A. **PURPOSE**:

Evidence that is in the form of powder, solid (e.g., rock-like), or plant material is 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.

B. **RESPONSIBILITY**:

All Forensic Science Examiners (FSE) and analysts who determine weights for evidentiary material.

C. **EQUIPMENT:**

Mettler AT-261
Mettler PE 300
Mettler-Toledo AG
Denver Instrument TR-603d
Denver Instrument TR-603
Mettler-Toledo XS203S
Ohaus Discovery DV215CD
Other analytical balances assigned to the section
Troemner Masses (or other certified masses assigned to the section)

D. **DEFINITIONS**:

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

Calculated Net Weight: This is calculated for cases with multiple like-items where a criteria weight may be exceeded. Calculated net weight is synonymous with the term, net weight, which may be found in certain forms or worksheets. Calculated net weight is determined by:

Calculated Net Weight = gross weight – [(average weight of packaging) * (the number of packages)]

Direct Weight: This is determined by weighing the item(s) without packaging.

Gross Weight: This is determined by weighing the item(s) with packaging.

Measurement Uncertainty of Weight Reporting: a number which describes the dispersion (or uncertainty) of the values resulting from the process of weight determination.

Criteria Weight: a weight of a controlled substance when reached or exceeded which may influence the penalty imposed during sentencing (State or Federal).

Dynamic Weight: a weight which is obtained by taring a weighing container and placing the item to be weighed within/on the container in order to get a resulting weight value. This can be done by placing a weigh-boat on a balance and taring it. The item to be weighed is then placed directly on the weigh-boat, without removing it from the balance platform, and obtaining the weight value. Dynamic weight measurements are considered one (1) weighing event.

Static Weight: a weight which is obtained by subtracting the weight of a weighing container and the item to be weighed from the weight of just the weighing container. This can be done by obtaining the mass of a weigh-boat and recording that mass. The item to be weighed is then placed on/in the weigh-boat and the combined weight is recorded. The mass of the item is obtained by subtracting the two weights. Static weight measurements are considered two (2) weighing events.

E. **SAFETY**:

Appropriate PPE (personal protective equipment) must be worn when handling drug evidence and includes gloves and a lab coat, at minimum. Additional equipment, eye protection and particle masks should be worn when appropriate. Items that are submitted the unit can contain a variety of substances, some of which may be directly absorbed through the skin (including, but are not limited to, phencyclidine (PCP) and lysergic acid diethylamide (LSD)).

F. **PROCEDURE**:

Weights for evidence and associated packaging will be taken in the presence of a witness.

1. Controls:
    a. Balances are checked for accuracy according to applicable policy.
    b. Masses used for checking balances (e.g., daily balance checks) have been certified according to applicable policy.
    c. Daily checks: each day a balance is used it is checked with at least one (1) certified mass. The check is logged into the appropriate balance log book (see CS-5.4). The acceptable ranges for each certified mass are kept with the balances.

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.

d. 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.

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

2. Balance Use:

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

b. An appropriately sized weigh boat is placed on the balance platform and is tared using the tare function key.

c. 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. A Lead Examiner/Supervisor or appropriate Deputy Director will be notified.

d. If the balance has been moved (either accidentally or deliberately), the instrument should be checked against certified masses. A low, medium, and high mass should be used. The instrument is acceptable if the measured masses are within the accepted ranges that are with each instrument. Balances should not be moved without prior authorization.

e. Analysts using balances will ensure that they are clean after each use and in-between samples. Ethanol or similar solvent can be used for cleaning purposes.

f. Analysts should not place any items directly on the weighing pan. A clean weigh paper or weigh boat should be used for each weighing measurement. This does not apply to the use of certified weights.

3. Sample Considerations:

a. Analyst determines the approach to the case weight based on the samples.

i. If a criteria weight will be reached, or exceeded, a direct weight needs to be performed. This can be a calculated net weight in submissions that have greater than six (6) like-items. For cases with less than five (5) like-items, or for non-like-items, single (or several single) direct weights can be obtained.

ii. For cases that contain suspected marijuana which have weights that approach or exceed 0.5 ounces, direct weights (weights without packaging) need to be taken (see Public Act 11-71). Analysts should consult with the Lead Examiner/Supervisor or appropriate Deputy Director to determine if it is necessary to report marihuana submissions with

direct weights when under 0.5 ounces. When this is done, it will be documented in the case notes.

iii. If a criteria weight won't be approached or exceeded, a gross weight (weight with packaging) can be taken. The analyst should ensure that the criteria weight won't be exceeded. In cases where samples have multiple bags of evidence, the analyst may need to ensure that the proper measurement is taken by performing a calculated net weight.

iv. For all multiple like-item submissions, the weight of items that are analyzed will be determined and reported. If the item is reported with packaging, then any sub-items can be reported with packaging. If the item is reported without packaging (net weight) then any sub-items should be reported using direct weight.

v. Uncertainty must also be taken into account when determining how to approach weighing the items in a case (see CS-5.1). Weight worksheets contain uncertainty determination sections and calculations (see CS-5.2 and 3).

vi. Uncertainty information is available for each balance.

vii. If a quantitation is reported, a direct weight or calculated net weight will be reported. In some cases it may be necessary to combine several items and take a combined weight for the quantitation.

4. Method:

a. Direct Weight: a weighing container is placed on a balance and the balance is tared. The item (e.g., rock, powder, plant material) is placed in the tared container and the weight is recorded. This should be recorded with no fewer than three (3) significant figures, whenever possible.

b. Weight with packaging: a weigh container is placed on the balance and the balance is tared. The material is placed in the tared weigh container with the packaging and the weight is recorded. This should be recorded with no fewer than three (3) significant figures, whenever possible. When performing 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 6 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 evidence bag and the paper bag will not be included in the overall weight measurement.

c. Calculated Net Weight: a weigh container is placed on the balance and the balance is tared. Like-items are placed in the tared weigh container and the gross weight of the like-items is recorded on the Net Weight Worksheet (CS-5.2). Five (5) representative specimens of the like-items are then randomly chosen and all of the weights are recorded on the same worksheet. Each bag is separately emptied, individually weighed using tared weigh containers, and the [empty bag] weights are recorded. If the [empty] bag weights do not vary

by more than 25% from the average empty-bag weight, then the approximate calculated net weight due to all the bags in the submission can be calculated.

Calculated Net Weight = Gross Weight – [(average empty-bag weight) * (number of bags)]

When calculating direct weight all digits should be used in the calculations and the final result will have its digits appropriately truncated.

If the empty-bag weights vary by more than 25% of the average empty-bag weight, more weights will need to be taken unless directed otherwise by a Lead Examiner/Supervisor or appropriate Deputy Director. Generally five (5) additional empty-bag 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-bag weight, then the new average will be based on the total (e.g., 10) readings.

5. Reporting:

In general weights should be reported to three (3) significant figures. Reported weights will be truncated and not rounded.

Examples: 1025 grams should be reported as 1.02 kilograms
0.1578 grams should be reported as 0.157 grams

Measurement Uncertainty: When required, the uncertainty associated with weight measurements will be reported. When reported, the weight will be listed with the appropriate uncertainty (i.e., expanded uncertainty) and confidence level. The expanded uncertainty shall be reported to a 95.45% level of confidence and should be reported to the same number of decimal places as the readability of the balance that was used.

G. **CALCULATIONS**:

1. Grams to ounces: divide the number of grams by 28.35
2. Ounces to pounds: divide the number of ounces by 16
3. Net Weight = gross weight – (average bag weight x number of packages)
4. 25% weight difference (for packaging) = [(highest value – lowest value)/highest value)] * 100

H. **SOURCES OF ERROR:**

1. Failing to tare a balance or weigh boat before adding the sample.
2. Failing to clean the balance before or after use.
3. Failing to change the weigh boat/paper in-between samples.

4. Improper calculation of weights.
5. For gross weight determination, failing to subtract all of the packaging weights that were included in the gross weight.
6. Sample loss during transfer into a weighing device

I. **REFERENCES**:

1. State of Connecticut Controlled Substance Laws. State of Connecticut Department of Consumer Protection Controlled Drug Schedules, Violations & Penalties: (http://www.ct.gov/dcp/lib/dcp/pdf/drug_control_pdf/2010_cs_violation.pdf)
2. Federal Controlled Substance Trafficking Penalties http://www.justice.gov/dea/agency/penalties.htm

Rev. #	History
5	Changed title. General verbiage changes throughout document. Section B: Changed 'Variance' to 'Coefficient of Variation' and removed 'Average Deviation.' Section D: Made in-house validation of equipment optional, re-worded procedure that GL policy will be followed for equipment calibrations, and clarified responsibilities. Section E: corrected calculation equations. Changed definition of timeframe for accuracy check of equipment to refer to GL policy. Replaced supervisor with Lead Examiner. Clarified verbiage throughout document. The use of 'shalls' and 'shoulds' were re-evaluated and changed accordingly. Frequency of uncertainty calculations no longer specifically stated.
6	Updated 'Net Weight' to be more accurately listed as 'Calculated Net Weight'. Defined like-items. Defined measurement uncertainty of weight reporting. Clarified dynamic weight and static weight. Updated the safety section. Removed CS section and replaced with 'Unit.' Defined acronyms. Case materials replaced with associated packaging. 'Applicable policy' added to Procedure section. Minor grammar and formatting changes. Added that certified weights can be weighed directly on a weighing pan. Removed uncertainty determination verbiage since it is covered within another SOP. Clarified the reported expanded uncertainty as having a confidence level at 95.45%