

Attachment 2020-1.0: Concrete Cracking - Definitions, Recommendations, and Element Level Inspection

Traditionally, inspectors have defined concrete cracks as “hairline”, “fine”, “medium”, and “wide” based on the width of the crack. The Authority is moving toward classifying cracks based on the terminology presented in AASHTO’s Manual for Bridge Element Inspection, 2nd Edition (2019) (MBEI), namely: “Insignificant”, “Moderate”, and “Wide”.

The following guidance is to be used when describing cracks in reinforced or prestressed concrete elements in the field notes, as well as the NBI and Element Inspection appraisal. Please refer to the MBEI for detailed descriptions of the Condition States and Defects, as well as for pictorial examples and further guidance on the assignment of the cracks.

Cracking in Reinforced Concrete Elements:

Condition State	Defect (1130)	Description
CS1	Insignificant cracks or moderate width cracks that have been sealed.	Cracks less than ≈ 0.012 " (say 1/64") in width can be considered “insignificant” and a defect is not warranted under the Element.
CS2	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking.	Cracks ranging from ≈ 0.012 " (say 1/64") up to ≈ 0.05 " (say 1/16") in width can be considered “moderate”.
CS3	*Wide crack or heavy pattern (map) cracking.	Cracks equal to or greater than ≈ 0.05 " (say 1/16") in width can be considered “wide”. Extent and severity are not excessive and/or widespread.
CS4	*Wide crack or heavy pattern (map) cracking including ASR.	Cracks equal to or greater than ≈ 0.05 " (say 1/16") with continued growth, evidence of displacement, and/or the presence of significant efflorescence. Extent and severity are excessive and/or widespread.

* All cracks considered “wide” in width should have the actual crack width noted in the field notes, rounded to the nearest 1/16".

Repairable Deficiencies and Recommendations for Routine Bridges:

Deck, Superstructure, and Substructure:

- Check the B/C checkbox on the field note form;
- Add the quantity to the “B/C QTY” box; and

Repairable Deficiencies and Recommendations for Major Bridges:

Deck:

- Check the B/C checkbox on the field note form;
- Add the quantity to the "B/C QTY" box;
- List the locations in the "REPAIRABLE DEFECTS" box at the top of each respective field note form; and
- Include a written recommendation in the Report to seal with methacrylate sealant once CS2 has been reached.

Superstructure and Substructure:

- Check the B/C checkbox on the field note form;
- Add the quantity to the "B/C QTY" box;
- List the locations in the "REPAIRABLE DEFECTS" box at the top of each respective field note form; and
- Include a written recommendation in the Report to pressure-inject an epoxy crack sealant once CS3 has been reached.

Cracking in Prestressed Concrete Elements:

Condition State	Defect (1110)	Description**
CS1	Insignificant cracks or moderate width cracks that have been sealed.	Cracks less than 0.004" can be considered "insignificant" and a defect is not warranted under the Element.
CS2	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking.	Cracks ranging from 0.004" to 0.009" can be considered "moderate".
CS3	*Wide crack or heavy pattern (map) cracking.	Cracks greater than 0.009" can be considered "wide".
CS4	*Wide / Open structural cracks.	Structural cracks are present: Flexure cracks are transverse to the load path near high moment regions. Shear cracks originate near the bearing area at the bottom of the member and extend diagonally upward and away.

* All cracks considered "wide" in width should have the actual crack width noted in the field notes, rounded to the nearest 0.01".

** The determination of all crack widths shall be through employment of a crack comparator card.

Repairable Deficiencies and Recommendations for Routine Bridges:

Superstructure:

- Check the B/C checkbox on the field note form;
- Add the quantity to the “B/C QTY” box; and

Repairable Deficiencies and Recommendations for Major Bridges:

Superstructure:

- Check the B/C checkbox on the field note form;
- Add the quantity to the “B/C QTY” box;
- List the locations in the “REPAIRABLE DEFECTS” box at the top of each respective field note form; and
- Include a written recommendation in the Report to repair / seal them once CS3 has been reached.
- For CS4 cracks, include a written recommendation in the Report to have the element structurally reviewed to determine the effect on strength or serviceability.

NBI Condition Rating Definitions:

NBI	RC or PSC Cracking
9/8	No signs of distress or discoloration
7	Insignificant cracking, isolated efflorescence staining.
6	Moderate cracking with leaking, efflorescence and isolated rust staining. Map cracking combined with areas of saturation.
5	Cracking with buildup of efflorescence and widespread rust staining. Structural cracking.
4	Advanced cracking with heavy buildup, leaking, efflorescence and rust staining.
3	Member has failed / bridge or part of bridge is closed.