Introduction

The recent update to AASHTO R 18 (2023) added a new table to Annex A-Equipment Calibration, Standardization, Check, and Maintenance Tables: **Table A.9**—Iron and Steel Testing Equipment. This table includes testing equipment calibration, standardization, check, and maintenance requirements that have not previously been reviewed as part of an on-site assessment. Starting in 2024, the items in Table A.9 will be reviewed during on-site assessments by the AASHTO Laboratory Assessment Program (LAP).

Table A.9—Iron and Steel Testing Equipment

Equipment	Standard	Requirement	Max. Interval (months)
Brinell Hardness Testing Machine	E10	Standardize as Prescribed in Annex 1	See Table A1.1
Brinell Hardness Indenters	E10	Standardize as Prescribed in Annex 3 by an ISO/IEC 17025 Accredited Agency	See Table A3.1
Rockwell Testing Machine	E18	Standardize as Prescribed in Annex 1	See Table A1.1
Rockwell Diamond Spheroconical Indenter and Rockwell Ball Indenters	E18	Standardize as Prescribed in Annex 3 by an ISO/IEC 17025 Accredited Agency	See Table A3.2
Charpy Impact Machine	A370	Standardize as Prescribed in Annex 2	12
Bending Pins, Mandrels, Rollers	E290	Check Critical Dimensions	12
Bolt Tension Measuring Device (Skidmore)	F3125/F3125M	Standardize Torque	12
Low and High-Voltage Holiday Detector	G62	Standardize Voltage	12
Peak or Crest Reading Voltmeter	G62	Standardize Resistance	12
Magnetic Thickness Gage	E376	Standardize Thickness Measurements	12

Brinell Hardness Testing (ASTM E10)

ASTM E10 has two equipment items listed in R 18 Table A.9: (1) Brinell Hardness Testing Machine; (2) Brinell Hardness Indenters.

(1) Brinell Hardness testing machines must be standardized as prescribed in Annex 1 of ASTM E10. The interval for standardization is listed in Table A1.1 of ASTM E10. There are three types of verification listed in Table A1.1: Direct Verification, Indirect Verification, and Daily Verification. Direct Verification must be performed according to Section A1.3, Indirect Verification must be performed according to section A1.4, and Daily Verification must be performed according to section A1.5 of E10. All verification reports must meet the requirements of R18, and also must include the information listed in section A1.6 of E10.

(2) Standardization of Brinell Hardness Indenters are performed as prescribed in Annex 3 by an ISO/IEC 17025 Accredited Agency. The frequency of the standardization is prescribed in Table A3.1. During the assessment, we will be looking for the certificate that came with the indenter when it was newly purchased. If that document has been lost, the indenter ball must be sent back out for standardization/verification or a new indenter ball must be purchased that includes a certification.

Rockwell Hardness Testing (ASTM E18)

ASTM E18 has two equipment items listed in R 18 Table A.9: (1) Rockwell Testing Machine; (2) Rockwell Diamond Spheroconical Indenter and Rockwell Ball Indenters.

(1) Rockwell Hardness testing machines must be standardized as prescribed in Annex 1 of ASTM E18. The interval for standardization is listed in Table A1.1 of ASTM E18. There are three types of

verification listed in Table A1.1: Direct Verification, Indirect Verification, and Daily Verification. Direct Verification must be done according to section A1.3, Indirect Verification must be done according to section A1.4, and Daily Verification must be done according to section A1.5 of E18. All verification reports must meet the requirements of R 18, and also must include the information listed in section A1.6 of E18.

(2) Standardization of Rockwell Hardness Indenters are performed as prescribed in Annex 3 by an ISO/IEC 17025 Accredited Agency. The frequency of the standardization is prescribed in Table A3.2. During the assessment, we will be looking for the certificate that came with the indenter when it was newly purchased. If that document has been lost, the indenter ball must be sent back out for standardization/verification or a new indenter ball must be purchased that includes a certification.

Charpy Impact Testing (ASTM E23)

The Charpy impact machine verification has two parts. The first is a direct verification and the second is an indirect verification. The direct verification consists of inspecting the machine to ensure the requirements of ASTM E23 Annex A1 and A2. The indirect verification entails the testing of verification specimens.

(1) **Direct verification** has two parts. The first part is detailed in Section A2.2 and lists the parts of the machine that need to be verified annually. The second part is detailed in Section A2.3 and lists the parts that need to be verified at least once. During an on-site assessment, the laboratory assessor will look for both records. Because this is now part of R18, the record will have to meet the requirements of AASHTO R 18 section 6.5.1. This will include detailed results for any part of the machine listed in A2.2 and A2.3 that requires a measurement. Certain items only require inspection, but they should still be included in the verification records.

(2) **Indirect verification** requires the testing of verification specimens with certified absorbed energy values to verify the accuracy of Charpy impact machines. These verification specimens can be purchased from NIST through their Charpy Machine Verification Program. Participation in the NIST Verification Program is not required. The self-verification specimens sold through their website will be sufficient to meet the requirements of AASHTO R 18. See ASTM E23 A2.4.1 to determine which specimens should be tested for each machine range. The record will have to meet the requirements of AASHTO R18 section 6.5.1.

Bending Pins, Mandrels, Rollers (ASTM E290)

Bend testing for A615 and A706 will now require facilities to check the critical dimensions of the bending pin, mandrel, or roller diameters used for testing according to AASHTO R 18 Table A.9. The required tolerance listed in ASTM E290 section 6.6 for bending pins, mandrels, or rollers is ±5%.

The frequency of the checks shall not exceed 12-months. The check records shall conform to the requirements listed in AASHTO R 18 section 6.5.1. The record shall also include the nominal diameter, measured value, and percent difference between the nominal and measured diameters. In addition, each facility will need to come up with an in-house check procedure that conforms to AASHTO R18 section 6.3.

Bolt Tension Measuring Device (Skidmore) (ASTM F3125/F3125M)

AASHTO R 18 Table A.9 requires bolt tension measuring devices (Skidmore) to be standardized at an interval not to exceed 12-months. If a facility chooses to do the standardization in-house, a procedure conforming to AASHTO R 18 section 6.3 must be created.

The standardization record shall conform to the requirements listed in AASHTO R18 section 6.5.1.

Low-Voltage Holiday Detector, High-Voltage Holiday Detector, Peak or Crest Reading Voltmeter (ASTM G62)

AASHTO R 18 Table A.9 requires Low-Voltage Holiday Detectors, High-Voltage Holiday Detectors, and Peak or Crest Reading Voltmeters to be standardized at an interval not to exceed 12-months.

ASTM G62 Section 9 requires both the low and high-voltage holiday detectors be calibrated annually by the equipment manufacturer, their authorized agent, or an accredited calibration laboratory approved by the manufacturer.

The peak or crest reading voltmeter does not need to be standardized by an outside agency. If a facility chooses to do the standardization in-house, a procedure conforming to AASHTO R 18 section 6.3 must be created. This item is only required if using a high-voltage holiday detector.

All standardization records shall conform to the requirements listed in AASHTO R 18 section 6.5.1.