July 1, 2011

Are You Getting What You Pay For?

HOW SCALE USE AFFECTS TRANSACTION ACCURACY

Byline: Rick Harshman

If we were to ask field officials today what they consider to be the greatest cause of transaction errors involving scales used in a retail application, most would probably agree that it is improper device use. True, scales are built better today than in years past; scale components have improved over time with advances in technology, and as a result, so has scale performance; but that is not the primary reason why officials might provide such an answer to this question. Rather, they have come to realize early on in their enforcement careers that the probability of finding an inaccurate scale (i.e., one that fails to conform to accuracy requirements) is much less than the chances of finding instances of one or more scale operators not taking tare, taking an incorrect tare, starting the weighing process with the scale behind or ahead of zero, or any one of a host of other user related deficiencies that can affect the accuracy of commercial transactions.

There are a number of requirements in NIST Handbook 44 (HB 44*), Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*, relating to proper maintenance and use of a scale and in NIST Handbook 130 (HB 130), *Uniform Laws and Regulation in the Areas of Legal Metrology and Engine Fuel Quality*, relating to misrepresentation of quantity and pricing, that if not followed, can significantly affect the accuracy of transactions. Field inspection not only involves verifying the accuracy of a scale, but also verifying proper design, maintenance, and use of the equipment. Experienced officials usually know what to look for and the right questions to ask to obtain the information they need to be able to judge with relative confidence whether scales they are inspecting are being maintained and used in accordance with the various requirements that apply. However, most of the time, their judgments are based on information that they're able to acquire only during that small window of time when they are actually in the store conducting official inspections. Unless they receive a consumer complaint or the store happens to be one in which they do their regular shopping, they have little way of knowing how the scales are actually being maintained and used once they've completed their inspections and left the store. Most of the time, they are relying on trust that users will continue to operate devices properly and in accordance with applicable requirements. This might be one reason why during visits to our local supermarket, delicatessen, garden center, etc., we sometimes observe scales that aren't being maintained on zero, improper tare or no tare being taken, incorrect unit prices being charged, and other user indiscretions that affect the amount of product received or the amount charged for those products.

While it might be true that weights and measures officials receive few consumer complaints relating specifically to improper use of a scale, it's also likely that many consumers are not aware of the potential impact that improper use can have on purchases being made from those scales. Perhaps if consumers were aware of the impact, they might be more inclined to pay closer attention to making sure the scale

operator weighed and priced their orders correctly and they might be more likely to file complaints with the weights and measures authority when they did not. This is not in any way meant to infer that user violations cause errors that are always in the device owner's favor, but rather, to make known that when violations do occur, someone, be it either the customer or device owner, must pay the price for those errors.

What can consumers do to improve their chances of receiving accurate quantities and correct prices on products that are weighed and priced in their presence? One thing they might do is to educate themselves on the responsibilities associated with using a commercial scale to weigh and price products offered for sale in a direct sale application. A direct sale application is one in which both parties in a transaction are present when the quantity is determined. For example, the scales operated by a store employee to weigh products in the presence of the customer, whether at the front checkout or in any of the various departments of a grocery store such as the deli, seafood, etc., are considered scales being used in a direct sale application. Once equipped with that knowledge, consumers could then begin paying closer attention to how operators maintain and use the scales that weigh and price their orders in stores where they shop. The NIST Weights and Measures Division (WMD) has put together a short list of simple observations that consumers can make to determine whether scale operators (and the businesses that employ them) are complying with many of the requirements that apply to scales used in a direct sale application. The list is not intended to include every applicable requirement that might apply, but rather is intended to include those in which a compliance determination can be made by simple observation of the scale in use. This list was developed from various requirements that are currently included in either HB 44 or HB 130. Items 1 to 5 of the list pertain to observations a consumer can make prior to placing a direct sale order for a weighed item. Items 6 to 8 are observations typically made as the order is weighed and priced by the scale operator. Italicized reference citations are included in parenthesis with each listed item to make it easy for weights and measures officials to locate the requirements. At the end of this article, a checklist titled "Did You Get What You Paid For?" is provided to make it easier for consumers to be able to judge whether or not the scales used to weigh and price their orders are being operated in accordance with applicable requirements.

THINGS CONSUMERS SHOULD LOOK FOR DURING A WEIGHING TRANSACTION

1. Unobstructed View of the Weighing Process. Is the scale positioned so that customers can easily see the entire weighing operation from a reasonable customer position? Customers should be able to observe that the:

    a. scale is on zero before weighing;
    b. scale platform is empty before the load is applied;
    c. unit price or price look-up code (PLU) on a computing scale is the correct one for the item being purchased*; and
    d. weighing elements are not being manipulated in any way by the operator.

    *Item c. does not apply to mechanical price-computing scales since only weight indications are required on the customer side of a mechanical price-computing scale and price look-up codes are not typically used. Additionally, the information in item c. is not required to be immediately

observable to the customer at the time an item is weighed and priced on a scale interfaced with an electronic cash register (i.e., a Point-of-Sale (POS) System) although some POS systems do display this information to the customer by way of a digital display. Instead, POS systems are required to print (rather than display) the sales information relative to items that are weighed to include the:

- net weight
- unit price
- total price; and
- product class or, in a system equipped with price look-up capability, the product name or code number.

Thus, customers oftentimes are not able to view the final weighing and pricing information required of POS systems until they actually receive a sales receipt generated by the system.

(HB 44 Code References: paragraph G-UR.3.3. Position of Equipment and Scales Code paragraph S.1.8.4. Customer's Indications)

2. **Level Condition.** Does the scale appear level and fully supported on a firm foundation? Most scales are designed to weigh accurately only when in a level condition. Nearly all of the small portable scales intended for commercial application are equipped with some form of level-indicator (e.g., bulls-eye level, plumb-bob, etc.) and a means to adjust the level condition of the scale (e.g., one or more adjustable leveling legs, etc.). Scales equipped with a level indicator are required to be maintained in level by the scale owner or operator. Thus, these scales should be leveled after they have been positioned on a firm foundation, and firmly supported on all sides. The supporting foundation should be of sufficient strength to withstand the largest load to be weighed and such that the level does not change throughout the entire weighing range of the scale. If the scale to be used to weigh your order does not appear to be level or is not fully supported on a firm foundation, you should ask the scale operator to check the level condition and adjust it as necessary, making certain that once it is adjusted to a proper level condition all sides of the scale are fully supported.

   (HB 44 Code Reference: Scales Code paragraph UR.4.2. Level Condition)

3. **Cleanliness of the Platform.** Is the platform clean and relatively free of loose debris? Loose material that is allowed to accumulate over time on a scale's platform can cause a change in the zero load reference or shift during the weighing process, altering the accuracy of loads weighed. For this reason, it is a good practice for device users to periodically clean the platform, being certain to remove all loose material that may have accumulated since the previous cleaning. Once the platform is clean and dry, it will be necessary for the user to reset the scale to zero prior to initiating the next commercial transaction. If you observe a seemingly large amount of loose material (e.g., tiny bits and pieces of deli meats and cheeses, chips of ice, etc.) on the platform of the scale that is to be used to weigh your order, you should ask the scale operator to clean the platform and reset the scale to zero prior to weighing your item.

(HB 44 Code References: paragraphs G-UR.3.1. Method of Operation and/or G-UR.4.1. Maintenance of Equipment.)

Note that a buildup of loose material on a scale platform is usually not considered a user violation unless the amount accumulated changes the zero balance condition of the scale or it becomes apparent that the material could shift during a weighing process altering the accuracy of the quantity weighed or the return to a zero balance condition once the weighed load is removed.

4. **Correct Zero Start.** Is the scale indicating zero with no load on the platform? Scales are designed to weigh accurately when the load to be weighed is applied starting from a proper zero balance condition (i.e., a zero indication with no load on the platform). Scale users are required to maintain the zero-load adjustment so that when there is no load on the platform, the scale will indicate or record a zero balance condition. Additionally, the weight indication at zero load should be a constant stable zero indication, as opposed to flashing back and forth between zero and a behind zero indication or zero and the next higher scale increment. Such flashing back and forth between increments could be caused by some environmental factor such as wind, vibration, etc., or it may simply be that the zero load reference needs adjusting. Whatever the cause, the condition should be corrected so that a stable zero indication is being displayed before the scale is used.

   (HB 44 Code References: Scales Code paragraph UR.4.1. Balance Condition. Also, possibly G-UR.1.2. Environment and Scales Code paragraph UR.2.3.Protection from Environmental Factors.)

5. Clearance around the Scale. Is adequate clearance maintained around the scale platform, (i.e., the "live" portion of the scale designed to receive the load to be weighed)? There should be clearance provided around the entire platform to the extent that no contacts may result when the platform is empty, nor throughout the entire weighing range of the scale. Contacts cause friction, which can alter the force of the applied load, ultimately affecting the accuracy of loads weighed. Some common sources of contact with the platform include such things as:

   - store advertising signs inappropriately positioned against or taped to a scale platform;
   - packages offered for sale or the racks in which they are displayed improperly positioned against the scale platform;
   - scales that have shifted to the extent that their platform is now resting against an adjacent countertop, wall, frame, housing, or some other stationary object;
   - bits of produce, small pieces of paper, plastic wrap, etc., lodged in the crack between the "live portion" of the scale platform and its surrounding frame for scales installed in a "front checkout" stand;
   - pieces of paper, wood, plastic wrap, and various other forms of debris, left to accumulate over time and become lodged between the scale platform and some stationary object or the housing surrounding the scale, etc.

(HB 44 Code Reference: G-UR.2.1. Installation)

6. **Adequate Deduction for Tare.** Did the scale operator make an adequate deduction for the weight of all packaging material (i.e., tare) when weighing the order? Products that are offered for sale and sold by weight must be sold by "net" weight, which is the weight of a commodity excluding all packaging material not considered to be part of the commodity. Thus, when a product offered for sale is placed onto a piece of paper, or inside a container and weighed, a deduction for the weight of the paper or container must be made to avoid charging the customer for the tare material. Tare typically includes, but is not limited to: wrappers, containers, lids, bags (including the ties), labels, absorbent cloths, wax on cheeses (if not intended to be consumed), etc. When witnessing orders being weighed, customers should 1) verify that a tare deduction is taken (i.e., assuming the product is weighed with some type of tare material), and 2) that the amount of the deduction taken is adequate in amount to offset the actual weight of the tare material. For example, if a 0.02 lb tare deduction is taken for tare material that actually weights 0.05 lb, the customer would receive 0.03 lb less product than what is charged when that particular package is weighed. If the deduction for tare does not seem adequate, customers might question the scale operator whether the tare is correct for the amount of packaging material being used or ask the scale operator to weigh the tare material in their presence to enable verification of its accuracy.

   As noted earlier, customers oftentimes are not able to view the final weighing and pricing information relative to items weighed on a POS system until they actually receive a sales receipt generated by the system. Although some POS systems provide this information to customers when their item is being weighed during checkout, most do not. For those systems that do not display the information during checkout, the only way customers are able to tell whether a tare deduction was taken (or how much of a tare deduction was taken) for a particular item weighed is to compare the displayed weight of the item (indicated during checkout) to the recorded weight of the item (printed on the receipt generated from the system).

   The receipt must provide an indication of the net weight of the item and may also provide an indication of the gross weight of the item and the tare deduction that was taken. However, the information required to be displayed to a customer during checkout is not the same as that which is required to be printed on the receipt. The weight values displayed may be either gross weight (even though a tare deduction has been made) or net weight. Thus, if the weight printed on the receipt is identical to the weight that was displayed on the customer readout when the product was weighed, this may provide an indication that no tare was taken.

   (HB 130, Uniform Weights and Measures Law, Section 15. Misrepresentation of Quantity)

7. **Selling Price Charged.** Was the unit price charged the same as that advertised? Before placing an order for a weighed item, observe the unit price advertised and compare it to the unit price charged when the product is weighed in your presence. Prices of products can change frequently, and unless scale operators are made aware of or recall price changes, they may

continue using the old (incorrect) price. Be aware that some scales are equipped with price look-up capability. Price look-up numbers are assigned to give products a numerical identification which is then stored into scale memory (or linked to a computer), along with the product's associated unit price, and other useful information. When a price look-up code is entered by the scale operator, the scale automatically computes the total sale price based on the unit price that is stored into memory. If the store elects to increase or decrease the unit price of a product (e.g., the price per pound posted on the store shelf), but fails to reprogram the new unit price, the scale will continue to compute at the old (incorrect) price.

(HB 130, Uniform Weights and Measures Law, Section 16. Misrepresentation of Pricing)

8. Price Computation. Was total sale price computed properly? The total sale values computed by digital retail-computing scales are required to be in mathematical agreement with their associated quantity representation or indication to the nearest 1 cent. That is, any computed total sale price indicated or recorded by the scale must agree to the nearest 1 cent of the product in the equation:

   Net Weight x Unit Price = Total Sale.

   For example, if the displayed net weight of a package being weighed is 1.015 lb and the unit price entered into the scale by the operator is $ 5.99 per pound, the scale must compute a total sale price that is to the nearest 1 cent of the answer (product) to the equation:

   1.015 lb Net Weight × $ 5.99 Unit Price = $ 6.07985 Total Sale

   The product in the example equation is "$ 6.07985," which when rounded to the nearest 1 cent becomes "$ 6.08." Thus, any indicated or recorded total price other than $ 6.08 would be considered incorrect for this transaction. On a scale that's capable of printing a ticket or label, you can verify compliance with this requirement by examining values printed on the label. However, if the scale isn't equipped with a ticket or label printer, the calculation must be made from values displayed on the scale after the package has been applied and a unit price or price look up code entered. A simple handheld calculator can be used to calculate the unrounded total sale price value, which is then compared to the rounded value indicated or recorded by the scale.

   (HB 44 Code Reference: G-S.5.5. Money Values, Mathematical Agreement Although not a User Requirement, this Specification Requirement applies to the computing capability of computing type scales and is an easy check for consumers to make certain that the computing scale used to weigh and price their orders is calculating total sale properly)

What you should do when you see a scale being used improperly is a matter of personal choice. This article was written with the intention of helping consumers judge whether or not the scales used to weigh their orders are being maintained and used properly and to verify that the amount charged for products purchased from those scales is correct. This article is not suggesting that each and every time

a consumer witnesses an apparent violation involving improper use or maintenance of a scale that they contact the weights and measures authority and file a complaint. In many cases, the best course of action may be to seek immediate correction by making the scale operator or store manager aware of the concern in an effort to get the issue resolved immediately. For example, if a customer notices that the unit price entered by a scale operator for a particular product is not in agreement with the advertised sale price, he or she might immediately make the scale operator aware so that the discrepancy can be corrected immediately. On the other hand, it might be appropriate to file a complaint with the weights and measures authority if incorrect pricing of products seems to be an ongoing problem in a particular store or if misuse of a device seems intentional and typically benefits the store. The choice on how to act is left up to the consumer. Your local weights and measures authority may also be able to offer guidance on an appropriate action to take relative to the severity of a problem, including how long the problem has existed or how many times you've witnessed it occurring. A list of all the state weights and measures directors and their contact information is available on the WMD's website at http://www.nist.gov/pml/wmd/index.cfm. To access the information, click on the link titled "State Directors," which is located towards the bottom of the right hand column of the website's home page. For additional information relating to this article, contact Rick Harshman by e-mail at richard.harshman@nist.gov or by phone at (301) 975-8107.

Did You Get What You Paid For?

Consumer Checklist For Weighing Transactions

Consumers can help ensure they receive accurate weights and "get what they pay for" by completing these observations when witnessing an order being weighed and priced by store personnel.

- ☐ Position of Scale (Can You See the Entire Weighing Operation?)
- ☐ Scale Level
- ☐ Scale Platform Empty (Before Item is Weighed)
- ☐ Cleanliness of Platform
- ☐ Correct Zero Start (Scale on Zero Before Your Item is Place on the Scale?)
- ☐ Clearance Around the Scale (No Platform Contacts)
- ☐ Is Tare Material Included With Item Being Weighed? If so:
  - ☐ Was a Deduction Made for the Tare Material?
  - ☐ Did the Amount of the Tare Deduction Seem Reasonable?
    Item: _____Tare Description: _____ Deduction Taken:_____
- ☐ Was the Unit Price Charged the Same as that Advertised?
- ☐ Item/Advertised Price:_____ Price Charged:_____
- ☐ Was Total Price Computed Properly (To the Nearest Cent)
- ☐ Other Concerns (List):
  (e.g., Scale operator did not know how to take tare or that it even needed to be taken, etc.)
  _____
  _____
  _____
  _____
  _____

For details and an explanation of each item listed in the checklist, visit the National Institute of Standards and Technology (NIST) Office of Weights and Measures website at http://www.nist.gov/pml/wmd and download a copy of the newsletter article "Are you Getting What you Pay For? How Scale Use Affects Transaction Accuracy" from the newsletter archives.