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Examination Procedure Outline for

Monorail Scales Equipped with Electronic Digital Indicators

It is recommended that this outline be followed for monorail scales equipped with electronic digital indicators used to weigh statically or dynamically. Requirements that apply only to scales marked with an accuracy class are indicated with an asterisk. Nonretroactive requirements are followed by the applicable date in parentheses.

SAFETY NOTES

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

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. The inspector should read and be familiar with the introductory section on safety found at the beginning of this publication. As a minimum, the following safety precautions should be noted and followed during the inspection. Definitions of each reminder are found in the "Glossary of Safety Key Phrases" at the back of this publication.

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

First Aid Kit

Lifting

Location

also: **Wet/Slick Conditions**
Overhead Hazards
Obstructions

Personal Protection Equipment
e.g., Safety Shoes
Hardhat – for protection from overhead hazards (e.g., meat hooks)

Eye Protection – for protection from hanging meat hooks

Support – for scales, test weights, and meat hooks, or test platform

Transportation of Equipment

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Inspection:

Safety First !!!

Check the inspection site carefully for safety hazards and take appropriate precautions.

Use caution in moving in wet, slippery areas.

Use personal protection equipment appropriate for the inspection site.

Be sure that a first aid kit is available and that the kit is appropriate for the type of inspection activity.

H-44 General Code and Scales Code References

1. Zero-load balance as found. If the device is not in balance, the user should be made aware of paragraph UR.4.1., and a warning issued if necessary. If device is set for tare, check accuracy of the tare being taken. ..... S.1.1., S.1.1.1., S.2.1.1., S.2.1.2., S.2.1.4., UR.4.1., G-S.5.2.2(d)*

2. Indicating and recording elements.
   - Scale division, value (d) and number (n) ..... S.1.2.*, S.1.2.1. (1/1/89), S.1.2.2. S.5.*, G-UR.1.1., UR.1.1., UR.1.1.(b), G-S.5.3., UR 1.3.1(a), UR.3.10.
   - Tare division value ..... S.2.3. (1/1/83), S.2.3.1.
   - Tare mechanism ..... S.2.3.
   - Appropriateness ..... G-S.5., S.1.7., S.5.2.*, UR.1.1.(a)*, UR.3.1.*
   - Customer readability, if applicable ..... G.UR.3.3.
   - Damping means ..... S.2.5., S.2.5.1.
   - Adjustable components ..... S.1.10.
   - Provision for sealing ..... S.1.11. (1/1/90), G-UR. 4.5., G.S.8.

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3. Marking ..... S.6.3., S.6.2.
   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)
         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 - weighing and indicating elements in same housing or covered on the same CC
      (in addition to marking for all devices) ..... S.6.3.
         Accuracy class ..... (1/1/86)
         Nominal capacity ..... Retroactive
         Value of scale division with nominal capacity, if not apparent ..... (1/1/83)
         Value of "e" (if different from "d") ..... (1/1/86)
         Temperature limits if other than -10 ^{0}C to 40 ^{0}C (14 ^{0}F to 104 ^{0}F) ..... (1/1/86)
         Scales designed for special purposes ..... (1/1/86)
   c. Marking requirements - indicating element not permanently attached or covered on separate CC
      (in addition to marking for all device) ..... S.6.3.
         Accuracy class ..... (1/1/86)
         Nominal capacity ..... Retroactive
         Value of scale division with nominal capacity, if not apparent ..... (1/1/83)
         Value of "e" (if different from "d") ..... (1/1/86)
         Temperature limits if other than –10 ^{0}C to 40 ^{0}C (14 ^{0}F to 104 ^{0}F) ..... (1/1/86)
         Scales designed for special purposes ..... (1/1/86)
         Maximum number of scale divisions (n_{max}) ..... (1/1/88)
   d. Marking requirements - weighing and load receiving 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 ..... Retroactive
         Temperature limits if other than –10 ^{0}C to 40 ^{0}C (14 ^{0}F to 104 ^{0}F) ..... (1/1/86)
         Scales designed for special purposes ..... (1/1/86)
         Maximum number of scale divisions (n_{max}) ..... (1/1/88)
         Minimum verification scale division for which
         device complies with the requirements (e_{min} or d) ..... (1/1/88)

Inspection (cont.):

   e. Marking requirements - load cell with Certificate of Conformance S.6.3., S.5.4. (1/1/94)
      (in addition to marking for all devices)

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Note: Requires information on a data plate attached to the load cell or in accompanying document. If a document is provided, the serial number shall appear on the load cell and in the document ..... (1/1/88)
Manufacturer's name or trademark, model designation, model prefix, and serial number and prefix shall also be marked on both the load cell and in any accompanying documents ..... (1/1/91)
Accuracy class ..... (1/1/88)
Temperature limits if other than –10 ^{0}C to 40 ^{0}C (14 ^{0}F to 104 ^{0}F) ..... (1/1/86)
Maximum number of divisions ..... (1/1/88)
"S" or "M" for single or multiple cell applications ..... (1/1/88)
Direction of loading, if not obvious ..... (1/1/88)
Minimum dead load, maximum capacity, safe load limit, and load cell verification interval, v_{min} ..... (1/1/88)

4. Design of weighing elements ..... S.4.

5. Installation ..... UR.2.3., UR.2.4., G-UR.2.

Check to be sure the scale supports are adequate to support the scale, test weights equal to the capacity of the scale and test platforms or chains used to suspend test weights !

6. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.) ..... G-S.2., G-UR.1.2., G-UR.3.1., G-UR.3.2., G-UR.4., UR.4.3.
7. Assistance ..... G-UR.4.4.

8. Provisions for testing and accessability ..... UR.2.9., G-UR.2.3.

9. Determination of Load Cell Suitability (applicable to load cells with an NTEP Certificate of Conformance):
   a. The number of scale divisions (n) of the scale is less than or equal to the n_{max} of the indicator or the load cells, whichever is less; e.g., if the indicator has an n_{max} of 10,000 and the load cells have an n_{max} of 5,000, then the scale may use up to 5,000 divisions.
   b. The load cell is approved for the required accuracy class. **Note:** A Class II load cell may be used in a Class III application; however the opposite is not true.
   c. The load cell is rated Single (S) or Multiple (M) use as appropriate to the application. **Note:** A load cell rated for single use may be used in a single or multiple load cell application; however, a load cell rated for multiple use cannot be used in a single load cell application.

Inspection (cont.):

   d. The load cell complies with the requirements for temperature effect on zero-load balance ..... S.5.4., T.N.8.1.3.

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Note: Testing to determine the effect of temperature on zero-load balance cannot be performed in the field; however, for purposes of field inspection, a load cell is considered to comply with T.N.8.1.3. if the v_{min} value marked on the load cell is less than or equal to the v_{min} value as calculated below based upon the "d" and "N" for the scale; if it is not, the scale does not comply with T.N.8.1.3.

Full electronic scale with more than one load cell: The verification scale division v_{min}, for the load cells must be less than or equal to the scale division, "d," divided by the square root of the number of load cells, N, used in the scale:

$$v_{min} \leq \frac{d}{\sqrt{N}}$$

For Example:

A monorail scale with two load cells and a displayed scale division of 1 lb, the maximum value permitted for each load cell is 0.71 lb. The calculation is shown below. If the value marked on the load cell is less than or equal to the value computed for the v_{min}, then the load cell is considered to comply with T.N.8.1.3.

$$v_{min} \leq \frac{d}{\sqrt{N}} = \frac{1\text{ lb}}{\sqrt{2}} = \frac{1\text{ lb}}{1.414} = 0.71\text{ lb}$$

For scales with mechanical lever systems:

$$v_{min} \leq \frac{d}{\sqrt{N} \times \text{scale multiple}}$$

Pretest Determinations:

1. Tolerances.
   - Acceptance/Maintenance ..... G-T.1., G-T.2.
   - Application ..... T.N.2.1., T.N.2.3., T.N.2.4.
   - Tolerance values:
     - Scales marked with an accuracy ..... T.N.3.1. Table 6 (Class III), T.N.3.2., T.N.3.8., T.N.4.1., T.N.4.4., T.N.4.5., T.N.5.
     - Scales not marked ..... T.1.1.,T.N.3.1. Table 6 (Class III), T.N.3.2., T.N.3.8., T.N.4.1., T.N.5.
     - Discrimination ..... T.N.7.2.

Pretest Determinations:

2. Select trolleys, trees, chains, or other auxiliary gear necessary to suspend test weights on rail or meat hook. If two or more trolley-and-tree combinations are used, they should be uniform in weight (within plus or minus two ounces).

Wear appropriate personal protection equipment such as hard hats and eye protection to prevent injury from overhead meat hooks and hanging carcasses falling weights and slipping on slick surfaces.

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3. Minimum test weights and test loads..... N.3.

Test Notes:

1. Suspend auxiliary gear (trolleys, trees, chains) from live rail.

2. Balance in auxiliary gear.

3. Check repeatability and agreement between indications throughout test. ..... T.N.5., G-S.5.2.2.(a)

4. Check zero-load balance each time test load is removed..... N.1.9., G-UR.4.2.

5. If the scale is equipped with a printer, print a ticket at each test load; check effectiveness of motion detection. ..... G-S.5.6., S.2.5.1., UR.1.3.(1/1/86)

6. If, during the conduct of the test, the performance of the device is questionable with respect to the zone of uncertainty or the width of zero, adequate tests should be conducted to determine compliance..... N.1.5., N.1.5.1., S.1.1.1.

7. If the device is equipped with operational features such as automatic zero-setting mechanism, programmable tare,*manual weight entries, or two scales with one printer, check proper operation and appropriateness.

   *Note: See UR.3.9. The use of manual gross weight entries, are not allowed on monorail scales.

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Static Test:

WEAR SAFETY SHOES !
USE PROPER LIFTING TECHNIQUES !

1. Increasing-load test. Test at not less than three points to maximum capacity test load. ..... N.1.1.

2. Shift test. Use test load equal to the largest load that can be anticipated to be weighed at the installation, but never less than one-half capacity. Apply load successively on the right end, the left end, and the center of the live rail. This can be conducted during the increasing-load test..... N.1.3.6.

3. RFI/EMI test (if a problem is suspected). ..... G-N.2., G-UR.3.2., G-UR.4.2., G-UR.1.2., N.1.6., T.4., T.N.9.*

   Radio Frequency Interference (RFI)
   Electromagnetic Interference (EMI)

4. Over-capacity test, if deemed necessary ..... S.1.7., S.2.1.5.

5. Decreasing-load test. Test at one-half of maximum test load. ..... N.1.2.

6. Remove all test weights and determine any zero-load balance change. ..... N.1.9., G-UR.4.2.

7. Test for proper design of automatic zero-setting mechanism, if device is so equipped. ..... S.2.1.3.(c) (1/1/81)

8. If device is equipped with a semi-automatic zero-setting mechanism (push button), test effectiveness of motion detection. ..... S.2.1.2.(b)

9. Establish correct zero-load balance.

Dynamic test ..... N.1.3.6.1.

On a dynamic test with 20 or more test drafts, 10 percent of the individual test drafts may be two times the basic tolerances, providing the error on the total of all test load drafts does not exceed 0.2 percent.

1. Conduct dynamic test w/livestock carcasses

2. Test no less than 20 test loads using carcasses or portions of carcasses of the type normally weighed. (two additional test loads may be included in the test run in the event that one or two of the test load are rendered unusable.

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Dynamic test (cont.) ..... N.1.3.6.1.

3. Position the test carcasses far enough ahead of the scale so the swaying motion settles to duplicate the normal sway of a continuously running plant chain.

4. If the plant conveyor chain does not space or prevent the carcasses from touching one another, the dynamic test should not be conducted until this condition is corrected.

5. Individually weigh (statistically) the carcasses on the same scale being tested or another monorail scale in close proximity with the same or smaller divisions.
   a) The scale selected for weighing the carcasses must be tested statically with test weights.

6. If the scale being tested is used for weighing freshly slaughtered animals, a static weighment of the carcasses must be taken as quickly as possible before or following the Dynamic weighment to avoid loss due to shrinkage.

7. If multiple dynamic tests are conducted using the same carcasses, obtain static weights before and after multiple dynamic tests.

8. If the carcass changes weight between static tests, the amount of weight change should be taken into account, or the carcass should be discarded for tolerance purposes.