Section 5.51. Wire- and Cordage-Measuring Devices

A. Application

A.1. This code applies to mechanisms and machines designed to indicate automatically the length of cordage, rope, wire, cable, or similar flexible material passed through the measuring elements.

A.2. See also Section 1.10. General Code requirements.

S. Specifications

S.1. Units. – A wire- or cordage-measuring device shall indicate lengths in terms of feet, yards, or meters, or combinations of units of the same measurement system, and shall have minimum increments with values that do not exceed the equivalent of 0.1 meter or 0.1 yard.

(Amended 1989)

S.2. Design of Indicating Elements.

S.2.1. Graduations.

S.2.1.1. Length. – Graduations shall be so varied in length that they may be conveniently read.

S.2.1.2. Width. – In any series of graduations, the width of a graduation shall in no case be greater than the width of the minimum clear interval between graduations, and the width of main graduations shall be not more than 50 % greater than the width of subordinate graduations. Graduations shall in no case be less than 0.2 mm (0.008 in), nor more than 1.0 mm (0.04 in), in width.

S.2.1.3. Clear Interval Between Graduations. – The clear interval between graduations shall be at least as wide as the widest graduation, and in no case less than 0.8 mm (0.03 in).

S.2.2. Indicator.

S.2.2.1. Symmetry. – The index of an indicator shall be symmetrical with respect to the graduations, at least throughout that portion of its length associated with the graduations.

S.2.2.2. Length. – The index of an indicator shall reach to the finest graduations with which it is used, unless the indicator and the graduations are in the same plane, in which case the distance between the end of the indicator and the ends of the graduations, measured along the line of the graduations, shall be not more than 1.0 mm (0.04 in).

S.2.2.3. Width. – The index of an indicator shall not be wider than the narrowest graduations with which it is used, and shall in no case exceed 0.4 mm (0.015 in).

S.2.2.4. Clearance. – The clearance between the index of an indicator and the graduations shall in no case be more than 1.5 mm (0.06 in).

S.2.2.5. Parallax. – Parallax effects shall be reduced to the practicable minimum.

S.2.3. Zero Indication. – Primary indicating elements shall be readily returnable to a definite zero indication.

S.3. Design of Measuring Elements.

S.3.1. Sensitiveness. – If the most sensitive element of the indicating system utilizes an indicator and graduations, the relative movement of these parts corresponding to a measurement of 30 cm (1 ft) shall be not less than 6 mm (¼ in).

S.3.2. Slippage. – The measuring elements of a wire- or cordage-measuring device shall be so designed and constructed as to reduce to the practicable minimum any slippage of material being measured and any lost motion in the measuring mechanism.

S.3.3. Accessibility. – A wire- or cordage-measuring device shall be so constructed that the measuring elements are readily visible and accessible, without disassembly of any supporting frame or section of the main body, for purposes of cleaning or removing any foreign matter carried into the mechanism by the material being measured.

S.4. Marking Requirements.

S.4.1. Limitation of Use. – If a device will measure accurately only certain configurations, diameters, types, or varieties of materials, or with certain accessory equipment, all limitations shall be clearly and permanently stated on the device.

S.4.2. Operating Instructions. – Any necessary operating instructions shall be clearly stated on the device.

S.4.3. Indications. – Indicating elements shall be identified by suitable words or legends so that the values of the indications will be unmistakable.

S.5. Design Accuracy. – Indications of length shall be accurate whether the values of the indications are being increased or decreased.

N. Notes

N.1. Testing Medium. – Wherever feasible, a wire- or cordage-measuring device shall be tested with a steel tape not less than 10 mm (⅜ in) in width and at least 15 m (50 ft) in length. When a device cannot be tested in this manner because of the design of the device, it shall be tested with a dimensionally stable material appropriately marked and compared at frequent periodic intervals with a steel tape in order to assure that any marked interval is not in error by more than ⅓ of the tolerance of the device at that particular interval.

(Amended 1981)

N.2. Minimum Test. – Tests shall be conducted at a minimum initial increment of 5 m (20 ft) and appropriate increments up to at least 15 m (50 ft).

T. Tolerances

T.1. Tolerance Values. - Maintenance and acceptance tolerances shall be as shown in Table 1. Maintenance and Acceptance Tolerances for Wire- and Cordage-Measuring Devices.

Table 1.
Maintenance and Acceptance Tolerances for
Wire- and Cordage-Measuring Devices

Indication of Device (feet)	Acceptance and Maintenance Tolerances	
	On underregistration (inches)	On overregistration (inches)
20	6	3
Over 20 to 30	8	4
Over 30 to 40	10	5
Over 40 to 50	12	6
Over 50	Add 2 inches per indicated 10 feet	Add 1 inch per indicated 10 feet

UR. User Requirements

UR.1. Installation Requirements.

UR.1.1. Installation. – A wire- or cordage-measuring device shall be securely supported and firmly fixed in position.

UR.2. Use Requirements.

UR.2.1. Limitation of Use. – A wire- or cordage-measuring device shall be used to measure only those materials that it was designed to measure, and in no case shall it be used to measure a material that a marking on the device indicates should not be measured.

UR.2.2. Return to Zero. – The primary indicating elements of a wire- or cordage-measuring device shall be returned to zero before each measurement.

UR.2.3. Operation of Device. – A wire- or cordage-measuring device shall not be operated in such a manner as to cause slippage or inaccurate measurement.

UR.2.4. Cleanliness. – The measuring elements of a wire- or cordage-measuring device shall be kept clean to prevent buildup of dirt and foreign material that would adversely affect the measuring capability of the device.

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