

# **Inspections Start to Finish: Prep, Access, Safety, & Component Rating**

**Rob Coop, PE** *Bridge Inspection Department Manager, USI*

**Jake Gould, PE** *Bridge Inspection Area Engineer, Indiana Department of Transportation*

# Inspection Preparation

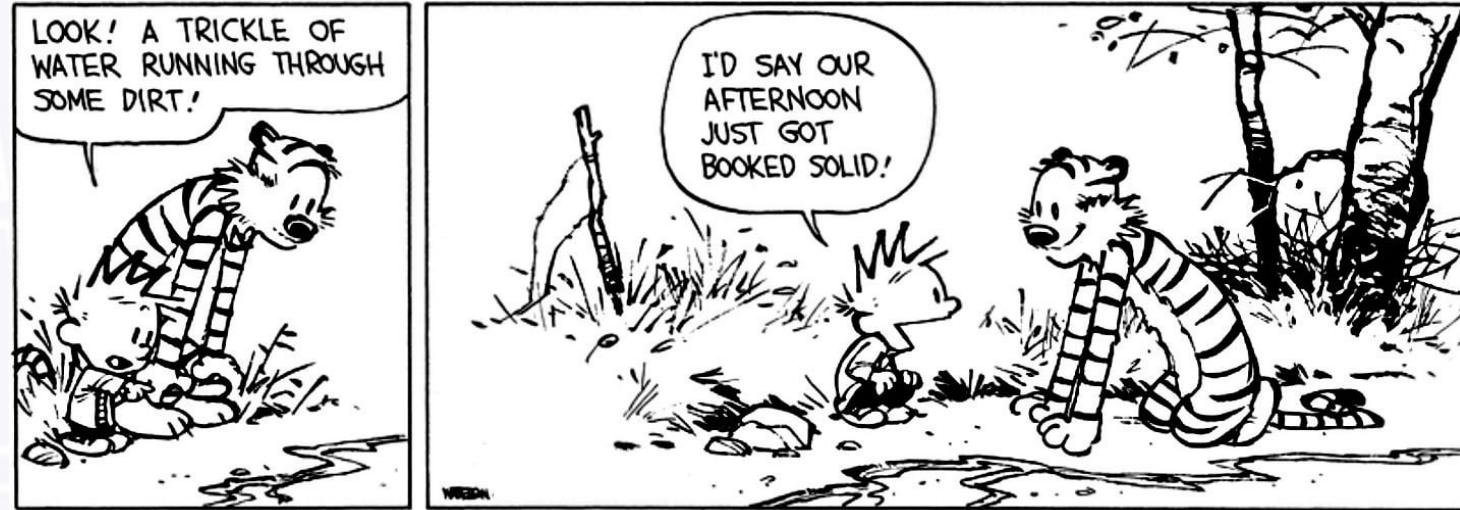
- Review plans and relevant files
- Review history of the bridge
  - Previous inspection reports
- Team's plan of attack
  - Assigned structures vs. not
- All contacts updated for critical finds, maintenance, bridge owners, etc.
- Internal Critical Finding SOP that includes:
  - Who to contact and how
  - Information to be collected and reported
- Do you have cell signal?





# Access Considerations

- ADT
- Roadway Features
- Large waterways
  - Kayaks, drones, boats, etc.
  - Schedule a follow-up inspection if needed.
- Railroads
  - IC 8-3-15 states a representative of INDOT may access the railroad.
  - Do not linger or cause problems. Leave and come back if needed.
- Right-of-Way
  - IC 8-23-7-26 State law allows off R/W work





# Access Considerations

## Right-of-Way

- State vs. local
- Fences, parking, shoulders, or lack thereof, etc.





# Safety Considerations

- Working in a team
  - Follow organizational rules
- Safety briefings
- Surrounding construction and lane closures
  - See Temporary Workzone Manual for guidance
- Specialized access equipment
  - Under bridge access trucks, kayaks
- Avoiding Hazards
  - Electric Fences
  - Water
  - Homeless People





# Safety & Access Considerations

MEWP Certification  
Traffic Control





# Safety & Access Considerations



# Condition Rating Descriptions

Table 20 in SNBI used for B.C.01 thru B.C.07

Severity

Extent

Strength/Performance

Code	Condition	SNBI Description
N	NOT APPLICABLE	Component does not exist.
9	EXCELLENT	Isolated inherent defects.
8	VERY GOOD	Some inherent defects.
7	GOOD	Some minor defects.
6	SAT.	Widespread minor or isolated moderate defects.
5	FAIR	Some moderate defects; strength and performance of the component are NOT affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance IS affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.
1	IMMINENT FAILURE	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.
0	FAILED	Bridge is closed due to component condition and is beyond corrective action. Bridge replacement is required to restore service.



# Condition Rating Descriptions

## Rating Chart (Unofficial) – Severity and Extent

SNBI Table 20 Expanded			SEVERITY *				
			INHERENT	MINOR	MODERATE	MAJOR	STRENGTH / PERFORMANCE AFFECTED?
G O O D	9	Excellent	Isolated				
	8	Very Good	Some				
	7	Good		Some			
F A I R	6	Satisfactory		Widespread	Or Isolated		
	5	Fair			Some		No
P O O R	4	Poor**			Widespread	Or Isolated	And Yes
	3	Serious				✓	Seriously
	2	Critical				✓	Compromised
	1	Imminent Failure				✓	Bridge Closed (Restorable)
	0	Failed				✓	Bridge Closed (Not Restorable)
	N	Not Applicable	-	-	-	-	-

\* Refer to SNBI Item Commentary and Appendix C for Rules and Clarification

\*\* The Whole Description Must Read True to Report '4-Poor'



# Example #1: 02-00340 (Allen 340)

- Single Span Corrugated Metal Pipe



East Elevation



Interior of Structure



# Example #1: 02-00340 (Allen 340)

- Condition Pictures



Rust Through at the Waterline



# Example #1: 02-00340 (Allen 340)

- Condition Pictures



Rust Through at the Waterline



# Example #1: 02-000340 (Allen 340)

---

- Previous (62) Culvert rating: ??
- Comments:
  - Rust through (~1/3 the length) along the flow line at the south end of the structure. Backfill is seeping through the holes and riprap has been displaced. Rust through hole through the top of the structure near the outlet. Possible crushing at ~20' from the outlet.

<u>Code</u>	<u>Condition</u>	<u>SNBI Description</u>
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.



# Example #1: 02-000340 (Allen 340)

- Comparing NBI vs. SNBI

<u>Code</u>	<u>Condition</u>	<u>SNBI Description</u>	<u>NBI Description</u>
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.	(ADVANCED LOSS TO PRIMARY STRUCTURE, MAY CLOSE BRIDGE) Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.



# Example #2: 77-00197 (Sullivan 197)

- Three span, prestressed concrete I-Beam (6) bridge with an RC deck
- Posted 10 Tons (Commercial)



Pier 3 and Span B Superstructure



Coping Edge of the Structure



# Example #2: 77-00197(Sullivan 197)

- Condition Pictures



Bent 4 and Span C Superstructure with a Surprise



Exposed Strands at Beam 3C (North)



# Example #2: 77-00197(Sullivan 197)

---

- Previous (59) Superstructure rating: ??
- Comments:
  - Beam 3 has failed at Bent 4 with heavy spalling (~4' long) that has exposed most of the strands at the end of the beam. The exposed strands and rebar have minor surface rust. The spalling has also occurred at the end diaphragms in this location. No other problems were noted in the other beams.

Code	Condition	SNBI Description
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.
1	IMMINENT FAILURE	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.
0	FAILED	Bridge is closed due to component condition and is beyond corrective action. Bridge replacement is required to restore service.

# Example #2: 77-00197(Sullivan 197)

- Comparing NBI vs. SNBI

Code	Condition	SNBI Description	NBI Description
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.	(ADVANCED LOSS TO PRIMARY STRUCTURE, MAY CLOSE BRIDGE) Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	IMMINENT FAILURE	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.	(BRIDGE CLOSED, PENDING CORRECTIVE ACTION) Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.



# Example #3: 07-00020 (Brown 20)

- Three span continuous steel stringer (4) bridge



North Elevation



Typical Underside of Structure



# Example #3: 07-00020 (Brown 20)

---

- Condition Pictures



Bent 1 with Retrofit



Rust Through of Beam 1A



# Example #3: 07-00020 (Brown 20)

---

- Condition Pictures



Rust Through of Beam 3C



Rust Through of Beam 4C



# Example #3: 07-00020 (Brown 20)

---

- Previous (59) Superstructure: ??
- Comments:
  - All beams have rust through along the bottom of the web at each end of the bridge. Rust through is approximately 8' long from the bearings. Diaphragms have also rusted through at the end bents. Moderate pitting is present throughout the remainder of the superstructure. Each end bent has temporary shoring repairs.

Code	Condition	SNBI Description
5	FAIR	Some moderate defects; strength and performance of the component are not affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.



# Example #3: 07-00020 (Brown 20)

- Comparing NBI vs. SNBI

Code	Condition	SNBI Description	NBI Description
5	FAIR	Some moderate defects; strength and performance of the component are not affected.	(MINOR SECTION LOSS) All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.	(ADVANCED LOSS TO PRIMARY STRUCTURE, MAY CLOSE BRIDGE) Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.



# Example #4: 142-55-07194 A

- Three span reinforced concrete slab bridge



North Elevation



Pier 3 and Span B Superstructure



# Example #4: 142-55-07194 A

- Condition Pictures



Minor Cracking and Delaminations in the Center of Slab



Exposed Steel in Span A, South Coping



# Example #4: 142-55-07194 A

- Condition Pictures



Exposed Steel in Span C, South Coping



# Example #4: 142-55-07194 A

---

- Previous (59) Superstructure:
- Comments:
  - The copings of the slab have several areas of delaminations around the drains while there are a few areas with large areas of exposed steel. The interior of the slab has minor longitudinal cracking and/or delaminations.

Code	Condition	SNBI Description
7	GOOD	Some minor defects.
6	SATISFACTORY	Widespread minor or isolated moderate defects.
5	FAIR	Some moderate defects; strength and performance of the component are not affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.



# Example #4: 142-55-07194 A

- Comparing NBI vs. SNBI

Code	Condition	SNBI Description	NBI Description
7	GOOD	Some minor defects.	Some minor problems
6	SATIS.	Widespread minor or isolated moderate defects.	(MINOR DETERIORATION) Structural elements show some minor deterioration.
5	FAIR	Some moderate defects; strength and performance of the component are not affected.	(MINOR SECTION LOSS) All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.



# Example #5: 45-00084 (Lake 84)

- Single span prestressed concrete box beams on timber pile bents
- Posted 12 Tons Commercial
- Posted 16 Tons, 28 Tons, and 39 Tons for Emergency Vehicles



North Elevation



East Bent



# Example #5: 45-00084 (Lake 84)

- Condition Pictures



Pile 3 on East Bent



Pile 7 on East Bent



Pile 7 on East Bent



# Example #5: 45-00084 (Lake 84)

- Condition Pictures



East Bent Piles



Piles 6 and 7 on East Bent



# Example #5: 45-00084

- Previous (60) Substructure: ???
- Comments:
  - Both End Bents
    - Temporary supports/sheet piling driven behind backwalls.
    - Rot in backwall planks at ends & ground line
    - Pile lateral bracing timbers are detached at both end bents.
    - Both end bents have rot in backwall planks & ground line.
    - Minor splitting in piles throughout.
    - Opening between west bent backwall and southwest wingwall timbers allowing southwest shoulder material to spill through. Separation at the northeast wingwall.
  - West End Bent
    - West Bent backfill planks are bowing towards stream from the south end to Pile 5. The top plank is tilted from the stream.
    - Pile 1 has a large split on the upper half.
    - Pile 2 at has a 2.5" wide split at the top. The rear portion has buckled and the front portion is pushing toward the stream.
    - Pile 3 has failed with 100% section loss at the center and has significant crushing.
  - East End Bent
    - Pile 2 is large split and rotted from the center at the lateral bracing connection with ~60% section loss.
    - Pile 6 has large splits and is starting to crush. It is rotted from the center with ~75% section loss.
    - Pile 7 has significantly split, crushed, and partially buckled with ~85% section loss.

Code	Condition	SNBI Description
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.



# Example #5: 45-00084 (Lake 84)

- Comparing NBI vs. SNBI

Code	Condition	SNBI Description	NBI Description
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.	(ADVANCED LOSS TO PRIMARY STRUCTURE, MAY CLOSE BRIDGE) Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	IMMINENT FAILURE	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.	(BRIDGE CLOSED, PENDING CORRECTIVE ACTION) Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.



# Example #6: 61-00020 (Parke 20)

- Three span reinforced concrete channel beam bridge
- Posted 13 Tons



North Elevation



Underside of Deck



# Example #6: 61-00020 (Parke 20)

---

- Condition Pictures



Wearing Surface



Exposed Steel that has been Partially Repaired



# Example #6: 61-00020 (Parke 20)

---

- Condition Pictures



Underside of the Deck



Underside of the Deck with a Minor Spall with Exposed Steel



# Example #6: 61-00020 (Parke 20)

- Previous (58) Deck: ???
- Comments:
  - There is debris that has gathered in the gutters and drains. The deck tends to hold water. There is severe abrasion & scaling in top of the beams which covers ~93 SFT (8.2%) of the top of beams. There is heavy spalling with exposed longitudinal and transverse steel on Beams 2B & 3B. The underside of the deck has hairline cracking throughout as well as one minor spall with exposed steel.

Code	Condition	SNBI Description
5	FAIR	Some moderate defects; strength and performance of the component are not affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.



# Example #6: 61-00020 (Parke 20)

- Comparing NBI vs. SNBI

Code	Condition	SNBI Description	NBI Description
5	FAIR	Some moderate defects; strength and performance of the component are not affected.	(MINOR SECTION LOSS) All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restriction, and/or corrective actions to keep the bridge open.	(ADVANCED LOSS TO PRIMARY STRUCTURE, MAY CLOSE BRIDGE) Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.



# Example #7: 90-00090 (Wells 90)

- Single span reinforced concrete under-fill arch



South Elevation



East Abutment



# Example #7: 90-00090 (Wells 90)

- Condition Pictures



Exposed Steel on NE Coping



Spalling on the Southeast Coping



East Abutment



# Example #7: 90-00090 (Wells 90)

---

- Previous (62) Culvert: ???
- Comments:
  - Northeast interface of the arch ring and spandrel wall has heavily spalled with exposed steel having over 50% section loss. The spall measured 12” deep x 18” wide x 18’ long. The southeast corner is spalling with exposed steel. The spall measured 10’ long. The center of the arch has minor cracking and spalling. The concrete railing has minor spalling. The copings below the railings have minor spalling.

Code	Condition	SNBI Description
5	FAIR	Some moderate defects; strength and performance of the component are not affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.



# Example #7: 90-00090 (Wells 90)

- Comparing NBI vs. SNBI

Code	Condition	SNBI Description	NBI Description
5	FAIR	Some moderate defects; strength and performance of the component are not affected.	(MINOR SECTION LOSS) All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.



# Example #8: I70-154-04534 BEBL

- Five span steel beam / prestressed concrete I-beam bridge with reinforced concrete end bents and reinforced concrete pier columns with bent cap



North Elevation



Pier 5



# Example #8: I70-154-04534 BEBL

- Condition Pictures



Bent 2, Column 2



Bent 2, Column 3



Bent 2, Column 4



Bent 2, Column 5



# Example #8: I70-154-04534 BEBL

- Condition Pictures



Pier 2



Exposed Steel on the Pier 2 Cap



# Example #8: I70-154-04534 BEBL

- Condition Pictures



Pier 5



Pier 5 with Exposed Steel



# Example #8: I70-154-04534 BEBL

---

- Previous (60) Substructure: ???
- Comments:
  - West end bent has moderate horizontal cracks with leaching, delaminations, & minor spalls with exposed steel.
  - Bent #2 cap has heavy spalling with exposed steel as well as heavy cracking on the bottom edge. The columns all have heavy spalling with exposed steel (especially north column that has section loss to the main vertical bar).
  - Bent #5 cap has heavy spalling with exposed steel and delaminations throughout

Code	Condition	SNBI Description
6	SATIS.	Widespread minor or isolated moderate defects.
5	FAIR	Some moderate defects; strength and performance of the component are not affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.



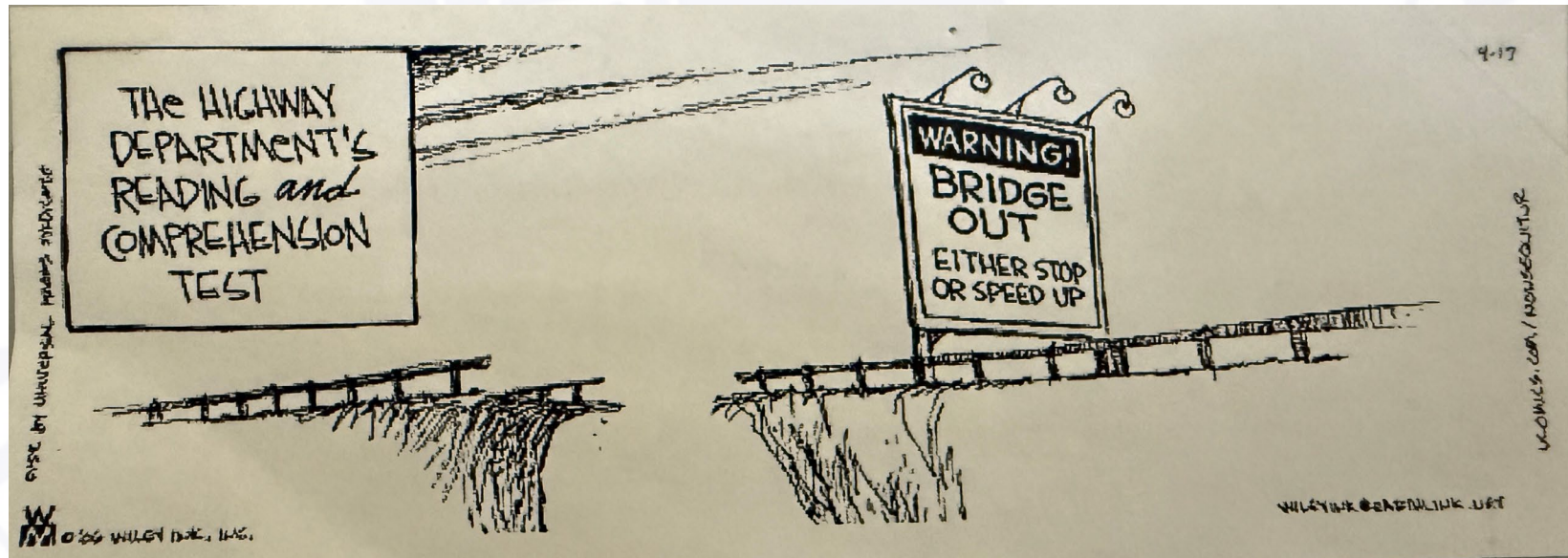
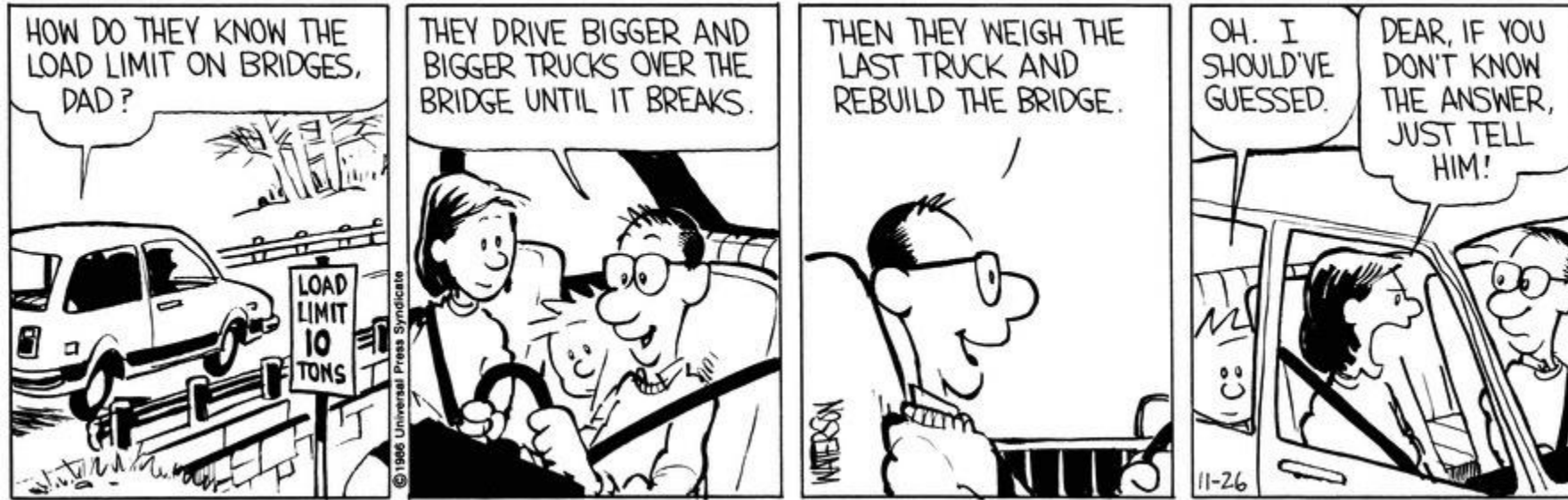
# Example #8: I70-154-04534 BEBL

- Comparing NBI vs. SNBI

Code	Condition	SNBI Description	NBI Description
6	SATIS.	Widespread minor or isolated moderate defects.	(MINOR DETERIORATION) Structural elements show some minor deterioration.
5	FAIR	Some moderate defects; strength and performance of the component are not affected.	(MINOR SECTION LOSS) All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance is affected.	(ADVANCED DETERIORATION) Advanced section loss, deterioration, spalling, or scour.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restriction, and/or corrective actions.	(PRIMARY STRUCTURE AFFECTED) Loss of section, deterioration, spalling, or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.



# Education Break





# The Not Quite End

---





# The End

---

