

EPO No. 13

Examination Procedure Outline for Vehicle and Axle-Load Scales Mechanical-Analog Indicating

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It is recommended that this outline be followed for vehicle and axle-load scales equipped with weighbeams and/or mechanical dials. Requirements that apply only to scales marked with an accuracy class are indicated with an asterisk. Non-retroactive requirements are followed by the applicable date in parentheses.

SAFETY NOTES

When excerpting this Examination Procedure Outline for duplication, the EPO Safety Annex (Safety Considerations and Glossary of Safety Key Phrases) should be duplicated and included with this outline.

Prior to beginning any inspection, the inspector should read and be familiar with the EPO Safety Annex - "Safety Considerations and Glossary of Safety Key Phrases." The terms and key phrases in each safety reminder of this outline are found in the glossary of the EPO Safety Annex. The inspector is reminded of the importance of evaluating potential safety hazards prior to an inspection and taking adequate precautions to avoid personal injury or damage to the device. As a minimum, the following safety precautions should be noted and followed during the inspection.

Safety policies and regulations vary among jurisdictions. It is essential that inspectors or servicepersons be aware of all safety regulations and policies in place at the inspection site and to practice their employer's safety policies. The safety reminders included in this EPO contain general guidelines useful in alerting inspectors and servicepersons to the importance of taking adequate precautions to avoid personal injury. These guidelines can only be effective in improving safety when coupled with training in hazard recognition and control.

Clothing

Personal Protection Equipment

Electrical Hazards

e.g., Safety Shoes

First Aid Kit

Hard Hat - for protection from overhead hazards

Lifting

Safety Cones/Warning Signs

Location

Support - for scale, test weights, and test equipment

Transportation of Equipment

See also: Wet/Slick Conditions, Chemicals, Petroleum Products, Hazardous Materials, Overhead Hazards, and Obstructions

H-44 General Code and Scales Code References

Inspection:

SAFETY REMINDER!!!	
<ul style="list-style-type: none"> - Check the inspection site carefully for safety hazards and take appropriate precautions. - Learn the nature of hazardous products used at, or near, the inspection site. - Use caution when moving in wet, slippery areas. - Use personal protection equipment appropriate for the inspection site. - Position safety cones and warning signs if necessary. - Be sure that a first aid kit is available and that the kit is appropriate for the type of inspection activity. 	

1. Position of equipment	G-UR.3.3.
2. Zero-load balance as found.....	S.1.1., S.1.5.1., S.2.1.1., S.2.1.2., UR.4.1.
If the device is not indicating a zero-balance condition, the user should be made aware of paragraph UR.4.1. and a warning issued if necessary.	
3. Indicating and recording elements.....	G-S.5.
Weighbeams	S.1.5.
Poises.....	S.1.6.
Graduations, indicators, capacity indication.....	S.1.3., S.1.4., S.1.7.
Scale division, value (d) and number(n).....	S.1.2. (1/1/86)*, UR.1., UR.1.1.(b), UR.1.3. (1/1/86)
Tare division value	S.2.3. (1/1/83)
Tare mechanism	S.2.3.
Damping means.....	S.2.5.
Adjustable components	S.1.10.
4. Suitability.	G-UR.1.1., G-UR.1.2., UR.1., S.5.2. (1/1/86)*, UR.1.1., UR.3.1.*, UR.3.2.
Customer readability, if applicable	G-UR.3.3.
Adjustable components	S.1.10.
5. Design of weighing devices, accuracy class	S.5.*, S.5.4. (1/1/94), S.1.10., G-S.8. (1/1/90), G-UR.4.5.

H-44 General Code and Scales Code References

Inspection (cont.):

6. Marking	S.6.
Nominal capacity (Suitability)	S.6.1. (1/1/89)
Nominal capacity must satisfy the relationship of: nominal capacity ≤ CLC x (N - 0.5), where N = the number of sections in the scale	
a. Marking requirements - all devices	
Identification	G-S.1.
Name or ID of manufacturer	Retroactive
Model designation	Retroactive
Model prefix	(1/1/03)
Nonrepetitive serial number	(1/1/68)
Serial number prefix	(1/1/86)
Serial number – appropriate abbreviation.....	(1/1/01)
NTEP CC prefix and number (for devices that have an NTEP CC).....	(1/1/03)
Remanufacturer information, as appropriate:	
name and ID of remanufacturer	(1/1/02)
model number if different from original model number	(1/1/02)
Lettering	G-S.7.
Operational controls, indications, and features.....	G-S.6. (1/1/77)
Visibility of identification	G-UR.2.1.1.
Interchange or reversal of parts	G-S.4.
b. Marking requirements - indicating element not permanently attached or covered on separate CC (in addition to marking for all devices).....	S.6.3.
Accuracy class	(1/1/86)
Nominal capacity.....	Table S.6.3.b. Note 18
Value of scale division with nominal capacity, if not apparent.....	(1/1/83)
Value of "e" (if different from "d")	(1/1/86)
Maximum number of scale divisions (n _{max}).....	(1/1/88)
Concentrated load capacity (CLC)	(1/1/89)
Section capacity (Sec Cap) (see note below).....	Retroactive
Combination vehicle (CLC)/railway scales (Sec Cap).....	(1/1/00)
Scales designed for special purposes.....	(1/1/86)
Note: Indicating elements manufactured prior to 1/1/89 are required to be marked with a section capacity rating. However, it is acceptable for these devices to be marked with a CLC instead. It is not permissible to substitute a section rating for a CLC on vehicle scales manufactured or placed into service on or after 1/1/89.	
c. Marking requirements - weighing/load-receiving element not permanently attached or covered on separate CC (in addition to marking for all devices).....	S.6.3.
Location of Marking Information.....	S.6.2.
Accuracy class	S.6.3. (1/1/88)
Nominal capacity on weighing/load-receiving element	(1/1/89)

**H-44 General Code and
Scales Code References**

Inspection (cont.):

Maximum number of scale divisions (n_{max}).....	(1/1/88)
Minimum verification scale division (e_{min} or d_{min})	(1/1/88)
Concentrated load capacity (CLC)	(1/1/89)
Section capacity (Section Cap) (see note below).....	Retroactive
Combination vehicle (CLC)/railway scales (Section Cap).....	(1/1/00)
Scales designed for special purposes.....	(1/1/86)

Note: Weighing/load-receiving elements manufactured prior to 1/1/89 are required to be marked with a section capacity rating. However, it is acceptable for these devices to be marked with a CLC instead. It is not permissible, however, to substitute a section rating for a CLC on devices manufactured or placed into service on or after 1/1/89.

7. Weighing and load-receiving elements.....	S.4., UR.2.8.
Access.....	UR.2.5.
8. Installation	G-UR.2., UR.2.3., UR.2.4.

SAFETY REMINDER!!!

– **If possible, observe normal weight determinations that are equal to or greater than the weight of the test equipment and test weights to verify the adequacy of the scale supports!**

9. Approaches	
Vehicle scales	UR.2.6.1. (1/1/76)
Axle-load scales	UR.2.6.2.
10. Maintenance, use, and environmental factors.	
Facilitation of fraud	G-S.2.
Environment	G-UR.1.2.
Operation.....	G-UR.3.1., G-UR.3.2.
Maintenance	G-UR.4.
Maximum load	UR.3.2.
Single draft vehicle weighing	UR.3.3.
Minimum load	UR.3.7.
Scale modification.....	UR.4.3.
11. Assistance	G-UR.4.4.

**H-44 General Code and
Scales Code References**

Pretest Determinations:

1. Tolerances.
 - Acceptance/maintenance..... G-T.1., G-T.2.
 - Application..... T.N.2.1., T.N.2.3.
 - Tolerance values:
 - Scale marked with an accuracy designation.
 - Maintenance tolerances..... Table 6 (Class III L),
 - Acceptance tolerances..... T.N.3.2.
 - Sensitivity (nonautomatic indicating scales)..... T.N.6., T.N.6.1.,
 - T.N.6.2.
 - Discrimination (automatic indicating scales)..... T.N.7.1.
 - T.N.4.1., T.N.4.2.,
 - Agreement of indications..... T.N.4.3., and T.N.4.4.,
 - (optional T.N.4.5.)
 - Repeatability..... T.N.5.
 - T.1.1./Table 1.1.
 - Scale not marked with an accuracy class..... T.N.3.1.
 - Maintenance tolerances..... Table 6 (Class III L)
 - T.N.3.2.
 - Acceptance tolerances..... T.N.4.1., T.N.4.2.,
 - Sensitivity requirement (SR) (nonautomatic indicating scales)..... T.2.1., T.2.7.
 - Agreement of indications..... T.N.4.3., and T.N.4.4.
 - Repeatability..... T.N.5.

- Note:** Many "T.N." tolerances apply to unmarked vehicle scales. See NIST HB 44 Table T.1.1. for a list of applicable "T.N." paragraphs applicable to unmarked scales.

2. Determine maximum test load to be applied during test: a test load not to exceed marked Concentrated Load Capacity (or for scales manufactured prior to January 1, 1989, the marked Section Capacity) may be applied to any section or between any two sections. A test load of 100 percent of capacity may be distributed over the entire platform.

3. Minimum test weights and test loads..... N.3., Table 4

SAFETY REMINDER!!!

– **Wear appropriate personal protection equipment such as safety shoes to prevent possible injury from falling weights and slipping on slick surfaces and a hard hat to prevent injury from overhead hazards.**

H-44 General Code and Scales Code References

Test Notes.

SAFETY REMINDER!!!

- Carefully inspect electrical supply lines, cables, chains, hydraulic lines, etc., on test equipment for wear or damage (e.g., electric weight carts, lifting equipment, etc.)!
- Protect test equipment cables, power cables, hydraulic lines, etc., from damage during use!
- Correct potentially hazardous conditions before use (e.g., obstacles, water or other slippery conditions)!

Note: If the scale uses a beam indicating element (e.g., full- or type-registering beam), balance small error weights on the platform, the smallest weight equal to the minimum tolerance value and the total value of the weights being equal to the tolerance value at maximum test load.

1. Check repeatability of, and agreement between, indications throughout the test T.N.4. T.N.5., G-S.5.4.
2. Recheck zero-load balance each time test load is removed. N.1.9., G-UR.4.2.
3. If the scale is equipped with a type-registering (T.R.) beam or a printer, print ticket at each test load..... G-S.5.6., UR.1.3. (1/1/86)*, G-S.5.2.2.(b)

Tests:

SAFETY REMINDER!!!

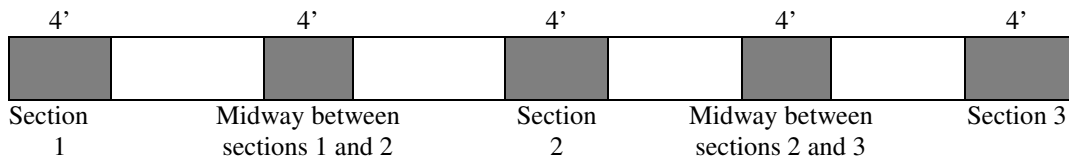
- WEAR SAFETY SHOES!
- USE PROPER LIFTING TECHNIQUES!

1. Sensitivity test at zero load (for weighbeams and balance indicators only) N.1.4.
Discrimination (dials and balance indicators with graduations having a specific value only) N.1.5. (1/1/86)*
2. Increasing-load and shift (section) test. N.1.1., N.1.3.
 - a. If beam scale, test at not less than two points on each weighbeam.
 - b. If automatic-indicating scale, test at not less than three points on reading face, including all possible quarters of the reading-face capacity. Test all unit weights possible.

**H-44 General Code and
 Scales Code References**

Tests (Cont.)

- c. Minimum shift test N.1.3.3.1.(a)
 Prescribes test pattern and loading precautions N.1.3.3.1.(b) through (e)
- d. Prescribed test pattern and test loads for combination vehicle/livestock scales with more than two sections N.1.3.3.2.
- **Minimum shift test:** Conduct at least one shift test with a minimum test load of 12.5 percent of scale capacity anywhere on the load receiving element using the prescribed test patterns and maximum test loads specified below.
- **Prescribed test pattern:** An area of 1.2 meters (4 feet) in length and 3.0 meters (10 feet) in width or the width of the scale platform, whichever is less. When loading the scale for testing, one side of the test pattern shall be loaded to no more than one-half of the concentrated load capacity before loading the other side. An example of a possible test pattern is shown in the following diagram.



- For test patterns less than 1.2 meters (4 feet) in length: Determine the maximum loading by the formula: [(wheelbase of test cart or length of test load - 7 48 in) x 0.9 x CLC]
- For test patterns that exceed 1.2 meters (4 feet): The maximum test load applied shall not exceed CLC x the largest r factor in Table UR.3.2. for the length of the area covered by the test load.
- Multiple pattern loading: To test to the nominal capacity, multiple patterns may be simultaneously loaded in a manner consistent with the method of use.
- Test load: The maximum test load applied to the prescribed test pattern shall not exceed the concentrated load capacity (or for scales manufactured prior to January 1, 1989, the rated section capacity).
- Other designs: Special design scales and those that are wider than 3.7 meters (12 feet) shall be tested in a manner consistent with the method of use but following the principles described above.

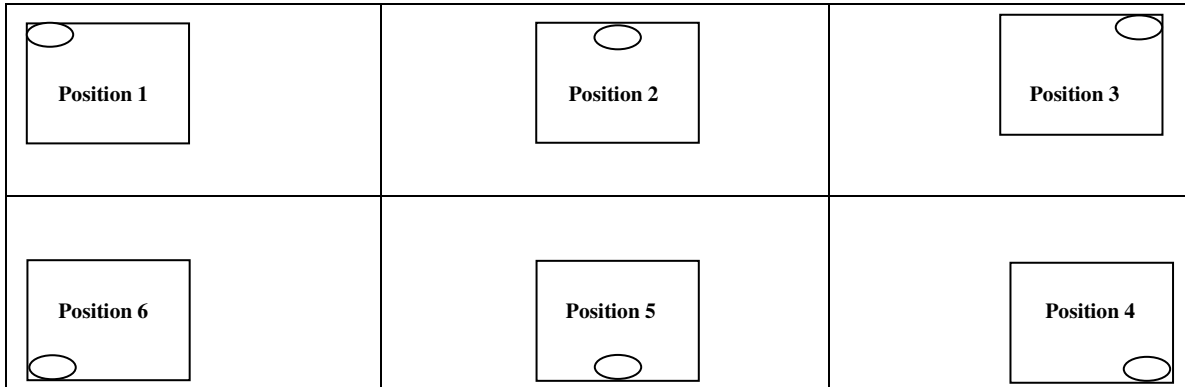
Note: When testing scales manufactured prior to January 1, 1989, caution should be exercised when loading test weights equivalent to the rated section capacity onto areas between sections.

Note: When loading the first section to be tested, it is recommended that observations be made at each increment of test weight application.

H-44 General Code and Scales Code References

Tests (Cont.)

A minimum test load of 5000 kg (10,000 lb) or one-half of the rated section capacity or CLC, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown below. Two section livestock scales shall also be tested consistent with N.1.3.7.



○ = Load Bearing Point

3. Decreasing-load test (automatic-indicating only), at one-half of maximum test load.
 (for dials, test at no less than one-half dial-face capacity)..... N.1.2., N.1.2.2.
4. Strain-load or substitution test on at least two sections N.1.11., N.1.12., N.3.,
 T.N.3.11., T.N.3.12.
 - Strain-load Tests: Follow the procedures in Appendix B for EPO 13E. Tolerances apply only to the test weights or substitution test load.
 - Substitution Test: Follow the procedures in Appendix B for EPO 13E. Tolerances are applied to the substitution test load.
5. Sensitivity test at maximum test load (weighbeams and balance indicators only) N.1.4.
 Discrimination (dials and balance indicators with graduations having a specific value only) N.1.5. (1/1/86)*
6. Counterpoise-weight test, if device is so equipped..... H-44 Weights Code
7. Remove test load and determine any zero-load balance change..... N.1.9., G-UR.4.2.
8. Remove error weights and establish correct zero-load balance.