

Mettler-Toledo Single Draft Weigh-in-Motion Vehicle Scale Handbook 44 Proposal

SCL-20.12 Sections Throughout the Code to Include Provisions for Commercial Single Draft Weigh-in-Motion Vehicle Scales

Source:

Mettler-Toledo, LLC

Purpose:

Recognize commercial single draft Weigh-in-Motion vehicle scale systems.

Item Under Consideration:

Amend NIST Handbook 44 Scales Code as follows:

S.1. Design of Indicating and Recording Elements and of Recorded Representations.

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S.1.14. Weigh-in-Motion (WIM) Vehicle Scales

S.1.14.1. Identification of a Fault. – Fault conditions shall be presented to the customer and the operator in a clear and unambiguous manner. No weight value shall be indicated or recorded when a fault condition is detected. The following fault conditions shall be identified if applicable:

- (a) Vehicle speed was below the minimum or above the maximum speed as specified by the manufacturer.
- (b) A change in vehicle speed greater than that specified by the manufacturer was detected.
- (c) Vehicle direction of travel was not valid for the installation.
- (d) The amount of time all vehicle axles were simultaneously on the scale was below the minimum Data Acquisition Time.
- (e) Vehicle's path of travel was outside the lateral side edges of the load-receiving element.

S.1.14.2 Information to be Recorded. – In addition to the information that is normally recorded for vehicle scales, the following shall also be printed and/or stored electronically for each vehicle weighment if applicable:

- (a) Scale identification if more than one lane at the site has the ability to weigh a vehicle in motion.
- (b) Vehicle direction of travel if the Weigh-in-Motion Vehicle Scale is bi-directional.

(Added 20XX)

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S.3. Design of Load-Receiving Element

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S.3.4. Length of Weigh-In-Motion Vehicle Scales – The load-receiving element shall be of sufficient length to allow the weighment of any vehicle intended to be weighed on the scale in a single draft (i.e. all axles of the vehicle are on the load-receiving element simultaneously during the weighment).

(Added 20XX)

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S.6. Marking Requirements

Table S.6.3.a. Marking Requirements						
To Be Marked With ↓	Weighing Equipment					
	Weighing, Load-Receiving, and Indicating Element in Same Housing or Covered on the Same CC¹	Indicating Element not Permanently Attached to Weighing and Load-Receiving Element or Covered by a Separate CC	Weighing and Load-Receiving Element Not Permanently Attached to Indicating Element or Covered by a Separate CC	Load Cell with CC (11)	Other Equipment or Device (10)	
Manufacturer's ID (1)	X	X	X	X	X	
Model Designation and Prefix (1)	X	X	X	X	X	
Serial Number and Prefix (2)	X	X	X	X	X (16)	
Certificate of Conformance Number (CC) (23)	X	X	X	X	X (23)	
Accuracy Class (17)	X	X (8)	X (19)	X		
Nominal Capacity (3)(18)(20)	X	X	X			
Value of Scale Division, "d" (3)	X	X				
Value of "e" (4)	X	X				
Temperature Limits (5)	X	X	X	X		
Concentrated Load Capacity (CLC) (12)(20)(22)		X	X (9)			
Special Application (13)	X	X	X			
Maximum Number of Scale Divisions (n_{max}) (6)		X (8)	X (19)	X		
Minimum Verification Scale Division (e_{min})			X (19)			
"S" or "M" (7)				X		
Direction of Loading (15)				X		
Minimum Dead Load				X		
Maximum Capacity				X		
Minimum and Maximum Speed (25)			X			
Maximum Speed Change (26)			X			
Vehicle Direction Restriction (27)			X			
Safe Load Limit				X		
Load Cell Verification Interval (V_{min}) (21)				X		

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Table S.6.3.a. Marking Requirements					
Section Capacity and Prefix (14)(20)(22)(24)		X	X		

(Added 1990) (Amended 1992, 1999, 2000, 2001, 2002, 2004 and 20XX)

Table S.6.3.b. Notes for Table S.6.3.a. Marking Requirements
<p><u>25. Weigh-in-Motion Vehicle Scales must be marked with minimum and maximum vehicle speed limitations.</u> <u>(Added 20XX)</u></p> <p><u>26. Weigh-in-Motion Vehicle Scales must be marked with maximum vehicle speed change allowed during the weighment.</u> <u>(Added 20XX)</u></p> <p><u>27. Weigh-in-Motion Vehicle Scales must be marked as uni-directional if the travel direction is restricted.</u> <u>(Added 20XX)</u></p>

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N.1. Test Procedures.

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N.7. Weigh-in-Motion Vehicle Scale.

N.7.1. Reference Scale – A static scale as approved by the local jurisdiction shall be used to establish the weight of Reference Vehicles used in this procedure.

N.7.1.1. Dimension - The Reference Scale shall be of such dimension and spacing as to weigh Reference Vehicles in a single draft.

N.7.1.2. Location - The Reference Scale should be located near the Weigh-in-Motion Vehicle Scale to minimize the effect of vehicle fuel consumption. The Reference Scale and the Weigh-in-Motion Vehicle Scale may be the same scale.

N.7.1.3. Timing - The Reference Scale shall be tested immediately prior to using it to establish Reference Vehicle weights. A subsequent test of the Reference Scale may be performed immediately following the establishment of the Reference Vehicle weights to ensure its repeatability.

N.7.1.4. Qualification - The Reference Scale shall comply with the principles in the Fundamental Considerations paragraph 3.2. Tolerances for Standards.

N.7.2. Reference Vehicle – One or more Reference Vehicles shall be used to provide varying weight conditions for testing. Reference Vehicles should be representative of vehicles that are customarily weighed on the Weigh-in-Motion Vehicle Scale during normal operation. A motorized Field Standard Weight Cart with test weights and a driver may be used as an additional Reference Vehicle.

N.7.2.1. Weight Conditions - Reference Vehicle(s) shall be selected to provide at least a high and low weight condition. Different vehicle types may be used.

N.7.2.2. Load Position - Loads on the Reference Vehicle should be positioned equally side-to-side.

N.7.2.3. Static Weight - Reference Vehicle(s) shall be statically weighed on a Reference Scale as defined in N.7.1. immediately before being used to conduct the Weigh-in-Motion Vehicle Scale tests.

N.7.2.3.1. Rounding - Error weights may be added to the Reference Vehicle to increase its weight to a whole scale division to minimize rounding errors.

N.7.2.3.2. Re-weighing - Reference Vehicles may be re-weighed at the discretion of the testing authority.

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N.7.3. Test speeds – The speed of the Reference Vehicle shall be maintained within the parameters as specified by the manufacturer during each test (see also S.1.14.1.a and S.1.14.1.b).

N.7.3.1 Range - Various speeds of the Reference Vehicle shall be used between the minimum and maximum operating speed specified for the Weigh-in-Motion Vehicle Scale. The minimum speed capability of the Reference Vehicle may be used as the minimum speed.

N.7.4. Static Tests for Weigh-in-Motion Vehicle Scale – The Weigh-in-Motion Vehicle Scale shall comply with applicable vehicle scale tests defined in N.1. when tested statically.

N.7.5 Dynamic Tests for Weigh-in-Motion Vehicle Scale – Test procedures shall simulate the normal intended use as closely as possible (i.e. test as used).

N.7.5.1. Vehicles - The tests shall be performed using the Reference Vehicle(s) defined in N.7.2.

N.7.5.2. Weighments - Each Reference Vehicle shall have a minimum of 5 weighments at the speeds as defined in N.7.3.

N.7.5.3. Vehicle Position - Reference Vehicle(s) must stay within the defined roadway along the load receiving element (see also S.1.14.1e).

N.7.5.4. Travel Directions - The tests shall be performed in both directions of travel unless travel direction is restricted by the marking.

N.7.5.5. Results - At the conclusion of the weigh-in-motion tests, there shall be a minimum of 10 total weight readings for the Reference Vehicle(s) for each applicable direction of travel. The tolerance for each weight reading shall be based on the gross vehicle weight and the applicable tolerance values for Class III L.

(Added 20XX)

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Table 7a. Typical Class or Type of Device for Weighing Applications	
Class	Weighing Application or Scale Type
I	Precision laboratory weighing
II	Laboratory weighing, precious metals and gem weighing, grain test scales
III	All commercial weighing not otherwise specified, grain test scales, retail precious metals and semi-precious gem weighing, grain-hopper scales, animal scales, postal scales, vehicle on-board weighing systems with a capacity less than or equal to 30 000 lb, and scales used to determine laundry charges
III L	Vehicle scales (<u>including weigh-in-motion vehicle scales</u>), vehicle on-board weighing systems with a capacity greater than 30 000 lb, axle-load scales, livestock scales, railway track scales, crane scales, and hopper (other than grain hopper) scales
III	Wheel-load weighers and portable axle-load weighers used for highway weight enforcement
Note: A scale with a higher accuracy class than that specified as “typical” may be used.	

(Amended 1985, 1986, 1987, 1988, 1992, 1995, ~~and~~ 2012, and 20XX)

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Appendix D. Definitions

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data acquisition time (DAT). – The total time an object is completely on a load-receiving element while it is being weighed in motion. An object is completely on a load-receiving element from the time the trailing edge of an object to be weighed first moves onto the load-receiving element up to the time the leading edge of the object first moves off the load-receiving element. This time duration is affected by the length of the load-receiving element, speed of the object to be weighed, and the length of the object to be weighed. [2.20]

(Added 20XX)

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reference vehicle. – A vehicle with an associated load, including the driver, that has been statically weighed for temporary use as a field standard, typically the time required to test one Weigh-in-Motion Vehicle Scale. [2.20]

(Added 20XX)

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vehicle scale. – A scale (including weigh-in-motion vehicle scales) adapted to weighing highway, farm, or other large industrial vehicles (except railroad freight cars), loaded or unloaded. [2.20]

(Amended 20XX)

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weigh-in-motion (WIM) vehicle scale. – A vehicle scale adapted to weighing vehicles as they travel across the scale without stopping. [2.20]

(Added 20XX)