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NBS HANDBOOK 112

Examination Procedure Outlines For Commercial Weighing and Measuring Devices

A Manual for Weights and Measures Officials

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards

Examination Procedure Outlines For Commercial Weighing and Measuring Devices

A Manual for Weights and Measures Officials

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Foreword

This publication is one of a number of Handbooks of the National Bureau of Standards designed to present in compact form comprehensive technical guides for state and local weights and measures officials.

This Handbook presents an operational guide for the field examination of commercial weighing and measuring devices. It includes inspection and test procedures, with code references to National Bureau of Standards Handbook 44, Fourth Edition, *Specifications, Tolerances, and Technical Requirements for Commercial Weighing and Measuring Devices.*

Authority for such activity on the part of the Bureau is found in basic legislation (64 Stat. 371), wherein the Bureau is authorized to undertake, among others, the following functions: "Cooperation with the states in securing uniformity in weights and measures laws and methods of inspection," and "The compilation and publication of general scientific and technical data resulting from the performance of the functions specified herein or from other sources when such data are of importance to scientific or manufacturing interests or to the general public, and are not available elsewhere."

This Handbook has been published in looseleaf form for insertion with Handbook 44 to further its usefulness to the official.

Although this Handbook is prepared primarily for use by weights and measures officials of the states, counties, and cities, it is believed that the information presented will be useful to manufacturers and commercial and industrial establishments interested in the examination of commercial weighing and measuring devices.

EXAMINATION PROCEDURE OUTLINES

Table of Contents

INTRODUCTION TO EXAMINATION PROCEDURE OUTLINES

The Examination Procedure Outlines in this series were developed by the Office of Weights and Measures of the National Bureau of Standards as an aid to the weights and measures official in conducting examinations of commercial weighing and measuring devices. The series includes an outline for each of the most frequently encountered scales and measuring devices and for weights. Each outline sets forth, step by step, what should be considered a minimum examination preceding official action.

The official field examination must necessarily include (1) The Inspection to determine compliance with specifications and other requirements, (2) The Pre-Test determinations to insure proper tolerance application and other appropriate test factors, and (3) The Test to determine compliance with performance requirements. The points included under the inspection are items of design, installation, and operation that may be subject to change subsequent to installation. Many specifications and other requirements must be considered during the first official examination of a particular device and may be appropriate also during any later examination of the device. The test should be so conducted as to develop, as nearly as practicable, the performance characteristics of the particular device under examination as it may be anticipated that the device will be used commercially. The outlined test for a device of a given class should, assuming sufficient and accurate standards and careful test administration, provide adequate information as to the acceptability or nonacceptability of that device for commercial service.

When the official encounters for the first time a device in commercial service, it will be necessary to go beyond the procedure as outlined. He should refer to all of the technical requirements of the General Code and the appropriate specific code. The test should extend further than a study under ideal conditions. It should be carried to the point of establishing that the device will perform, in all probability, adequately under average conditions of use. It may also be necessary for the official to go beyond the technical requirements of the General Code and the appropriate specific code and consider the overall suitability (G-UR.1.1.) of a particular device in the service and in the environment in which the device is or will be commercially used.

All code citations refer to National Bureau of Standards Handbook 44, Fourth *Edition, Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices.* A citation that begins with the letter "G" refers to the General Code, others to the appropriate specific code. Replacement Sheets for Handbook 44 are issued each year by the National Bureau of Standards to incorporate changes made by the National Conference on Weights and Measures. The H-44 references in the Examination Procedure Outlines should be checked against these Replacement Sheets annually, and such changes or corrections as are necessary should be made to keep the outlines up to date.

A thorough knowledge of the fundamentals of the design and operation of a weighing or measuring device is a prerequisite to a proper examination of the device.

Although the Examination Procedure Outlines were designed specifically for weights and measures officials in field examinations of commercial devices, they can be used as a guide when courtesy examinations are made, upon request, of noncommercial equipment. They should also be helpful to equipment manufacturers and to individuals involved in the installation or service of commercial weighing and measuring devices.

THE EXAMINATION OF A DEVICE MUST BE A PRECISE OPERATION BASED UPON PROVEN STANDARDS AND SO CONDUCTED AS TO DUPLICATE, AS NEARLY AS PRACTICABLE, SERVICE CONDITIONS OF OPERATION.

EPO No. 1

Examination Procedure Outline for COMPUTING SCALES

It is recommended that this outline be followed for automatic-indicating computing scales of cylinder and fan types and for packaging scales.

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found. (Do not adjust.)	S.1.1., UR.4.1., S.2.1.
2. Support for scale	G-UR.2.1., UR.2.1.
3. Level condition If the device is out of level and/or not in a zero-balance condition (except prepackaging scales), the user should be made aware of paragraphs UR. 4.1. and UR.4.2. and a warning issued if necessary. Before proceeding with the test, these conditions must be corrected.	S.2.3., UR.4.2.
4. Indicating and recording elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.1.
Money-value graduations	S.1.5.1.
Appropriateness	G-S.5., S.1.6.1., S.1.6.2.
Customer readability	S.1.5.3., G-UR.3.2.
Parallax	S.1.3.4., S.1.3.5.
Damping means	S.2.4., G-UR.4.1.
Tare mechanism	S.2.1.3.
5. Weighing elements	S.4.
Drainage—if wet commodities are weighed	S.3.2., UR.3.3.
Scoop counterbalance	S.3.3.
6. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
7. Marking requirements	G-S.1., G-S.6., S.6., UR.3.1.

PRE-TEST DETERMINATIONS:

1. Tolerances.
   - Applicable requirements — G-T.
   - Application — T.1., T.1.1., T.1.2., T.1.3.
   - Minimum values — T.2.1.
   - Basic values — T.3.1.

TEST:

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed — G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

If scale is equipped with ticket printer, print ticket at each test load and check weight and money values — G-S.5.5., G-S.5.6., S.1.5.2., S.1.6., T.1.2., T.1.3.

1. Increasing-load test—at 1, 3, 7, 15 ounces, or .05, .15, .45, .95 pounds centered; then at each pound to one-quarter capacity — N.1.1., T.1.5.
2. Shift test—one-half capacity load — N.1.3.1., T.1.4.
3. Continue increasing-load test—at three-quarters and capacity.
4. Decreasing-load test—one-half capacity — N.1.2., T.1.6.
5. Recheck zero-load balance.
6. Money-value test — check chart or drum at several points — G-S.5.5., S.1.5.2.

EPO No. 2

Examination Procedure Outline for HANGING SCALES

It is recommended that this outline be followed for dial and straight-face scales.

	H-44 General and Scale Code References
INSPECTION:	
1. Zero-load balance as found. (Do not adjust.) If the device is not in a zero-balance condition, the user should be made aware of paragraph UR. 4.1. and a warning issued if necessary. Before proceeding with the test, this condition must be corrected.	S.1.1., UR.4.1., S.2.1.
2. Suspension of scale	G-UR.2.1., UR.2.2.
3. Indicating elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.1.
Appropriateness	G-S.5.
Customer readability	S.1.5.3., G-UR.3.2.
Parallax	S.1.3.4., S.1.3.5.
Damping means	S.2.4.
4. Drainage—if wet commodities are weighed	S.3.2., UR.3.3.
5. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
6. Marking requirements	G-S.1., G-S.6., S.6.
PRE-TEST DETERMINATIONS:	
1. Tolerances.	
Applicable requirements	G-T.
Application	T.1., T.1.1., T.1.2., T.1.3.
Minimum values	T.2.1.
Basic values	T.3.2.
TEST:	
Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed	G-S.5.4.

During an official test, a scale should not shift its zero-load indications by an amount greater than the minimum tolerance applicable.

1. Increasing-load test _____ N.1.1., T.1.5.
   (a) 30 pounds capacity or less, test at 1, 3, 7, 15 ounces, centered; then each pound to one-quarter dial capacity, then half, three-quarters, and full dial capacity.
   (b) More than 30 pounds capacity, at least at each quarter of dial capacity and at each quarter of scale capacity.
2. Decreasing-load test — at one-half capacity _____ N.1.2., T.1.6.
3. Recheck zero-load balance.

EPO No. 3

Examination Procedure Outline for

EQUAL-ARM AUTOMATIC-INDICATING SCALES

It is recommended that this outline be followed for equal-arm automatic-indicating scales whether or not equipped with weighbeams.

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found. (Do not adjust.)	S.1.1., UR.4.1., S.2.1.
2. Support for scale	G-UR.2.1., UR.2.1.
3. Level condition	S.2.3., UR.4.2.
If the device is out of level and/or not in a zero-balance condition (except prepackaging or check-weighing scales), the user should be made aware of paragraphs UR.4.1. and UR.4.2. and a warning issued if necessary. Before proceeding with the test, these conditions must be corrected.	
4. Indicating elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.1.
Appropriateness	G-S.5.
Customer readability—if applicable	S.1.5.3., G-UR.3.2.
Parallax	S.1.3.5.
Weighbeam	S.5.1.
Poises	S.5.2.
Tare mechanism	S.2.1.3.
Damping means	S.2.4., G-UR.4.1.
5. Weighing elements	S.4.
Drainage	S.3.2., UR.3.3.
Scoop counterbalance	S.3.3.
6. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
7. Marking requirements	G-S.1., G-S.6., S.6., UR.3.1.

PRE-TEST DETERMINATIONS:

1. Tolerances.
   - Applicable requirements __ G-T.
   - Application _____ T.1., T.1.1., T.1.2., T.1.3.
   - Minimum values _____ T.2.1.
   - Basic values _____ T.3.1.

TEST:

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed _____ G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

1. Increasing-load test _____ N.1.1., T.1.5.
   - (a) Reading face at two points on each side of zero.
   - (b) Weighbeam at two points on each side of zero or at one-half and full capacity.
   - (c) Each pan at one-half and full capacity of scale (ratio test with standard weights) ___ T.1.7.
2. Shift test—one-half capacity and shift on each pan (ratio test with standard weights) _____ N.1.3.3., T.1.4., T.1.7.
3. Decreasing-load test — at half capacity _____ N.1.2., T.1.6.
4. Recheck zero-load balance.
5. Test equal-arm weights.
   If a balance is not available and the scale under test has proven suitable, these weights should be tested by substitution as explained in the EPO for weights—Equal-Arm.

EPO No. 4

Examination Procedure Outline for

EQUAL-ARM NONAUTOMATIC-INDICATING SCALES

It is recommended that this outline be followed for equal-arm nonautomatic-indicating scales, including those equipped with balance indicator.

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found. (Do not adjust.)	S.1.1., UR.4.1., S.2.1.
2. Support for scale	G-UR.2.1., UR.2.1.
3. Level condition. If the device is out of level and/or not in a zero-balance condition (except prepackaging or check-weighing scales), the user should be made aware of paragraphs UR.4.1. and UR.4.2. and a warning issued if necessary. Before proceeding with the test, these conditions must be corrected.	S.2.3., UR.4.2.
4. Indicating elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.1.
Appropriateness	G-S.5.
Customer readability—if applicable	S.1.5.3., G-UR.3.2.
Weighbeam	S.5.1.
Poises	S.5.2.
Tare mechanism	S.2.1.3.
Damping means	S.2.4., G-UR.4.1.
5. Weighing elements	S.4.
Pan travel	S.3.1.
Drainage	S.3.2., UR.3.3.
Scoop counterbalance	S.3.3.
6. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
7. Marking requirements	G-S.1., G-S.6., S.6., UR.3.1.

PRE-TEST DETERMINATIONS:

1. Tolerances.
   - Applicable requirements __ G-T.
   - Application _____ T.1., T.1.1. T.1.2., T.1.3.
   - Minimum values _____ T.2.1.
   - Basic values _____ T.3.1.

TEST:

Error weights—balance small weights on one pan, the smallest weight being equal to the minimum tolerance value and the total value of the weights being equal to the tolerance value at maximum test load. Scales not equipped with full capacity beams should be ratio tested using standard weights on counter-poise hanger _____ N.1.5., T.1.7.

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed _____ G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

1. SR at zero load _____ SR.1., SR.2., N.1.4. (b), (d), (e).
2. Increasing-load test _____ N.1.1., T.1.5.
   - (a) Weighbeam at two points on each side of zero or at one-half and full capacity.
   - (b) Each pan at one-half and full capacity of scale (ratio test with standard weights) ___ T.1.7.
3. Shift test—one-half capacity and shift on each pan (ratio test with standard weights) _____ N.1.3.3., T.1.4.,

4.	SR at capacity load _____	T.1.7., SR.1., SR.2.,
5.	Recheck zero-load balance.	N.1.4.(b), (d), (e).
6.	Test equal-arm weights. If a balance is not available and the scale under test has proven suitable, these weights should be tested by substitution as explained in the EPO for Weights—Alternate Procedure.	

EPO No. 5

Examination Procedure Outline for

PRESCRIPTION, JEWELERS, CREAM-TEST, MOISTURE-TEST, AND GRAIN MOISTURE-TEST SCALES

It is recommended that this outline be followed when the scales named are of conventional design.

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found. (Do not adjust.)	S.1.1., UR.4.1.
2. Support for scale	G-UR.2.1., UR.2.1.
3. Level condition. If the device is out of level and/or not in a zero-balance condition, the user should be made aware of paragraphs UR. 4.1. and UR.4.2. and a warning issued if necessary. Before proceeding with the test, these conditions must be corrected.	S.2.3., UR.4.2.
4. Indicating and recording elements.	
Value of minimum graduated interval	G-UR.1.1.
Balance indicator	S.2.5.1.
Arresting or damping means	S.2.4., S.2.6.1.
Weighbeam	S.5.1.
Poises	S.5.2.
5. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
6. Marking requirements	G-S.1., G-S.6., S.6.1., N.3.

PRE-TEST DETERMINATIONS:

1. Tolerances.
   - Applicable requirements -- G-T.
   - Application ---------- T.1., T.1.1., T.1.2., T.1.3.
   - Minimum values ---------- T.2.2., T.2.3., T.2.4., T.2.5.
   - Basic values ---------- T.3.

TEST:

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed ---------- G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

On a cream-test scale, balance on each pan 2 ounces for each bottle the pan is designed to accommodate.

1. SR at zero load ---------- N.1.4., SR.1., SR.2., SR.3., SR.4., SR.5.
2. Shift test ---------- N.1.3.1., N.1.3.2., N.1.3.3., T.1.4.
   Shift on each pan, using half capacity load for prescription, jewelers, and grain moisture-test scales, and 18-gram load for a cream-test or moisture-test scale.
3. Ratio test (equality of arms) at half and full capacity ---------- T.1.7., T.3.1., T.3.2., T.3.3., T.3.4., N.1.5.
4. SR at maximum test load --- N.1.4., SR.1., SR.2., SR.3., SR.4., SR.5.
5. Weighbeam test—at half and full capacity on each bar ---------- N.1.1., T.1.5.
6. Recheck zero-load balance.
7. Test equal-arm weights. See EPO for Weights.

NOTE: Weights of 2 grams and larger may be tested on the scale under test, providing the scale has met all of the requirements. Weights of less than 2 grams must be tested with standard weights better than NBS Class F and on a more appropriate balance.

EPO No. 6

Examination Procedure Outline for

ANALYTICAL BALANCES—EQUAL ARM

It is recommended that this outline be followed when making courtesy examinations of balances and for those balances used commercially.

Although there are few specific requirements in Handbook 44 relating to balances, the same general consideration is given these devices as any others in commercial use. It is recommended that the official making the examination have a thorough working knowledge of the design and method of operation of balances.

INSPECTION:	H-44 General and Scale Code References
1. Support	G-UR.2.1., UR.2.1.
2. Level condition	
3. Appropriateness and suitability	G-UR.1.1., G-S.5.
4. Environmental factors — cleanliness, etc.	G-UR.4.1., G-S.2.

PRE-TEST DETERMINATIONS:

1. Tolerances—Applicable requirements.

   For balances used commercially for weighing commodities such as precious metals, apply the tolerance set forth in Handbook 44 as follows:

   T.3.3.—Basic tolerance values for jewelers scales.

   T.2.3.—Minimum tolerance values for jewelers scales.

   SR.3.—Sensitivity requirements for jewelers scales.

   When conducting courtesy examinations of devices not used commercially, the test will determine compliance with the performance capabilities as set forth by the manufacturer of the balance. In the absence of such information, the test will determine the performance capabilities of the device.

TEST:

1. Test scale divisions for linearity.
    1.1. Release arrestments and balance instrument so that the indicator coincides with the center division on the scale with no load on the pans.
    1.2. Without arresting, add small weights necessary to change equilibrium five divisions and record weight value. To determine sensitivity (weight necessary to change equilibrium one division from rest point), divide the value obtained by 5.
    1.3. Add additional small weights necessary to change equilibrium ten divisions. If the reading scale is linear, the weights added should equal twice the weights added in step 2.

    NOTE: If the device is not equipped with ten divisions on both sides of midpoint, these tests can be conducted by using first one-half the number of divisions in a single direction and then all the divisions, and the sensitivity would be determined by dividing by the appropriate value.

    Arrest the instrument—remove weights.
2. Test arm length at half capacity. Use weights on both sides of balance that are *exactly* equal.
    2.1. Reestablish zero-load balance to midpoint of scale divisions.
    2.2. Load each pan with test weights equal to one-half the capacity of the balance.
    2.3. Add small weights necessary to establish equilibrium to determine error. Information obtained in step 1.2. may be used to determine weight needed to achieve midpoint balance.
    2.4. Repeat scale division linearity test as described in step 1.

    Arrest the instrument—remove weights.
3. Test arm length at full capacity.
    3.1. Reestablish zero-load balance to midpoint of scale divisions.
    3.2. Load each pan with test weights equal to full capacity of the balance.
    3.3. Add small weights necessary to establish equilibrium to determine error.
    3.4. Repeat scale division linearity test as described in step 1.

    Arrest the instrument—remove weights.

4. Check zero-load balance. Add small weights to reestablish midpoint balance and record an arrestment error.

5. Test all riders, chains, or other beams or poises for accuracy.

6. Weight test—Test the weights used with the balance as set forth further in the EPO for Weights—Recommended Procedure. If the weights are better than Class F, the weight test should be conducted in the laboratory with more appropriate standards.

EPO No. 7
Examination Procedure Outline for AUTOMATIC-INDICATING SCALES—UNEQUAL ARM

It is recommended that this outline be followed for counter, portable, floor, and built-in scales except livestock and vehicle.

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found. (Do not adjust.)	S.1.1., UR.4.1., S.2.1., S.5.1.1.
2. Support or installation	G-UR.2., G-UR.3.2., G-UR.4.3., UR.2.1.,
3. Level condition	UR.2.3., UR.2.4.
If the device is out of level and/or not in a zero balance condition (except prepackaging or check-weighing scales), the user should be made aware of paragraphs UR.4.1. and UR.4.2. and a warning issued if necessary. Before proceeding with the test, these conditions must be corrected.	S.2.3., UR.4.2.
4. Indicating and recording elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.1., UR.1.1.8.
Appropriateness	G-S.5.
Customer readability—if applicable	G-UR.3.2.
Weighbeam	S.5.1.
Poises	S.5.2.
Tare mechanism	S.2.1.3.
Damping means	S.2.4.
5. Weighing elements	S.4.
Drainage	S.3.2., UR.3.3.
Scoop counterbalance	S.3.3.
6. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
7. Marking requirements	G-S.1., G-S.6., S.6., UR.3.1.

PRE-TEST DETERMINATIONS:

1. Tolerances.

Applicable requirements	G-T.
Application	T.1., T.1.1., T.1.2., T.1.3.
Minimum values	T.2.1.
Basic values	T.3.1.

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed ..... G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

If scale is equipped with ticket printer, print ticket at each test load ..... G-S.5.5., G-S.5.6., S.1.5.2., S.1.6., T.1.2., T.1.3.

1. Increasing-load test ..... N.1.1., T.1.4.
   Small scales at several loads to capacity; larger scales at several loads to used capacity. Weighbeams at one-half and total test load.
2. Shift test (can be conducted at appropriate test load during increasing-load test).

   Use quarter capacity load over each main load support or half capacity load centered successively in each quarter of platform ... N.1.3.1., N.1.3.6. T.1.4.

3. Decreasing-load test — at one-half capacity ..... N.1.2., T.1.6.

4. Remove all test weights and determine any zero-load balance shift.

5. Strain-load test—if appropriate. Use tolerances for test-weight loads only _____ N.1.1., T.1.5., T.3.2. (See Handbook 94.)

6. Recheck zero-load balance.

EPO No. 8

Examination Procedure Outline for

BEAM SCALES—UNEQUAL ARM

It is recommended that this outline be followed for counter, portable, floor, and built-in beam scales except livestock and vehicle.

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found. (Do not adjust.)	S.1.1., UR.4.1., S.2.1., S.5.1.1.
2. Support or installation	G-UR.2., G-UR.3.2., G-UR.4.3., UR.2.1., UR.2.3., UR.2.4.
3. Level condition. If the device is out of level and/or not in zero balance condition (except prepackaging or check-weighing scales), the user should be made aware of paragraphs UR.4.1. and UR.4.2. and a warning issued if necessary. Before proceeding with the test, these conditions must be corrected.	S.2.3., UR.4.2.
4. Indicating elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.1., UR.1.1.8.
Appropriateness	G-S.5.
Customer readability—if applicable	G-UR.3.2.
Weighbeam	S.5.1.
Poises	S.5.2.
5. Weighing elements	S.4.
Drainage	S.3.2., UR.3.3.
Scoop counterbalance	S.3.3.
6. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
7. Marking requirements	G-S.1., G-S.6., S.6., UR.3.1.

PRE-TEST DETERMINATIONS:

1. Tolerances.
   - Applicable requirements -- G-T.
   - Application ---------- T.1., T.1.1., T.1.2.
   - Minimum values ---------- T.2.1.
   - Basic values ---------- T.3.1.

TEST:

Error weights—Balance small weights on platform, the smallest weight being equal to the minimum tolerance value and the value of the weights being equal to the tolerance value at maximum test load.

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed ---------- G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

1. SR at zero load ---------- N.1.4., SR.1., SR.2.
2. Increasing-load test ---------- N.1.1., T.1.5.
   - (a) Small scales at several loads to capacity; larger scales at several loads to used capacity.
   - (b) Scales not equipped with full capacity beam should be ratio tested using standard weights on counterpoise hanger ---------- T.1.7., N.1.5.
   - (c) Test weighbeams at one-half and maximum test load. When ratio testing, without removing maximum test load, substitute poise position with the removal of appropriate standard weights on counterpoise hanger ---------- T.3.1.

3.	Shift test (can be conducted at appropriate test load during increasing-load test). Use quarter capacity test load over each main load support or half capacity load centered successively in each quarter of platform	N.1.3.1., N.1.3.6., T.1.4.
4.	SR at maximum load	N.1.4., SR.1., SR.2.
5.	Recheck zero-load balance.	
6.	Test counterpoise weights, if any. If a balance is not available and the scale under test has a suitable sensitivity, these weights may be tested by substitution with the standard weights on the counterpoise hanger, as explained in the EPO for Weights—Alternate Procedure.	
7.	Remove all weights and establish correct zero-load balance.	

EPO No. 9

Examination Procedure Outline for

MONORAIL SCALES AND MEAT BEAMS BEAM AND AUTOMATIC INDICATING STATIC AND IN-MOTION

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found --	S.1.1., S.2.1.,
If the device is not in balance, the user should be made aware of paragraph UR.4. and a warning issued if necessary.	S.5.1.1., UR.4.1.
2. Installation ----------	UR.2.3., UR.2.4., UR.2.5., G-UR.2.
3. Indicating and recording elements.	
Value of minimum graduated interval ----------	G-UR.1.1., UR.1.1.8.
Appropriateness ----------	G-S.5.
Customer readability (if applicable) ----------	G-UR.3.2.
Weighbeam ----------	S.5.1.
Poises ----------	S.5.2.
Tare mechanism ----------	S.2.1.3.
Damping means ----------	S.2.4.
4. Weighing elements ----------	S.4.
5. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.) ----------	G-S.2., G-UR.3., G-UR.4., UR.4.3.
6. Marking requirements ------	G-S.1., G-S.6., S.6.
7. Assistance ----------	G-UR.4.3.

PRE-TEST DETERMINATIONS:	
1. Tolerances.	
Applicable requirements --	G-T.
Application ----------	T.1., T.1.1., T.1.2., T.1.3.
Minimum values ----------	T.2.1.
Basic values ----------	T.3.5.
2. Select trolleys, trees, chains, or other auxiliary gear necessary to suspend test	

weights on rail or meat hook. If more than one trolley and tree combination is used, they should be uniform in weight (within plus or minus two ounces).

TEST:

Auxiliary gear (trolleys, trees, chains)—Suspend from live rail or hook as required.

Error weights—Place small weights on or suspend from the live rail or hook equal to the minimum tolerance value and the total value of the weights being equal to the tolerance value at maximum test load.

Balance in error weights and auxiliary gear.

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed _____ G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

If the scale is equipped with a ticket printer, print ticket at each test load _____ G-S.5.6., T.1.2., T.1.3.

BEAM SCALES—STATIC TEST

1. SR at zero load _____ N.1.4., SR.1., SR.2.
2. Increasing-load test _____ N.1.1., T.1.5.
   (a) Small scales at several loads to capacity; larger scales at several loads to used capacity.
   (b) Scales not equipped with full capacity beam should be ratio tested using standard weights on counterpoise hanger _____ T.1.7., N.1.5.

(c) Test weighbeams at not less than two points or at one-half and maximum test load. When ratio testing, without removing maximum test load, substitute poise position with the removal of appropriate standard weights on counterpoise hanger __ T.3.1.

3. Shift test. (Can be conducted at appropriate test load during increasing-load test.) Use one-half capacity load at each end of live rail.

4. SR at maximum test load ____ N.1.4., SR.1., SR.2.

5. Counterpoise weight test. (See EPO for Weights.)

6. Remove all test weights and determine any zero-load balance shift.

7. Remove error weights and auxiliary gear and establish correct zero-load balance.

AUTOMATIC INDICATING SCALES—STATIC TEST

1. Increasing-load test.
   (a) Small scales at several loads to capacity; larger scales at several loads to used capacity.
   (b) Test at not less than three points on reading face, including all possible quarters of capacity. Test all unit weights possible.
   (c) If equipped with tare bars, test at half and full capacity of each bar.

2. Shift test. (Can be conducted at appropriate test load during increasing-load test.) Use one-half capacity load at each end of live rail.
3. Decreasing-load test — at one-half of maximum test load (at no less than one-half dial face capacity) _____ N.1.2., T.1.6.
4. Counterpoise weight test (if scale is so equipped). See EPO for Weights.
5. Remove all test weights and determine any zero-load balance shift.

AUTOMATIC INDICATING SCALES— IN-MOTION TEST

1. Conduct static test as previously indicated.
2. Conduct dynamic test.
   - 2.1. Suspend trolleys and trees on dead rail and place test weights in varying amounts on each.

     Example: Five trolley and tree combinations with test weights in 100-pound increments, thus providing five test weight values of 100 pounds, 200 pounds, 300 pounds, 400 pounds, and 500 pounds.
   - 2.2. With the scale adjusted for the appropriate tare for trolleys and trees, start conveyor system and run test loads across weigh rail in the same manner that product is weighed. If the device is equipped with a recording system, test with system operative.
   - 2.3. Run the test weight combination across the weigh rail at least five times, recording the errors at each load that is indicated visually.
   - 2.4. The zero-load balance should be checked after each test run.
   - 2.5. Obtain a printout from the recording system and compare recorded values with indicated values.

3. Tolerance application.

The acceptance and maintenance tolerance value for each test load indicated and recorded digitally for devices of 1,000-pound capacity with a 1-pound operating minimum graduated interval is ±1 pound. The acceptance and maintenance tolerance value for each test load indicated and recorded digitally for devices of 500-pound capacity with a ½-pound operating minimum graduated interval is ±½ pound.

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

EPO No. 10

Examination Procedure Outline for

HOPPER SCALES

INSPECTION:	H-44 General and Scale 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. and a warning issued if necessary.	S.1.1., S.2.1., S.5.1.1., UR.4.1.
2. Installation _____	UR.2.3., UR.2.4., G-UR.2., G-UR.4.3.
3. Indicating and recording elements.	
Value of minimum graduated interval _____	G-UR.1.1., UR.1.1.4., UR.1.1.8.
Appropriateness _____	G-S.5.
Customer readability (if applicable) _____	G-UR.3.2.
Weighbeam _____	S.5.1.
Poises _____	S.5.2.
Tare mechanisms _____	S.2.1.3.
Damping means _____	S.2.4.
4. Weighing elements _____	S.4.
5. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.) _____	G-S.2., G-UR.3., G-UR.4., UR.4.3.
6. Marking requirements _____	G-S.1., G-S.6.
7. Assistance _____	G-UR.4.3.

PRE-TEST DETERMINATIONS:

1. Tolerances.	
Applicable requirements __	G-T.
Application _____	T.1., T.1.1., T.1.2., T.1.3.
Minimum values _____	T.2.1.
Basic values _____	T.3.1., T.3.5.

TEST:

Error weights—If beam scale, balance small weights on platform, the smallest weight being equal to the minimum tolerance value and the total value of the weights being equal to the tolerance value at maximum test load.	
Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed _____	G-S.5.4.
During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.	
If the scale is equipped with a ticket printer, print ticket at each test load _____	G-S.5.6., T.1.2., T.1.3.
1. SR at zero load—if appropriate _____	N.1.4., SR.1., SR.2.
2. Ratio test—if applicable ____	N.1.5., T.1.7.
3. Increasing-load test. (a) If beam scale, test at not less than two points on each weigh-beam bar. (b) If automatic-indicating scale, test at not less than three points on reading face, including all possible quarters of reading-face capacity. Test all unit weights possible _____	N.1.1., T.1.2., T.1.5.
4. Decreasing-load test—one-half maximum test load _____	N.1.2., T.1.6.
5. Strain-load test—if appropriate. Use tolerances for test-weight loads only _____	N.1.1., T.1.5., T.3.2. (See NBS Handbook 94.)

6. SR at maximum test load ___ N.1.4., SR.1., SR.2.
7. Counterpoise-weight test (if scale is so equipped). See EPO for Weights.
8. Remove all test weights and determine any zero-load balance shift.
9. Remove error weights and establish correct zero-load balance.

TEST PROCEDURE FOR PORTABLE OR TRUCK-MOUNTED HOPPER SCALES

These are recommended test procedures for those devices used for the delivery of feed in feed lots. As is the case in the examination of all devices, the application of proven standards is the most acceptable and best method for determinations of performance capabilities. However, because of the construction and design of some of these devices and the available testing apparatus, it may be impossible to apply standard test weights. In those cases a carefully conducted comparison test is the next most acceptable method.

TEST PROCEDURE WITH STANDARD TEST WEIGHTS:

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

If scale is equipped with ticket printer, print ticket at each test load.

1. Increasing-load Test—Basic Tolerance
   Apply test weights distributed evenly on the load receiving element and test at several different loads to used capacity.
2. Shift Test—Basic Tolerance
   Conduct shift test only on those devices that are so designed that off-center loads are actually weighted. Use half capacity test load over each section. The shift test may be conducted during the increasing-load test when the half capacity test load has been applied.
3. Decreasing-load Test—Basic Tolerance
   Since these devices are designed to weigh out, this test is conducted in a manner similar to service conditions of operation. Consequently, the decreasing-

load test tolerance is not applied. With maximum test load applied, place control switch in weigh-out position and remove all test weights, maintaining a distributed load, in increments of, for example, 1,000 pounds or 2,000 pounds, or 2,500 pounds, taking a reading at each point.

NOTE: The combined errors should not exceed the individual tolerance times one-half the number of observations.

4. Check Zero-load Balance

As is the case in the examination of any device, if the information obtained is not sufficient to provide a reasonable determination of the dispositon of the device (approved, rejected, condemned), repeat all or any part of the test.

COMPARISON TEST PROCEDURE:

1. Select Proper Scale—Select a motor vehicle scale that meets all of the requirements of Handbook 44 and has the following features or characteristics:
   - 1.1. A reading capability to the closest 5 pounds, preferably a beam scale with a 5-pound minimum graduation and which meets or exceeds the sensitivity requirements.
   - 1.2. Adequately protected to prevent the adverse effects of environmental conditions such as wind.
2. Test Comparison Test Scale
   - 2.1. Since the scale will be used for comparison only, it will be necessary to apply test weights in amounts equal to or nearly the weight of the empty truck and all other values at which test observations will be made. Record all indications for each test load so corrections can be made during the comparison test.
   - 2.2. The test weights should be located on the scale platform in the same position the truck under test will occupy.
3. Increasing-load Test—Basic Tolerance
   - 3.1. Place empty truck on scale in proper location as previously determined and obtain weight. Correct if necessary, and record.
   - 3.2. Load empty truck to capacity with product, determine gross weight and corrected net weight. Compare corrected net weight with indication of scale under test, and record all observations and resultant error, if any.

4. Decreasing-load Test—Basic Tolerance

4.1. On scale under test, control switch to weigh out position to establish zero indication.

4.2. Discharge product from truck in amounts equal to average drafts (approximately 2,000 pounds). Compare scale indications with previously obtained observations and record errors. It is preferable that the discharge of product occurs with the truck on the scale. However, if it is necessary to remove the truck, care should be exercised to eliminate or take into consideration all of the variables involved—that is, truck weight variations caused by gas consumption, the pickup or loss of mud, etc.

5. Check Zero-load Balance

EPO No. 11

Examination Procedure Outline for

AUTOMATIC GRAIN HOPPER SCALES

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found	S.1.1., S.2.1., S.5.1.1., UR.4.1.
2. Installation	UR.2.3., UR.2.4., G-UR.2.
3. Indicating and recording elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.8.
Appropriateness	G-S.5.
Weighbeam	S.5.1.
Poises	S.5.2.
4. Weighing elements	S.4.
5. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
6. Marking requirements	G-S.1., G-S.6.
7. Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:	
1. Tolerances.	
Applicable requirements	G-T.
Application	T.1., T.1.1., T.1.2.
Minimum values	T.2.1.
Basic values	T.3.1.

TEST:	
1. SR at zero load	N.1.4., SR.1., SR.2.
2. Ratio test (multiple of lever system) at one-half and maximum test loads, using standard weights in the weight box against standard weights in or upon the weigh hopper	N.1.5., T.1.7., T.3.1.
3. SR at maximum test load	N.1.4., SR.1., SR.2.

4. Scale-weight test _____ N.1.1., T.1.5.
   Test each scale weight separately by placing it in the weight box and checking for accurate scale balance against test weights in or upon the weigh hopper.

5. Residue-weighbeam test (if scale is so equipped) _____ N.1.1., N.1.4., SR.1., SR.2., T.1.5.
   Lock main weighbeam, then determine SR and test accuracy of residue beam at one-half and full capacity of this beam.

6. Recheck zero-load balance ___ G-S.5.4.

7. Test drafts: As a final check, test the operation of the entire scale installation by checkweighing several drafts of grain that have been weighed by the scale. Repeat the test draft procedure if the scale is used for more than one type of grain by first checkweighing with a heavy grain such as wheat and then checkweighing with a light grain such as oats.

EPO No. 12

Examination Procedure Outline for

LIVESTOCK AND ANIMAL SCALES BEAM AND AUTOMATIC INDICATING [1]

INSPECTION:	H-44 General and Scale 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. and a warning issued if necessary.	S.1.1., S.2.1., S.5.1.1., UR.4.1.
2. Installation	UR.2.3., UR.2.4., UR.2.5., G-UR.2., G-UR.4.3.
3. Indicating and recording elements.	
Value of minimum graduated interval	G-UR.1.1., UR.1.1.2., UR.1.1.3.
Appropriateness	G-S.5.
Customer readability (if applicable)	G-UR.3.2.
Weighbeam	S.5.1.
Poises	S.5.2.
Damping means	S.2.4.
4. Weighing elements	S.4.
5. Stock rack	UR.2.7.
6. Pit	G-UR.4.1., UR.2.5.
7. Environmental factors—(cleanliness, obstruction, modifications, etc.)	G-UR.4., G-S.2., UR.4.3.
8. Marking requirements	G-S.1., G-S.6., S.6.
9. Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:	
1. Tolerances.	
Applicable requirements	G-T.
Application	T.1., T.1.1., T.1.2., T.1.3.

[1] If livestock or animal scales are being tested in a cooperative program with the U.S. Department of Agriculture, note the directives of "Scales and Weighing Memorandum No. 1, Instructions for Testing Livestock Scales," copies of which are available from the U.S. Department of Agriculture, Packers and Stockyards Division, Consumer and Marketing Service, Washington, D.C. 20250.

Minimum values _____ T.2.6., T.2.7.
Basic values _____ T.3.5.

2. Determine "used" capacity—Multiply square feet of platform area by 110 pounds for cattle, 70 pounds for calves and hogs, 50 pounds for sheep.

TEST:

Error weights. If beam scale, balance small weights on platform, the smallest weight being equal to the minimum tolerance value and the total value of the weights being equal to the tolerance value at maximum test load.

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed _____ G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

If the scale is equipped with a ticket printer, print ticket at each test load _____ G-S.5.6., T.1.2., T.1.3.

1. SR at zero load, if beam scale N.1.4., SR.1., SR.6.

2. Increasing-load test _____ N.1.1., T.1.2., T.1.3., T.1.5.

   (a) Test to "used" capacity, with test load distributed.

   (b) Scales not equipped with a full capacity beam should be ratio tested using standard weights on counterpoise hanger _____ T.1.7., N.1.5.

(c) If beam scale, test at half and full capacity on the fractional bar, 100-pound increments to 1,000 pounds, and at least at three other points on main weighbeam bar, including "used" capacity.[2] When ratio testing without removing maximum test load, substitute poise position with removal of appropriate standard weights on counterpoise hanger.

(d) If automatic indicating scale, test at 100-pound increments to 1,000 pounds and at each quarter of dial capacity. Test all unit or drop weights normally used.

3. Shift test. (Can be conducted at appropriate test load during increasing-load test.) _____ T.1.4.
   Use quarter capacity load successively at each corner of platform, or, if lever system has more than two sections, centered successively over each section.
4. SR at maximum load, if beam scale _____ N.1.4., SR.1., SR.6.
5. Decreasing-load test, if automatic indicating scale, at one-half of maximum test load (at no less than one-half dial face capacity) ____ N.1.2., T.1.6.
6. Test counterpoise weights, if any.

[2] In acknowledgement of differences among jurisdictions in denominations of test weights, this constitutes a minimum increasing-load test of a livestock beam scale as recommended by the Packers and Stockyards Division of the U.S. Department of Agriculture.

7. Remove all test weights and determine any zero-load balance shift.

8. If beam scale, remove error weights and establish correct zero-load balance; if automatic indicating scale, establish correct zero-load balance.

EPO No. 13

Examination Procedure Outline for VEHICLE SCALES

INSPECTION:	H-44 General and Scale Code References
1. Zero-load balance as found -- If the device is not in balance, the user should be made aware of the paragraph UR.4. and a warning issued if necessary.	S.1.1., S.2.1., S.5.1.1., UR.4.1.
2. Installation	UR.2.3., UR.2.4., UR.2.5., G-UR.2.,
3. Indicating and recording elements.	G-UR.4.3.
Value of minimum graduated interval	G-UR.1.1., UR.1.1.6.
Appropriateness	G-S.5.
Customer readability (if applicable)	G-UR.3.2.
Weighbeam	S.5.1.
Poises	S.5.2.
Tare mechanism	S.2.1.3.
Damping means	S.2.4.
4. Weighing elements	S.4.
5. Pit	G-UR.4.1., UR.2.5.
6. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
7. Marking requirements	G-S.1., G-S.6., S.6.
8. Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:	
1. Tolerances.	
Applicable requirements	G-T.
Application	T.1., T.1.1., T.1.2., T.1.3.
Minimum values	T.2.1.
Basic values	T.3.5.
2. Determine maximum test load to be applied during test.	

(a) On a two-section scale, a test load of 100 percent of nominal capacity may be applied to either section or distributed over the entire platform.

(b) On scales having more than two sections, a test load of 50 percent of nominal capacity may be applied to any section, or a test load of 100 percent of nominal capacity may be distributed over the the entire platform.

TEST:

Error weights—If beam scale, balance small weights on platform, the smallest weight being equal to the minimum tolerance value and the total value of the weights being equal to the tolerance value at maximum test load.

Check repeatability of indications throughout test. Recheck zero-load balance each time test load is removed _____ G-S.5.4.

During an official test, a scale should not shift its zero-load indication by an amount greater than the minimum tolerance applicable.

If the scale is equipped with a ticket printer, print ticket at each test load _____ G-S.5.6., T.1.2., T.1.3.

1. SR at zero load—if beam scale _____ N.1.4., SR.1., SR.6.
2. Increasing-load and shift test.

(a) Use not less than two loads successively over each section of lever system and on a two-section scale centered on the platform.
(b) If beam scale, test at not less than two points on each weigh-beam bar.
(c) If automatic-indicating scale, test at not less than three points on reading face, including all possible quarters of reading-face capacity. Test all unit weights possible _____ N.1.1., N.1.3.4., T.1.2., T.1.4., T.1.5.

3. Decreasing-load test, if automatic-indicating scale at one-half of maximum test load (at no less than ½ dial-face capacity) _____ N.1.2., T.1.6.

4. Strain-load test—use tolerances for test weight loads only _____ N.1.1., T.1.5., T.3.5. (See NBS Handbook 94.)

5. SR at maximum test load—if beam scale _____ N.1.4., SR.1., SR.6.

6. Counterpoise-weight test (if scale is so equipped). See EPO for Weights.

7. Remove all test weights and determine any zero-load balance shift.

8. Remove error weights and establish correct zero-load balance.

EPO No. 14

Examination Procedure Outline for

BELT-CONVEYOR SCALES

	H-44 General and Scale Code References
INSPECTION:	
1. Installation	G-UR.2., UR.2.
2. Indicating and recording elements.	
Value of the smallest unit	S.1.4., G-UR.1.1.
Appropriateness	G-S.5., S.1.
3. Weighing elements	S.2., G-S.3.
4. Maintenance, use, and environmental factors (cleanliness, obstructions, modifications, etc.)	G-S.2., G-UR.3., G-UR.4., UR.4.3.
5. Marking requirements	G-S.1., G-S.6., S.3.
6. Assistance	G-UR.4.3.
PRE-TEST DETERMINATIONS:	
1. Tolerances.	
Applicable requirements	G-T.
Application	T.1.
Zero-test load	N.3.1.
2. Zero-load test conditions	N.3.1.
3. Simulated test conditions	N.3.3.
4. Material test conditions	N.3.2.
TEST:	
1. Zero-load test	N.3.1.
2. Simulated test	N.3.3.
3. Material test	N.3.2.
4. Simulated test	N.3.3.

EPO No. 19

Examination Procedure Outline for

WEIGHTS—EQUAL-ARM AND COUNTERPOISE

INSPECTION:	H-44 General and Weight Code References
1. Material	G-S.3., S.1.
2. Design—smooth surface, no sharp edges or corners	G-S.2., S.2.
3. Finish	G-S.3., S.3.
4. Marking of nominal and counterpoise values	G-S.6., S.4.
5. Cleanliness	G-UR.4.1.
6. Loose adjusting material	G-S.2., G-UR.4.2.
7. Suitability—type and multiple of scale with which weights are used	G-UR.1.1., S.4.

PRE-TEST DETERMINATIONS:

1. Tolerance requirements applicable — acceptance or maintenance values	G-T., T.

TEST:

Recommended Procedure

Use an equal-arm balance with SR, accuracy, and repeatability at least as good as one-tenth the acceptance tolerance on the smallest weight of the group of weights under test.

1. Place on the left pan of the balance the weight to be tested, and on the other pan place a standard weight (or an accumulation of standard weights) of the same nominal value.

2. If the pans do not balance exactly (or the indicator does not oscillate equally on both sides of the center of the graduated scale), place on the high pan a standard weight equal to the tolerance on the weight under test. If this brings the high pan to balance position or lower, the weight under test may be considered acceptable; if not, the weight is unacceptable.

Alternative Procedure

If the scale with which the weight under test is used conforms to official requirements, it may be used (although certainly not with the confidence with which the precise balance is used) to test its equal-arm or counterpoise weights.

For Equal-Arm Weights

3. Balance the equal-arm scale with a standard weight equal in nominal value to the weight under test on the left pan and with any appropriate balancing material on the right pan.

4. Replace the standard weight on the left pan with the weight under test.

5. If the pans do not now exactly balance, place on the high pan a standard weight equal to the tolerance on the weight under test. If this brings the high pan to balance position or lower, the weight under test may be considered acceptable; if not, the weight is unacceptable.

For Counterpoise Weights

6. Place a standard weight equal in nominal value to the weight under test *plus* a standard weight equal to the tolerance on that weight on the counterpoise hanger of the compound-lever scale.

7. Place any appropriate balancing material on the load-receiving element of the scale, and, utilizing the balance ball, bring the weighbeam into a position of equilibrium at the very top, but not actually touching the top, of the trig loop or other limiting stop.

8. Replace the standard weight with the weight under test. (Do not remove the "tolerance" weight.)

9. Should the weighbeam now be lower than it was when balanced in step 7, remove the tolerance weight from the counterpoise hanger. Then, if the weighbeam is restored to its high balance position or actually touches the trig loop or other limiting stop, the weight under test may be considered acceptable; if not, it is unacceptably *heavy*.

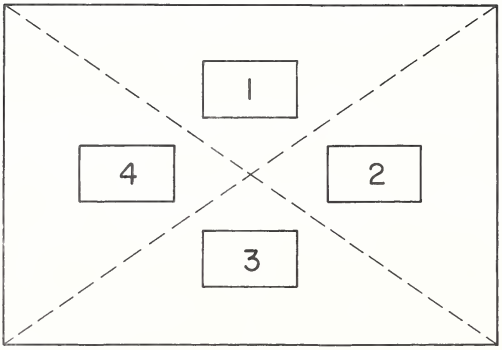
10. If, following step 8, the weighbeam is actually touching the trig loop or other limiting stop, add to the counterpoise a second "tolerance" weight. If this additional load lowers the weighbeam so that it no longer touches the top of the trig loop or other limiting stop, the weight under test may be considered acceptable; if not, it is unacceptably *light*.

SHIFT TEST SUPPLEMENTS

The following three pages illustrate the test weight positions, the test load, and the tolerance to be applied for shift tests as described in the Notes section of the Scale Code.

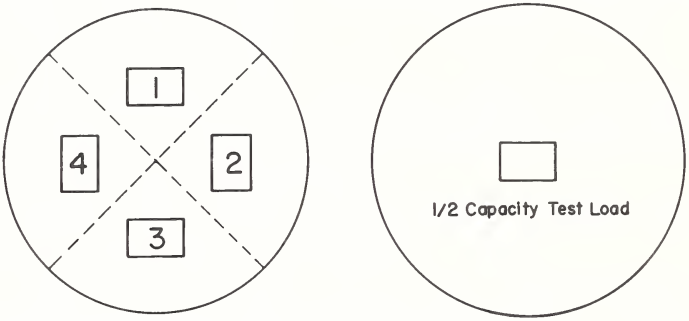
The numerical designations for the test weight positions are universally accepted and are based on the assumption that the individual conducting the test is facing the load-receiving element in the same manner that he would generally read the indicating element.

N.I.3.1. Shift Test
Bench or Counter Scales



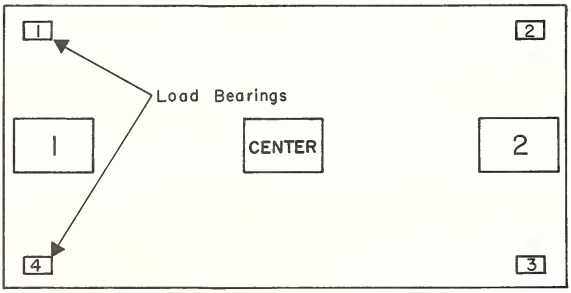
Test Load – 1/2 Capacity
Tolerance – Basic

N.I.3.3. Shift Test
Equal Arm Scales



Test Load – 1/2 Capacity
Test Each Pan Independently
Tolerance – Basic

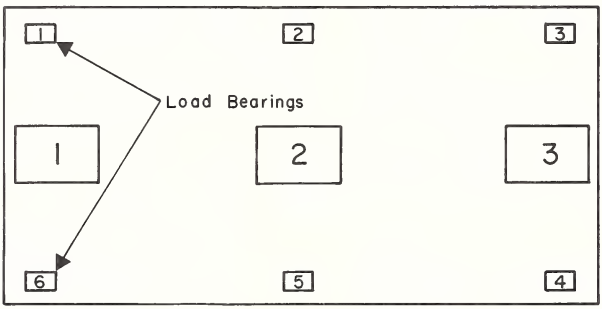
N.I.3.4. Shift Test
Vehicle Scales - 2 Section



Test Load – 2 Different Test Loads Including Maximum Available Not To Exceed Sectional Capacity

Tolerance – Basic

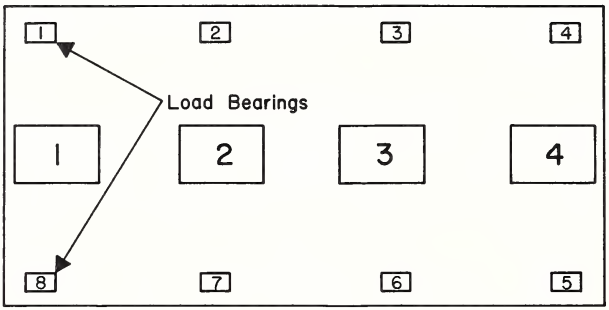
N.I.3.4. Shift Test
Vehicle Scales - 3 Section



Test Load – 2 Different Test Loads Including Maximum Available Not To Exceed Sectional Capacity

Tolerance – Basic

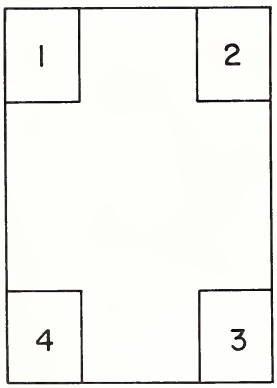
N.I.3.4. Shift Test
Vehicle Scales - 4 Section



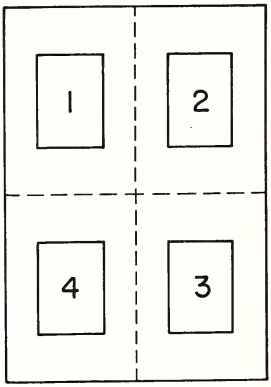
Test Load – 2 Different Test Loads Including Maximum Available Not To Exceed Sectional Capacity

Tolerance – Basic

N.I.3.6. Shift Test
Other Scales



OR



Test Load - 1/4 Capacity
Tolerance - Basic

Test Load - 1/2 Capacity
Tolerance - Basic

EPO No. 21

Examination Procedure Outline for

RETAIL MOTOR-FUEL DISPENSERS—SINGLE PRODUCT

It is recommended that this outline be followed for conventional, single-product, power-operated retail dispensers —"gasoline pumps."

INSPECTION:	H-44 General and Liquid Measuring Device Code References
1. Indicating and recording elements.	
Design	S.1.1.
Readability	G-S.5., G-S.6., G-UR.3.2.
Unit Price and Product Identity	S.1.4.3., S.1.4.4., UR.3.2.
Advancement and Return to Zero	S.1.1.4., S.1.4.2., UR.3.1.
2. Measuring elements.	
Air eliminator vent (if self-contained pump)	S.2.1.
Security seal on adjusting mechanism	G-UR.4.4., S.2.2.
3. Discharge hose	S.3.4., UR.1.1., S.3.1.
4. Marking requirements	G-S.1., S.4.1., G-UR.3.3.
5. General considerations.	
Selection	G-UR.1.1.
Maintenance	G-UR.3.1., G-UR.4.1.
Installation	G-UR.2.1., UR.2.1., UR.2.4.
Accessibility	G-UR.2.3.
Assistance	G-UR.4.3.

RE-TEST DETERMINATIONS:

1. Tolerances.	
Applicable requirements	G-T., T.1.
Basic values	T.2.1., T.2.4.

TEST:

If test measure is dry, add one cubic inch to gage reading to allow for amount of liquid required to "wet" measure.

Allow 10-second drain period each time test measure is emptied.

To determine proper operation of totalizers, observe and record the totalizer indications before and after all test drafts.

1. Normal test—full flow—basic tolerance _____ N.1., N.2., N.3.4., N.4.1.

If first test is well within tolerance, proceed to 2; otherwise, repeat this test.

2. Check computed price on both sides of dispenser _____ G-S.5.5.
   (See Price Computation Table.)
3. Special test — slow flow basic tolerance _____ N.4.2., N.4.2.2.
4. Check effectiveness of zero-set-back interlock _____ S.2.5.1., UR.3.4.
   On equipment with remote pumping systems, activate one dispenser and check all others operated by the same pump to make certain they will not operate without activating the individual starting levers.
5. Check effectiveness of anti-drain valve _____ S.3.6.
6. Elapsed time-test (if necessary) _____ N.4.3., T.2.4.

Security seal—Apply lead-and-wire seal to secure adjusting mechanism.

Note on the official report the number of gallons of product dispensed during test.

EPO No. 22

Examination Procedure Outline for

RETAIL MOTOR-FUEL DISPENSERS—BLENDED PRODUCT

It is recommended that this outline be followed for blending-type, power-operated retail dispensers—"gasoline pumps."

INSPECTION:	H-44 General and Liquid Measuring Device Code References
1. Indicating and recording elements.	
Design	S.1.1.
Readability	G-S.5., G-S.6., G-UR.3.2.
Unit Price and Product Identity	S.1.4.3., UR.3.2., S.1.4.4.
Advancement and Return to Zero	S.1.1.4., S.1.4.2., UR.3.1.
2. Measuring elements.	
Air eliminator vent	S.2.1.
Security seal on adjusting mechanism	G-UR.4.4., S.2.2.
3. Discharge hose	S.3.4., UR.1.1., S.3.1.
4. Marking requirements	G-S.1., S.4.1., G-UR.3.3.
5. General considerations.	
Selection	G-UR.1.1.
Maintenance	G-UR. 3.1., G-UR.4.1.
Installation	G-UR.2.1., UR.2.1., UR.2.4.
Accessibility	G-UR.2.3.
Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:

1. Tolerances.	
Applicable requirements	G-T., T.1.
Basic values	T.2.1., T.2.4.

TEST:

If test measure is dry, add one cubic inch to gage reading to allow for amount of liquid required to "wet" measure.

Allow 10-second drain period each time test measure is emptied.
To determine proper operation of totalizers, observe and record the totalizer indications before and after all test drafts.

1. Test at lowest octane. Set selector control so that lowest octane product is dispensed. Normal test—full flow—basic tolerance _____ N.1., N.2., N.3.4., N.4.1.

If the first test is *well* within tolerance, proceed to 2; otherwise *repeat* this test.

2. Check computed price on both sides of dispenser _____ G-S.5.5. (See Price Computation Table.)
3. Test at highest octane. Set selector control so that highest octane product is dispensed. Normal test—full flow—basic tolerance _____ N.1., N.2., N.3.4., N.4.1.

If test is *well* within tolerance, proceed to 4; otherwise *repeat* this test.

4. Check computed price on both sides of dispenser _____ G-S.5.5.
5. Test at blend—Set selector control at an intermediate blend. Special test—slow-flow—basic tolerance _____ N.2., N.4.2., N.4.2.2.

If test is *well* within tolerance *and* the error is less than or equals the average error of the previous two tests, proceed to 6; otherwise slow-flow test at first grade above lowest octane and first grade beneath highest octane.

6. Check computed price on both sides of dispenser _____ G-S.5.5.
7. Set money-value computation on other blends. Set selector control at each of the remaining blends and dispense one indicated gallon to check computed price__ G-S.5.5.

8. Check effectiveness of zero-set-back interlock ---------- S.2.5.1., UR.3.4.
9. Check effectiveness of anti-drain valve ---------- S.3.6.
10. Elapsed-time test (if necessary) ---------- N.4.3., T.2.4.

Security seal—Apply lead-and-wire seal to each meter to secure adjusting mechanisms.

Note on the official report the number of gallons of each blend or product dispensed during test.

EPO No. 23

Examination Procedure Outline for POWER-OPERATED VEHICLE-TANK METERS

It is recommended that this outline be followed for all power-operated vehicle-tank meters; for gravity discharge meters, see EPO No. 24.

INSPECTION:	H-44 General and Vehicle-Tank Meters Code References
1. Indicating and recording elements.	
Design	S.1.1.
Readability	G-S.5., G-S.6.
Unit price	S.1.4.1., S.1.4.3., UR.1.2.
Advancement and Return to Zero	S.1.1.4.
2. Measuring elements.	
Air eliminator vent	S.2.1.
Security seal on adjusting mechanism	G-UR.4.4., S.2.2.
3. Piping.	
Discharge line and valves	S.2.3., S.3.
Antidrain valve	S.3.6.
Leaks	G-UR.4.1., S.3.1.
Fraud	G-S.2.
4. Marking requirements	G-S.1., S.5.
5. General considerations.	
Selection	G-UR.1.1.
Maintenance	G-UR.3.1., G-UR.4.1.
Installation	G-UR.2.1., UR.1.1.
Accessibility	G-UR.2.3.
Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:	
1. Determine that the test fluid in the tank compartments is similar in character to the fluid to be measured commercially	N.1.
2. Tolerances.	
Applicable requirements	G-T., T.1.
Basic values	T.2.
3. Note totalizer reading.	

TEST:

Wet prover: Allow 30-second drain period each time prover is emptied.
If meter is equipped with recording element, print a ticket after each test run.
If computing type, check computation _____ G-S.5.6., S.1.4.2., S.1.4.3., S.1.4.4.

1. Normal test—full flow—basic tolerance _____ N.4.1., T.2.
2. Special test—slow flow—special tolerance _____ N.4.2., T.2.

If either the normal or special test result is close to or outside the applicable tolerance, repeat that test.

3. Special test—split-compartment—special tolerance ____ S.2.1., N.4.2., T.2.
   - 3.1. Start test (normal flow rate) from a compartment containing less test fluid than one-half the capacity of the prover and with pump in operation and pressure to the discharge nozzle.
   - 3.2. Permit test to continue until lack of fluid supply causes meter register to stop absolutely.
   - 3.3. With pump in operation, shut manifold valve (or disconnect whip-hose connection) from now empty compartment.
   - 3.4. Open valve from compartment with adequate supply of fluid to complete test.
4. Check automatic-stop mechanism _____ G-UR.4.1.
   No tolerance.

5. Check effectiveness of anti-drain valve with pump pressure off line _____ S.3.6., N.4.3.

Security seal: Apply lead-and-wire seal to secure adjusting mechanism. Also seal register to meter.

Note on the official report the number of gallons of product dispensed during test.

EPO No. 24

Examination Procedure Outline for GRAVITY-DISCHARGE VEHICLE-TANK METERS

It is recommended that this outline be followed for all gravity-discharge vehicle-tank meters; for power-operated meters, see EPO No. 23.

	H-44 General and Vehicle-Tank Meters Code References
INSPECTION:	
1. Indicating and recording elements.	
Design	S.1.1.
Readability	G-S.5., G-S.6.
Unit price	S.1.4.1., S.1.4.3., UR.1.2.
Advancement and Return to Zero	S.1.1.4.
2. Measuring elements.	
Air eliminator vent	S.2.1.
Security seal on adjusting mechanism	G-UR.4.4., S.2.2.
3. Piping.	
Discharge line and valves	S.2.3., S.3.
Antidrain valve	S.3.6.
Leaks	G-UR.4.1., S.3.1.
Fraud	G-S.2.
4. Marking requirements	G-S.1., S.5.
5. General considerations.	
Selection	G-UR.1.1.
Maintenance	G-UR.3.1., G-UR.4.1.
Installation	G-UR.2.1., UR.1.1.
Accessibility	G-UR.2.3.
Assistance	G-UR.4.3.
PRE-TEST DETERMINATIONS:	
1. Determine that the test fluid in the tank compartment is similar in character to the fluid to be measured commercially	N.1.
2. Tolerances.	
Applicable requirements	G-T., T.1.
Basic values	T.2.
3. Note totalizer reading.	

TEST:

Inlet to prover must be lower than the meter outlet.

Wet prover: Allow 30-second drain period each time prover is emptied.

If meter is equipped with recording element, print a ticket after each test run.

If computing type, check computation _____ G-S.5.6., S.1.4.2., S.1.4.3., S.1.4.4.

1. Normal test—full flow—basic tolerance high head (full compartment) _____ N.4.1., T.2.

2. Normal test—full flow—basic tolerance medium head (one-half full compartment) _____ N.4.1., T.2.

3. Normal test—full flow—basic tolerance low head (compartment to contain 1½ times prover capacity) __ N.4.1., T.2.

4. Special test—split compartment—special tolerance _____ N.4.2., T.2., S.2.1.
   - 4.1. Start test (normal flow rate) from compartment containing less test load than one-half prover capacity.
   - 4.2. Permit test to continue until lack of fluid supply causes meter register to stop.
   - 4.3. Shut manifold valve (or disconnect whip-hose connection) from now empty compartment.
   - 4.4. Open valve from compartment with adequate supply of fluid to complete test.

5. Check automatic stop mechanism. No tolerance _____ G-UR.4.1.

Security seal: Apply lead-and-wire seal to secure adjusting mechanism. Also seal register to meter.

Note on the official report the number of gallons of product dispensed during test.

EPO No. 25

Examination Procedure Outline for LOADING-RACK METERS

It is recommended that this outline be followed for all power-operated and gravity discharge loading-rack meters.

INSPECTION:	H-44 General and Liquid-Measuring Device Code References
1. Indicating and recording elements.	
Design	S.1.1.
Readability	G-S.5., S.1.2., S.1.3.
Advancement and Return to Zero	S.1.1.4.
2. Measuring elements.	
Air eliminator vent	S.2.1.
Automatic temperature compensation	S.2.6.
Security seals, adjusting mechanism, and automatic temperature compensator	G-UR.4.4., S.2.2., S.2.6.3.
3. Piping.	
Discharge line and valves	S.2.3., S.3.
Leaks	G-UR.4.1., S.3.1.
Fraud	G-S.2.
4. Marking requirements	G-S.1., S.4., G-S.6.
5. General considerations.	
Selection	G-UR.1.1., S.1.1.3.
Maintenance	G-UR.3.1., G-UR.4.1.
Installation	G-UR.2.1., UR.2.2.
Accessibility	G-UR.2.3.
Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:

1. Determine that the test liquid available is the same liquid to be commercially measured or a liquid of the same general physical characteristics.
2. Tolerances.
   - Applicable requirements — G-T., T.1.
   - Basic values — T.2.3.
3. Note totalizer reading.

TEST:

Wet prover. Allow 30-second drain period each time prover is emptied.

If meter is equipped with recording element, print a ticket after each run.

If computing type, check computation _____ G-S.5.6., S.1.5.2.

1. Nontemperature-compensated meters

1. Normal test—full flow—basic tolerance _____ N.2., N.4.1.1., N.5., T.2.3.
2. Special test—slow flow—special tolerance _____ N.2., N.4.2.4., N.5., T.2.3.

If any of the test results are close to or outside the applicable tolerances, repeat that test.

2. Temperature-compensated meters that indicate or record both gross gallons (uncompensated) and net gallons (compensated)

1. To determine the accuracy of the gross gallons, follow the test procedure for nontemperature-compensated meters.
2. To determine the accuracy of the net gallons, proceed as follows:
   - 2.1. Calculate average temperature for each test run. During each test run conducted when determining the accuracy of the gross gallons, read temperature of product at meter at one-third and two-thirds prover capacity. Add the two temperatures obtained together and divide by 2.
   - 2.2. Find factor for reducing volume to 60° F. It is necessary that either the specific gravity or the API gravity of the product is specified by the terminal operator. Dependent on which gravity is known, select either ASTM Petroleum Measurement Table No. 6 or No. 24 to find the appropriate factor.
   - 2.3. Correct volume in prover to 60° F. Multiply the factor obtained by the prover reading.

Example: (specific gravity known)

What is the volume at 60° F of 1000.2 gallons (prover reading) at an average temperature of 45° F of an oil whose specific gravity is .725?

Table 24

0.720-0.750 Volume Reduction to 60°F ASTM-IP

0–50 °F.

Observed Temperature, °F.	Specific Gravity 60/60 °F.													
	0.720		0.725		0.730		0.735		0.740		0.745		0.750	
	Factor for Reducing Volume to 60°F.													
40	1.0131	2	1.0129	2	1.0127	2	1.0125	2	1.0123	1	1.0122	2	1.0120	
41	1.0124	1	1.0123	2	1.0121	2	1.0119	2	1.0117	1	1.0116	2	1.0114	
42	1.0118	2	1.0116	2	1.0114	1	1.0113	2	1.0111	2	1.0109	1	1.0108	
43	1.0111	1	1.0110	2	1.0108	2	1.0106	1	1.0105	2	1.0103	1	1.0102	
44	1.0195	2	1.0103	1	1.0102	2	1.0100	1	1.0099	2	1.0097	1	1.0096	
45	1.0098	1	1.0097	2	1.0095	1	1.0094	1	1.0093	2	1.0091	1	1.0090	
46	1.0092	2	1.0090	1	1.0089	1	1.0088	2	1.0086	1	1.0085	1	1.0084	
47	1.0085	1	1.0084	1	1.0083	2	1.0081	1	1.0080	1	1.0079	1	1.0078	
48	1.0079	2	1.0077	1	1.0076	1	1.0075	1	1.0074	1	1.0073	1	1.0072	
49	1.0072	1	1.0071	1	1.0070	1	1.0069	1	1.0068	1	1.0067	1	1.0066	

1.0097 (factor from Table 24) X 1000.2 (prover reading) = 1009.9 gallons

The error is the difference between the net gallon representation and 1009.9 gallons.

Example: (API gravity known)

What is the volume at 60° F of 749.7 gallons (prover reading) at an average temperature of 80° F of a gasoline whose API gravity is 2?

Table 6

ASTM-IP Volume Reduction to 60°F 0.9° API 50-100°F

Observed Temperature, °F.	API Gravity at 60 °F.									
	0	1	2	3	4	5	6	7	8	9
	Factor for Reducing Volume to 60 °F.									
75	.9951	.9950	.9950	.9949	.9949	.9948	.9948	.9947	.9947	.9946
76	.9948	.9947	.9946	.9946	.9945	.9945	.9944	.9944	.9943	.9942
77	.9944	.9944	.9943	.9943	.9942	.9941	.9941	.9940	.9939	.9939
78	.9941	.9940	.9940	.9939	.9939	.9938	.9937	.9937	.9936	.9935
79	.9938	.9937	.9936	.9936	.9935	.9934	.9934	.9933	.9932	.9932
80	.9934	.9934	.9933	.9932	.9932	.9931	.9930	.9930	.9929	.9928
81	.9931	.9930	.9930	.9929	.9928	.9928	.9927	.9926	.9925	.9925
82	.9928	.9927	.9926	.9926	.9925	.9924	.9923	.9923	.9922	.9921
83	.9925	.9924	.9923	.9922	.9921	.9921	.9920	.9919	.9918	.9917
84	.9921	.9921	.9920	.9919	.9918	.9917	.9916	.9916	.9915	.9914

.9933 (factor from Table 6) X 749.7 (prover reading) = 744.7 gallons

The error is the difference between the net gallon representation and 744.7 gallons.

If any of the test results are close to or outside the applicable tolerances, repeat that test.

3. Temperature-compensated meters

1. Normal test—full flow—basic tolerance (Do not deactivate temperature compensator.)	N.2., N.4.1.1., N.5., T.2.3.
Deactivate temperature compensator.	N.4.1.
2. Normal test—full flow—basic tolerance	N.2., N.4.1., N.5., T.2.3.
3. Special test—slow flow—special tolerance	N.2., N.4.2., N.5., T.2.3.

If any of the test results are close to or outside the applicable tolerances, repeat that test.

Reactivate temperature compensator.

4. All devices

1. Check effectiveness of anti-drain valve	S.3.5., S.3.6.

Check effectiveness of valve at nozzle if wet-hose system; otherwise check for complete drainage of discharge line.

2. Check automatic-stop mechanism	G-UR.4.1.

Security seal: Apply lead-and-wire seal to secure adjusting mechanism. Also seal register to meter.

Note final totalizer reading and record on the official report the number of gallons of product dispensed during test.

EPO No. 26

Examination Procedure Outline for

LIQUEFIED PETROLEUM GAS MOTOR-FUEL DEVICE

For a more complete description, refer to NBS Handbook 99.

INSPECTION:	H-44 General and LPG Liquid-Measuring Device Code References
1. Indicating and recording elements.	
Design	S.1.1.
Readability	G-S.5., G-S.6., G-UR.3.2.
Unit Price and Product Identity	S.1.4.3.
Advancement and Return to Zero	S.1.1.4., S.1.4.2., UR.2.1.
2. Measuring elements.	
Vapor elimination	S.2.1., S.2.4.
Automatic temperature compensation	S.2.6.1.
Thermometer well	S.2.5.
Security seals	G-UR.4.4., S.2.2., S.2.6.2.
3. Discharge hose	G-S.2., S.3., UR.1.2.
4. Marking requirements	G-S.1., S.4.
5. General considerations.	
Selection	G-UR.1.1.
Maintenance	G-UR.3.1., G-UR.4.1.
Installation	G-UR.2.1., G-UR.2.2., UR.1.1.
Accessibility	G-UR.2.3.
Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:

1. Tolerances.	
Applicable requirements	G-T., T.1.
Basic values	T.2.

TEST:

To determine proper operation totalizers, observe and record the totalizer indication before and after all test drafts.

Wet prover (fill to nominal capacity). Allow 30-second drain period each time prover is emptied.

Read temperature and pressure of product in prover immediately following each test draft ---------- N.5.

If dispenser is equipped with a recording element, print ticket after each test run ---------- G-S.5.6., UR.2.5.

If computing type, check computation ---------- G-S.5.5., S.1.4.4

Nontemperature-compensated devices

Read temperature of product at meter at one-third and two-thirds prover capacity ---------- N.5.

1. Normal test—full flow—basic tolerance ---------- N.2., N.3., N.4.1., N.5., T.2.
2. Repeat normal test.
3. Special test—slow flow—special tolerance ---------- N.2., N.4.2.1., N.4.2.2., N.5., T.2.

If any of the test results are close to or outside the applicable tolerance, repeat that test.

Temperature-compensated devices

1. Normal test—full flow—basic tolerance ---------- N.2., N.4.1.1., N.5., T.2.
   (Do not deactivate temperature compensator.)

Deactivate temperature compensator ---------- N.4.1.

2. Normal test—full flow—basic tolerance ---------- N.2., N.3., N.5., T.2.

3. Special test—slow flow—special tolerances _____ N.2., N.4.2.1., N.4.2.2., N.5., T.2.

If any of the test results are close to or outside the applicable tolerance, repeat the test.

Reactivate temperature compensator.

4. Check effectiveness of zero-set-back-interlock _____ S.2.7.1.

Security seal—Apply lead-and-wire seals to secure meter and temperature adjusting mechanisms. Also seal register to meter.

Note final totalizer reading and record on the official report the number of gallons of product dispensed during test.

EPO No. 27

Examination Procedure Outline for
LIQUEFIED PETROLEUM GAS LIQUID-MEASURING DEVICES

It is recommended that this outline be followed for all LP Gas liquid meters except motor-fuel dispensers.

For a more complete description, refer to NBS Handbook 99.

INSPECTION:	H-44 General and LPG Liquid-Measuring Device Code References
1. Indicating and recording elements.	
Design	S.1.1.
Readability	G-S.5., G-S.6.
Unit Price and Product Identity	S.1.4.3.
Advancement and Return to Zero	S.1.1.4., S.1.4.1., S.1.4.2.
2. Measuring elements.	
Vapor elimination	S.2.1., S.2.4.
Security seals	G-UR.4.4., S.2.2., S.2.6.2.
Thermometer well	S.2.5.
Automatic temperature compensation	S.2.6.1.
3. Piping.	
Discharge line and valves	S.2.3., S.3.
Leaks	G-UR.4.1., S.3.1.
Fraud	G-S.2., S.3.1.
4. Marking requirements	G-S.1., S.4.
5. General considerations.	
Selection	G-UR.1.1.
Maintenance	G-UR.3.1., G-UR.4.1.
Installation	G-UR.2.1., UR.1.1.
Accessibility	G-UR.2.3.
Assistance	G-UR.4.3.

PRE-TEST DETERMINATIONS:

1. Determine that the test liquid in the tank compartments is similar in character to the liquid to be measured commercially	N.1.

2. Tolerances.
   Applicable requirements -- G-T., T.1.
   Basic values ---------- T.2.
3. Note totalizer reading.

TEST:

Wet prover (fill to nominal capacity). Allow 30-second drain period each time prover is emptied.

Read temperature and pressure of product in prover immediately following each test draft -- N.5.

If meter is equipped with a recording element, print ticket after each test run ---------- G-S.5.6., UR.2.5.

If computing type, check computation ---------- S.1.1.5., S.1.4.4.

Nontemperature-compensated meters

Read temperature of product at meter at one-third and two-thirds prover capacity ---------- N.5.

1. Normal test—full flow—basic tolerance ---------- N.2., N.3., N.4.1. N.5., T.2.
2. Repeat normal test.
3. Special test—slow flow—special tolerance ---------- N.2., N.4.2.2., N.4.2.3., N.5., T.2.

If any of the test results are close to or outside the applicable tolerance, repeat the test.

Temperature-compensated meters

1. Normal test—full flow—basic tolerance Do not deactivate temperature compensator.	N.2., N.4.1.1., N.5., T.2.
Deactivate temperature compensator	N.4.1.
2. Normal test—full flow—basic tolerance	N.2., N.3., N.5., T.2.
3. Special test—slow flow—special tolerance	N.2., N.4.2.2., N.4.2.3., N.5., T.2.

If any of the test results are close to or outside the applicable tolerance, repeat that test.

Reactivate temperature compensator.

Security seal—Apply lead-and-wire seals to secure meter and temperature adjusting mechanisms. Also seal register to meter.

Note final totalizer reading and record on the official report the number of gallons of product dispensed during test.

Supplement to Examination Procedure Outlines Nos. 21 and 22

Price Computation Table

A = price per gallon (cents)

B = price per five gallons (dollars)

A	B	A	B	A	B	A	B	A	B
15.0	0.75	16.0	0.80	17.0	0.85	18.0	0.90	19.0	0.95
15.1	0.755	16.1	0.805	17.1	0.855	18.1	0.905	19.1	0.955
15.2	0.76	16.2	0.81	17.2	0.86	18.2	0.91	19.2	0.96
15.3	0.765	16.3	0.815	17.3	0.865	18.3	0.915	19.3	0.965
15.4	0.77	16.4	0.82	17.4	0.87	18.4	0.92	19.4	0.97
15.5	0.775	16.5	0.825	17.5	0.875	18.5	0.925	19.5	0.975
15.6	0.78	16.6	0.83	17.6	0.88	18.6	0.93	19.6	0.98
15.7	0.785	16.7	0.835	17.7	0.885	18.7	0.935	19.7	0.985
15.8	0.79	16.8	0.84	17.8	0.89	18.8	0.94	19.8	0.99
15.9	0.795	16.9	0.845	17.9	0.895	18.9	0.945	19.9	0.995

A	B	A	B	A	B	A	B	A	B
20.0	1.00	21.0	1.05	22.0	1.10	23.0	1.15	24.0	1.20
20.1	1.005	21.1	1.055	22.1	1.105	23.1	1.155	24.1	1.205
20.2	1.01	21.2	1.06	22.2	1.11	23.2	1.16	24.2	1.21
20.3	1.015	21.3	1.065	22.3	1.115	23.3	1.165	24.3	1.215
20.4	1.02	21.4	1.07	22.4	1.12	23.4	1.17	24.4	1.22
20.5	1.025	21.5	1.075	22.5	1.125	23.5	1.175	24.5	1.225
20.6	1.03	21.6	1.08	22.6	1.13	23.6	1.18	24.6	1.23
20.7	1.035	21.7	1.085	22.7	1.135	23.7	1.185	24.7	1.235
20.8	1.04	21.8	1.09	22.8	1.14	23.8	1.19	24.8	1.24
20.9	1.045	21.9	1.095	22.9	1.145	23.9	1.195	24.9	1.245

A	B	A	B	A	B	A	B	A	B
25.0	1.25	26.0	1.30	27.0	1.35	28.0	1.40	29.0	1.45
25.1	1.255	26.1	1.305	27.1	1.355	28.1	1.405	29.1	1.455
25.2	1.26	26.2	1.31	27.2	1.36	28.2	1.41	29.2	1.46
25.3	1.265	26.3	1.315	27.3	1.365	28.3	1.415	29.3	1.465
25.4	1.27	26.4	1.32	27.4	1.37	28.4	1.42	29.4	1.47
25.5	1.275	26.5	1.325	27.5	1.375	28.5	1.425	29.5	1.475
25.6	1.28	26.6	1.33	27.6	1.38	28.6	1.43	29.6	1.48
25.7	1.285	26.7	1.335	27.7	1.385	28.7	1.435	29.7	1.485
25.8	1.29	26.8	1.34	27.8	1.39	28.8	1.44	29.8	1.49
25.9	1.295	26.9	1.345	27.9	1.395	28.9	1.445	29.9	1.495

A	B	A	B	A	B	A	B	A	B
30.0	1.50	31.0	1.55	32.0	1.60	33.0	1.65	34.0	1.70
30.1	1.505	31.1	1.555	32.1	1.605	33.1	1.655	34.1	1.705
30.2	1.51	31.2	1.56	32.2	1.61	33.2	1.66	34.2	1.71
30.3	1.515	31.3	1.565	32.3	1.615	33.3	1.665	34.3	1.715
30.4	1.52	31.4	1.57	32.4	1.62	33.4	1.67	34.4	1.72
30.5	1.525	31.5	1.575	32.5	1.625	33.5	1.675	34.5	1.725
30.6	1.53	31.6	1.58	32.6	1.63	33.6	1.68	34.6	1.73
30.7	1.535	31.7	1.585	32.7	1.635	33.7	1.685	34.7	1.735
30.8	1.54	31.8	1.59	32.8	1.64	33.8	1.69	34.8	1.74
30.9	1.545	31.9	1.595	32.9	1.645	33.9	1.695	34.9	1.745

A	B	A	B	A	B	A	B	A	B
35.0	1.75	36.0	1.80	37.0	1.85	38.0	1.90	39.0	1.95
35.1	1.755	36.1	1.805	37.1	1.855	38.1	1.905	39.1	1.955
35.2	1.76	36.2	1.81	37.2	1.86	38.2	1.91	39.2	1.96
35.3	1.765	36.3	1.815	37.3	1.865	38.3	1.915	39.3	1.965
35.4	1.77	36.4	1.82	37.4	1.87	38.4	1.92	39.4	1.97
35.5	1.775	36.5	1.825	37.5	1.875	38.5	1.925	39.5	1.975
35.6	1.78	36.6	1.83	37.6	1.88	38.6	1.93	39.6	1.98
35.7	1.785	36.7	1.835	37.7	1.885	38.7	1.935	39.7	1.985
35.8	1.79	36.8	1.84	37.8	1.89	38.8	1.94	39.8	1.99
35.9	1.795	36.9	1.845	37.9	1.895	38.9	1.945	39.9	1.995

The half-cent computed values shown above, as 1.255, should appear on an analog type register as halfway between appropriate whole cent indications.

Supplement to Examination Procedure Outlines Nos. 21 and 22—Continued

Price Computation Table

A=Price per gallon (cents) B=Price per five gallons (dollars)

A	B	A	B	A	B	A	B	A	B
40.0	2.00	41.0	2.05	42.0	2.10	43.0	2.15	44.0	2.20
40.1	2.005	41.1	2.055	42.1	2.105	43.1	2.155	44.1	2.205
40.2	2.01	41.2	2.06	42.2	2.11	43.2	2.16	44.2	2.21
40.3	2.015	41.3	2.065	42.3	2.115	43.3	2.165	44.3	2.215
40.4	2.02	41.4	2.07	42.4	2.12	43.4	2.17	44.4	2.22
40.5	2.025	41.5	2.075	42.5	2.125	43.5	2.175	44.5	2.225
40.6	2.03	41.6	2.08	42.6	2.13	43.6	2.18	44.6	2.23
40.7	2.035	41.7	2.085	32.7	2.135	43.7	2.185	44.7	2.235
40.8	2.04	41.8	2.09	42.8	2.14	43.8	2.19	44.8	2.24
40.9	2.045	41.9	2.095	42.9	2.145	43.9	2.195	44.9	2.245
A	B	A	B	A	B	A	B	A	B
45.0	2.25	46.0	2.30	47.0	2.35	48.0	2.40	49.0	2.45
45.1	2.255	46.1	2.305	47.1	2.355	48.1	2.405	49.1	2.455
45.2	2.26	46.2	2.31	47.2	2.36	48.2	2.41	49.2	2.46
45.3	2.265	46.3	2.315	47.3	2.365	48.3	2.415	49.3	2.465
45.4	2.27	46.4	2.32	47.4	2.37	48.4	2.42	49.4	2.47
45.5	2.275	46.5	2.325	47.5	2.375	48.5	2.425	49.5	2.475
45.6	2.28	46.6	2.33	47.6	2.38	48.6	2.43	49.6	2.48
45.7	2.285	46.7	2.335	47.7	2.385	48.7	2.435	49.7	2.485
45.8	2.29	46.8	2.34	47.8	2.39	48.8	2.44	49.8	2.49
45.9	2.295	46.9	2.345	47.9	2.395	48.9	2.445	49.9	2.495
A	B	A	B	A	B	A	B	A	B
50.0	2.50	51.0	2.55	52.0	2.60	53.0	2.65	54.0	2.70
50.1	2.505	51.1	2.555	52.1	2.605	53.1	2.655	54.1	2.705
50.2	2.51	51.2	2.56	52.2	2.61	53.2	2.66	54.2	2.71
50.3	2.515	51.3	2.565	52.3	2.615	53.3	3.665	54.3	2.715
50.4	2.52	51.4	2.57	52.4	2.62	53.4	2.67	54.4	2.72
50.5	2.525	51.5	2.575	52.5	2.625	53.5	2.675	54.5	2.725
50.6	2.53	51.6	2.58	52.6	2.63	53.6	2.68	54.6	2.73
50.7	2.535	51.7	2.585	52.7	2.635	53.7	2.685	54.7	2.735
50.8	2.54	51.8	2.59	52.8	2.64	53.8	2.69	54.8	2.74
50.9	2.545	51.9	2.595	52.9	2.645	53.9	2.695	54.9	2.745
A	B	A	B	A	B	A	B	A	B
55.0	2.75	56.0	2.80	57.0	2.85	58.0	2.90	59.0	2.95
55.1	2.755	56.1	2.805	57.1	2.855	58.1	2.905	59.1	2.955
55.2	2.76	56.2	2.81	57.2	2.86	58.2	2.91	59.2	2.96
55.3	2.765	56.3	2.815	57.3	2.865	58.3	2.915	59.3	2.965
55.4	2.77	56.4	2.82	57.4	2.87	58.4	2.92	59.4	2.97
55.5	2.775	56.5	2.825	57.5	2.875	58.5	2.925	59.5	2.975
55.6	2.78	56.6	2.83	57.6	2.88	58.6	2.93	59.6	2.98
55.7	2.785	56.7	2.835	57.7	2.885	58.7	2.935	59.7	2.985
55.8	2.79	56.8	2.84	57.8	2.89	58.8	2.94	59.8	2.99
55.9	2.795	56.9	2.845	57.9	2.895	58.9	2.945	59.9	2.995
A	B	A	B	A	B	A	B	A	B
60.0	3.00	61.0	3.05	62.0	3.10	63.0	3.15	64.0	3.20
60.1	3.005	61.1	3.055	62.1	2.105	63.1	3.155	64.1	3.205
60.2	3.01	61.2	3.06	62.2	3.11	63.2	3.16	64.2	3.21
60.3	3.015	61.3	3.065	62.3	3.115	63.3	3.165	54.3	3.215
60.4	3.02	61.4	3.07	62.4	3.12	63.4	3.17	64.4	3.22
60.5	3.025	61.5	3.075	62.5	3.125	63.5	3.175	64.5	3.225
60.6	3.03	61.6	3.08	62.6	3.13	63.6	3.18	64.6	3.23
60.7	3.035	61.7	3.085	62.7	3.135	63.7	3.185	64.7	3.235
60.8	3.04	61.8	3.09	62.8	3.14	63.8	3.19	64.8	3.24
60.9	3.045	61.9	3.095	62.9	3.145	63.9	3.195	64.9	3.245

The half-cent computed values shown above, as 2.255, should appear on an analog type register as halfway between appropriate whole cent indications.

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