

- (xiii) Freight storage and other sales costs;
- (xiv) Product packaging materials;
- (xv) Fuel and lubrication;
- (xvi) Observer fees and monitoring costs;
- (xvii) General administrative costs;
- (xviii) Insurance;
- (xix) Fisheries landing taxes;
- (xx) Total raw fish purchases; and
- (xxi) All other costs related to vessel operations not included in the preceding list.

(5) *Calendar year labor.* Average number and total number of employees for fishing, processing, and other activities on this vessel.

(i) Average number of hours worked per day by processing line employee; and

(ii) Crew revenue share system used for some processing, all processing, some non-processing, and all non-processing crew.

(c) *Permit revenues or expenditures.* An Amendment 80 QS holder or his designated representative will record revenues and expenditures for any tradable fishing or processing privilege. Attribute those revenues or costs to a specific Amendment 80 vessel or Amendment 80 LLP as applicable.

(1) *Permit revenues.* (i) Income from sale or lease of fishery licenses, permits, harvesting or processing rights: record license or permit number and revenue for each asset sold; and

(ii) Royalties received from leasing allocations including metric tons and dollars for Amendment 80 yellowfin sole, rock sole, flathead sole, Atka mackerel, Pacific ocean perch, Pacific cod, Amendment 80 leased halibut PSC, leased crab PSC, and any other species leased.

(2) *Permit expenditures.* (i) Fishery licenses, permits, harvesting or processing rights: record license or permit number and cost for each asset purchased;

(ii) Royalties paid for leases of catcher/processing quota, including metric tons, and dollars for Amendment 80 yellowfin sole, rock sole, flathead sole, Atka mackerel, Pacific ocean perch, Pacific cod, Amendment 80 leased halibut PSC, leased king crab PSC, and any other species leased;

(iii) Cooperative costs including lawyer and accountant costs, association fees, and other fees charged by harvest cooperative; and

(iv) Any other costs incurred from the use of fishery licenses, permits, harvesting or processing rights not included in the preceding list.

(d) *EDR audit procedures.* (1) NMFS will conduct verification of information with the Amendment 80 QS holder or designated representative, if applicable.

(2) The Amendment 80 QS holder or designated representative, if applicable, must respond to inquiries by NMFS within 20 days of the date of issuance of the inquiry.

(3) The Amendment 80 QS holder or designated representative, if applicable, must provide copies of additional data to facilitate verification by NMFS. The NMFS auditor may review and request copies of additional data provided by the Amendment 80 QS holder or designated representative, including but not limited to, previously audited or reviewed financial statements, worksheets, tax returns, invoices, receipts, and other original documents substantiating the data submitted.

APPENDIX A TO PART 679—PERFORMANCE AND TECHNICAL REQUIREMENTS FOR SCALES USED TO WEIGH CATCH AT SEA IN THE GROUND FISH FISHERIES OFF ALASKA

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### 1. Introduction

(a) This appendix to part 679 contains the performance and technical requirements for scales to be approved by NMFS for use to weigh, at sea, catch from the groundfish fisheries off Alaska. The performance and technical requirements in this document have not been reviewed or endorsed by the National Conference on Weights and Measures. Regulations implementing the requirements of this appendix and additional requirements for and with respect to scales used to weigh catch at sea are found at 50 CFR 679.28(b).

(b) Revisions, amendments, or additions to this appendix may be made after notice and opportunity for public comments. Send requests for revisions, amendments, or additions to the Sustainable Fisheries Division, Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802.

(c) *Types of Scales Covered by Appendix*—This appendix contains performance and technical requirements for belt, automatic hopper, platform, and hanging scales.

(d) *Testing and Approval of Scales Used to Weigh Catch at Sea*—Scales used to weigh catch at sea are required to comply with four categories of performance and technical requirements: (1) Type evaluation; (2) initial inspection after installation while the vessel is tied up at a dock and is not under power at sea; (3) annual reinspection while the vessel is tied up at a dock and is not under power at sea; and (4) daily at-sea tests of the scale's accuracy. This appendix contains only the performance and technical requirements for type evaluation and initial and annual reinspections by an authorized scale inspector.

### 2. Belt Scales

2.1 *Applicability*. The requirements in this section apply to a scale or scale system that employs a conveyor belt in contact with a weighing element to determine the weight of a bulk commodity being conveyed across the scale.

2.2 *Performance Requirements*—2.2.1 *Maximum Permissible Errors*. For laboratory tests of a scale and initial inspections and annual reinspections of an installed scale when the vessel is tied up at a dock and is not under power at sea, the following maximum permissible errors (MPEs) are specified:

2.2.1.1 *Laboratory Tests*. See annex A to this appendix A for procedures for disturbance tests and influence factors.

a. *Disturbances*.  $\pm 0.18$  percent of the weight of the load totalized.

b. *Influence Factors*.  $\pm 0.25$  percent of the weight of the load totalized.

c. *Temperature Effect at Zero Flow Rate*. The difference between the values obtained at zero flow rate taken at temperatures that differ by 10 °C  $\pm 0.2$  °C must not be greater than 0.035 percent of the weight of the load

totalized at the maximum flow-rate for the time of the test.

2.2.1.2 *Zero Load Tests*. For zero load tests conducted in a laboratory or on a scale installed on a vessel and conducted when the vessel is tied up at a dock and not under power at sea,  $\pm 0.1$  percent of the value of the minimum totalized load or 1 scale division (d), whichever is greater.

2.2.1.3 *Material Tests*. For material tests conducted in a laboratory or on a scale installed on a vessel and conducted when the vessel is tied up at a dock and not under power at sea,  $\pm 1.0$  percent of the known weight of the test material.

2.2.2 *Minimum Flow Rate ( $Q_{min}$ )*. The minimum flow rate must be specified by the manufacturer and must not be greater than 35 percent of the rated capacity of the scale in kilograms per hour (kg/hr) or metric tons per hour (mt/hr).

2.2.3 *Minimum Totalized Load ( $\Sigma_{min}$ )*. The minimum totalized load must not be less than the greater of—

a. Two percent of the load totalized in 1 hour at the maximum flow rate;

b. The load obtained at the maximum flow rate in 1 revolution of the belt; or

c. A load equal to 800 scale divisions (d).

2.2.4 *Influence Quantities*. The following requirements apply to influence factor tests conducted in the laboratory.

2.2.4.1 *Temperature*. A belt scale must comply with the performance and technical requirements at a range of temperatures from  $-10$  °C to  $+40$  °C. However, for special applications the temperature range may be different, but the range must not be less than 30 °C and must be so specified on the scale's descriptive markings.

2.2.4.2 *Power Supply*. A belt scale must comply with the performance and technical requirements when operated within a range of  $-15$  percent to  $+10$  percent of the power supply specified on the scale's descriptive markings.

2.3.1 *Technical Requirements*.

2.3.1 *Indicators and Printers*.

2.3.1.1 *General*. A belt scale must be equipped with an indicator capable of displaying both the weight of fish in each haul or set and the cumulative weight of all fish or other material weighed on the scale between annual inspections ("the cumulative weight"), a rate of flow indicator, and a printer. The indications and printed representations must be clear, definite, accurate, and easily read under all conditions of normal operation of the belt scale.

2.3.1.2 *Values Defined*. If indications or printed representations are intended to have specific values, these must be defined by a sufficient number of figures, words, or symbols, uniformly placed with reference to the indications or printed representations and as close as practicable to the indications or

printed representations but not so positioned as to interfere with the accuracy of reading.

2.3.1.3 *Units.* The weight of each haul or set must be indicated in kilograms, and the cumulative weight must be indicated in either kilograms or metric tons and decimal subdivisions.

2.3.1.4 *Value of the Scale Division.* The value of the scale division (d) expressed in a unit of weight must be equal to 1, 2, or 5, or a decimal multiple or sub-multiple of 1, 2, or 5.

2.3.1.5 *Range of Indication.* The range of the weight indications and printed values for each haul or set must be from 0 kg to 999,999 kg and for the cumulative weight must be from 0 to 99,999 metric tons.

2.3.1.6 *Resettable and Non-resettable Values.* The means to indicate the weight of fish in each haul or set must be resettable to zero. The means to indicate the cumulative weight must not be resettable to zero without breaking a security means and must be reset only upon direction of NMFS or an authorized scale inspector.

2.3.1.7 *Rate of Flow Indicator.* Permanent means must be provided to produce an audio or visual signal when the rate of flow is less than the minimum flow rate or greater than 98 percent of the maximum flow rate.

2.3.1.8 *Printed Information.* The information printed must include—

- a. For catch weight:
  - i. The vessel name;
  - ii. The Federal fisheries or processor permit number of the vessel;
  - iii. The haul or set number;
  - iv. The total weight of catch in each haul or set;
  - v. The total cumulative weight of all fish or other material weighed on the scale; and
  - vi. The date and time the information is printed.
- b. For the audit trail:
  - i. The vessel name;
  - ii. The Federal fisheries or processor permit number of the vessel;
  - iii. The date and time (to the nearest minute) that the adjustment was made;
  - iv. The name or type of adjustment being made; and
  - v. The initial and final values of the parameter being changed.

2.3.1.9 *Permanence of Markings.* All required indications, markings, and instructions must be distinct and easily readable and must be of such character that they will not tend to become obliterated or illegible.

2.3.1.10 *Power Loss.* In the event of a power failure, means must be provided to retain in a memory the weight of fish in each haul or set for which a printed record has not yet been made, the cumulative weight, and the information on the audit trail.

2.3.1.11 *Adjustable Components.* An adjustable component that when adjusted affects the performance or accuracy of the scale

must be held securely in position and must not be capable of adjustment without breaking a security means unless a record of the adjustment is made on the audit trail described in 2.3.1.12.

2.3.1.12 *Audit Trail.* An audit trail in the form of an event logger must be provided to document changes made using adjustable components. The following information must be provided in an electronic form that cannot be changed or erased by the scale operator, can be printed at any time, and can be cleared by the scale manufacturer's representative upon direction by NMFS or by an authorized scale inspector:

- a. The date and time (to the nearest minute) of the change;
- b. The name or type of adjustment being made; and
- c. The initial and final values of the parameter being changed.

2.3.1.13 *Adjustments to Scale Weights.* The indicators and printer must be designed so that the scale operator cannot change or adjust the indicated and printed weight values.

#### 2.3.2 *Weighing Elements.*

2.3.2.1 *Speed Measurement.* A belt scale must be equipped with means to accurately sense the belt travel and/or speed whether the belt is loaded or empty.

2.3.2.2 *Conveyer Belt.* The weight per unit length of the conveyor belt must be practically constant. Belt joints must be such that there are no significant effects on the weighing results.

2.3.2.3 *Overload Protection.* The load receiver must be equipped with means so that an overload of 150 percent or more of the capacity does not affect the metrological characteristics of the scale.

2.3.2.4 *Speed Control.* The speed of the belt must not vary by more than 5 percent of the nominal speed.

2.3.2.5 *Adjustable Components.* An adjustable component that can affect the performance of the belt scale must be held securely in position and must not be capable of adjustment without breaking a security means.

2.3.2.6 *Motion Compensation.* A belt scale must be equipped with automatic means to compensate for the motion of a vessel at sea so that the weight values indicated are within the MPEs. Such means shall be a reference load cell and a reference mass weight or other equally effective means. When equivalent means are utilized, the manufacturer must provide NMFS with information demonstrating that the scale can weigh accurately at sea.

2.3.3 *Installation Conditions.* A belt scale must be rigidly installed in a level condition.

2.3.4 *Marking.* A belt scale must be marked with the—

- a. Name, initials, or trademark of the manufacturer or distributor;
- b. Model designation;
- c. Non-repetitive serial number;

- d. Maximum flow rate (Qmax);
- e. Minimum flow rate (Qmin);
- f. Minimum totalized load ( $\Sigma$ min);
- g. Value of a scale division (d);
- h. Belt speed;
- i. Weigh length;
- j. Maximum capacity (Max);
- k. Temperature range (if applicable); and
- l. Mains voltage.

2.3.4.1 *Presentation.* The markings must be reasonably permanent and of such size, shape, and clarity to provide easy reading in normal conditions of use. They must be grouped together in a place visible to the operator.

#### 2.4 Tests.

2.4.1 *Minimum Test Load.* The minimum test load must be the greater of—

- a. 2 percent of the load totalized in 1 hour at the maximum flow rate;
- b. The load obtained at maximum flow rate in one revolution of the belt; or
- c. A load equal to 800 scale divisions.

#### 2.4.2 Laboratory Tests.

2.4.2.1 *Influence Quantity and Disturbance Tests.* Tests must be conducted according to annex A and the results of these tests must be within the values specified in section 2.2.1.1.

2.4.2.2 *Zero-Load Tests.* A zero-load test must be conducted for a time equal to that required to deliver the minimum totalized load ("min). At least two zero-load tests must be conducted prior to a material test. The results of these tests must be within the values specified in section 2.2.1.2.

2.4.2.3 *Material Tests.* At least one material test must be conducted with the weight of the material or simulated material equal to or greater than the minimum test load. The results of these tests must be within the values specified in section 2.2.1.3.

#### 2.4.3 Annual Inspections.

2.4.3.1 *Zero-Load Tests.* A zero-load test must be conducted for a time equal to that required to deliver the minimum totalized load ( $\Sigma$ min). At least one zero-load test must be conducted prior to each material test. The results of this test must be within the values specified in section 2.2.1.2.

2.4.3.2 *Material Tests.* At least one material or simulated material test must be conducted with the weight of the material or simulated material equal to or greater than the minimum test load. The results of these tests must be within the values specified in section 2.2.1.3.

### 3. Automatic Hopper Scales

3.1 *Applicability.* The requirements in this section apply to a scale or scale system that is designed for automatic weighing of a bulk commodity in predetermined amounts.

#### 3.2 Performance Requirements.

3.2.1 *Maximum Permissible Errors.* For laboratory tests of a scale and initial inspection and annual reinspections of an installed

scale when the vessel is tied up at a dock and is not under power at sea, the following MPEs are specified:

3.2.1.1 *Laboratory Tests.* See annex A to appendix A for procedures for disturbance test and influence factors.

a. *Disturbances.* Significant fault (sf) ( $\pm$ scale division).

b. *Influence Factors.*  $\pm 1$  percent of test load.

3.2.1.2 *Increasing and Decreasing Load Tests.* For increasing and decreasing load tests conducted in a laboratory or on a scale installed on a vessel tied up at a dock and not under power at sea,  $\pm 1.0$  percent of the test load.

3.2.2 *Minimum Weighment ( $\Sigma$ min).* The minimum weighment must not be less than 20 percent of the weighing capacity, or a load equal to 100 scale intervals (d), except for the final weighment of a lot.

3.2.3 *Minimum Totalized Load (Lot).* The minimum totalized load must not be less than 4 weighments.

3.2.4 *Influence Quantities.* The following requirements apply to influence factor tests conducted in the laboratory:

3.2.4.1 *Temperature.* A hopper scale must comply with the metrological and technical requirements at temperatures from  $-10^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ . However, for special applications the temperature range may be different, but the range must not be less than  $30^{\circ}\text{C}$  and must be so specified on the scale's descriptive markings.

3.2.4.1.1 *Operating Temperature.* A hopper scale must not display or print any usable weight values until the operating temperature necessary for accurate weighing and a stable zero-balance condition have been attained.

3.2.4.2 *Power Supply.* A hopper scale must comply with the performance and technical requirements when operated within  $-15$  percent to  $+10$  percent of the power supply specified on the scale's descriptive markings.

#### 3.3 Technical Requirements.

##### 3.3.1 Indicators and Printers.

3.3.1.1 *General.* a. A hopper scale must be equipped with an indicator and printer that indicates and prints the weight of each load and a no-load reference value; and a printer that prints the total weight of fish in each haul or set and the total cumulative weight of all fish and other material weighed on the scale between annual inspections ("the cumulative weight"). The indications and printed information must be clear, definite, accurate, and easily read under all conditions of normal operation of the hopper scale.

b. A no-load reference value may be a positive or negative value in terms of scale divisions or zero. When the no-load reference value is zero, the scale must return to a zero indication (within  $\pm 0.5$  scale division) when the load receptor (hopper) is empty following

the discharge of all loads, without the intervention of either automatic or manual means.

3.3.1.2 *Values Defined.* If indications or printed representations are intended to have specific values, these must be defined by a sufficient number of figures, words, or symbols, uniformly placed with reference to the indications or printed representations and as close as practicable to the indications or printed representations but not so positioned as to interfere with the accuracy of reading.

3.3.1.3 *Units.* The weight of each haul or set must be indicated in kilograms, and the cumulative weight must be indicated in either kilograms or metric tons and decimal subdivisions.

3.3.1.4 *Value of the Scale Division.* The value of the scale division (d) expressed in a unit of weight must be equal to 1, 2, or 5, or a decimal multiple or sub-multiple of 1, 2, or 5.

3.3.1.5 *Weighing Sequence.* For hopper scales used to receive (weigh in), the no-load reference value must be determined and printed only at the beginning of each weighing cycle. For hopper scales used to deliver (weigh out), the no-load reference value must be determined and printed only after the gross-load weight value for each weighing cycle has been indicated and printed.

3.3.1.6 *Printing Sequence.* Provision must be made so that all weight values are indicated until the completion of the printing of the indicated values.

3.3.1.7 *Printed Information.* The information printed must include—

- a. For catch weight:
  - i. The vessel name;
  - ii. The Federal fisheries or processor permit number of the vessel;
  - iii. The haul or set number;
  - iv. The total weight of catch in each haul or set;
  - v. The total cumulative weight of all fish or other material weighed on the scale; and
  - vi. The date and time the information is printed.
- b. For the audit trail:
  - i. The vessel name;
  - ii. The Federal fisheries or processor permit number of the vessel;
  - iii. The date and time (to the nearest minute) of the change;
  - iv. The name or type of adjustment being made; and
  - v. The initial and final values of the parameter being changed.

3.3.1.8 *Permanence of Markings.* All required indications, markings, and instructions must be distinct and easily readable and must be of such character that they will not tend to become obliterated or illegible.

3.3.1.9 *Range of Indication.* The range of the weight indications and printed values for each haul or set must be from 0 kg to 999,999

kg and for the cumulative weight must be from 0 to 99,999 metric tons.

3.3.1.10 *Non-Resetable Values.* The cumulative weight must not be resettable to zero without breaking a security means and must be reset only upon direction by NMFS or by an authorized scale inspector.

3.3.1.11 *Power Loss.* In the event of a power failure, means must be provided to retain in a memory the weight of fish in each haul or set for which a printed record has not yet been made, the cumulative weight, and the information on the audit trail described in 3.3.1.13.

3.3.1.12 *Adjustable Components.* An adjustable component that, when adjusted, affects the performance or accuracy of the scale must not be capable of adjustment without breaking a security means, unless a record of the adjustment is made on the audit trail described in 3.3.1.13.

3.3.1.13 *Audit Trail.* An audit trail in the form of an event logger must be provided to document changes made using adjustable components. The following information must be provided in an electronic form that cannot be changed or erased by the scale operator, can be printed at any time, and can be cleared by the scale manufacturer's representative upon direction of NMFS or by an authorized scale inspector:

- a. The date and time (to the nearest minute) of the change;
- b. The name or type of adjustment being made; and
- c. The initial and final values of the parameter being changed.

3.3.1.14 *Zero-Load Adjustment.* A hopper scale must be equipped with a manual or semi-automatic means that can be used to adjust the zero-load balance or no-load reference value.

3.3.1.14.1 *Manual.* A manual means must be operable or accessible only by a tool outside of, or entirely separate from, this mechanism or enclosed in a cabinet.

3.3.1.14.2 *Semi-Automatic.* A semi-automatic means must be operable only when the indication is stable within  $\pm 1$  scale division and cannot be operated during a weighing cycle (operation).

3.3.1.15 *Damping Means.* A hopper scale must be equipped with effective automatic means to bring the indications quickly to a readable stable equilibrium. Effective automatic means must also be provided to permit the recording of weight values only when the indication is stable within plus or minus one scale division.

3.3.1.16 *Adjustments to Scale Weights.* The indicators and printer must be designed so that the scale operator cannot change or adjust the indicated and printed weight values.

3.3.2 *Interlocks and Gate Control.* A hopper scale must have operating interlocks so that—

- a. Product cannot be weighed if the printer is disconnected or subject to a power loss;
- b. The printer cannot print a weight if either of the gates leading to or from the weigh hopper is open;
- c. The low paper sensor of the printer is activated;
- d. The system will operate only in the sequence intended; and
- e. If the overflow sensor is activated, this condition is indicated to the operator and is printed.

3.3.3 *Overflow Sensor.* The weigh hopper must be equipped with an overflow sensor that will cause the feed gate to close, activate an alarm, and stop the weighing operation until the overflow condition has been corrected.

3.3.4 *Weighing Elements.*

3.3.4.1 *Overload Protection.* The weigh hopper must be equipped with means so that an overload of 150 percent or more of the capacity of the hopper does not affect the metrological characteristics of the scale.

3.3.4.2 *Adjustable Components.* An adjustable component that can affect the performance of the hopper scale must be held securely in position and must not be capable of adjustment without breaking a security means.

3.3.4.3 *Motion Compensation.* A hopper scale must be equipped with automatic means to compensate for the motion of a vessel at sea so that the weight values indicated are within the MPEs. Such means shall be a reference load cell and a reference mass weight or other equally effective means. When equivalent means are utilized, the manufacturer must provide NMFS with information demonstrating that the scale can weigh accurately at sea.

3.3.5 *Installation Conditions.* A hopper scale must be rigidly installed in a level condition.

3.3.6 *Marking.* A hopper scale must be marked with the following:

- a. Name, initials, or trademark of the manufacturer or distributor;
- b. Model designation;
- c. Non-repetitive serial number;
- d. Maximum capacity (Max);
- e. Minimum capacity (min);
- f. Minimum totalized load ( $\Sigma$ min);
- g. Minimum weight;
- h. Value of the scale division (d);
- i. Temperature range (if applicable); and
- j. Mains voltage.

3.3.6.1 *Presentation.* Descriptive markings must be reasonably permanent and grouped together in a place visible to the operator.

3.4 *Tests.*

3.4.1 *Standards.* The error of the standards used must not exceed 25 percent of the MPE to be applied.

3.4.2 *Laboratory Tests.*

3.4.2.1 *Influence Quantity and Disturbance Tests.* Tests must be conducted according to annex A and the results of these tests must

be within the values specified in section 3.2.1.1.

3.4.2.2 *Performance Tests.* Performance tests must be conducted as follows:

a. *Increasing load test.* At least five increasing load tests must be conducted with test loads at the minimum load, at a load near capacity, and at 2 or more critical points in between; and

b. *Decreasing load test.* A decreasing load test must be conducted with a test load approximately equal to one-half capacity when removing the test loads of an increasing load test.

3.4.3 *Annual Inspections.*

At least two increasing load tests and two decreasing load tests must be conducted as specified in 3.4.2.2. Additionally, tests must be conducted with test loads approximately equal to the weight of loads at which the scale is normally used.

4. *Platform Scales and Hanging Scales*

4.1 *Applicability.* The requirements in this section apply to platform and hanging scales used to weigh total catch. Platform scales used only as observer sampling scales or to determine the known weight of fish for a material test of another scale are not required to have a printer under sections 4.3.1 and 4.3.1.5 or an audit trail under section 4.3.1.8.

4.2 *Performance Requirements.*

4.2.1 *Maximum Permissible Errors.* For laboratory tests of a scale and initial inspection and annual reinspections of an installed scale while the vessel is tied up at a dock and is not under power at sea, the following MPEs are specified:

4.2.1.1 *Laboratory Tests.* See annex A to this appendix A for procedures for disturbance tests and influence factors.

a. *Disturbances.* Significant fault ( $\pm 1$  scale division); and

b. *Influence Factors.* See Table 1 in section 4.2.1.2.

4.2.1.2 *Increasing and Decreasing Load and Shift Tests.* Increasing and decreasing load and shift tests conducted in a laboratory or on a scale installed on a vessel while the vessel is tied up at a dock and is not under power at sea, see Table 1 as follows:

TABLE 1—INFLUENCE FACTORS

Test load in scale divisions (d)		Maximum permissible error (d)
Class III <sup>1</sup>	Class III	
0 < m <sup>2</sup> ≤ 500 .....	0 < m ≤ 50 .....	0.5
500 < m ≤ 2000 .....	50 < m ≤ 200 .....	1.0
2000 < m .....	200 < m .....	1.5

<sup>1</sup> Scale accuracy classes are defined in section 4.2.2, table 2.

<sup>2</sup> Mass or weight of the test load in scale divisions.

4.2.2 *Accuracy Classes.* Scales are divided into two accuracy classes, class III and class

III. The accuracy class of a scale is designated by the manufacturer. The design of each accuracy class with respect to number of scale divisions (n) and the value of the scale division (d) is specified according to table 2:

TABLE 2—ACCURACY CLASSES

Accuracy class	Value of scale division (d)	Number of scale divisions (n)	
		Minimum	Maximum
III .....	5 g or greater	500	10,000
IIII .....	5 g or greater	100	1,000

4.2.3 *Minimum Load.* For a Class III scale, 20d; for a Class IIII scale, 10d.

4.2.4 *Influence Quantities.* The following requirements apply to influence factor tests conducted in the laboratory.

4.2.4.1 *Temperature.* A scale must comply with the performance and technical requirements at temperatures from -10 °C to +40 °C. However, for special applications the temperature range may be different, but the range must not be less than 30 °C and must be so specified on the descriptive markings.

4.2.4.1.1 *Operating Temperature.* A scale must not display or print any usable weight values until the operating temperature necessary for accurate weighing and a stable zero-balance condition have been attained.

4.2.4.2 *Power Supply.* A scale must comply with the performance and technical requirements when operated within -15 percent to +10 percent of the power supply specified on the scale's descriptive markings.

4.3 *Technical Requirements.*

4.3.1 *Indicators and Printers.*

4.3.1.1 *General.* A scale must be equipped with an indicator and a printer. The indications and printed information must be clear, definite, accurate, and easily read under all conditions of normal operation of the scale.

4.3.1.2 *Values Defined.* If indications or printed representations are intended to have specific values, these must be defined by a sufficient number of figures, words, or symbols, uniformly placed with reference to the indications or printed representations and as close as practicable to the indications or printed representations but not so positioned as to interfere with the accuracy of reading.

4.3.1.3 *Units.* The weight units indicated must be in terms of kilograms and decimal subdivisions.

4.3.1.4 *Value of the Scale Division.* The value of the scale division (d) expressed in a unit of weight must be equal to 1, 2, or 5, or a decimal multiple or sub-multiple of 1, 2, or 5.

4.3.1.5 *Printed Information.* The information printed must include—

- a. For catch weight:
  - i. The vessel name;

- ii. The Federal fisheries or processor permit number of the vessel;
- iii. The haul or set number;
- iv. Net weight of the fish.
- b. For the audit trail:
  - i. The vessel name;
  - ii. The Federal fisheries or processor permit number of the vessel;
  - iii. The date and time (to the nearest minute) of the change;
  - iv. The name or type of adjustment being made; and
  - v. The initial and final values of the parameter being changed.

4.3.1.6 *Permanence of Markings.* All required indications, markings, and instructions must be distinct and easily readable and must be of such character that they will not tend to become obliterated or illegible.

4.3.1.7 *Power Loss.* In the event of a power failure, means must be provided to retain in a memory the weight of the last weighing if it is a non-repeatable weighing.

4.3.1.8 *Adjustable Components.*

a. An adjustable component that, when adjusted, affects the performance or accuracy of the scale must be held securely in position and must not be capable of adjustment without breaking a security means.

b. An audit trail in the form of an event logger must be provided to document changes made using adjustable components. The following information must be provided in an electronic form that cannot be changed or erased by the scale operator, can be printed at any time, and can be cleared by the scale manufacturer's representative upon direction of NMFS or an authorized scale inspector:

- i. The date and time (to the nearest minute) of the change;
- ii. The name or type of adjustment being made; and
- iii. The initial and final values of the parameter being changed.

4.3.1.9 *Zero-Load Adjustment.* A scale must be equipped with a manual or semi-automatic means that can be used to adjust the zero-load balance or no-load reference value.

4.3.1.9.1 *Manual.* A manual means must be operable or accessible only by a tool outside of or entirely separate from this mechanism or enclosed in a cabinet.

4.3.1.9.2 *Semi-automatic.* A semi-automatic means must meet the provisions of 4.3.1.8 or must be operable only when the indication is stable within ±1 scale division and cannot be operated during a weighing cycle (operation).

4.3.1.10 *Damping Means.* A scale must be equipped with effective automatic means to bring the indications quickly to a readable stable equilibrium. Effective automatic means must also be provided to permit the recording of weight values only when the indication is stable within plus or minus one scale division.



#### 4.3.2 Weighing Elements.

4.3.2.1 *Overload Protection.* The scale must be so designed that an overload of 150 percent or more of the capacity does not affect the metrological characteristics of the scale.

4.3.2.2 *Adjustable Components.* An adjustable component that can affect the performance of the scale must be held securely in position and must not be capable of adjustment without breaking a security means.

4.3.2.3 *Motion Compensation.* A platform scale must be equipped with automatic means to compensate for the motion of a vessel at sea so that the weight values indicated are within the MPEs. Such means shall be a reference load cell and a reference mass weight or other equally effective means. When equivalent means are utilized, the manufacturer must provide NMFS with information demonstrating that the scale can weigh accurately at sea.

4.3.3 *Installation Conditions.* A platform scale must be rigidly installed in a level condition. When in use, a hanging scale must be freely suspended from a fixed support or a crane.

4.3.4 *Marking.* A scale must be marked with the following:

- a. Name, initials, or trademark of the manufacturer or distributor;
- b. Model designation;
- c. Non-repetitive serial number;
- d. Accuracy class (III or IIII);
- e. Maximum capacity (Max);
- f. Minimum capacity (min);
- g. Value of a scale division (d);
- h. Temperature range (if applicable); and
- i. Mains voltage.

4.3.4.1 *Presentation.* Descriptive markings must be reasonably permanent and grouped together in a place visible to the operator.

#### 4.4 Tests.

4.4.1 *Standards.* The error of the standards used must not exceed 25 percent of the MPE applied.

#### 4.4.2 Laboratory Tests.

4.4.2.1 *Influence Quantities and Disturbance Tests.* Tests must be conducted according to annex A to this appendix A, and the results of these tests must be within the values specified in section 4.2.1.1.

4.4.2.2 *Performance Tests.* Performance tests must be conducted as follows:

a. *Increasing load test.* At least five increasing load tests must be conducted with test loads at the minimum load, at a load near capacity, and at 2 or more critical points in between.

b. *Shift test (platform scales only).* A shift test must be conducted during the increasing load test at one-third capacity test load centered in each quadrant of the platform.

c. *Decreasing load test.* A decreasing load test must be conducted with a test load approximately equal to one-half capacity when removing the test loads of an increasing load test.

#### 4.4.3 Annual Scale Inspections.

At least two increasing load tests, shift tests, and decreasing load tests must be conducted as specified in section 4.4.2.2. Additionally tests must be conducted with test loads approximately equal to the weight of loads at which the scale is normally used. The results of all tests must be as specified in Table 1 in section 4.2.1.2.

### 5. Definitions

*Adjustable component*—Any component that, when adjusted, affects the performance or accuracy of the scale, e.g., span adjustment or automatic zero-setting means. Manual or semi-automatic zero-setting means are not considered adjustable components.

*Audit trail*—An electronic count and/or information record of the changes to the values of the calibration or configuration parameters of a scale.

*Automatic hopper scale*—A hopper scale adapted to the automatic weighing of a bulk commodity (fish) in predetermined amounts. Capacities vary from 20 kg to 50 mt. It is generally equipped with a control panel, with functions to be set by an operator, including the start of an automatic operation. (See definition of hopper scale).

*Belt scale*—A scale that employs a conveyor belt in contact with a weighing element to determine the weight of a bulk commodity being conveyed. It is generally a part of a system consisting of an input conveyor, the flow scale, and an output conveyor. The conveyor belt may be constructed of various materials, including vulcanized rubber, canvas, and plastic. The capacity is generally specified in terms of the amount of weight that can be determined in a specified time, and can vary from, for example, 1 ton per hour to 100 or more tons per hour. An operator generally directs the flow of product onto the input conveyor.

*Calibration mode*—A means by which the span of a scale can be adjusted by placing a known “test weight” on the scale and manually operating a key on a key board.

*Disturbances*—An influence that may occur during the use of a scale but is not within the rated operating conditions of the scale.

*Event logger*—A form of audit trail containing a series of records where each record contains the identification of the parameter that was changed, the time and date when the parameter was changed, and the new value of the parameter.

*Final weighment*—The last partial load weighed on a hopper scale that is part of the weight of many loads.

*Hanging scale*—A scale that is designed to weigh a load that is freely suspended from an overhead crane or it may be permanently installed in an overhead position. The load receiver may be a part of the scale such as a pan suspended on chains, or simply a hook that is used to “pick-up” the container of

the commodity to be weighed. The technology employed may be mechanical, electro-mechanical, or electronic. The loads can be applied either manually or by such means as a crane.

*Hopper scale*—A scale designed for weighing individual loads of a bulk commodity (fish). The load receiver is a cylindrical or rectangular container mounted on a weighing element. The weighing element may be mechanical levers, a combination of levers and a load cell, or all load cells. The capacity can vary from less than 20 kg to greater than 50 mt. The loads are applied from a bulk source by such means as a conveyor or storage hopper. Each step of the weighing process, that is the loading and unloading of the weigh hopper, is controlled by an operator.

*Indicator*—That part of a scale that indicates the quantity that is being weighed.

*Influence factor*—A value of an influence quantity, e.g., 10°, that specifies the limits of the rated operating conditions of the scale.

*Influence quantity*—A quantity that is not the subject of the measurement but which influences the measurement obtained within the rated operating conditions of the scale.

*Influence quantity and disturbance tests*—Tests conducted in a laboratory to determine the capability of the scale under test to perform correctly in the environmental influences in which they are used and when subjected to certain disturbances that may occur during the use of the scale.

*Initial verification*—The first evaluation (inspection and test) of a production model of a weighing instrument that has been type evaluated to determine that the production model is consistent with the model that had been submitted for type evaluation.

*Known weight test*—A test in which the load applied is a test weight with a known value simulating the weight of the material that is usually weighed.

*Load receiver*—That part of the scale in which the quantity is placed when being weighed.

*Material test*—A test using a material that is the same or similar to the material that is usually weighed, the weight of which has been determined by a scale other than the scale under test.

*Maximum flow-rate*—The maximum flow-rate of material specified by the manufacturer at which a belt scale can perform correctly.

*Minimum flow-rate*—The minimum flow-rate specified by the manufacturer at which a belt scale can perform correctly.

*Minimum load*—The smallest weight load that can be determined by the scale that is considered to be metrologically acceptable.

*Minimum totalized load*—The smallest weight load that can be determined by a belt scale that is considered to be metrologically acceptable.

*Minimum weightment*—The smallest weight that can be determined by a hopper scale that is considered to be metrologically acceptable.

*Motion compensation*—The means used to compensate for the motion of the vessel at sea.

*No-load reference value*—A weight value obtained by a hopper scale when the load receiver (hopper) is empty of the product that was or is to be weighed.

*Non-repeatable weightment*—A process where the product after being weighed is disposed of in such a manner that it cannot be retrieved to be reweighed.

*Number of scale divisions (n)*—The number of scale divisions of a scale in normal operation. It is the quotient of the scale capacity divided by the value of the scale division.  $n = \text{Max}/d$

*Performance requirements*—A part of the regulations or standards that applies to the weighing performance of a scale, e.g., MPES.

*Performance test*—A test conducted to determine that the scale is performing within the MPE applicable.

*Periodic verification*—A verification of a weighing instrument at an interval that is specified by regulation or administrative ruling.

*Platform scale*—A scale by the nature of its physical size, arrangement of parts, and relatively small capacity (generally 220 kg or less) that is adapted for use on a bench or counter or on the floor. A platform scale can be self contained, that is, the indicator and load receiver and weighing elements are all comprised of a single unit, or the indicator can be connected by cable to a separate load receiver and weighing element. The technology used may be mechanical, electro-mechanical, or electronic. Loads are applied manually.

*Rated capacity*—The maximum flow-rate in terms of weight per unit time specified by the manufacturer at which a belt scale can perform correctly.

*Scale division (d)*—The smallest digital subdivision in units of mass that is indicated by the weighing instrument in normal operation.

*Sealing*—A method used to prevent the adjustment of certain operational characteristics or to indicate that adjustments have been made to those operational characteristics.

*Security seals or means*—A physical seal such as a lead and wire seal that must be broken in order to change the operating or performance characteristics of the scale, or a number generated by the scale whenever a change is made to an adjustable component. The number must be sequential and it must not be possible for the scale operator to alter it. The number must be displayed whenever the scale is turned on.

*Significant fault*—An error greater than the value specified for a particular scale. For a belt scale: A fault greater than 0.18 percent of the weight value equal to the minimum totalized load. For all other scales: 1 scale division (d). A significant fault does not include faults that result from simultaneous and mutually independent causes in the belt scale; faults that imply the impossibility of performing any measurement; transitory faults that are momentary variations in the indications that cannot be interpreted, memorized, or transmitted as a measurement result; faults so serious that they will inevitably be noticed by those interested in the measurement.

*Simulated material test*—A test in which the load applied is test material simulating the weight of the material that is usually weighed.

*Simulated test*—A test in which the weight indications are developed by means other than weight, e.g., a load cell simulator.

*Stationary installation*—An installation of a scale in a facility on land or a vessel that is tied-up to a dock or in dry dock.

*Subsequent verification*—Any evaluation of a weighing instrument following the initial verification.

*Suitability for use*—A judgement that must be made that certain scales by nature of their design are appropriate for given weighing applications.

*Technical requirements*—A part of the regulations or standards that applies to the operational functions and characteristics of a scale, e.g., capacity, scale division, tare.

*Testing laboratory*—A facility for conducting type evaluation examinations of a scale that can establish its competency and proficiency by such means as ISO Guide 25, ISO 9000, EN 45011, NVLAP, NTEP.

*Type evaluation*—A process for evaluating the compliance of a weighing instrument with the appropriate standard or regulation.

*User requirements*—A part of the regulations or standards that applies to the operator/owner of the scale.

*Weighment*—A single complete weighing operation.

ANNEX A OF APPENDIX A TO PART 679—  
INFLUENCE QUANTITY AND DISTURBANCE TESTS

*A.1 General*—Included in this annex are tests that are intended to ensure that electronic scales can perform and function as intended in the environment and under the conditions specified. Each test indicates, where appropriate, the reference condition under which the intrinsic error is determined.

*A.2 Test Considerations*

*A.2.1* All electronic scales of the same category must be subjected to the same performance test program.

*A.2.2* Tests must be carried out on fully operational equipment in its normal oper-

ational state. When equipment is connected in other than a normal configuration, the procedure must be mutually agreed to by NMFS and the applicant.

*A.2.3* When the effect of one factor is being evaluated, all other factors must be held relatively constant, at a value close to normal. The temperature is deemed to be relatively constant when the difference between the extreme temperatures noted during the test does not exceed 5 °C and the variation over time does not exceed 5 °C per hour.

*A.2.4* Before the start of a test, the equipment under test (EUT) must be energized for a period of time at least equal to the warm-up time specified by the manufacturer. The EUT must remain energized throughout the duration of the test.

*A.3 Tests*

Test	Characteristics under test	Conditions applied
A.3.1 Static temperatures .....	Influence factor	MPE
A.3.2 Damp heat, steady state ...	Influence factor	MPE
A.3.3 Power voltage variation .....	Influence factor	MPE
A.3.4 Short time power reduction .....	Disturbance ....	sf
A.3.5 Bursts .....	Disturbance ....	sf
A.3.6 Electrostatic discharge .....	Disturbance ....	sf
A.3.7 Electromagnetic susceptibility.	Disturbance ....	sf

*A.3 Tests*

*A.3.1 Static Temperatures*

*Test method:* Dry heat (non condensing) and cold.

*Object of the test:* To verify compliance with the applicable MPE under conditions of high and low temperature.

*Reference to standard:* See Bibliography (1).

*Test procedure in brief:* The test consists of exposure of the EUT to the high and low temperatures specified in section 2.2.4.1 for belt scales, section 3.2.4.1 for automatic hopper scales, and section 4.2.3.1 for platform scales and hanging scales, under “free air” condition for a 2-hour period after the EUT has reached temperature stability. The EUT must be tested during a weighing operation consisting of:

*For belt scales*—the totalization of the  $\Sigma_{min}$ , 2 times each at approximately the minimum flow rate, an intermediate flow rate, and the maximum flow rate.

*For platform, hanging, and automatic hopper scales*—tested with at least five different test loads or simulated loads under the following conditions:

- At a reference temperature of 20 °C following conditioning.
- At the specified high temperature, 2 hours after achieving temperature stabilization.
- At the specified low temperature, 2 hours after achieving temperature stabilization.

d. At a temperature of 5 °C, 2 hours after achieving temperature stabilization.

e. After recovery of the EUT at the reference temperature of 20 °C.

*Test severities:* Duration: 2 hours.

*Number of test cycles:* At least one cycle.

*Maximum allowable variations:*

a. All functions must operate as designed.

b. All indications must be within the applicable MPEs.

*Conduct of test:* Refer to the International Electrotechnical Commission (IEC) Publications mentioned in section A.4 Bibliography (a) for detailed test procedures.

*Supplementary information to the IEC test procedures.*

*Preconditioning:* 16 hours.

*Condition of EUT:* Normal power supplied and “on” for a time period equal to or greater than the warm-up time specified by the manufacturer. Power is to be “on” for the duration of the test. Adjust the EUT as close to a zero indication as practicable prior to the test.

*Test Sequence:*

a. Stabilize the EUT in the chamber at a reference temperature of 20 °C. Conduct the tests as specified in the test procedure in brief and record the following data:

- i. Date and time,
- ii. Temperature,
- iii. Relative humidity,
- iv. Test load,
- v. Indication,
- vi. Errors, and
- vii. Functions performance.

b. Increase the temperature in the chamber to the high temperature specified. Check by measurement that the EUT has reached temperature stability and maintain the temperature for 2 hours. Following the 2 hours, repeat the tests and record the test data indicated in this A.3.1 Test Sequence section.

c. Reduce the temperature in the chamber as per the IEC procedures to the specified low temperature. After temperature stabilization, allow the EUT to soak for 2 hours. Following the 2 hours, repeat the tests and record the test data as indicated in this A.3.1 Test Sequence section.

d. Raise the temperature in the chamber as per the IEC procedures to 5 °C. After temperature stabilization, allow the EUT to soak for 2 hours. Following the 2 hours, repeat the tests and record the test data as indicated in this A.3.1 Test Sequence section. NOTE: This test relates to a –10 °C to +40 °C range. For special ranges, it may not be necessary.

e. Raise the temperature in the chamber as per the IEC procedures and to the 20 °C reference temperature. After recovery, repeat the tests and record the test data as indicated in this A.3.1 Test Sequence section.

*A.3.2 Damp Heat, Steady State*

*Test method:* Damp heat, steady state.

*Object of the test:* To verify compliance with the applicable MPE under conditions of high humidity and constant temperature.

*Reference to standard:* See section A.4 Bibliography (b)

*Test procedure in brief:* The test consists of exposure of the EUT to a constant temperature at the upper limit of the temperature range and of a constant relative humidity of 85 percent for a 2-day period. The EUT must be tested during a weighing operation consisting of the following:

*For belt scales*—the totalization of the  $\Sigma_{min}$ , 2 times each at approximately the minimum flow rate, an intermediate flow rate, and the maximum flow rate.

*For platform, hanging, and automatic hopper scales*—tested with at least five different test loads or simulated loads at a reference temperature of 20 °C and a relative humidity of 50 percent following conditioning, and at the upper limit temperature and a relative humidity of 85 percent 2 days following temperature and humidity stabilization.

*Test severities:*

Temperature: upper limit.

Humidity: 85 percent (non-condensing).

Duration: 2 days.

*Number of test cycles:* At least one test.

*Maximum Allowable Variations:*

- a. All functions must operate as designed.
- b. All indications must be within the applicable MPE.

*Conduct of the test:* Refer to the IEC Publications mentioned in section A.4 Bibliography (b) for detailed test procedures.

*Supplementary information to the IEC test procedures.*

*Preconditioning:* None required.

*Condition of EUT:*

a. Normal power supplied and “on” for a time period equal to or greater than the warm-up time specified by the manufacturer. Power is to be “on” for the duration of the test.

b. The handling of the EUT must be such that no condensation of water occurs on the EUT.

c. Adjust the EUT as close to a zero indication as practicable prior to the test.

*Test Sequence:*

a. Allow 3 hours for stabilization of the EUT at a reference temperature of 20 °C and a relative humidity of 50 percent. Following stabilization, conduct the tests as specified in the test procedures in brief and record the following data:

- i. Date and time,
- ii. Temperature,
- iii. Relative humidity,
- iv. Test load,
- v. Indication,

- vi. Errors, and
- vii. Functions performance.
- b. Increase the temperature in the chamber to the specified high temperature and a relative humidity of 85 percent. Maintain the EUT at no load for a period of 2 days. Following the 2 days, repeat the tests and record the test data as indicated in this A.3.2 Test Sequence section.

c. Allow full recovery of the EUT before any other tests are performed.

#### A.3.3 Power Voltage Variation

##### A.3.3.1 AC Power Supply

*Test method:* Variation in AC mains power supply (single phase).

*Object of the test:* To verify compliance with the applicable MPEs under conditions of varying AC mains power supply.

*Reference to standard:* See section A.4 Bibliography (c).

*Test procedure in brief:* The test consists of subjecting the EUT to AC mains power during a weighing operation consisting of the following:

*For belt scales*—while totalizing the  $\Sigma_{\min}$  at the maximum flow rate.

*For platform, hanging, and automatic hopper scales*—at no load and a test load between 50 percent and 100 percent of weighing capacity.

*Test severities:* Mains voltage:

Upper limit U (nom) +10 percent.

Lower limit U (nom) -15 percent.

*Number of test cycles:* At least one cycle.

*Maximum allowable variations:*

- a. All functions must operate correctly.
- b. All indications must be within MPEs specified in sections 2, 3, or 4 of this appendix to part 679.

*Conduct of the test:*

*Preconditioning:* None required.

*Test equipment:*

- a. Variable power source,
- b. Calibrated voltmeter, and
- c. Load cell simulator, if applicable.

*Condition of EUT:*

a. Normal power supplied and “on” for a time period equal to or greater than the warm-up time specified by the manufacturer.

b. Adjust the EUT as close to a zero indication as practicable prior to the test.

*Test sequence:*

a. Stabilize the power supply at nominal voltage  $\pm 2$  percent.

b. Conduct the tests specified in the test procedure in brief and record the following data:

- i. Date and time,
- ii. Temperature,
- iii. Relative humidity,
- iv. Power supply voltage,
- v. Test load,
- vi. Indications,

- vii. Errors, and
- viii. Functions performance.

c. Reduce the power supply to -15 percent nominal.

d. Repeat the test and record the test data as indicated in this A.3.3 Test Sequence section.

e. Increase the power supply to +10 percent nominal.

f. Repeat the test and record the test data as indicated in this A.3.3 Test Sequence section.

g. Unload the EUT and decrease the power supply to nominal power  $\pm 2$  percent.

h. Repeat the test and record the test data as indicated in this A.3.3 Test Sequence section.

*NOTE:* In case of three-phase power supply, the voltage variation must apply for each phase successively. Frequency variation applies to all phases simultaneously.

##### A.3.3.2 DC Power Supply

Under consideration.

##### A.3.4 Short Time Power Reduction

*Test method:* Short time interruptions and reductions in mains voltage.

*Object of the test:* To verify compliance with the applicable significant fault under conditions of short time mains voltage interruptions and reductions.

*Reference to standard:* See section A.4 Bibliography (d) IEC Publication 1000-4-11 (1994).

*Test procedure in brief:* The test consists of subjecting the EUT to voltage interruptions from nominal voltage to zero voltage for a period equal to 8-10 ms, and from nominal voltage to 50 percent of nominal for a period equal to 16-20 ms. The mains voltage interruptions and reductions must be repeated ten times with a time interval of at least 10 seconds. This test is conducted during a weighing operation consisting of the following:

*For belt scales*—while totalizing at the maximum flow rate at least the  $\Sigma_{\min}$  (or a time sufficient to complete the test).

*For platform, hanging, and automatic hopper scales*—tested with one small test load or simulated load.

*Test severities:* One hundred percent voltage interruption for a period equal to 8-10 ms. Fifty percent voltage reduction for a period equal to 16-20 ms.

*Number of test cycles:* Ten tests with a minimum of 10 seconds between tests.

*Maximum allowable variations:* The difference between the weight indication due to the disturbance and the indication without the disturbance either must not exceed 1d or the EUT must detect and act upon a significant fault.

*Conduct of the Test:*

*Preconditioning:* None required.

*Test equipment:*

- a. A test generator suitable to reduce the amplitude of the AC voltage from the mains. The test generator must be adjusted before connecting the EUT.
- b. Load cell simulator, if applicable.

*Condition of EUT:*

- a. Normal power supplied and “on” for a time period equal to or greater than the warm-up time specified by the manufacturer.
- b. Adjust the EUT as close to zero indication as practicable prior to the test.

*Test sequence:*

- a. Stabilize all factors at nominal reference conditions.
- b. Totalize as indicated in this A.3.4 Test Sequence section and record the—
  - i. Date and time,
  - ii. Temperature,
  - iii. Relative humidity,
  - iv. Power supply voltage,
  - v. Test load,
  - vi. Indications,
  - vii. Errors, and
  - viii. Functions performance.
- c. Interrupt the power supply to zero voltage for a period equal to 8-10 ms. During interruption observe the effect on the EUT and record, as appropriate.
- d. Repeat the steps four times in this A.3.4 Test Sequence section, making sure that there is a 10 second interval between repetitions. Observe the effect on the EUT.
- e. Reduce the power supply to 50 percent of nominal voltage for a period equal to 16-20 ms. During reduction observe the effect on the EUT and record, as appropriate.
- f. Repeat the steps four times in this A.3.4 Test Sequence section, making sure that there is a 10 second interval between repetitions. Observe the effect on the EUT.

*A.3.5 Bursts*

*Test method:* Electrical bursts.

*Object of the test:* To verify compliance with the provisions in this manual under conditions where electrical bursts are superimposed on the mains voltage.

*Reference to standard:* See section A.4 Bibliography (e)

*Test Procedure in brief:*

The test consists of subjecting the EUT to bursts of double exponential wave-form transient voltages. Each spike must have a rise in time of 5 ns and a half amplitude duration of 50 ns. The burst length must be 15 ms, the burst period (repetition time interval) must be 300 ms. This test is conducted during a weighing operation consisting of the following:

*For belt scales*—while totalizing at the maximum flow rate at least the  $\Sigma_{\min}$  (or a time sufficient to complete the test).

*For platform, hanging, and automatic hopper scales*—tested with one small test load or simulated load.

*Test severities:* Amplitude (peak value) 1000 V.

*Number of test cycles:* At least 10 positive and 10 negative randomly phased bursts must be applied at 1000 V.

*Maximum allowable variations:* The difference between the indication due to the disturbance and the indication without the disturbance either must not exceed the values given in sections 2.2.1.1b., 3.2.1.1b., and 4.2.1.1b, of this appendix, or the EUT must detect and act upon a significant fault.

*Conduct of the test:* Refer to the IEC Publication referenced in section A.4 Bibliography (e) for detailed test procedures.

*Supplementary information to the IEC test procedures:*

*Test equipment:*

A burst generator having an output impedance of 50 ohms.

*Test conditions:*

The burst generator must be adjusted before connecting the EUT. The bursts must be coupled to the EUT both on common mode and differential mode interference.

*Condition of EUT:*

- a. Normal power supplied and “on” for a time period equal to or greater than the warm-up time specified by the manufacturer.
- b. Adjust the EUT as close to a zero indication as practicable prior to the test.

*Test Sequence:*

- a. Stabilize all factors at nominal reference conditions.
- b. Conduct the test as indicated in this A.3.5 Test Sequence section and record the—
  - i. Date and time,
  - ii. Temperature,
  - iii. Relative humidity,
  - iv. Test load,
  - v. Indication,
  - vi. Errors, and
  - vii. Functions performance.
- c. Subject the EUT to at least 10 positive and 10 negative randomly phased bursts at the 1000 V mode. Observe the effect on the EUT and record, as appropriate.
- d. Stabilize all factors at nominal reference conditions.
- e. Repeat the test and record the test data as indicated in this A.3.5 Test Sequence section.

*A.3.6 Electrostatic Discharge*

*Test method:* Electrostatic discharge (ESD).

*Object of the test:* To verify compliance with the provisions of this manual under conditions of electrostatic discharges.

*Reference to standard:* See section A.4 Bibliography (f)

*Test procedure in brief:*

A capacitor of 150 pF is charged by a suitable DC voltage source. The capacitor is then discharged through the EUT by connecting one terminal to ground (chassis) and the other via 150 ohms to surfaces which are normally accessible to the operator. This test is conducted during a weighing operation consisting of the following:

*For belt scales*—while totalizing at the maximum flow rate at least the  $\Sigma_{\min}$  (or a time sufficient to complete the test).

*For platform, hanging, and automatic hopper scales*—test with one small test load or simulated load.

*Test severities*

Air Discharge: up to and including 8 kV.

Contact Discharge: up to and including 6 kV.

*Number of test cycles:* At least 10 discharges must be applied at intervals of at least 10 seconds between discharges.

*Maximum allowable variations:*

The difference between the indication due to the disturbance and the indication without the disturbance either must not exceed the values indicated in sections 2.2.1.1 b., 3.2.1.1 b., and 4.2.1.1 b. of this appendix, or the EUT must detect and act upon a significant fault.

*Conduct of the test:* Refer to the IEC Publication mentioned in section A.4 Bibliography (d) for detailed test procedures.

*Supplementary information to the IEC test procedures.*

*Preconditioning:* None required.

*Condition of EUT:*

a. The EUT without a ground terminal must be placed on a grounded plate which projects beyond the EUT by at least 0.1 m on all sides. The ground connection to the capacitor must be as short as possible.

b. Normal power supplied and "on" for a time period equal to or greater than the warm-up time specified by the manufacturer. Power is to be "on" for the duration of the test.

c. The EUT must be operating under standard atmospheric conditions for testing.

d. Adjust the EUT as close to a zero indication as practicable prior to the test.

*Test sequence:*

a. Stabilize all factors at nominal reference conditions.

b. Conduct test as indicated in this A.3.6 Test Sequence section and record the—

- i. Date and time,
- ii. Temperature,
- iii. Relative humidity,
- iv. Power supply voltage,
- v. Test load,

- vi. Indication,
- vii. Errors, and
- viii. Functions performance.

c. Approach the EUT with the discharge electrode until discharge occurs and then remove it before the next discharge. Observe the effect of the discharge on the EUT and record, as appropriate.

d. Repeat the above step at least nine times, making sure to wait at least 10 seconds between successive discharges. Observe the effect on the EUT and record as appropriate.

e. Stabilize all factors at nominal reference conditions.

f. Repeat the test and record the test data as indicated in this A.3.6 Test Sequence section.

*A.3.7 Electromagnetic Susceptibility*

*Test method:* Electromagnetic fields (radiated).

*Object of the Test:*

To verify compliance with the provisions in this manual under conditions of electromagnetic fields.

*Reference to standard:* See section A.4 Bibliography (g).

*Test procedure in brief:*

a. The EUT is placed in an EMI chamber and tested under normal atmospheric conditions. This test is first conducted at one load in a static mode, and the frequencies at which susceptibility is evident are noted. Then tests are conducted at the problem frequencies, if any, during a weighing operation consisting of the following:

*For belt scales*—while totalizing at the maximum flow rate at least the  $\Sigma_{\min}$  (or a time sufficient to complete the test). It is then exposed to electromagnetic field strengths as specified in the Test severities in this section A.3.7 of this annex to appendix A of this part.

*For platform, hanging, and automatic hopper scales*—tested with one small test load.

b. The field strength can be generated in various ways:

i. The strip line is used at low frequencies (below 30 MHz or in some cases 150 MHz) for small EUT's;

ii. The long wire is used at low frequencies (below 30 MHz) for larger EUT's;

iii. Dipole antennas or antennas with circular polarization placed 1 m from the EUT are used at high frequencies.

c. Under exposure to electromagnetic fields the EUT is again tested as indicated above.

*Test severities:* Frequency range: 26-1000 MHz.

*Field strength:* 3 V/m.

*Modulation:* 80 percent AM, 1 kHz sine wave.

*Number of test cycles:* Conduct test by continuously scanning the specified frequency range while maintaining the field strength.

*Maximum allowable variations:* The difference between the indication due to the disturbance and the indication without the disturbance either must not exceed the values given in this manual, or the EUT must detect and act upon a significant fault.

*Conduct of the test:* Refer to the IEC Publication referenced in section A.4 Bibliography (g) for detailed information on test procedures.

*Supplementary information to the IEC test procedures.*

*Test conditions:*

a. The specified field strength must be established prior to the actual testing (without the EUT in the field). At least 1 m of all external cables must be included in the exposure by stretching them horizontally from the EUT.

b. The field strength must be generated in two orthogonal polarizations and the frequency range scanned slowly. If antennas with circular polarization, *i.e.*, log-spiral or helical antennas, are used to generate the electromagnetic field, a change in the position of the antennas is not required. When the test is carried out in a shielded enclosure to comply with international laws prohibiting interference to radio communications, care needs to be taken to handle reflections from the walls. Anechoic shielding might be necessary.

*Condition of EUT:*

a. Normal power supplied and “on” for a time period equal to or greater than the warm-up time specified by the manufacturer. Power is to be “on” for the duration of the test. The EUT must be operating under standard atmospheric conditions for testing.

b. Adjust the EUT as close to a zero indication as practicable prior to the test.

*Test sequence:*

a. Stabilize all factors at nominal reference conditions.

b. Conduct the test as indicated in this A.3.7 Test Sequence section and record the—

- i. Date and time,
- ii. Temperature,
- iii. Relative humidity,
- iv. Test load,
- v. Indication,
- vi. Errors, and
- vii. Functions performance.

c. Following the IEC test procedures, expose the EUT at zero load to the specified field strengths while slowly scanning the three indicated frequency ranges.

d. Observe and record the effect on the EUT.

e. Repeat the test and observe and record the effect.

f. Stabilize all factors at nominal reference conditions.

g. Repeat the test and record the test data.

A.4 Bibliography

Below are references to Publications of the International Electrotechnical Commission (IEC), where mention is made in the tests in annex A to appendix A of this part.

a. IEC Publication 68–2–1 (1974): Basic environmental testing procedures. Part 2: Tests, Test Ad: Cold, for heat dissipating equipment under test (EUT), with gradual change of temperature.

IEC Publication 68–2–2 (1974): Basic environmental testing procedures, Part 2: Tests, Test Bd: Dry heat, for heat dissipating equipment under test (EUT) with gradual change of temperature.

IEC Publication 68–3–1 (1974): Background information, Section 1: Cold and dry heat tests.

b. IEC Publication 68–2–56 (1988): Environmental testing, Part 2: Tests, Test Cb: Damp heat, steady state. Primarily for equipment.

IEC Publication 68–2–28 (1980): Guidance for damp heat tests.

c. IEC Publication 1000–4–11 (1994): Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 11. Voltage dips, short interruptions and voltage variations immunity tests. Section 5.2 (Test levels—Voltage variation). Section 8.2.2 (Execution of the test-voltage variation).

d. IEC Publication 1000–4–11 (1994): Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques, Section 11: Voltage dips, short interruptions and voltage variations immunity tests. Section 5.1 (Test levels—Voltage dips and short interruptions). Section 8.2.1 (Execution of the test-voltage dips and short interruptions) of the maximum transit speed and the range of operating speeds.

e. IEC Publication 1000–4–4 (1995): Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques—Section 4: Electrical fast transient/burst immunity test. Basic EMC publication.

f. IEC Publication 1000–4–2 (1995): Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques—Section 2: Electrostatic discharge immunity test. Basic EMC Publication.

g. IEC Publication 1000–4–3 (1995): Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques—Section 3: Radiated, radio-frequency electromagnetic field immunity test.

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