

# Determining Scale Suitability

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 [NIST Handbook 44](#)  
Sec. 1.10.G-UR.1.1., Sec.  
2.20, Tables 7a, 7b, and

## Background

There are thousands of establishments today engaged in the business of offering for sale, buying, and dispensing commodities based on weight. NIST Handbook 44 gives guidance on the suitability of devices and each situation must be evaluated individually. Some of the variables that must be considered are as follows:

1. The device must have an NTEP certificate of conformance if brought into the state after December 31, 1996. Scales brought into the state before then must have been designed for commercial use.
2. What is the appropriate value of the scale division size?
3. What is the appropriate scale capacity?
4. How to determine significant economic impact.

## Policy

The determination of suitability of a scale for a specific task should include:

1. Is it legal for trade? Even if unmarked, the device had to be designed for commercial use. Classroom equipment is generally not considered commercial. Do some research if you are not sure, contact your supervisor.
2. Is it NTEP approved? If brought into the state after January 1, 1997 an NTEP approval is required.
3. Anticipated weight or weight range of product to be weighed. HB 44 Table 7a and 7b gives some general guidance.
4. Size of item to be weighed. The item must fit on the load receiving element.
5. Weight of the smallest load. HB 44 Table 8.
6. Is there a special application? Pre-pack? Wet commodities? Shipping? Etc.
7. Scale capacity and minimum graduation size (d).
8. Accuracy class and tolerance of the device. (Table 6 and 7a)
9. Minimum load size (Table 8 of Handbook 44, Section 2.20.)
10. The price per pound (unit) of products weighed. Monetary impact.
11. Impact of weighing small loads. (discussed below)
12. Location of the indicator.
13. Pre-pack only? Capable of meeting HB 133 requirements for average and MAV and labeling requirements?
14. Point of sale? Customer readability? Proper recorded representations?
15. Recycling?
16. Shipping? Weight classifier?
17. Computing capability. Computes an accurate price for all anticipated transactions?
18. POS compatibility. Recorded representations match the indicator?
19. Environmental Factors. Wind, vibration, EFI, RFI, weather, temperature, etc.

Selection of a suitable scale is the responsibility of the owner, but the weights and measures regulator can be of great assistance to that owner. The design of the device must be matched with its intended use. A scale designed for a special application must not be used for any other purpose. Education is one of the most powerful tools for gaining compliance.

## **GENERAL**

Handbook 44 G-UR.1.1 Suitability of Equipment, 2.20.UR.1 Selection Requirements, 2.20.UR.3.1 Recommended Minimum Load, and 2.20. Table 8 Recommended Minimum Load

A scale used to weigh loads less than the Table 8 Recommended Minimum Load is not suitable for the application. Applied loads less than the Table 8 recommendations are likely to result “economically significant” errors.

Minimum loads are based on the impact of the device rounding and tolerance errors relative to the load being weighed. For example, on a class III scale, a load of 10d has a permissible rounding and tolerance error of 15%. Table 8 recommends that loads of 10d not be weighed on a class III scale because of this potential error. At the minimum recommended load of 20d, the permissible scale error is 7.5% of the load applied and this is the maximum rounding and tolerance error allowed. Use of a scale with loads less than that are likely to result in relatively large errors.

To give an example of the effect of that error in the first 500 scale divisions consider the following:

A customer wishes to purchase 0.25 pounds of a commodity priced at \$5.00/pound.  
The seller is using a class III scale with a division size of .01 lb.

The possible built in error for this transaction is: 6% or \$0.075.

The same transaction at a price of \$10.00/pound:

The possible built in error for this transaction is: 6% or \$0.15.

If we increase the amount of product being purchased to 2.5 lbs, the load is still less than 500 divisions so maintenance tolerance is still 0.01 lb. at that point. The dollar error remains the same because the tolerance remains the same, but the percentage of the applied load decreases tenfold:

2.5 lbs at \$5.00/pound = 0.6% error or \$0.075

2.5 lbs at \$10.00/pound = 0.6% error or \$0.15

As the price of the commodity increases, the money value of the possible error increases even though the error percentage stays the same. This is why the price of the commodities weighed on the device is important to consider in addition to table 8.

For class I or class II scales, the division size (d) may be smaller than the verification scale division (e) so when determining the digital rounding and tolerance possible error, one must base that determination on the value of (e).

For example, a class II scale where (e) is 0.1 gram and (d) is 0.01 gram. Table 8 shows a minimum load of 50 (e) or 5 grams. When (e) is greater than (d), the division size (d) is not considered when calculating the minimum load.

A class III scale has a recommended minimum load of 50 (d) except when used for weighing refuse or material for recycling where a minimum load of 10 (d) is recommended.

**The majority of weighing should occur between 25% and 75% of scale capacity although occasional use below the recommended load is not prohibited.**

## **SPECIFIC REQUIREMENTS**

When determining the quantity of foreign material (dockage) in grain, the minimum load **SHALL** be equal to or greater than 500 (d) or (e) HB 44 2.20.UR.3.1.1.

A scale **shall** not be used to weigh a load of more than the nominal capacity HB 44 2.20.UR.3.2.

A vehicle **shall** be commercially weighed in a single draft HB 44 2.20.UR.3.3.

Wet commodities not in watertight containers **shall** be weighed on a scale that drains properly HB 44 2.20.UR.3.6.

The dimensions or capacity of a scale **shall not** be modified beyond the manufacturer's specifications except when the modification has been approved by a competent engineering authority and by the weights and measures authority having jurisdiction HB 44 2.20.UR.4.3.

## **SPECIAL CONSIDERATIONS**

### Precious Metal Scales

Negotiation to determine the price of precious metal commodities is a legal and acceptable practice. However, when a scale is used for the approximation, reference, or exact weight of a commodity, the scale is considered an integral part of the transaction and must meet all commercial scale requirements.

**HB 130 2.17.2.-Quantity** – The unit of measure and the method of sale of precious metals, if the price is based in part or wholly on a weight determination, shall be either troy weight or SI units...

Due to the high price per unit of precious metals, the Wisconsin Bureau of Weights and Measures expects scales used for the buying or selling of gold or platinum to have a division size (d) or a verification scale division (e) (if "e" is larger than "d") of **no greater than 0.1 gram.**

### Shipping Scales

Scales used for shipping may be scales used for other purposes for example: Retail computing scales, portable platform scales, etc. while some scales may be specifically designed for shipping purposes like weight classifiers.

Weighing devices other than weight classifiers should follow the minimum loads in Table 8.

If a weighing device is a weight classifier, it must be clearly marked as such (special purpose). The minimum load for a weight classifier is 10d.

#### Retail scales used for the sale of low weight bulk commodities

Products like teas and spices are high priced commodities relative to the weight of the product. As the unit price increases or consumers purchase small quantities of the commodity, a class III scale may not be suitable.

Educate the business on what the requirements are. Explain the potential or actual errors in money values because it usually has a greater impact than scale divisions or weight. Explain the Chapter 98.26 penalties for representation of a false quantity. Provide the retailer with options like pre-packaging smaller quantities instead of selling from bulk or purchasing a scale with a smaller division size.

The official can review sales records to determine the loads sold. For example, “one month of records for the sale of bulk tea”. Document “actual” losses through multiple test transactions, duplicating the weight of common sales and using the actual tare material. Then determine the errors of those transactions based on HB 133 procedures (a class II package checking scale may be required for this determination).

The Wisconsin Bureau of Weights and Measures expects scales used for selling bulk teas and spices to have a division size (d) or a verification scale division (e) (if “e” is larger than “d”) of **no greater than 0.005 lb or 2 grams.**

#### Recycling Scales (other than IIII)

Recycling transactions are typically conducted using class III or IIII scales. This document addresses the use of class III scales in recycling transactions.

A letter dated February 01, 1991 outlined some of the specific requirements that pertain to recycling scales. This letter was sent to all scale service companies, State and City Weights and Measures officials, as well as recycling and salvage establishments. On February 08, 2002, that letter, which is attached was formally incorporated into the Policy and Procedures Manual.

**State of Wisconsin Department  
of Agriculture, Trade and  
Consumer Protection**

**DATE:**       **February 1, 1991**

**TO:**           Scale Service Companies  
                  State and City Weights & Measures Inspectors  
                  Recycling and Salvage Establishments

**FROM**         Alan Porter, Supervisor  
                  Weights and Measures Technical Unit  
                  Trade and Consumer Protection Division

**SUBJECT:**    Scale and Recycling Devices

Due to resurgence in recycling throughout the state and mandated recycling in many communities, a need has been expressed to set forth requirements for devices and guidelines to follow to ensure accurate weight is given at time of sale / purchase.

There are several general code requirements in “National Institute of Standards and Technology (NIST) Handbook 44 – 1991, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices” that apply. The following list are some of the more pertinent requirements:

- G-S.1.           Identification
- G-S.2.           Facilitation of Fraud
- G-S.3.           Permanence
- G-S.5.4         Repeatability of Indication
- G-S.7.           Lettering
- G-UR.1.1.      Suitability of Equipment
- G-UR.2.1        Installation
- G-UR.2.3.       Accessibility for Testing Purposes
- G-UR.3.3.       Position of Equipment
- G-UR.4.4.       Assistance in Testing Operations
- G-UR.4.5.       Security Seal

Two of the major concerns and problems experienced leading to inaccurate weights being given are:

1. Size of the scale division being used,
2. Accuracy of the tare being used in the transaction.

UR.3.1. & Table 8 of the scale code recommend minimum loads to be weighed on a device because the weighing of light loads is likely to result in larger errors. For Class III scales, commercial weighing devices, the recommended load is 20 divisions. The following table should assist you in choosing the scale with the appropriate division.

<u>Scale division (d)</u>		<u>Size of net load (20d)</u>
5 pounds	used to weigh loads	> 100 pounds
2 pounds		> 40 pounds
1 pounds		> 20 pounds
0.5 pound		> 10 pounds
0.2 pound		> 4 pounds
0.1 pound		> 2 pounds

This may entail most business establishments having to use two scales if they currently are using a platform scale with one, two, or five pound divisions and they wish to purchase loads less than 20 pounds.

Tare weights should be computed to the nearest ½ scale division when possible and used or entered into the device if possible when weighing. This will minimize errors incorporated in using too large and incorrect tares. Otherwise, the value of the tare used should be rounded down to the next nearest scale division.

Money values should be computed from the size of the scale division times the price per pound. Example: 7.4 # X \$ 0.35 / # = \$ 2.59 for a scale with 0.1 # division.

A load-receiving element intended to receive wet commodities may be constructed to drain effectively; however, arbitrary deductions based on moisture are not permitted.

These requirements and guidelines apply primarily to point of sale systems where both the buyer and seller are present. Other requirements and different scale divisions may apply to different unattended operations and / or bulk weighing systems. Weighing devices and procedures may need to be determined and evaluated individually by your local or state inspector.