some cases it may be necessary to mathematically combine several items in order to make an evaluation of the criteria weights.

7.4 Gross Weight

7.4.1 A weigh container is placed on the balance and the balance is tared to zero.

7.4.2 The item is placed in the tared weigh container with its packaging and the gross weight is recorded.

7.4.3 This should be recorded with the appropriate number of decimal places based on the readability of the balance used.

7.4.4 When taking a weight with packaging, only the smallest packaging possible should be included. Do not include the evidence bag with the weight of the packaging.

Example: If six zip-lockable bags of plant material are submitted in a paper bag, and the paper bag is found inside a plastic evidence bag, the weight of the plastic evidence bag and the paper bag will not be included in the overall weight measurement.

7.5 Direct Weights

7.5.1 A weighing container is placed on a balance and the balance is tared to zero.

7.5.2 The material is placed in the tared container and the weight is recorded.

7.5.3 Weights should be recorded based on the readability of the balance.

7.5.4 When totaling direct weights, all digits should be used in the calculations and the final result will have digits appropriately truncated.

7.6 Calculated Net Weight

7.6.1 Record the gross weight for the group of like-items.

7.6.2 Randomly select five representative units of the like-items.

7.6.3 The direct weight of the material and the empty packaging are separately recorded.

7.6.4 Use form CS 5.2 to record the weights and perform the calculation.

7.6.4.1 Calculated Net Weight =

Gross Weight – [(avg. empty-package weight) * (# of packages)]

7.6.5 If the weights of the empty-primary packaging vary by more than 25% of the average empty-primary packaging weight, more weights will need to be taken unless directed otherwise by a Lead Examiner or higher. Generally five additional empty-packaging weights will be obtained. If these weights are consistent with one another and don't vary by more than 25% of the previous average empty-packaging weight, then the new average will be based on the total (e.g., 10) readings.

7.7 Reporting

7.7.1 <u>Weights</u>

7.7.1.1 Weighing measurements will be limited to a maximum of two decimal places unless doing so would cause ounce conversions or uncertainty values to be reported as 0.00. If this happens then more decimal places can be used. For example, a balance with an expanded uncertainty of 0.005g would cause measurements to be reported as '+/- 0.00g' if only two decimal places were used. In these cases the weights will be reported to three decimal places (e.g., '+/- 0.005g').

7.7.1.2 Reported weights will be truncated and not rounded.

Example: 0.1578 grams will be reported as 0.15 grams

7.7.2 Measurement Uncertainty

7.7.2.1 Expanded measurement uncertainty values will be reported to a 95.45% level of confidence and will be reported to the same number of decimal places as the weight measurement.

7.7.2.2 The following format will be used within reports:

Weight +/- Expanded Uncertainty (same units and decimal places)

7.7.2.3 Only one measurement unit uncertainty is required to be reported.

7.7.2.3.1 If a weight measurement is reported in both grams and ounces it is permissible to only report the measurement uncertainty of the corresponding weight in grams, not in both grams and ounces.

Report Writing Examples:

Item #001-01: weighed 100.523 grams (3.545 ounces) +/- 0.004 grams

Item #001-02: weighed 150.52 grams (5.30 ounces) +/- 0.03 grams

8. Calculations

8.1 Ounces to pounds: divide the number of ounces by 16.

8.2 Grams to ounces: divide the number of grams by 28.35

8.3 Calculated Net Weight = gross weight – (average packaging weight x number of primary packages)

8.4 Weight variation (25% for packaging): 0.25 x (average primary packaging weight)

9. Safety

Appropriate PPE (personal protective equipment) must be worn when handling drug evidence and includes at least a lab coat, gloves, and safety glasses. Additional equipment such as masks should be worn, when appropriate. Items that are submitted into the Unit can contain a variety of potentially harmful substances, some of which may be directly absorbed through the skin and some which may easily be aerosolized and inhaled.

10. References

10.1 State of Connecticut Controlled Substance Laws. State of Connecticut Department of Consumer Protection Controlled Drug Schedules, Violations & Penalties:
(e.g., ControlledDrugSchedulesViolationsPenaltiespdf.pdf (ct.gov)

10.2 Federal Controlled Substance Trafficking Penalties
(e.g., Drugs of Abuse, A DEA Resource Guide (2020 Edition))