VISION ZERO
zero deaths
zero serious injuries

**Montana Department of Transportation**
*2701 Prospect*
*PO Box 201001*
*Helena MT 59620-1001*

*Greg Gianforte, Governor*
*Malcolm "Mack" Long, Director*

## *MEMORANDUM*

Approved By: Henry Henning, P.E., Bridge Inspection Engineer HCH

Date: 6/1/2021

Subject: Interim Guidance for Quantifying Sister Girders on Timber Bridges

---

In the past, original timber girders with helper, a.k.a. "sister" girders have not been included in element 111 (Timber Girder) quantity. However, it is appropriate to include the original girders when they still have capacity to carry load. This guidance and flow chart are meant to help clarify whether to include the original timber girder in element 111 (Timber Girder) quantity and the numbering nomenclature of all girders. This interim guidance will stay in effect until a new version of the Manual is published, or until otherwise superseded.

### GIRDERS THAT ARE PART OF A TIMBER WIDENING

Many State-Owned timber bridges have been widened from their original construction. As part of the widening, a common detail involved placing a new girder directly adjacent to the original exterior girder. Girders that are next to each other as part of a widening are not true sister girders as they support the widened portion of the timber deck. These girders should always be included in element 111 (Timber Girder) and have standard girder numbering.

### SISTER GIRDERS WITH PROPERLY DOCUMENTED INSTALLATIONS

To address deficiencies in live load, some steel sister girders have been recently installed by MDT Maintenance. These installations have been documented in the SMS repairs tab and include a completed post rehab inspection and an updated load rating. The post rehab inspection should have a comment about the timber girder quantity in the inspection comments. If the comment in the post rehab inspection indicates that the original timber girder was determined to have the ability to carry load during the post rehab inspection, include it in the element quantity. If it is not apparent in the comments of the post rehab inspection whether the original girder was determined to have the ability to carry load or if there is additional deterioration that is discovered during an inspection on the original timber girder, use inspection experience and best judgement to determine if the girder can carry load and if so, include the original girder in the element quantities.

### SISTER GIRDERS WITH NO DOCUMENTED INSTALLATIONS

Original timber girders that have a sister girder with no properly documented repair in SMS should be evaluated on an individual basis for their ability to carry load. If the original girder is broken, cracked, or deteriorated to the point that it no longer has any capacity to carry load, do not include the

girder in the element quantity. This determination should be based on MDT timber inspection guidance, inspection experience, and an inspector's best judgement. Although girders that are determined to have no capacity are not to be included in timber girder element quantity, they should still have their defects noted in the inspection (see *Documentation of Girders Not Included In Element Quantity* for more details). If there are defects that affect the shear or moment capacity, but the girder still has capacity to carry some load, include the original girder in the element quantity. Document the deteriorated girder that is suspected to have some capacity with adequate photos, comments, and descriptions. This will allow the Load Rating Engineer to use the MDT Interim Guidance memo *Load Rating of Timber Bridges* and engineering judgement to determine the appropriate allowable capacity to assign to the girder.

## DOCUMENTATION OF GIRDERS NOT INCLUDED IN ELEMENT QUANTITY

Document defects on original girders that are not included in the timber girder element quantity (because they have been determined to have no capacity to carry load) in the inspection using the appropriate condition state 4 defect. These defects do not count toward the defect quantity, and if they are the only girder with a specific defect, a quantity of 0 (zero) should be entered into that defect quantity. These defects also should not be considered when assessing the superstructure NBI rating. Include comments and photos about the girder in the defect, including the location of the original and sister girder, the defect on the girder, reason for no capacity determination, photo(s) showing the defect, and photo(s) showing the overall location of the sister girder.

Example Comment:

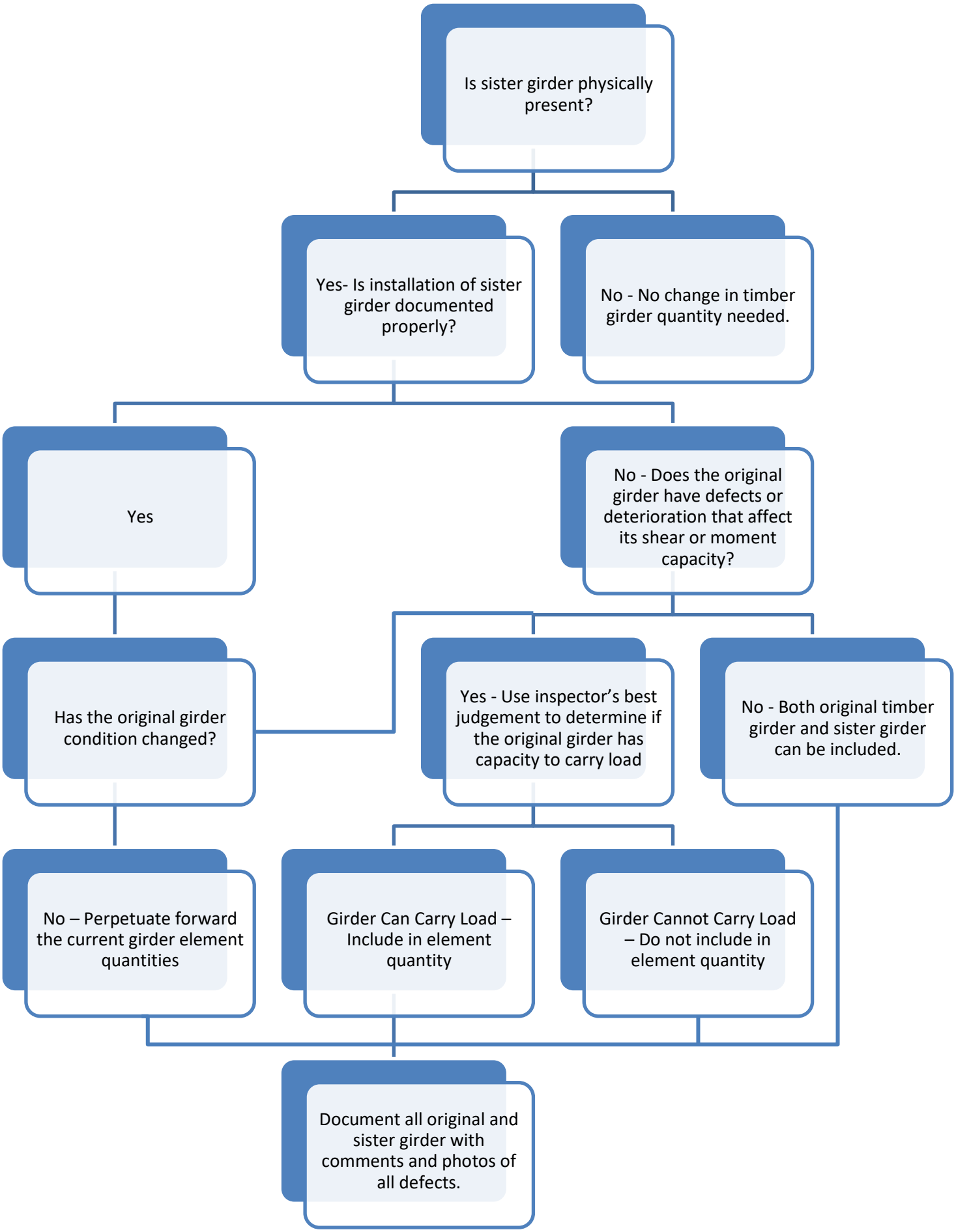
*Span X Original Girder X has a sister girder on the (Right/Left) due to a (Describe defect) in the original timber girder. This girder has not been included in the element quantity due to the defect and is not included in the defect quantity.*

## SISTER GIRDER NAMING CONVENTION

Girders with sister girders have a different naming convention than what has been done in the past. Use the following naming convention to number bridge girders with sister girders. The original girder number should always remain the same, however, the sister girder will have a name corresponding to the original girder number and what side (right or left) the sister girder is on. For example, if the original girder 7 has a sister girder on the right the sister girder would have the name G7R. The sister girder will have this name regardless of the condition of the original timber girder and whether the original girder is included in the element quantities. Right and left denotations are determined when looking in the direction of the bridge inventory direction. See *Bridge Inventory and Nomenclature Memo* for more information on bridge inventory direction and how to determine the direction.

## BEST PRACTICES - DOCUMENTATION OF SISTER GIRDERS

- Measurement Sheets
    - Include all original and sister girders
    - When new sister girder is added measure and update bridge measurement forms
    - For bridges with multiple sister girders, attach a plan view sketch that shows all existing girders (original and sister) and indicates whether they are included in the element quantities or not.
    - Nomenclature should match the *Sister Girder Naming Convention*
- Inspection
    - Document with comments and photos the condition of all original girders (that have sister girders) and sister girders during every inspection.
    - Include photos and comments to describe the condition of defects and repairs made.
    - Original girders (with sister girders) that are not included in the timber girder element quantities should still have their defects noted and documented with photos.
        - See *Documentation of Girders Not Included In Element Quantity*
- Photos
    - Always include photos to show where a sister girder is relative to the other girders in the span.
    - When documenting with photos physically mark the girder (paint pen, spray paint, chalk, etc…) with its number (Sp2-G4L, Sp1-G7, etc….) prior to taking photo, when possible.


Is sister girder physically present?
Yes- Is installation of sister girder documented properly?
No - No change in timber girder quantity needed.
Yes
No - Does the original girder have defects or deterioration that affect its shear or moment capacity?
Has the original girder condition changed?
Yes - Use inspector's best judgement to determine if the original girder has capacity to carry load
No - Both original timber girder and sister girder can be included.
No – Perpetuate forward the current girder element quantities
Girder Can Carry Load – Include in element quantity
Girder Cannot Carry Load – Do not include in element quantity
Document all original and sister girder with comments and photos of all defects.