AASHTO
Craig Thompson, *President*
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Errata for G9.1—*Steel Bridge Bearing Guidelines*, Second Edition (NSBASBB-2)

December 2023

Dear Customer:

Recently, we were made aware of some technical revisions that need to be applied to G9.1—*Steel Bridge Bearing Guidelines*, Second Edition. Please scroll down to see the full erratum.

In the event that you need to download this file again, please download from AASHTO's online bookstore at: http://downloads.transportation.org/NSBASBB-2-Errata.pdf.

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

December 2023 Errata

AASHTO staff sincerely apologizes for any inconvenience to our readers. Please feel free to contact us if you have questions or need any additional information.

Sincerely,
AASHTO Publications

Summary of Errata Changes for NSBAASBB-2, December 2023

<table>
<tr><th>Page</th><th>Existing Text/Notes</th><th colspan="2">Corrected Text</th></tr>
<tr><td colspan="4">Section 2</td></tr>
<tr><td>2-11</td><td>The design movement of the bearing is normally not based on the entire expected temperature range. The design movement is normally taken from a mean temperature. It is not realistic to expect that the bearing will be installed at an exact mean temperature; therefore, the bearing should be designed for a movement that is equal to the mean, plus or minus a specified temperature range If construction is anticipated during temperature extremes, the bearing can be designed for a larger temperature range. Alternatively, the bridge can be designed and detailed for future jacking where the. bearings can be reset. This should be noted in the contract documents.</td><td colspan="2">The design movement of the bearing is normally not based on the entire expected temperature range. The design movement is normally taken from a mean temperature. It is not realistic to expect that the bearing will be installed at an exact mean temperature; therefore, the bearing should be designed for a movement that is equal to the mean, plus or minus a specified temperature range.
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<tr><td colspan="4">Section 4</td></tr>
<tr><td>4-1</td><td>Paragraph and C4.2.1 heading missing. The corrected text should appear in alignment with Article 4.2.1.</td><td colspan="2">C4.2.1

If an owner desires to use steel sliding surface expansion bearing, refer to Section 3 (High Load Multi-Rotational Bearings) for design guidelines.</td></tr>
<tr><td>4-1</td><td>Main text and commentary text are misaligned in Article 4.2.1. Item number 3 on the list should be aligned with the sentence “See Drawings E 4.1 and E 4.2 in Article 2.10 for examples of keeper angles and keeper blocks.”</td><td>2. The bearings are attached to the girder by field welding or bolting.

3. Lateral forces are restrained by means of keeper angles, concrete keeper blocks (keys), or anchor rods.</td><td>Some owners prefer welding and others prefer bolting. Welded attachment allows for minor adjustment during installation and is often the most economical design. Bolting provides limited damage to coating systems and allows for easier removal in the future.
See Drawings E 4.1 and E 4.2 in Article 2.10 for examples of keeper angles and keeper blocks.</td></tr>
</table>

2.5—QUALITY CONTROL TESTING

Elastomeric bearings are sampled and typically tested in accordance with AASHTO M 251.

In general, testing includes the following:

- Dimensional verification.
- Material properties including shear modulus or durometer.
- Compressive load test at 1.5 times the design service load. The load is held for five minutes, removed, and reapplied for a second period of five minutes.
- Creep and shear bond test. Figure 2.5-1 depicts a shear bond test.

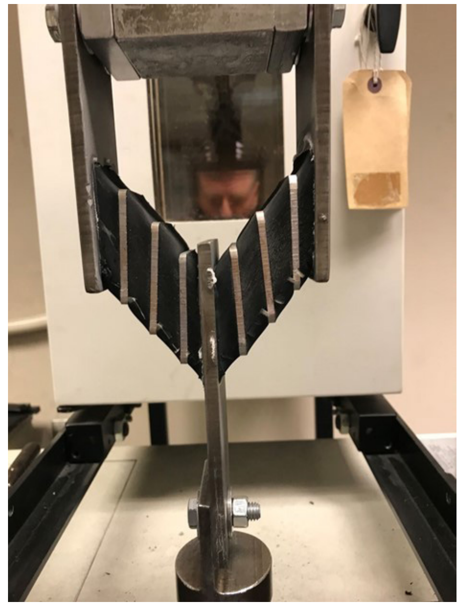

Figure 2.5-1. Shear Bond Test

2.6—MARKING

The designer should add the following notes to the plans:

"All bearings shall be marked prior to shipping. The marks shall include the bearing location on the bridge, and a direction arrow that points up-station. All marks shall be permanent and be visible after the bearing is installed."

C2.6

Problems have occurred in the field with the installation of bearings with beveled sole plates. It is not always obvious which orientation a bearing must take on a beam before the dead load rotation has been applied. This is especially true for bearings with minor bevels.

2.7—INSTALLATION PRACTICE

The installation practice of an elastomeric bearing should be based on the assumptions made during design. Designers should specify any special requirements for the installation of the bearing that may affect the bearing's performance.

Designers should assume a mean setting temperature range when calculating the design movement. The temperature setting range should be shown in the contract documents.

C2.7

The design movement of the bearing is normally not based on the entire expected temperature range. The design movement is normally taken from a mean temperature. It is not realistic to expect that the bearing will be installed at an exact mean temperature; therefore, the bearing should be designed for a movement that is equal to the mean, plus or minus a specified temperature range.

If construction is anticipated during temperature extremes, the bearing can be designed for a larger temperature range. Alternatively, the bridge can be designed and detailed for future jacking where the bearings can be reset. This should be noted in the contract documents.

Bearings designed with masonry plates and anchor rods should be detailed with an adjustable connection between the bearing assembly and the steel framing above. Field welding is an acceptable way to accomplish this.

It is not reasonable to assume that the anchor rods and steel framing will be constructed to a tolerance that would accommodate a simple bolted connection. Field welding allows for significant adjustment.

2.8—FIELD INSPECTION AND MAINTENANCE

Elastomeric bearings should be inspected during standard bridge inspection cycles. The following measures of proper performance can be checked during inspection:

- Over-translation
- Proper translation
- Sliding or "walking"
- Splitting, tearing, or excessive bulging

C2.8

Elastomeric bearings are relatively maintenance-free but should be inspected in accordance with the most recent procedures set forth by FHWA's National Bridge Inspection Program or a more stringent state or local government policy.

Because the total sum thickness of internal steel shims may be unknown at the time of inspection, if the translation (deviation from vertical) is half the total height of the bearing (not including external load plates), the position of the bearing should be considered to be past the allowable one-way movement. For situations where the beam can slip infrequently to reach translation equilibrium on the bearing pad and not move the bearing pad from the substructure support, lateral translation of up to half the thickness of the pad should not be a reason for concern.

Normal operating temperature for most owners is approximately 50–70 degrees F in which the forward and back station vertical faces of the bearing are near vertical. Translation beyond expected or opposite of expected could mean that the bearing was set outside of the normal operating temperature and never reset.

Elastomeric bearings should be checked for evidence that the bearing has "walked out" from under the beam or girder.

A small amount of bulging, splitting, or tearing in steel reinforced elastomeric bearings will not necessarily reduce the serviceability of the bearing pad unless the internal reinforcement becomes subjected to an excessively-corrosive environment. Check the area where the pad is bonded to the sole and masonry plates, if applicable, for evidence of separation. Check for thickness variations that cannot be attributed to normal rotation of the bearing. Older elastomeric bearings may have been designed before the shape factor was included in the design. Therefore, check for excessive bulging (vertical faces of plain pads and vertical face of

SECTION 4:

DECEMBER 2023 ERRATA

STEEL BEARINGS

4.1—GENERAL

This Article is intended to assist civil engineers in the design and detailing of steel bearings. The information included is intended to permit efficient fabrication, installation, and maintenance of these types of bearings.

C4.1

Where practical, steel bearings should only be considered for fixed bearing types.

Many owners have experienced long-term problems with steel expansion bearings. The most important issues have been high cost, the need for expensive sliding surfaces (bronze), corrosion and binding of parts, and poor performance.

Steel roller and rocker expansion bearings should not be used below bridge deck mechanical expansion joints. The design of these types of bearings relies on the rotation between steel elements. Debris and corrosion between steel plates due to deck joint failure will result in poor performance of the bearing.

4.2—BASIC ASSUMPTIONS

4.2.1—Approach

These Guidelines make the following design and detailing assumptions for steel bearings:

1. Steel bearings are limited to fixed bearing designs that do not need sliding or rolling surfaces.
2. The bearings are attached to the girder by field welding or bolting.
3. Lateral forces are restrained by means of keeper angles, concrete keeper blocks (keys), or anchor rods.

C4.2.1

If an owner desires to use steel sliding surface expansion bearing, refer to Section 3 (High Load Multi-Rotational Bearings) for design guidelines.

Some owners prefer welding and others prefer bolting. Welded attachment allows for minor adjustment during installation and is often the most economical design. Bolting provides limited damage to coating systems and allows for easier removal in the future.

See Drawings E 4.1 and E 4.2 in Article 2.10 for examples of keeper angles and keeper blocks.

4.3—DESIGN AND DETAILING RECOMMENDATIONS

4.3.1—Design

The design of steel bearings is the responsibility of the design engineer. The design should follow the provisions of the *AASHTO LRFD Bridge Design Specifications*.

Sole plate, masonry plate, and anchor rod design are best handled by the bridge designer since the bearing manufacturer may not be aware of important dimensional limitations.

The bridge designer should include notes on the plans allowing the bearing manufacturer to make minor adjustments to the dimensions of the sole plate, masonry plate, and anchor rods. The bridge designer should also identify dimensions that are not to be changed due to design or geometric constraints. For instance, the reinforcing steel in the concrete substructure often limits anchor rod locations. The bearing designer must coordinate any changes with both the contractor and the bridge design engineer.

4.3.1.1—Design Rotation

In general, steel bearing assemblies should be designed for unfactored dead load and live load rotations and additional rotations for uncertainties and construction tolerances.

The bearing should also be designed for dead load and live load rotations, rotations due to profile grade, and additional rotations for uncertainties (0.005 radians) and construction tolerances (0.005 radians).

Sole plates should be detailed as flat plates. If beveled sole plates are used, the design rotation for the bearing due to profile grade should be neglected.

If the beam is cambered for dead loads, the dead load design rotation of the bearing should be neglected.

C4.3.1.1

Bearing assemblies consist of the bearing element, connection plates, and a sole plate (beveled or flat). See Article 4.6 for details of a typical bearing assembly. Please refer to Appendix A for information on calculating rotations.

It is relatively easy to design a steel bearing for significant rotation, therefore the rotation due to grade of beams can normally be accommodated in the bearing.

Refer to Appendix A for information on the effect of beam cambering on bearing design rotations.

4.3.2—Sole Plate Connections

The connection of the sole plate to girders should be field-welded.

C4.3.2

Welding of the sole plate provided flexibility in accommodating erection tolerances, as the location of most steel bearings is fixed by the anchor rods. Welding allows for minor adjustment in the location of the sole plate relative to the beam.

The damage due to removal of the weld for future removal and maintenance can be reasonably repaired. The *AASHTO/AWS D1.5/D1.5M Bridge Welding Code* has information on weld removal and repair.

4.3.3—Sole Plate Details

The sole plate should extend transversely beyond the edge of the bottom flange of the girder at least 1 in. on each side.

C4.3.3

The recommendation to extend the sole plate is to facilitate the welding process and to allow sufficient room for welding. Fabricators will not overturn a girder in the shop to make a small weld; therefore, it