

November 2023 ERRATA for *Guide Specifications for Highway Construction, 10th Edition* (GSH-10)

November 2023

Dear Customer:

AASHTO has issued an erratum, which includes technical revisions, for *Guide Specifications for Highway Construction, 10th Edition* (GSH-10).

To download additional copies of this erratum, please go to:

<https://downloads.transportation.org/GSH-10-Errata.pdf>

The changes in this erratum are detailed in the table under the “November 2023” heading. Pages with the changes have a gray box in the page header reading as follows:

November 2023 Errata

AASHTO staff sincerely apologizes for any inconvenience.

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List of Errata for *Guide Specifications for Highway Construction, 10th Edition (GSH-10)*

Original Page	Section	Existing Text	Corrected Text
November 2023			
3	Table 101.2-2	In the Volume section of the table, the SI symbols and unit names were misaligned in relation to the inch-pound symbols and unit names.	The SI symbols and unit names are all moved down one row.
50	107.9	Two sentences were omitted.	The following two sentences are added at the end of the section: The Engineer will contact the State archeological authorities, who will determine the item's disposition. When directed, excavate the site to preserve the artifacts and remove them to the custody of the proper State authorities.
189	563.4A	Editorial: "3" should have been superscripted in the units.	Units now read "yd ³ (m ³)".
393	Table 811.3-4	Column 1 included the wrong symbol (£) in all three data rows.	Symbol is changed to "≤".
394	811.3D5ciii	The inch-pound equation for torque was missing an operator.	The operator "≤" is inserted.

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C. *Measurement Units.* These Specifications provide measurements in both the inch-pound units of U.S. customary measure and in the International System of Units (abbreviated as SI, and known commonly in the United States as the metric system). Inch-pound units appear first, followed by metric units inside parentheses.

The Agency will identify the system of measurements that will be used on a particular project. Do not mathematically convert units from one system of measure to another; the Agency does not intend for the values to be interchangeable.

D. *Measurement Symbols.* To specify sizes, dimensions, and similar properties, the Agency will use symbols for units of measure, as shown in Table 101.2-2.

Table 101.2-2. Measurement Symbols

Inch-Pound Units (U.S. Customary System)		SI (International System) Units (Metric)		
Symbol	Unit Name	Measurement	Symbol	Unit name
Length				
mil	mil (0.001 inch)		μm	micrometer
in.	inch		mm	millimeter
ft	foot			
yd	yard		m	meter
mi	mile		km	kilometer
Area				
in ²	square inch			
yd ²	square yard			
mi ²	square mile		km ²	square kilometer
acre	acre			
Volume				
gal	gallon			
in. ³	cubic inch		mL	milliliter
ft ³	cubic foot		L	liter
yd ³	cubic yard		m ³	cubic meter
Weight (Mass)				
oz	ounce		g	gram
lb	pound		kg	kilogram
kip	1,000 pounds			
ton	ton, short (2000 lb)		Mg	Megagram

Inch-Pound Units (U.S. Customary System)			SI (International System) Units (Metric)	
Symbol	Unit Name	Measurement	Symbol	Unit name
Force				
lb	pound		N	newton
kip	1000 pounds		kN	kilonewton
Pressure, Stress				
psi	pounds per square inch		Pa	pascal
ksi	kips per square inch		kPa	kilopascal
			MPa	megapascal
Energy				
ft-lb	foot-pound		J	joule
Illumination				
fc	foot candle		lx	lux
Time				
s	second		s	second
min	minute		min	minute
h	hour		h	hour
d	day		d	day
Temperature				
°F	degree Fahrenheit		°C	degree Celsius

101.3 DEFINITIONS

Acts of God. Earthquake, tidal wave, tornado, hurricane, or any other cataclysmic phenomenon of nature beyond the control of the Agency and Contractor.

Actual Cost. Contractor's actual cost to provide labor, material, equipment owned or invoiced rental, and administrative overhead necessary for the work.

Addendum. Contract revision developed between advertising and opening proposals.

Advertisement. Public announcement requesting bids for specified work or materials.

Agency. The State Highway or Transportation Department, Commission, or other organization, constituted under State or Commonwealth laws, that administers highway or transportation work.

Award. Agency acceptance of proposal.

Comply with all laws and ordinances, as well as Title 29, Title 30, and the Code of Federal Regulations Part 1926—Safety and Health Regulations for Construction (OSHA), whichever is more restrictive, when using, handling, loading, transporting, and storing explosives and blasting agents.

Comply with all Federal, State, and local laws, rules, and regulations that govern unlawful employment practices including discrimination based on race, religion, color, sex, or national origin and that define actions required for Affirmative Action and Minority (Disadvantaged) Business programs.

Perform work within or adjacent to a State or National Forest under regulations of the State Fire Marshall, Conservation Commission, Forestry Department, or authority with jurisdiction to protect forests. Immediately notify the Engineer in writing upon discovering any discrepancy or inconsistency between the contract and any law, ordinance, regulation, or order, except as noted in Subsection 107.4.

107.2 PERMITS, LICENSES, AND TAXES

Acquire all permits and licenses; pay charges, fees, and taxes; and give all notices necessary to perform the work. Include these costs in the appropriate unit prices bid for the contract items.

107.3 PATENTED DEVICES, MATERIALS, AND PROCESSES

Provide proof of legal agreement with the patentee or owner, if necessary, for use of a design, device, material, or process covered by letters, patents, or copyrights.

Indemnify and save harmless the Agency and any affected third party or political subdivision from claims of infringement on patents, copyrights, or trademarks.

Indemnify the Agency for costs, expenses, and damages, which it may be obligated to pay as a result of an infringement during the conduct of the work or after the project is completed.

107.4 FEDERAL-AID PARTICIPATION

Federal requirements of a federally assisted contract supersede conflicting provisions of state or local laws, rules, or regulations.

When the Federal Government participates in the cost of the contract, proceed with the work under the supervision of the Agency, but subject to the inspection and approval of appropriate Federal officials. Note, however, that the U.S. Government is not a party to the contract and will not interfere with the rights of contract parties.

107.5 PUBLIC CONVENIENCE AND SAFETY

Store materials and conduct work with minimal obstruction to traffic. Ensure the safety and convenience of the public and property as provided under Subsection 104.4. Follow the safety provisions of all applicable laws, rules, codes, and regulations.

107.6 BARRIERS, BARRICADES, AND WARNING SIGNS

Provide, erect, and maintain traffic control devices to protect the work and public safety. Use barriers and barricades to delineate highway sections closed to traffic. Illuminate obstructions during darkness and provide warning signs to control and direct traffic.

Erect warning signs for work that may interfere with traffic or where new work crosses or coincides with an existing road. Place and maintain warning signs according to the project traffic management plan. Obtain approval before dismantling or removing traffic control devices.

Ensure traffic control devices meet the MUTCD and Section 618.

107.7 USING EXPLOSIVES

Ensure that the use of explosives does not endanger life, property, or new work. Assume liability for property damage, injury, or death resulting from the use of explosives.

Notify property owners and public utility companies in the vicinity of the proposed detonation before using explosives.

107.8 PROTECTING AND RESTORING PROPERTY AND LANDSCAPE

Preserve public and private property during the work. Ensure that the Engineer affirms the location of monuments and property line markers before they are moved, disturbed, or damaged.

Assume liability for any damage to public or private property resulting from defective work or materials, or non-execution of the contract. Maintain liability until the project is accepted.

Restore damaged property to a condition similar or equal to that existing before the damage at no cost to the Agency.

107.9 CULTURAL RESOURCES

When construction operations encounter possible artifacts of historical or archaeological significance, immediately suspend operations in the area and notify the Engineer. The Engineer will contact the State archeological authorities, who will determine the item's disposition. When directed, excavate the site to preserve the artifacts and remove them to the custody of the proper State authorities.

D. *Testing and Opening to Traffic.*

1. *Slump.* Use concrete having a maximum slump, as determined by AASHTO T 119M/T 119, of 3 in. (75 mm) for concrete placed by vibration or 4 in. (100 mm) for hand-placed concrete.
2. *Percent Entrained Air.* Meet Subsection 562.3(D)(2).
3. *Compressive Strength.* Open pavements to traffic as specified in Subsection 562.3(D)(4).
4. *Pavement Rideability.* The Engineer will test pavement surfaces for smoothness as specified in Subsection 401.3(L)(2).

563.4 MEASUREMENT

The Engineer will measure work acceptably completed as specified in Subsection 109.1 and as follows:

- A. *Concrete Overlay, Furnish Only.* The Engineer will measure the quantity of overlay concrete, including patching and miscellaneous concrete per type of mix proportions and admixture specified, by the yd³ (m³). The measurement will include quantities used for overlay for partial-depth patches, full-depth patches, curb replacement, manhole adjustment, and structure adjustment.
- B. *Concrete Overlay, Placement Only.* The Engineer will compute the area in yd² (m²) from longitudinal surface measurement and nominal width. The Engineer will measure irregular and patched areas separately in yd² (m²).
- C. *Removing Asphalt and Milling Portland Cement Concrete Surface.* The Engineer will measure quantity of pavement surface scarified in yd² (m²).
- D. *Partial-Depth Removals, 1 in. (25 mm) and 2 in. (50 mm).* The Engineer will compute the areas in yd² (m²) from measurements of the locations by depth class.
- E. *Full-Depth Removal.* The Engineer will compute areas of full-depth removals in yd² (m²) from surface measurements. The measurement will include full-depth removal areas around manholes and structures adjusted or raised to meet new grade lines. Consider removal and replacement of unsuitable subgrade as incidental to the work.
- F. *Curb Removal.* The Engineer will measure the length of curb removal in ft (m) along the line and slope of the curb to be removed.
- G. *Reinforcing Steel.* The Engineer will measure quantities as follows:
 1. *Plain Resurfacing.* The Engineer will compute the quantity of reinforcing steel placed over random cracks by measuring the size and length placed and converting to lb (kg) using the standard No. 4 bar. The Engineer will include dowels at joints in the measure.

2. *Mesh-Reinforced Resurfacing.* The Engineer will include steel reinforcing or dowels in the measure.
3. *Continuously Reinforced Resurfacing.* The Engineer will measure reinforcing bars by area in yd² (m²) of concrete resurfacing specified or required to be reinforced, with no allowances made for necessary laps and splices.

H. *Interlayer Treatment.* The Engineer will measure quantities as follows:

1. *Slurry Seal.* The Engineer will compute the area of slurry seal in yd² (m²) from surface measurements.
2. *Asphalt.* The Engineer will measure asphalt by the ton (Mg).
3. *Lean Concrete, Furnish Only.* The Engineer will measure the quantity of lean concrete furnished by the yd³ (m³).
4. *Lean Concrete, Placement Only.* The Engineer will compute the area of lean concrete placed in yd² (m²) from longitudinal surface measurements and nominal plan width. The Engineer will measure irregular areas separately in yd² (m²).
5. *Polyethylene Sheeting.* The Engineer will compute quantities in yd² (m²) from surface measurements.
6. *Roofing Felt.* The Engineer will compute quantities in yd² (m²) from surface measurements.

563.5 PAYMENT

The Agency will pay for accepted quantities at the contract unit price as follows:

Pay Item	Pay Unit
(A) Concrete overlay, furnish only	yd ³ (m ³)
(B) Concrete overlay, placement only	yd ² (m ²)
(C) Removing asphalt and milling portland cement concrete surface	yd ² (m ²)
(D) Partial-depth patch	yd ² (m ²)
(E) Full-depth removal	yd ² (m ²)
(F) Curb removal	ft (m)
(G) Plain resurfacing reinforcing steel	lb (kg)
(H) Continuously reinforced resurfacing steel	yd ² (m ²)
(I) Slurry seal	yd ² (m ²)
(J) Asphalt concrete	ton (Mg)
(K) Lean concrete, furnish only	yd ³ (m ³)
(L) Lean concrete, placement only	yd ² (m ²)
(M) Polyethylene sheeting	yd ² (m ²)
(N) Roofing felt	yd ² (m ²)

retorquing previously tensioned bolts that may have been loosened by the tensioning of adjacent bolts as the torquing continues from the initial position and that do not require greater rotation, including the tolerance, than that required by Table 811.3-4.

Table 811.3-4. Nut Rotation from the Snug Condition

Bolt length measured from underside of head to end of bolt	Geometry of Outer Faces of Bolted Parts		
	Both faces normal to bolt axis	One face normal to bolt axis and other face sloped not more than 1:20. Bevel washer not used.	Both faces sloped not more than 1:20 from normal to bolt axis. Bevel washers not used.
≤4 diameters	1/3 turn	1/2 turn	2/3 turn
>4 diameters, but ≤8 diameters	1/2 turn	2/3 turn	5/6 turn
>8 diameters, but ≤12 diameters	2/3 turn	5/6 turn	1 turn

Install bolts in all holes of the connection and bring the connection to a snug condition.

Snug systematically from the most rigid part of the connection to the free edges. Repeat until the full connection is in a snug condition.

The minimum required bolt tension is 70 percent of the specified minimum tensile strength of bolts [ASTM Specifications for tests of full-size Grade A325 (A325M) and Grade A490 (A490M) bolts, loaded in axial tension] rounded to the nearest 1,000 lb (4,500 N).

For situations in which the bolt length measured from the underside of the head to the end of the bolt exceeds 12 diameters, determine the required rotation by tests in a suitable tension device simulating the actual conditions.

- iv. *Rotational Capacity Tests.* Test after galvanizing. Perform tests for all fastener assemblies. Include washers as part of the test even if they are required as part of the installation procedure.

Perform the rotational capacity test according to ASTM F3125 Grade A325 (ASTM F3125M Grade A325M) and as follows: Test each combination of bolt production lot, nut lot, and washer lot as an assembly. The Contractor does not have to include washers not required by the installation procedures in the lot identification. Assign a rotational capacity lot number to each combination of lots tested. Test a minimum of two assemblies per rotational capacity lot.

For bolts that are long enough to fit in a Skidmore-Wilhelm Calibrator, assemble the bolt, nut, and washer assembly in this device or an acceptable equivalent as approved by the Engineer

Ensure the torque necessary to produce the required fastener tension does not exceed the value obtained by the following equation:

$$\text{Torque} \leq 0.25PD$$

where:

Torque = measured torque (ft-lb)

P = measured bolt tension (lb)

D = bolt diameter (ft)

Or, for metric units,

$$\text{Torque} \leq 340PD$$

where:

Torque = measured torque (Nmm)

P = measured bolt tension (N)

D = bolt diameter (mm)

Test bolts that are too short to test in a Skidmore-Wilhelm Calibrator in a steel joint. Do not apply the tension requirement specified above. Instead, compute the maximum torque requirement, $0.25PD$ ($340PD$), using a value of P equal to the turn test tension taken as 1.15 times the bolt tension specified in Table 811.3-3.

- v. *Washer Requirements.* Where the outer face of the bolted parts has a slope greater than 1:20 with respect to a plane normal to the bolt axis, use a hardened beveled washer to compensate for the lack of parallelism.

Ensure that hardened beveled washers for American Standard Beams and Channels that are square or rectangular meet ASTM F436/F436M, and taper in thickness.

Hardened washers are not required in this installation method, except as may be specified in *AASHTO LRFD Bridge Design Specifications*.

- vi. *Turn of Nut Installation Method.* Check a representative sample of not fewer than 3 bolt and nut assemblies of each diameter, length, and grade to be used in the work. Use a device capable of indicating bolt tension. Demonstrate that the method used by the bolting crew to develop a snug condition and to control the turns develops a tension of not less than 5 percent greater than the tension required by Table 811.3-3. Retest as required.