

TRAIL BRIDGE INSPECTION

BRIDGE INSPECTION PROCEDURES



Objectives:

- Learn the different inspection methods
- Learn a standard procedure to conduct routine bridge inspection
- Learn what to look for during an inspection

Bridges Inspection Methods

- There are three basic methods used to inspect a timber bridge.
- They include:
 - Visual
 - Physical
 - Advanced inspection techniques

Visual Inspections

For timber members, visual inspections reveal areas that need further investigation such as checks, splits, shakes, fungus decay, deflection, or loose fasteners.

Types of Visual Inspections

■ Cursory Inspection

- Involves reviewing the previous inspection report and visually examining the members
- Involves a visual assessment to identify obvious defects

■ “Hands-on” Inspection.

- Requires the inspector to visually assess all defective timber surfaces at a distance no further than an arm’s length
- Timber surfaces are given close visual attention to quantify and qualify any defects.

Physical Examination

- Once the defects are identified visually
- Physical procedures are then used to find out the extent of the deterioration or decay
- The basic methods for physical examination are:
 - Pick Test
 - Sounding

Pick Test

- Probing with a pointed tool such as an awl will locate decay near the wood surface.
- Decay will be evidenced by excessive softness or lack of resistance to the probe penetration and the breakage pattern of the splinters.
- A brash break indicates decayed wood, whereas a crisp splintered break with the splinter hinging from one end indicates sound wood.

Pick Test



Decayed wood breaks abruptly across grain without splintering.



Sound wood pries out as long splinters.

Sounding

- Sounding the surface by striking it with a hammer is one of the oldest and most commonly used inspection methods.
- Although sounding is widely used, interpretation is VERY subjective.
- Soundings are based on the tonal quality of the ensuing sounds and the rebound of the hammer
- Practical experience has shown that sounding is only useful for members less than 4 inches thick.

Sounding

Interpreting Soundings:

- Sound timber gives a crisp sound.
- Defective timber gives a dull sound.
- Loose hardware will vibrate.

Note: A 2 inch thick shell of competent wood is sufficient to mask any interior rot.



Advanced Inspection Techniques

- Other types of advanced inspection techniques are:
 - Coring and Drilling
 - Resistograph Drill
 - Stress Wave Meter
 - Moisture Meter
- These techniques are beyond the scope of this training course.

General Bridge Inspection Procedures

The bridge inspection procedure should be completed *by the numbers*.

Which means the bridge is inspected in a methodical way from either top to bottom or bottom to top.

It is important to document the inspection.

General Bridge Inspection Procedures

Documentation should include:

- An inspection report and notes
- And lots of photographs

Photographs should be a minimum of 10 pictures with additional pictures of problem areas.

General Bridge Inspection Procedures

Minimum required photographs:

- 1) Near approach looking at the bridge
- 2) Far approach looking at the bridge
- 3) Bridge deck and railing
- 4) Underside of the deck and beams
- 5) Upstream looking downstream at the bridge
- 6) Downstream looking upstream at the bridge
- 7) Looking upstream from the bridge
- 8) Looking downstream from the bridge
- 9) Near side substructure
- 10) Far side substructure

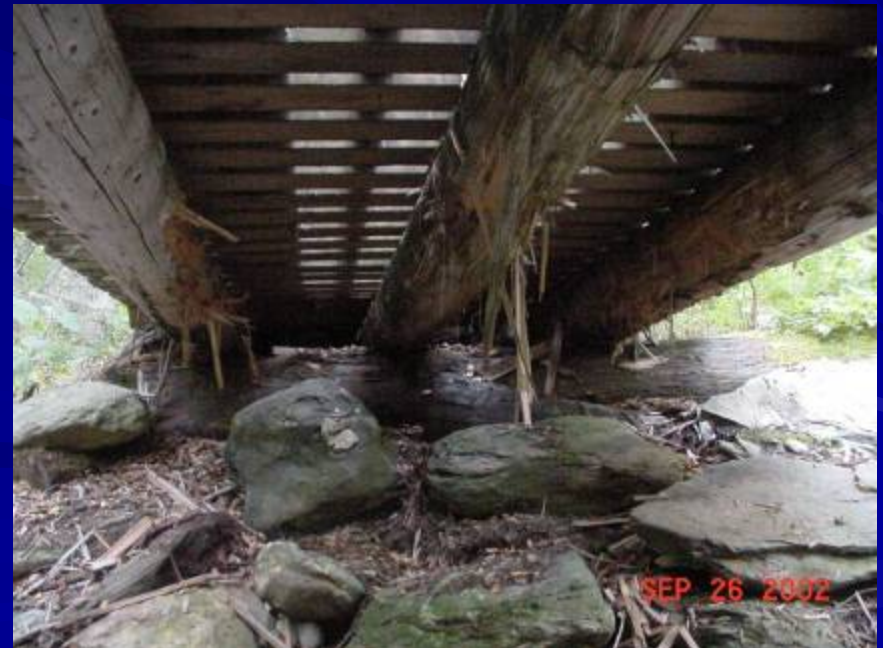
Near and far approaches looking at the bridge



Bridge Deck and Railing



Underside of Deck and Beams



Looking upstream and downstream from the bridge deck



Looking upstream and downstream at the bridge



Looking at right and left abutments



Additional Photos



- Anything that needs to be noted or watched.

Starting an Inspection

First conduct a cursory visual inspection of the entire bridge looking for indications of problems.

Cursory Visual Inspection

Look for:

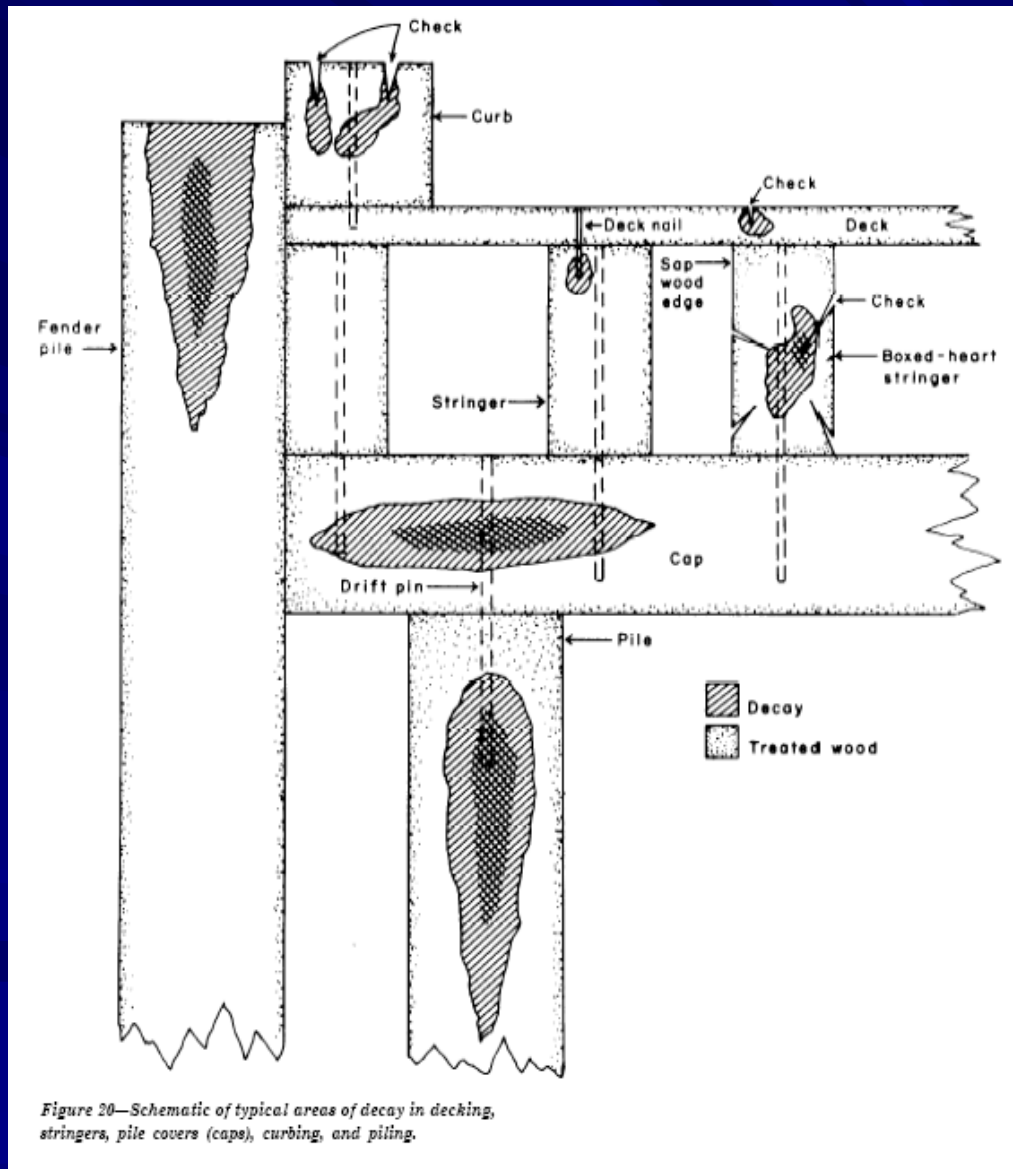
- Sagging or twisted beams
- Hanging or broken beams
- Pounding water
- Settlement



Next, conduct a hands-on visual inspection of the bridge parts taking into account any indications of problem found during the cursory inspection.

During the hands-on visual inspection, the inspector should look for signs of deterioration or decay that will require a physical examination.

Where to look for decay?



Where to look for decay?

- Around Checks
- Around Splits
- Around Shakes
- Around Cracks
- Around Fasteners
- Areas in contact with soil
- Areas where debris and water collect

Conduct the inspection

BY THE NUMBERS

Start at the top of the bridge and work your way down the load paths. This will help you from missing any parts of the structure.

One Inspection order could be:

1. Railings/curbs
2. Decking (Planks)
3. Superstructure (Beams, Stringers)
4. Substructure (Abutments, Sills)
5. Channel
6. Approaches
7. Signage

General Bridge Inspection Procedures

1) Inspection of railings/curbing

Things to looking for?

- Missing rails, posts, curbs or hardware
- Broken rails, posts or curbs
- Deteriorated (rotten) rails, posts or curbs

1) Inspection of railings/curbing

- Missing rails, posts, curbs or hardware



1) Inspection of railings/curbing

- Broken rails, posts or curbs



1) Inspection of railings/curbing

- Deteriorated (rotten) rails, posts or curbs



General Bridge Inspection Procedures

2) Inspection of decking

Things to looking for?

- Missing planks or hardware
- Broken planks or hardware
- Deteriorated (rotten) planks
- Wear of the deck
- Debris on deck

2) Inspection of decking

- Missing planks or hardware



2) Inspection of decking

- Broken planks or hardware



2) Inspection of decking

- Deteriorated (rotten) planks



2) Inspection of decking

- Wear of the deck



2) Inspection of decking

- Debris on deck



General Bridge Inspection Procedures

3) Inspection of superstructure

Things to looking for?

- Sagging beams
- Broken or cracked beams
- Missing hardware
- Deteriorated (rotten) beams
- Impact damage of beams from floating debris or ice

3) Inspection of superstructure

- Sagging beams



3) Inspection of superstructure

- Broken or cracked beams



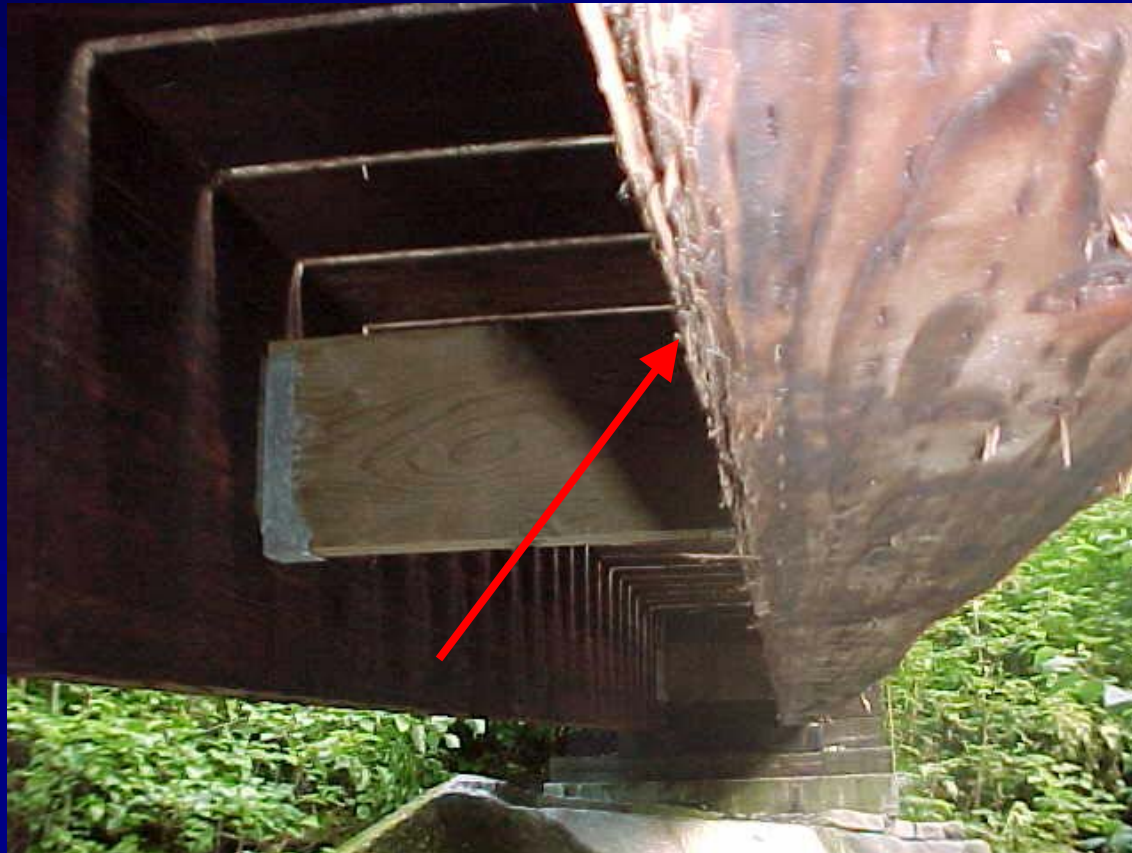
3) Inspection of superstructure

- Deteriorated (rotten) beams



3) Inspection of superstructure

- Impact damage of beams from floating debris or ice



General Bridge Inspection Procedures

4) Inspection of substructure

Things to looking for?

- Settlement of the substructure
- Missing substructure or hardware
- Deteriorated (rotten) substructure
- Damage of substructure from floating debris or ice
- Scour damage

4) Inspection of substructure

- Settlement of the substructure



4) Inspection of substructure

- Deteriorated (rotten) substructure



4) Inspection of substructure

■ Scour damage



4) Inspection of substructure

Other things to look for:

- Missing substructure or hardware
- Damage of substructure from floating debris or ice

General Bridge Inspection Procedures

5) Inspection of the Channel

Things to looking for?

- Degrading of the stream (down cutting)
- Aggrading of the stream (deposits)
- Scour of the banks
- Loss of bank protection
- Floating debris or Ice damage

General Bridge Inspection Procedures

6) Inspection of approaches

Things to looking for?

- Approach material washed away
- Slumping of the approaches at the backwall
- Unraveling at the edges of trail
- Potholes

General Bridge Inspection Procedures

7) Inspection of signs

Things to looking for?

- Broken or damaged signs and posts
- Don't forget to count the bullet holes
- Missing fasteners
- Missing signs/object markers for ATV and Snowmobile bridges

References

- FHWA *Bridge Inspection Reference Manual*
- FHWA *Field Manual for Timber Bridge Inspection, Draft*
- FPL *Controlling Decay in Water Front Structures*
- FPL *Timber Bridges Design, Construction, Inspection and Maintenance*
- FPL *Wood Handbook*
- FPS *Wood and Timber Condition Assessment Manual*
- R6 Trail Bridge Inspection
- R10 Training PowerPoint's

End

Bridge Inspection Procedures