SOP 33

Standard Operating Procedure for Calibration of Weight Carts

1 Introduction

1.1 This Standard Operation Procedure (SOP) describes the procedure to be followed for the calibration of weight carts used to test livestock and vehicle scales. This procedure may be used for any nominal values provided adequate standards and equipment are available and the item being calibrated meets appropriate specifications. Detailed measurement ranges, standards, equipment, and uncertainties for this SOP are generally compiled in a separate document in the laboratory.

1.2 Prerequisites

1.2.1 Facility. Verify that the laboratory facilities meet the following minimum conditions to meet the expected uncertainty possible with this procedure.

Table 1. Environmental conditions.

Echelon	Temperature Requirements During a Calibration	Relative Humidity (%)
III	Lower and upper Limit: 18 °C to 27 °C Maximum changes: ± 5 °C / 12 h and ± 3 °C / h	40 to 60 ± 20 / 4 h

1.2.2 Balance/scale. Verify that the balance, scale, or load cell is in good operating condition with sufficiently small process standard deviation as verified by a valid control chart or preliminary experiments to ascertain its performance quality. The expanded uncertainty (k = 2) must be less than one-third of the applicable tolerance and balance operating characteristics must be evaluated against this requirement prior to calibration.

If a scale or load cell is used for the calibration that is not a permanent piece of equipment in the calibration laboratory, appropriate verification and repeatability statistics must be obtained prior to a calibration to determine suitability and acceptability for calibration. Records must be maintained of this verification. Minimum verification includes an increasing and decreasing load test to at least the capacity of the weight cart, a shift test, a sensitivity test at the test load, and evaluation of the repeatability based on a minimum of 7 repeated weighings (following the same SOP to be used to test the weight cart).

1.2.3 Standards. Ensure the availability of suitable working standards or recently calibrated (and unused) field standards in quantities up to the capacity of the weight cart(s) that will be calibrated. All standards must have known conventional mass values with valid metrological traceability to the SI, which may be through laboratory working standards to the National Institute of Standards and Technology.

Standards must be evaluated to ensure that standard uncertainties for the intended level of calibration are sufficiently small. Reference standards should not be used to routinely calibrate customer standards using this procedure. The expanded uncertainty (k = 2) must be less than one-third of the applicable tolerance and evaluated prior to calibration. The contribution of the mass standards must be assessed prior to calibration and Class F mass standards without corrections or with uncertainties greater than 1/3 of the tolerance will not be acceptable.

1.2.4 Staff. Verify that the operator is experienced in precision weighing techniques and has had specific training in SOP 8, SOP 4, SOP 29, and GMP 10. Safety precaution: weight carts should be calibrated with at least two people present.

2 Methodology

2.1 Scope, Precision, Accuracy

This method is applicable to lower echelon mass calibration (tolerance testing) of weight carts, provided that the uncertainty requirements can be met. The achievable precision using this procedure is appropriate, provided the expanded uncertainty of the measurement is no more than one-third of the permissible tolerance of the weight cart. The accuracy achievable with this procedure depends on the accuracy of the calibration of the working standards and the precision of the comparison equipment/devices chosen and the procedure selected (e.g., SOP 8 or SOP 4).

2.2 Summary

A weight cart is calibrated by substitution with standards having known values, using weighing equipment that has been evaluated as having sufficient resolution and repeatability, to maintain uncertainty to tolerance ratios needed in legal metrology. Modified or double substitution methods are used (SOP 8, SOP 4) and are modified to obtain the replicate observations needed for measurement assurance and determination of the calibration uncertainty.

2.3 Equipment /Apparatus/Assistance

2.3.1 A balance, scale, or load cell with suitable resolution and repeatability, in good repair.

2.3.1.1 General guidelines regarding selection of weighing equipment must include consideration of the device repeatability to determine the achievable standard deviation of the measurement process. To ensure that appropriate uncertainty to tolerance ratios are maintained, the following guidance is provided:

When using Modified SOP 8:
- For a 1000 lb to 2000 lb cart, the maximum division size should be 0.01 lb or less.
- For a 5000 lb cart, the maximum division size should be 0.05 lb or less.

When using Modified SOP 4:
- For a 1000 lb to 2000 lb cart, the maximum division size should be 0.05 lb or less.
- For a 5000 lb cart, the maximum division size should be 0.1 lb or less.

Some balances will require suitable supports to be mounted on the scale deck (platform) to receive the weight cart dimensions without damage to the scale or weight cart. Supports must be appropriately stable and sturdy.

2.3.2 Standards and correction weights, meeting NIST Class F tolerances with current Calibration Reports and known values and uncertainties (as listed with prerequisites).

2.3.3 Hand tools such as the following are needed: wrenches; screw driver; wire cutters; lead and wire seals, and seal press.

2.3.4 Means to move the weight cart safely. Weight carts are large, bulky items and are awkward to move safely. Appropriate safety precautions must be followed in the laboratory. Movement of liquid powered fuel carts is usually not done using the power system of the carts because exhaust from gasoline or diesel powered carts is considered unsafe in the laboratory; if no other options exist, suitable air handling must be available. Use of forklifts to move the carts should only be considered when other options are unavailable and extreme care must be taken. Use of a hoist may provide adequate means to move the cart, however, adequate care must be taken to prevent tipping the cart or bumping into other items in the laboratory as the cart is lifted and moved.

2.3.5 A basic knowledge of weight carts, including the braking system and operating controls is required. Only qualified personnel should operate and inspect the weight cart. Verification that the brakes are operative prior to movement of the cart is essential.

2.3.6 Suitable adjustment material must be available for placement in the adjusting compartments; lead or steel shot is recommended.

2.3.7 Inspection checklist (See Appendix A). Weight carts are not considered Class F standards due to the extent of motorized and mechanical parts and fluids; therefore, special care must be taken in their calibration and use. An inspection checklist must be completed for each new cart prior to placing it into service. The checklist becomes a permanent part of the records for each weight cart and must be available for review prior to each use or calibration.

2.3.8 For safety reasons, two people should be present to conduct a calibration of a weight cart.

3 Fundamental Considerations

3.1 Weight carts must be properly cleaned and painted, with all repairs and maintenance completed (as needed) prior to calibration. Obtaining actual "as found" values for reverse traceability is not possible with this procedure. Obtaining "as found" values may be achieved by performing a calibration before and after repairs and maintenance are completed. Alternatively, see the "Recommended Method for Intermediate Verification of Mass Values for Weight Cart Users" included as Appendix B.

3.2 Weight carts must be completely dry, with no ice or moisture on the surface or under carriage of the cart.

Experience has shown that a light coating of frost can cause errors more than the tolerance for the cart. In heated facilities, the cart must be allowed enough time to warm to prevent condensation.

Table 2. Stabilization Time.

Temperature Range 22 ºC (lab temp)	**Temperature Range 72 ºF (lab temp)**	**Minimum Equilibration Time[a]**
± 5 ºC, 17 ºC to 28 ºC	± 10 ºF, 62 ºF to 82 ºF	4 hours
< 17 ºC and > 28 ºC	< 62 ºF and > 82 ºF	24 hours/overnight
[a]deviation is allowed if the known cart temperature is at the lab temperature ± 2.5 ºC (5 ºF).		

3.3 Weight carts that repeatedly demonstrate excessive “as found” out-of-tolerance conditions from the previous calibration date, may be required to be submitted on a more frequent basis; with every consideration being given to determine the cause of the variance.

4 Pretest Weight Cart Inspection

Complete the Weight Cart Inspection Checklist that is included in Appendix A. The Inspection Checklist is an integral part of the Calibration Report of a weight cart and must be transported with each weight cart and verified prior to each use or calibration. Note and ensure completion of any needed repairs or maintenance prior to calibration.

5 Procedure

5.1 Follow SOP 8 or SOP 4 to determine the conventional mass value of the weight cart, except for items modified and clarified in this SOP. Follow good laboratory practices such as properly exercising the balance prior to calibration.

5.2 SOP 8 Modifications.

5.2.1 Repeat the intermediate weighing of the weight cart as if multiple weights were being verified. Obtain at least 3 observations that are taken with a release/removal of the weight from the sensing device. Determine the calculated differences per SOP 8 and calculate the range between the largest and smallest numerical mass value differences. Record the range values in a suitable control chart for weight cart calibrations.

5.2.2 Mass adjustments to the cart may be made at the end of exercising the balance or after the first observation. The cart must be adjusted as close as possible to zero error. The first reading then becomes a “zero” difference when compared to the standards (the correction values of the standard must be considered). Adjustments must be made quickly to avoid errors due to balance drift or shifting. If balance drift or shifts are noticed, the 3 replicate observations should be made after the adjustment is completed.

5.2.3 Care must be taken to ensure that the center of the mass of the weight cart is centered on the balance pan as much as is possible. By rotating the cart by 180 degrees and remeasuring it, off-center loading factors may be considered as a part of standard deviation.

5.3 SOP 4 Modifications.

5.3.1 Repeat the double substitution procedure 3 times. Determine the calculated differences per SOP 4 and calculate the range between

the largest and smallest differences. Record the range information in a suitable control chart for weight cart calibration range values.

5.3.2 Mass adjustments to the cart may be made at the end of exercising the balance or after the first double substitution. The cart must be adjusted as close as possible to zero error. The first reading then becomes a "zero" difference when compared to the standards (the correction values of the standard must be considered). Adjustments must be made quickly to avoid errors due to balance drift or shifting. If balance drift or shifts are noticed, the 3 replicate double substitutions should be made after the adjustment is completed.

5.3.3 Care must be taken to ensure that the center of the mass of the weight cart is centered on the balance pan as much as is possible. By rotating the cart by 180 degrees and remeasuring it, off-center loading factors may be considered as a part of standard deviation.

6 Calculations

6.1 Follow calculations as described in SOP 4 or SOP 8 as appropriate.

6.2 Calculate and report the mean of the 3 replicate measurements as the calibrated mass of the weight cart. When adjustments are made, use the mean of the adjusted value as the "as left" reported value.

7 Tolerance

7.1 Tolerances are established in NIST Handbook 105-8[1]. Weight carts must be adjusted as close as possible to zero error during calibration. The expanded (k = 2) combined uncertainty of the calibration must be less than one-third of the tolerance specified in Handbook 105-8.

7.2 The values of weight carts and their tolerance status are issued and evaluated based on Conventional Mass (previously called Apparent Mass versus a reference density of 8.0 g/cm³ at 20 °C). If a reference density other than 8.0 g/cm³ is used, the reference density must be reported. No correction for the effect of air buoyancy is general made unless stated on the test report.

[1] NIST Handbook 105-8, Specifications and Tolerances for Weight Carts, 2019.

7.3 Tolerances for weight carts (See also NIST Handbook 105-8). Tolerances are calculated as 0.035 % of the nominal mass, rounded to the nearest 10 grams.

Table 3: Weight Cart Tolerances

Nominal (lb)	Tolerance (± g)		Nominal (kg)	Tolerance (± g)	Nominal (kg)	Tolerance (± g)
1000	160		400	140	2600	910
1500	240		500	170	2700	940
2000	320		600	210	2800	980
2500	400		700	240	2900	1010
3000	480		800	280	3000	1050
3500	560		900	310	3100	1080
4000	640		1000	350	3200	1120
4500	710		1100	380	3300	1150
5000	790		1200	420	3400	1190
5500	870		1300	450	3500	1220
6000	950		1400	490	3600	1260
6500	1030		1500	520	3700	1290
7000	1110		1600	560	3800	1330
7500	1190		1700	590	3900	1360
8000	1270		1800	630	4000	1400
8500	1350		1900	660	4100	1430
9000	1430		2000	700	4200	1470
9500	1510		2100	730	4300	1500
10000	1590		2200	770	4400	1540
			2300	800	4500	1570
			2400	840	4600	1610
			2500	870		

8 Measurement Assurance

8.1 Adequate measurement assurance is a required component of every quality system and uncertainty analysis but maintaining a surrogate weight cart for use in the laboratory as a check standard is impractical.

8.2 Three repeated observations are made and the standard deviation of the values or the range of values (largest mass difference minus the smallest mass difference) is entered in a control chart. The pooled standard deviation of the process is used, or the pooled mean range value is used to estimate a standard deviation of the process. When plotting each new variability value, verify that it is within previously accepted limits.

8.3 Alternatively, though not preferred, 7 to 12 repeated observations are made (following the same SOP to be used to test the weight cart) and a short-term

standard deviation of the process is calculated each time a weight cart is calibrated. A minimum of 7 replicate weighings may be used if a balance is not permanent equipment of the laboratory (with additional balance evaluations).

9 Assignment of Uncertainty

The limits of expanded uncertainty, *U*, include estimates of the standard uncertainty of the mass standards used, u_s, and estimates of the standard deviation of the measurement process, $s_{p.}$ These estimates should be combined using the root-sum-squared method (RSS), and the expanded uncertainty, *U*, reported with a coverage factor of two ($k = 2$), to give an approximate 95 percent level of confidence. See SOP 4 or SOP 8 for a detailed uncertainty budget table as appropriate. See SOP 29 for the complete standard operating procedure for calculating and reporting the measurement uncertainty.

9.1 The expanded uncertainty for the standards, U, are obtained from the calibration report. The combined standard uncertainty, uc, is used and not the expanded uncertainty, U, therefore the reported uncertainty for the standards will usually need to be divided by the coverage factor *k*.

9.1.1 A combination or summation of standards is typically needed for the calibration of weight carts. The dependence or independence of the calibration of such standards must be determined prior to combining the uncertainties associated with the standards. In the case of dependent standards (calibrated against the same working standard), the us values are summed by addition prior to including them in a root sum square calculation: ($u_{s1} + u_{s2} + \ldots u_{sn}$). In the case of independent standards, the us values are summed by root sum square: $(u_{s1}^2 + u_{s2}^2 + \ldots u_{sn}^2)^{0.5}$. All u_s values must represent one standard deviation prior to combining.

9.2 Standard deviation of the measurement process, sp, is obtained by using the pooled standard deviation of similar size carts over time or by calculating the estimated standard deviation of the process based on the mean range value calculated from applicable range charts

9.3 Buoyancy corrections are not generally needed at the uncertainty level this procedure is designed for. An uncorrected systematic error should be included for the uncorrected magnitude of the air buoyancy correction, following NISTIR 6969, SOP 2; this value is treated as a rectangular distribution.

9.4 Additional components due to balance drift or sensitivity errors need to be evaluated and may need to be included per SOP 8.

10 Calibration Certificate

10.1 Prepare a Calibration Certificate according to SOP 1. Report the mean of the calculated conventional mass measurement result and the calculated uncertainty. A sample calibration certificate is included in Appendix A; review the final certificate against the checklist provided in SOP 1.

10.2 Conformity Assessment.

The Inspection Checklist is an integral part of the calibration certificate. The expanded uncertainty, U, must be $\leq 1/3$ of the applicable tolerance from NIST Handbook 105-8. Compliance assessments must note the applicable documentary standard and which portions of the standard were or were not evaluated.

Appendix A

Sample Calibration Certificate for Weight Cart

Test Number: Date Issued: Date of Calibration:

Submitted by:

Manufacturer: **Date of Manufacture:**

Model Number: **Identification/Serial Number:**

Calibration Values:

As Found Conventional Mass[a] (lb)	As Left Conventional Mass (lb)	Uncertainty (lb)

[a] *The Conventional Mass is the mass determined/calculated by weighing in air of reference density 1.2 mg/cm^3, reference weights of density 8.0 g/cm^3 and at a reference temperature of 20 °C. Buoyancy corrections are considered negligible and were not made unless otherwise stated.*

Conditions of Test & Traceability:
The above weight cart was compared with standards of the State of XXXX, which are traceable to the International System of Units (SI) and/or the National Institute of Standards and Technology (NIST) and have current calibration values. The assigned test number shown above provides documented evidence for metrological traceability.

Test method: {Enter SOP 4 or 8 as applicable} NISTIR 6969, Selected Procedures for Mass Calibrations. {Enter publication date}

Balance:
Temperature:
Pressure:
Relative Humidity:

Components of Uncertainty:
The uncertainty is reported as an expanded uncertainty at an approximate 95 % confidence interval (k = 2) and calculated according to SOP 29 which is compliant with the ISO/IEC Guide to the Expression of Uncertainty in Measurement. Components included in the calibration uncertainty are the uncertainty associated with the standards and the standard deviation of the measurement process as determined through repeated observations or other suitable range chart for this measurement process. Factors included on the inspection checklist have not been included in the calibration uncertainty. However, factors on the

checklist may contribute measurement errors that are significant if not properly maintained during use.

Conformity Assessment:
The weight cart identified on this calibration certificate complies with NIST Handbook 105-8, 2019 specifications and tolerances. Additional details regarding the assessment are included in the associated checklist that is an integral part of this calibration certificate. The weight cart was found (or adjusted) to within the specified tolerances.

Inspection Checklist
The weight cart was cleaned and painted and allowed to come to thermal and environmental equilibrium in the laboratory prior to calibration. The weight cart was adjusted (as needed and noted above) as close as possible to zero error. All fluid levels were adjusted as close as possible to the full/reference marks and sealed. Liquid levels must be maintained as close to reference levels as possible during use. The fluid levels include:

_____Engine Oil;

_____Hydraulic Fluid (sealed);

_____Battery Water Level (sealed battery); and

_____Liquid Fuel {Enter gasoline or diesel here} (note reference mark).

The attached Inspection Checklist is an integral component of this Calibration Report and a copy must be maintained with the cart and reviewed prior to use.

Any maintenance, repairs, replacement of parts, or damage to weight cart or its components will likely result in an out-of-tolerance condition; therefore, maintenance or replacement of components such as batteries, tires, filters, or other items listed on the checklist, require calibration of the weight cart prior to subsequent use.

Tolerance:
Reference: NIST Handbook 105-8, Specifications and Tolerances for Weight Carts, 2019. The applicable tolerances are as follows:

Inspection Checklist Table 1: Weight Cart Tolerances

Nominal (lb)	Tolerance (± g)		Nominal (kg)	Tolerance (± g)
1000	160		500	170
2000	320		1000	350
3000	480		1500	520
4000	640		2000	700
5000	790		2500	870
6000	950		3000	1050
7000	1110		3500	1220
8000	1270		4000	1400
9000	1430		4500	1570
10000	1590			

For carts intermediate between these values, tolerances are calculated as 0.035 % of the nominal mass, rounded to the nearest ten grams.

Authorized Signature

Inspection Checklist for Weight Cart

Test Number: Date of Inspection:

Manufacturer: Date of Manufacture:

Model Number: ID/SN Number:

_____Nominal Mass of Weight Cart: _____ Suitably marked: Yes/No
_____Powered by: Electric/Generator_____ Diesel_____ Gasoline _____
_____Fluid Levels: Engine Oil _____
Hydraulic Fluid _____ Sealed: Yes/No
Battery _____ Sealed: Yes/No
Liquid Fuel _____ Reference line present: Yes/No
_____Fluid drain tubes extend beyond the body of the cart: Yes/No
_____Number of axles: _____
_____Number/Size of Tires: _____
_____Sealed wheel bearings: Yes/No
_____Drain holes present in locations where water may accumulate: Yes/No
_____Weight restraint railing permanently fixed and solid: Yes/No
_____Adjusting cavity accessible: Yes/No
_____Adjusting cavity approximate capacity: _____lb
_____Adjusting cavity sealed: Yes/No
_____Service brakes functioning properly: Yes/No
_____Parking brakes functioning properly: Yes/No
_____Remote control functioning properly: Yes/No

_____General condition at time of calibration (note any accumulated dirt/debris, damage, loose parts, or evidence of tampering or unauthorized entry of seals).

_____

_____List and report any repair and maintenance performed, parts replaced, etc., Leaks repaired, new battery, carburetor, exhaust system, wheels changed, welding performed, etc. Include any comments or changes since the last calibration.

_____

_____

_____

Appendix B

Recommended Method for Intermediate Verification of Mass Values for Weight Cart Users

1. Introduction

1.1. This Recommended Method is intended to provide an intermediate verification of weight cart mass values to obtain a rough estimate of an "as found" value to provide adequate evidence for or against the need for corrective action on scales that have been tested.

1.2. This method may be performed as often as needed during a calibration cycle as a preventive action due to the inherent instability of weight cart mass values. It should also be performed prior to repairs or maintenance to obtain and record adequate evidence of mass values and calibration status prior to the change of mass values resulting from repair and maintenance.

1.3. Records of all such intermediate tests should be retained with the Inspection Checklist and should be submitted with the completed Inspection Checklist when the weight cart is submitted for calibration.

1.4. This method may NOT be used as a substitute for a proper laboratory calibration according to SOP 33 and does NOT provide a traceable mass value with an appropriate calibration uncertainty. Recall that the error on the standard must be less than one third of the applicable tolerance applied to a scale under test. This level of verification is difficult and may be impossible to determine under field conditions. Only errors more than Handbook 44 requirements may be determined using this method.

2. Prerequisites

2.1. Facility. Intermediate verification tests are normally conducted under field or under maintenance shop/garage conditions rather than in a controlled laboratory environment. As such, the avoidance of extreme conditions of temperature, wind, and precipitation are critical. A rough estimate of conditions at the time of verification must be recorded when data is obtained.

2.2. Equipment. A suitable scale must be selected. This typically needs to be of better resolution than the scales being tested with the weight cart or as a minimum, a scale with the smallest resolution on which the cart may be used. A repeatability test, with a minimum of 3 repetitions is needed to ensure that the mass values will repeat to within one-half of a scale division at the load of the weight cart.

2.3. Standards. Class F field standards are used if they are within the prescribed calibration cycle. A small Class F weight kit is used as correction weights to determine small errors and partial division values.

2.4. Staff. Staff must be trained in substitution calibration methods and be able to perform calculations associated with determining mass values.

2.5. The weight cart fuel levels, where liquid fuels are used, must be set at the reference mark on the fuel sight gauge.

3. Fundamental Considerations

Weight carts must be completely clean and dry, with no mud, ice or moisture on the surface or under carriage of the cart. Tires must be cleaned as well. (Values obtained under actual operating conditions may provide some insight to the user regarding the impact of maintenance and cleanliness of the weight cart).

4. Pretest Weight Cart Inspection

Complete the Weight Cart Inspection Checklist that is included in Appendix A.

5. Procedure

5.1. Establish scale repeatability with a minimum of three repetitions such that the scale repeats to within one-half of a division at the weight cart capacity.

5.2. Load Class F field standards onto the scale in the same location(s) where the weight cart will be placed to the same load as the stated conventional mass of the weight cart. Assign a mass value to this summation of standards based on the nominal values of the weights. The added mass values of these weights is the value for your standards. With the weights loaded on the scale deck, use small error weights to determine the break point of the nearest larger scale division.

5.3. Remove the large Class F field standards and leave the small error weights on the scale.

5.4. Load the weight cart onto the scale in the same location(s) where the weights were loaded. Add or remove the small error weights until the scale responds in the same way as the previously loaded mass standards to determine the break point of the same scale division.

6. Calculations

Calculate the difference between the error weights used with the Class F field standards and the error weights used with the weight cart. Because this is not an accepted calibration method, the observed difference in these values only represents an estimated mass value. (Error weights used with Class F standards – Error weights used with the weight cart = Observed Estimated Error).

7. Tolerance and Evaluation

The observed estimated error must be less than one third of the smallest tolerance applied to a scale on which the weight cart might be used. Corrective action is required if the observed mass of the weight cart exceeds the calibrated mass by more than one-third of the applicable tolerance.

8. Measurement Assurance

Measurement assurance is obtained through three replicate measurements.

9. Assignment of Uncertainty

An uncertainty is not calculated, estimated, or assigned with this intermediate verification method. It is not considered a valid calibration with evidence of traceability.

10. Calibration Certificate

A calibration certificate is not prepared for an intermediate verification. Recorded and observed data must be maintained.

Example of Intermediate Verification Procedure and Calculations

A. A 2000 lb weight cart is to be tested on a scale with 10 lb divisions.

B. When 2) 1000 lb Class F field standards are placed on the scale, the scale reading repeats to within one-half of a division when 3 replicate weighings are performed (weights must be moved on and off the scale or the scale arrested and released to determine this repeatability). The scale reads 2000 lb for each test.

C. Error weights are slowly placed on the scale deck in increments of 0.1 lb and the addition of 5.5 lb causes the scale to read the next larger division of 2010 lb.

D. The 2) 1000 lb Class F field standards are removed and the 2000 lb weight cart is placed on the scale deck, leaving the previous 5.5 lb error weights. Error weights of 6.5 lb are needed for the scale to break to 2010 lb with the weight cart on the scale deck (an additional 1.0 lb was added).

E. Error weights used with Class F standards = 5.5 lb

F. Error weights used with the weight cart = 6.5 lb.

G. Error weights used with Class F standards – Error weights used with the weight cart = Observed Estimated Error; 5.5 lb – 6.5 lb = - 1 lb

H. Evaluation: the smallest tolerance on the scale will be one-half of a division, or 5 lb. One third of 5 lb is 1.7 lb. The error on standards used on the scale must be less than this level. The observed error on the cart of – 1.0 lb is less than 1.7 lb and corrective action for previous scale tests is not needed at this time. The - 1 lb value is recorded on the Inspection Checklist as an Intermediate Verification.

I. If the cart has been damaged or if repairs to the cart are needed, calibration is required at this time.

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