

NBI Component Condition Ratings: Consistent 0–9 Ratings

The 0–9 component condition rating is still the backbone of the National Bridge Inventory and federal performance measures. This course builds consistent rating practice for deck, superstructure, substructure and culvert.

Learning objectives

- Apply the 0–9 condition rating scale
- Relate ratings to Good/Fair/Poor classification
- Avoid common rating inconsistencies
- Link ratings to federal performance measures

The 0–9 scale

Component ratings describe overall condition: 9 Excellent, 8 Very Good, 7 Good, 6 Satisfactory, 5 Fair, 4 Poor, 3 Serious, 2 Critical, 1 Imminent Failure, 0 Failed. Lower ratings indicate loss of section, deterioration or distress affecting structural capacity, with 3 and below indicating serious structural concern and 2 and below requiring immediate attention or closure considerations. The SNBI (FHWA-HIF-22-017) continues 0–9 component condition ratings with refined descriptions.

Good / Fair / Poor classification

Under 23 CFR 490 Subpart D, a bridge's classification is based on the *lowest* of deck, superstructure, substructure (or culvert) rating: **Good** when the lowest is 7 or greater, **Fair** when 5 or 6, **Poor** when 4 or less. States report the percentage of NHS deck area in Good and Poor condition, and minimum condition requirements apply to NHS bridges classified Poor.

Rating with consistency

- Rate the component based on the condition of the *whole* component, considering the severity and extent of the worst problems and their effect on capacity.
- Localized severe defects can control the rating when they affect load-carrying capacity (e.g., a severed strand bundle in one beam).
- Do not rate on age or appearance alone; a 70-year-old bridge with sound members can rate 6 or 7.
- Use the previous report as context, but rate what you see today and explain changes.
- Element data and component ratings should tell the same story.

Why ratings matter downstream

A rating of 3 or less forces a 12-month routine interval (23 CFR 650.311(a)(1)(ii)); 2 or less is a minimum critical finding trigger (650.313(q)); under Method 1, deck, superstructure and substructure (or culvert) all coded 6 or greater is one of several criteria that must all be met for an extended interval of up to 48 months (650.311(a)(1)(iii)); it is necessary but not sufficient on its own. Ratings also drive federal performance measures, funding eligibility analyses and condition-based re-rating decisions under agency load rating policies.

Common rating errors

- **OVERRATING DECKS UNDER OVERLAYS** — inspect the underside and consider delamination history.
- **RATING THE SUBSTRUCTURE ON THE WORST PILE ONLY** without considering redundancy and extent — or the opposite, ignoring a pile that is lost through.
- **IGNORING SCOUR** in substructure ratings when undermining is observed.
- **UNEXPLAINED JUMPS** of two points without repair — document the reason.

Example: prestressed box beams with longitudinal cracking and rust staining on two beams and one exposed corroded strand: often a 5 or 4 depending on extent and capacity effect, with load rating review requested.

Part A — Learning objectives and how to use this course

By the end of this course you should be able to:

- Explain what each point on the 0–9 component condition scale means in practical, field-observable terms.
- Rate decks, superstructures, substructures and culverts consistently, considering both the severity and the extent of deterioration.
- Identify when a single localized defect should control a component rating and when it should not.
- Classify a bridge as Good, Fair or Poor and explain how that classification feeds federal performance measures.
- Recognize how a rating triggers downstream actions: inspection intervals, load rating review, and critical findings follow-up.
- Write a short, defensible rating justification that a reviewer or the next inspector can follow.

The course is built around worked rating examples. Read each scenario, decide on your own rating before reading the discussion, and compare your reasoning. Rating is a judgment skill, and the goal is calibrated judgment, not memorized numbers.

Part B — Reading the scale in field terms

The coding guides give general descriptions for each rating. The table below restates them in terms an inspector can apply on site. Always use your owner's adopted descriptions; the SNBI (FHWA-HIF-22-017) contains the current federal descriptions and component-specific guidance.

Rating	Name	Typical field picture
9	Excellent	New or like-new; isolated, inconsequential construction-related marks only.
8	Very Good	No problems noted beyond very minor, isolated items.
7	Good	Some minor problems: hairline cracking, minor efflorescence, light rust staining, minor coating breakdown.
6	Satisfactory	Structural elements show some minor deterioration: limited spalls, isolated areas of corrosion without meaningful section loss.
5	Fair	Primary elements sound but with minor section loss, cracking, spalling or scour; deterioration is more widespread but not yet affecting capacity meaningfully.
4	Poor	Advanced section loss, deterioration, spalling or scour; capacity may be affected and should be considered in load rating.

Rating	Name	Typical field picture
3	Serious	Loss of section, deterioration or scour has seriously affected primary members; local failures are possible; fatigue cracks in steel or shear cracks in concrete may be present.
2	Critical	Advanced deterioration of primary members; cracks or scour may have removed substructure support; unless closely monitored the bridge may need to be closed until corrective action.
1	Imminent failure	Major deterioration or section loss in critical members, or obvious movement affecting stability; closed to traffic but corrective action could restore light service.
0	Failed	Out of service; beyond corrective action.

The two questions behind every rating

Every rating decision comes down to two questions: **how bad** is the worst deterioration (severity), and **how much** of the component is affected (extent)? A third question tempers both: **does it matter structurally**? A large area of surface scaling on a deck may be widespread but structurally minor; a single cracked steel girder flange is local but structurally significant.

The 7/6 and 5/4 boundaries matter most

Because of the Good/Fair/Poor classification, the boundaries between 7 and 6 and between 5 and 4 carry the most programmatic consequence. A deck that moves from 5 to 4 can turn the whole bridge Poor and change how it is counted in federal performance measures. Take extra care at these boundaries and document your reasoning.

Part C — Rating the deck

The deck rating covers the structural deck, including the riding surface where the deck itself is the riding surface. Joints, railings, curbs and drainage are not rated as part of the deck component, though their condition can affect it (for example, a leaking joint causing deterioration of the deck end).

What to look at

- **Top surface:** spalls, patches, potholes, cracking pattern and density, scaling, wear. Under an overlay, look for overlay cracking that reflects deck movement, and for patching history.
- **Underside:** often the most honest view of a concrete deck. Look for efflorescence, rust staining, map cracking, delaminations and spalls with exposed reinforcement, and full-depth patches or holes.
- **Stay-in-place forms:** they hide the underside. Look for rust, staining and seepage at seams, and note the limitation.
- **History:** NDE surveys, previous patching quantities, and element data showing trends.

Rating considerations

Observation	Rating tendency
Hairline cracking, no rust staining, no spalls	7
Cracking with some efflorescence; a few small spalls or sound patches (under ~2% of area)	6
Spalls and delaminations more widespread (roughly a few percent to ~10% of area); rust staining on underside	5
Extensive spalling/delamination, exposed corroded rebar with section loss, temporary patches failing; deck replacement or rehabilitation needed	4

Observation	Rating tendency
Full-depth failures or holes, punching risk	3 or lower

The percentages are illustrative rules of thumb that some owners use, not federal thresholds. Use your owner's guidance where it exists.

Worked example 1 — Overlaid deck

A 1975 concrete deck with a 1998 asphalt overlay. The overlay shows longitudinal and transverse cracking with some patched potholes. The underside shows map cracking with efflorescence over about 20% of the bays and three small spalls exposing rebar with light rust. A 2019 GPR survey estimated deterioration in about 12% of the deck area. *Discussion:* The underside and GPR together indicate deterioration beyond isolated areas. The top cannot be seen directly. A rating of 5 is defensible; 4 would be supported if there were extensive exposed rebar with section loss or failing patches. Document the overlay limitation and the GPR result.

Worked example 2 — Bare deck, new cracking

A 2012 bare deck shows transverse cracks at about 4 ft spacing over the full length, hairline to 0.012 in, with no efflorescence or staining on the underside. *Discussion:* Early-age shrinkage cracking without signs of corrosion: rating 7. Recommend crack sealing as preservation.

Part D — Rating the superstructure

The superstructure rating covers the primary load-carrying members above the bearings: girders, beams, trusses, floor systems, arches and their connections, as defined by the owner. Bearings are generally considered with the superstructure in the coding guides, though element data record them separately; check your owner's convention.

Material-specific cues

Material	Watch for
Steel	Section loss at beam ends under joints, at fascias and at connections; fatigue cracks at welded details; impact damage; pack rust distorting plates
Prestressed concrete	Longitudinal cracks along strands, spalls exposing strands, broken or corroded strands, impact damage to bottom flanges
Reinforced concrete	Flexural and shear cracking (especially diagonal cracks near supports), spalls, rebar corrosion
Timber	Decay at bearings, crushing, splits, insect damage

Worked example 3 — Steel beam ends

A four-girder rolled-beam bridge with leaking joints. All eight beam ends show corrosion; two have web section loss measured at about 25% over a 6 in by 10 in area above the bearing, with no buckling. The rest of the girders have light rust only. *Discussion:* The section loss is local but sits in a high-shear region. A rating of 5 is typical for minor section loss; with 25% web loss at bearings on two girders, 4 is defensible, and the load rating engineer should evaluate shear capacity.

Recommend joint repair and beam-end repair or cleaning and painting. Note: the rating should reflect the effect on capacity, so the load rating review matters here.

Worked example 4 — Prestressed beam impact

An overheight vehicle struck the fascia prestressed I-beam: a 4 ft spall of the bottom flange with two strands exposed, one visibly severed. The other beams are in good condition. *Discussion:* A severed strand is a loss of prestress force in a primary member. Even though only one beam is affected, the rating may be controlled by the damaged beam: 4 or lower depending on the number of strands lost relative to the total and the engineer's assessment. Report it promptly per the owner's critical-finding or damage procedures and request a load rating evaluation.

Part E — Rating the substructure

The substructure rating covers abutments, piers, bents, piles, footings and the members that support the superstructure, including their foundations. Scour that affects foundation support is part of the substructure condition, even though channel and scour items are also coded separately.

What to look at

- Cracking, spalling and rebar corrosion in caps, columns and abutment walls, especially under leaking joints.
- Settlement, tilt or rotation: check bearing seats, joint openings and the alignment of the railing and deck.
- Pile condition: section loss at the waterline or groundline for steel, decay at the groundline for timber, cracking and spalling for concrete.
- Scour: exposed footings, undermining, exposed piles, and loss of embankment at abutments.

Redundancy and extent

A multi-column pier with one deteriorated column is different from a single-column hammerhead with the same defect. Consider redundancy: how much of the load path is affected, and could the remaining members carry the load? Do not ignore a severely deteriorated member because the rest are good, and do not rate the entire substructure on the worst member without considering its significance.

Worked example 5 — Pile bent

A timber pile bent bridge with five bents of six piles each (30 piles). Two piles in bent 3 have groundline decay with a sound shell of about 2 in on 12 in piles, confirmed by boring. Others are sound. *Discussion:* These two piles have severe section loss. With six piles per bent, the bent may still carry load, but capacity is reduced. A rating of 4 is defensible; 3 if the engineer finds the bent capacity seriously affected. Recommend posting the piles or replacing them soon, and an engineering evaluation.

Worked example 6 — Scour at a pier

Underwater inspection finds a 3 ft deep scour hole on the upstream nose of a spread-footing pier, with the footing exposed and about 2 ft of undermining under the leading edge. The design footing bottom is 4 ft below the original streambed. *Discussion:* Undermining of a spread footing is a direct threat to support. Rating 3 or lower is typical, together with action under the scour Plan of Action, and possibly a critical finding under the owner's procedures. The substructure rating must reflect this even though the concrete itself is sound.

Part F — Rating culverts

Culverts that meet the bridge definition (more than 20 ft along the roadway centerline, including multiple barrels where the clear distance between openings is less than half the smaller opening) receive a culvert rating instead of deck, superstructure and substructure ratings. The culvert rating covers the barrel, headwalls, wingwalls, and conditions such as scour and settlement that affect the structure.

Material	Key rating cues
Corrugated metal	Invert corrosion and perforation, shape deformation (deflection from design shape), seam separation, end damage
Concrete box	Cracking with efflorescence, spalls with exposed rebar, joint separation and infiltration of soil, settlement
Concrete pipe	Cracks, joint offsets, loss of invert, soil infiltration

Worked example 7 — CMP pipe arch

A 12 ft span CMP pipe arch shows heavy invert corrosion with scattered perforations over the outlet half and about 8% deflection of the crown, with roadway settlement visible above. *Discussion:* Perforations combined with deformation and settlement indicate significant distress. Rating 3–4; 3 if the deformation is active or soil loss through perforations is evident. Recommend engineering evaluation and possibly a lining or replacement project.

Part G — Good, Fair, Poor and why one number can move the measure

Under 23 CFR 490, the lowest of the deck, superstructure and substructure ratings (or the culvert rating) decides the classification: 7 or above is Good, 5 or 6 is Fair, 4 or below is Poor. States report the share of NHS bridge deck area in Good and Poor condition.

Worked example 8 — Classification

Bridge	Deck	Super	Sub	Culvert	Lowest	Class
A	7	7	8	N	7	Good
B	5	7	7	N	5	Fair
C	6	4	6	N	4	Poor
D	N	N	N	6	6	Fair

Worked example 9 — Deck-area weighting

A small State NHS inventory has three bridges: 10,000 sq ft (Good), 40,000 sq ft (Fair) and 50,000 sq ft (Poor). Total 100,000 sq ft. Good = 10%, Poor = 50%. If the 50,000 sq ft bridge's lowest rating moved from 4 to 5 after a repair, Poor would drop to 0% and Fair rise to 90%. Large bridges dominate the measure, which is why ratings on major bridges are reviewed so closely.

Part H — Ratings as triggers

Rating outcome	Typical downstream effect
Any component 3 or less	Routine inspection interval no longer than 12 months under the NBIS

Rating outcome	Typical downstream effect
Component ratings at or above the owner's extended-interval criteria	Bridge may be eligible for a longer interval under Method 1 or 2
Rating drop that reflects capacity loss	Load rating review; a new load rating is due within 3 months of the change being identified
Posting needed	Posting within 30 days of the determination
Severe deterioration	Critical finding procedures; possible closure

Check the current regulation text and your owner's procedures for the exact triggers; this table summarizes the relationships covered in BR-I02 and BR-I03.

Worked example 10 — Following the chain

An inspector lowers a superstructure rating from 5 to 4 because of new web section loss at beam ends. The report goes to QC review, which confirms the rating. The program manager sends it to the load rating engineer, who re-rates the bridge within the required period. The new rating shows an operating rating below a legal load, so the bridge is posted within 30 days. Every link in that chain started with one well-documented rating change.

Part I — Writing a rating justification

A rating without reasoning is hard to review, hard to defend, and hard for the next inspector to build on. A short justification should answer four questions:

- 1. **What** is the controlling deterioration?
- 2. **Where** and how much: location and extent, with quantities where possible.
- 3. **So what:** its effect on capacity or serviceability.
- 4. **Change:** what is different from the last inspection, and why.

Weak versus strong justifications

Weak	Strong
"Deck in fair condition."	"Deck rated 5: underside map cracking with efflorescence in ~25% of bays; 6 spalls with exposed rebar, light section loss (total ~40 sq ft, ~1% of area). Was 6 in 2024; spalls are new in bays 3–5 under the leaking joint."
"Steel rusted. Rating 4."	"Superstructure rated 4: girders G1 and G4 have web section loss at the abutment 1 bearings, measured 3/16 in remaining of 3/8 in web over 8 × 12 in (about 50% loss). No buckling. Load rating review requested."
"Same as last time."	"No change from 2024. Pier 2 column crack (0.02 in) re-measured, not growing; crack monitor installed in 2024 shows no movement."

Worked example 11 — Write it

Scenario: a substructure with three RC piers. Pier 2 has a vertical crack in the cap under the joint, 0.03 in wide, with rust staining and a 2 sq ft spall exposing one stirrup with light rust. Abutments and other piers have hairline cracks only. Last rating 6. *Model justification:* "Substructure rated 5 (was 6). Pier 2 cap: vertical crack 0.03 in with rust staining and a new 2 sq ft spall exposing a stirrup with light corrosion, below the leaking joint. Other units: hairline cracking only. No settlement or scour. Recommend joint repair and patching."

Part J — Calibration: why two inspectors disagree

Inspector disagreement is normal but should be small. Studies of visual inspection reliability, including FHWA's research on the reliability of visual inspection, found substantial variability in condition ratings among inspectors viewing the same bridges. Programs reduce variation through training, calibration exercises and QC/QA reviews.

Common sources of variation

- **Anchoring** on the previous rating rather than on current conditions.
- **Different weighting** of severity versus extent.
- **Access differences:** one team had a snooper, the other did not.
- **Material bias:** inspectors may rate unfamiliar materials more harshly or more leniently.
- **Programmatic pressure:** concern about making a bridge Poor, or about the work a low rating generates. Ratings must reflect condition, not consequence.

Worked example 12 — A calibration session

Five inspectors rate the same deck from photos and notes: 6, 5, 5, 5, 4. The facilitator asks the "6" and "4" inspectors to explain. The 6 relied on the top surface, which looks good under a recent overlay; the 4 weighted a past GPR survey heavily. After discussion the group agrees on 5, with the note that the top surface is hidden and a new NDE survey would improve confidence. The lesson: be explicit about what evidence controls your rating.

Part K — Special situations

Recently repaired components

A repair should raise a rating only if it actually restores condition. A deck with many new patches over deteriorated concrete may still be a 5: patches are sound, but the deck around them may be contaminated with chlorides. A rehabilitated beam end with new steel welded or bolted in can justify an increase for that member.

Temporary supports and shoring

If a component is relying on temporary shoring, rate the component's own condition, which is usually poor or worse, and record the shoring. The shoring is not a substitute for the member.

Hidden or inaccessible areas

Rate based on all available evidence (visible condition, NDE, history), state the limitation clearly, and recommend access. Do not inflate a rating because problems could not be seen.

Fatigue cracks

A fatigue crack in a primary steel member is a serious finding. Coding guides cite fatigue cracks as an indicator at the Serious (3) level, though the significance depends on the detail, the crack's length and orientation, and whether it has been arrested. Report fatigue cracks promptly and get an engineering assessment.

Worked example 13 — Repaired deck

A deck rated 4 last cycle received a partial-depth patching project: 600 sq ft of patches out of 8,000 sq ft. Two years later the patches are sound, but new cracking and rust staining appear around six patch perimeters. *Discussion:* Sound patches but ongoing deterioration around them suggests 5. A jump to 7 is not supported because chloride-contaminated concrete remains. Document both the repair and the new distress.

Worked example 14 — Arrested fatigue crack

A 1 in crack at a cover plate end on G3 was drilled with crack-arrest holes in 2020. The 2026 inspection with dye penetrant shows no extension beyond the holes. *Discussion:* The crack is stable but the detail remains fatigue-prone; owner policy may keep the superstructure at 4–5 depending on the extent of similar details. Record the NDT method, results and comparison with previous photos.

Part L — Rating practice set

Decide on your rating for each scenario before reading the discussion.

Scenario 1 — Deck

Bare concrete deck, 1990. Top: 15 sound patches totaling 120 sq ft out of 6,000 sq ft, three small open spalls (total 6 sq ft). Underside: scattered efflorescence, no exposed rebar. *Discussion:* Some deterioration, limited in extent, no exposed steel below: 6 is reasonable; 5 if the patches are failing or the underside shows rust staining.

Scenario 2 — Superstructure

Adjacent prestressed box beams with longitudinal reflective cracking in the asphalt over the shear keys, water leaking between beams, and rust staining along two beam bottoms with a longitudinal crack along a strand line. *Discussion:* Leaking keys and staining along strands suggest strand corrosion has started, which is a known problem with adjacent box beams. Rating 5, or 4 if spalls expose corroded or broken strands. Recommend closer inspection of the stained beams and consider NDE.

Scenario 3 — Substructure

Concrete abutments with hairline cracks, one wingwall with a 1 in wide crack and 1 in outward rotation at the top, no recent change compared with photos from 10 years ago. *Discussion:* The wingwall is a secondary element and the movement appears stable; the abutment stems are good. Rating 6 is reasonable, with the wingwall documented and monitored. If the wingwall supports the roadway fill against a traffic lane and the movement is active, rate lower and escalate.

Scenario 4 — Culvert

Twin-cell concrete box, 1960s. Top slab underside shows cracking with efflorescence and rust staining, two spalls with exposed rebar and moderate section loss, and minor sediment. No settlement. *Discussion:* Rating 5, or 4 if section loss is advanced or spalling is widespread. Recommend patching and keeping the barrels clear.

Scenario 5 — Steel truss

A through-truss with pack rust at several lower chord gusset plates, causing bowing of one gusset about 1/2 in. Lower chord eyebars have light pitting. *Discussion:* Gusset distortion at a truss panel point is significant: gussets are critical connection

elements, and after the I-35W collapse there is heightened attention to them. Rating 4 is defensible, and the load rating engineer should evaluate the gussets. If the truss is an NSTM, follow the owner's NSTM procedures.

Scenario 6 — Timber deck and stringers

Timber deck with a few broken planks replaced recently, stringers with surface weathering and two stringers with crushing at the bearings about 1 in deep. *Discussion:* Deck 6 after repairs; superstructure 5 because of the local crushing at bearings; consider shimming or adding blocking.

Part M — Relating element data to component ratings

Element data describe extent and severity; component ratings summarize overall condition. They should not contradict each other. Some agencies use rule-of-thumb translations or check rules to flag inconsistencies, for example, a deck rated 7 with 15% of its area in CS3, or a superstructure rated 4 with all steel in CS1. These checks are a QC tool, not a substitute for judgment: a single severed strand barely shows in element quantities but may control the superstructure rating.

Worked example 15 — Consistency check

Element	CS1	CS2	CS3	CS4
Deck (6,000 sq ft)	4,800	900	300	0

That is 15% in CS2 and 5% in CS3. A deck rating of 7 would be inconsistent, because CS3 quantities on this scale indicate deterioration beyond minor problems. A 5 or 6 fits, depending on the nature of the CS3 defects (spalls with exposed rebar push toward 5).

Part N — FAQ

Should I rate on the worst spot or the average?

Neither alone. Consider severity, extent and structural significance together. A local defect controls when it affects capacity; widespread minor deterioration can also lower a rating.

Can I change a rating by two or more points?

Yes, when conditions justify it, such as after damage or repair or when new information appears. Explain the change clearly; unexplained jumps are a red flag in QC reviews.

What if I disagree with the previous rating?

Rate what you see and explain why the rating differs: new evidence, better access, or a correction. Avoid simply copying the previous rating.

How do ratings relate to load ratings?

Condition ratings describe physical condition. Load ratings calculate capacity. A drop in condition that affects members should prompt a review of the load rating, and the load rater often uses your section loss measurements, so record them.

Does a Poor classification mean the bridge is unsafe?

No. Poor means at least one major component has advanced deterioration and needs attention. Unsafe conditions are handled through critical findings, posting and closure. Many Poor bridges carry traffic safely with appropriate monitoring and load restrictions.

Part O — Glossary, key points and wrap-up

Term	Meaning
Component rating	0–9 overall condition rating for the deck, superstructure, substructure or culvert
Severity / extent	How bad the worst deterioration is / how much of the component is affected
Good / Fair / Poor	Bridge classification from the lowest component rating (≥ 7 / $5-6$ / ≤ 4)
Controlling defect	The deterioration that determines the rating
Calibration	Process of aligning inspector judgment through shared exercises

Key points

- Rate the whole component, weighing severity, extent and structural significance.
- Local defects control when they affect capacity.
- The 7/6 and 5/4 boundaries carry the most programmatic consequence, so document your reasoning carefully there.
- Ratings trigger intervals, load rating reviews, posting and critical-finding actions.
- Write justifications that cover what, where and how much, so what, and what changed.
- Ratings must reflect condition, not the consequence of the number.

Consistent ratings make the national inventory trustworthy and help owners spend money where it matters. The next courses apply these principles to specific materials: concrete (BR-I06), steel (BR-I07) and substructures (BR-I08).

Part P — A field routine for consistent ratings

Experienced inspectors follow a routine that keeps ratings consistent from bridge to bridge:

1. **Before the visit:** review the previous report, ratings, element data, photos, load rating, repair history and any open recommendations. Note which items need re-measurement.
2. **Walk the whole component first.** Get an overall impression before focusing on defects, so the worst spot does not anchor your judgment too early.
3. **Find and measure the controlling defects.** Measure crack widths, spall sizes, section loss and scour depths, and take photos with scale.
4. **Estimate extent.** Use element quantities as your extent check.
5. **Decide significance.** Ask whether the deterioration affects load-carrying capacity, and whether redundancy helps.
6. **Assign the rating and write the justification on site,** while details are fresh.
7. **Compare with the previous rating.** If it changed, make sure the reason is documented; if it did not change despite new deterioration, ask yourself why.
8. **Escalate** any critical conditions immediately under the owner's procedures, without waiting for the report.

Worked example 16 — Applying the routine

Before the visit, the inspector notes that the previous report recommended monitoring a pier 1 column crack (0.02 in). On site, the walk-through shows the bridge is generally good. The crack is re-measured at 0.04 in with new rust staining. Extent is limited to this one column out of six, and the structural significance is moderate because it is a vertical crack in a column of a multi-column bent. The substructure rating goes from 6 to 5 with this justification: "Pier 1 column C2 vertical crack widened from 0.02 to 0.04 in since 2024, with new rust staining; other columns hairline only. Recommend crack sealing or injection and evaluation of the cause."

Part Q — Case study: one bridge over three cycles

Following a bridge over time shows how ratings and documentation build a story.

Year	Deck	Super	Sub	Key notes
2020	6	6	7	Joint at abutment 2 leaking; light beam-end rust
2022	6	5	6	Beam-end corrosion with minor section loss at A2; cap staining under joint
2024	5	4	5	Web section loss ~30% at two beam ends; cap spall with exposed rebar; deck spalls near the joint
2026	7	6	6	2025 rehab: joint replaced with a continuity closure, beam ends repaired, cap patched, deck end repaired

Discussion: The leaking joint drove deterioration across all three components. The 2022 and 2024 reports documented the progression with measurements, which supported the rehabilitation project and the load rating review in 2024. After the 2025 rehabilitation, ratings rose, and each increase was justified by the repair records. A reviewer reading this history can see cause, effect and response, which is the goal of good rating documentation. Had the 2020 recommendation to repair the joint been acted on, the bridge might have avoided the Poor classification in 2024. That is a strong argument for preservation.

Part R — Ratings under the SNBI

The Specifications for the National Bridge Inventory (FHWA-HIF-22-017) replaced the 1995 Coding Guide as the federal data specification. States transition to it on the schedule set by FHWA. Component condition ratings remain on the 0–9 scale, with refined, component-specific descriptions and additional guidance. The SNBI also restructures many inventory and appraisal items and integrates element data reporting.

Practical implications for inspectors:

- Learn your owner's updated rating descriptions and any new items you are responsible for.
- Expect software and forms to change; the judgment principles in this course do not.
- Watch for item-level differences during transition, and do not assume a rating item maps one-for-one to its predecessor without checking the specification.

Whatever the specification, the fundamentals stay the same: observe carefully, measure, weigh severity, extent and significance, and document the reasoning.

Part S — Items that are not components, but still matter

Several features are not rated as components but strongly influence component ratings and should be reported elsewhere in the inspection:

Feature	Where it is recorded	How it affects component ratings
Expansion joints	Element data; maintenance recommendations	Leaking joints cause deterioration of the deck ends, beam ends and caps below
Bearings	Element data; included with the superstructure under many owners' conventions	Frozen or tipped bearings can overstress members and seats
Railings	Railing appraisal and element items	Generally not a component rating factor, but a safety item
Approach slabs and roadway	Approach items	A bump at the end of the bridge increases impact loads on the deck end and joint
Channel and scour	Channel and scour items; the Plan of Action	Scour that affects foundations lowers the substructure rating
Drainage	Maintenance notes; element data where defined	Clogged scuppers and leaking downspouts drive concrete and steel deterioration

A good report connects these items to the component ratings. For example: "Superstructure rated 5 because of beam-end corrosion caused by the leaking joint (see joint element, CS3 36 ft)." That link tells the program manager which inexpensive repair would stop the decline.

Worked example 17 — Bump at the end of the bridge

The approach slab has settled 1.5 in, creating a noticeable bump. The deck end shows a 3 ft spall and the joint armor is loose.

Discussion: The deck rating may drop because of the spall, and the inspector should recommend approach repair as the root cause, not just patching the spall, which would fail again under continued impact.

Part T — Self-check

1. **A bridge's lowest rating is 5 (deck). What is its classification?** Fair.
2. **Name the two dimensions every rating weighs, plus the tempering question.** Severity and extent; structural significance.
3. **A deck looks excellent on top under a new overlay, but the underside shows rust-stained cracking in 30% of the bays. Which view controls?** The underside evidence of deterioration, because the overlay hides the deck. Document the limitation.
4. **When should a single local defect control the rating?** When it affects the load-carrying capacity of a primary member, for example a severed strand, a fatigue crack, or undermining of a footing.
5. **Why are unexplained two-point rating jumps a QC concern?** They suggest either missed earlier deterioration, a rating error, or an undocumented repair, and they distort trend data.
6. **What should happen after a superstructure rating drop caused by section loss?** A load rating review using the measured section loss, with posting if the new rating requires it.
7. **Should a repair automatically raise a rating?** No. Only if the repair actually restores the condition of the component.

8. **What is the danger of rating by consequence?** Ratings are adjusted to avoid Poor classification or additional work, which hides real needs and undermines the inventory.

If you answered at least six correctly, you are ready for the quiz. If not, revisit Parts B, D and I, and work through the practice set in Part L again before you start the quiz.

Part U — Quick reference by bridge type

Each common bridge type has characteristic weak spots. Use this table as a reminder of where controlling defects usually hide.

Bridge type	Where controlling defects usually appear
Rolled steel beams with concrete deck	Beam ends under joints, fascia girders, bearings, deck underside at the joints
Steel plate girders	Welded details (cover plate ends, web gaps, connection plates), bearings, cross-frame connections
Prestressed I-beams	Beam ends under joints, impact damage to the fascia bottom flange, strand exposure
Adjacent box beams	Shear keys, longitudinal cracking and staining along strands, hidden interior corrosion
RC slab or T-beam	Underside cracking and spalling, shear cracks near supports, deterioration of the deck ends
Steel truss	Gusset plates, lower chord and floor beam connections, pin and hanger details, impact damage to portal members
Timber	Pile groundline and caps, stringer bearings, deck planks
Culverts	Invert, barrel shape, joints, outlet scour

Worked example 18 — Putting it together

A 1968 three-span RC T-beam bridge. The deck top is bare, with 5% patched area and a few small spalls. The underside of the T-beams shows diagonal cracks near the pier supports in two stems (0.02 in, rust staining), plus flexural hairline cracks at midspan. The pier caps have spalls below the joints, with exposed rebar and light section loss. No scour. *Ratings:* deck 6 (limited, sound patching); superstructure 5 (diagonal shear-region cracks with staining warrant attention and possibly an engineering check, but they are not yet serious); substructure 5 (cap spalls with exposed rebar under the joints). Classification: Fair. Recommendations: monitor and measure the shear cracks each cycle, repair the joints and patch the caps, and seal the deck.

Notice how each rating cites the controlling defect and how the recommendations attack the root causes (the joints) as well as the symptoms. That is the rating discipline this course aims to build.

Worked example 19 — Second opinion

A QC reviewer reads the T-beam report and asks whether the diagonal cracks were compared with the previous inspection. The inspector checks the 2024 photos: the cracks were present but narrower (hairline) and without staining. That change supports the superstructure rating of 5 and justifies a recommendation for an engineering review of shear capacity, because widening diagonal cracks with corrosion staining in older T-beams, many of which were designed under earlier shear provisions, deserve attention. The reviewer also confirms that the crack widths were measured with a crack comparator card at the same marked locations as last time, so the comparison is valid and not just a difference in measurement method. Using the same marked locations and tools each cycle is a simple habit that makes trend data far more reliable for everyone who

uses the inventory later. The report is revised to include the comparison: "Diagonal cracks at pier 1, stems 2 and 3, widened from hairline (2024) to 0.02 in with new rust staining." With that one sentence, a reviewer, the load rater and the next inspector can all see what changed and why the rating stands where it does. Good ratings are rarely about a single number. They are about evidence that holds up when someone else looks at the same bridge.

Key takeaways

- 0–9 scale: 7+ Good, 5–6 Fair, 4 or less Poor for performance measures.
- Classification uses the lowest of deck/super/sub or culvert.
- 3 or less triggers 12-month intervals; 2 or less is a critical finding trigger.
- Rate the whole component; document reasons for changes.

References

1. FHWA, Specifications for the National Bridge Inventory (SNBI), FHWA-HIF-22-017, March 2022
2. FHWA, Bridge Inspector's Reference Manual (BIRM), FHWA-NHI-12-049, 2012 (as revised)
3. 23 CFR Part 490, Subpart D — National Performance Management Measures for Assessing Bridge Condition

Study text only; the final quiz is taken online. Verify all references against the edition your agency has adopted.