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Appendix A: Deck Scanning Policy 2



APPENDIX A: DECK SCANNING POLICY

This deck scanning policy applies to state-owned bridges, offering guidance on the use of non-destructive testing (NDT), semi-destructive testing (SDT), and non-destructive evaluation (NDE). Any means or methods not described in this policy are to be performed at the discretion/approval of the Bureau of Structures (BOS). This policy is directly related to the scope of work covered under the deck survey master contract and also includes sounding/chaining of bridge decks performed through routine inspections. This policy is necessary to determine accurate scope of deliverable projects, certify structure work concepts for various funding programs, and refine deterioration models used in the Wisconsin Structures Asset Management System (WiSAMS). The following bullet points are applicable to all NDT, SDT, and NDE methods described in this policy:

- All deck scanning methods are performed on 100% of the wearing surface(s), or scanned using sensors at appropriate spacing to deliver accurate results on 100% of the wearing surface(s).
- All results (required values and final reports) are to be entered/uploaded into the Highway Structures Information System (HSIS) using the DECK EVALUATION activity type. All final reports, in addition to meeting all contractual requirements, will also include a description of the NDT/SDT systems utilized, NDE methods for determining results, and any factors that may affect the quality of results.
- Condition-based criteria references the most recent Structures Inspection Field Manual using element/defect number, condition state (CS) number, and percent (%) of total element quantity. Example notation of condition criteria that would trigger an early deck scan on a bare wearing surface is 3210(CS2+CS3+CS4) > 1%. This means that the summation of quantities in CS2, CS3, and CS4 of defect 3210 (Debonding/Delaminations/Spalls/Patched Area/Pothole) is greater than 1% of the total quantity of the bare wearing surface.

Thermography (Infrared, IR)

Deliverables

- Estimated quantities and percentage of total deck (i.e. not a range such as 5-10%, but an actual value such as 6%). Very small values may utilize tenths of percent, but this level of accuracy is not required on most values.
- Date and time of scan
- Weather type during scan and temperature (°F)
- Level selection: Level 0 (aerial) or Level 1 is the default level. Level 2 is performed within 2 years of any deck-related project work. The purpose of the level 2 scan is to estimate deck repair quantities and locations for plan development. Level 2 may also be performed if BOS requires additional data for programming decisions. Level 3 is not



recommended as this scope of work should be determined by state personnel, but may be utilized in certain situations with BOS approval.

- Level 0 (aerial)
 - Quantities and percentage of total deck for various defects, including: Delamination, Debonding (if technology allows), Concrete Patching, and Asphalt Patching.
 - HD aerial photo and corresponding thermography photo (may be stitched from multiple photos)
- Level 1
 - Quantities and percentage of total deck for various defects, including: Delamination, Debonding, Concrete Patching, Asphalt Patching, and Spalling.
- Level 2
 - All deliverables of Level 1
 - Plan view of defect locations
- Level 3
 - All deliverables of level 2
 - Plan view of deck prep locations
 - Quantities and percentages of deck prep

When to perform IR on a bare deck

- Regions may elect to perform chain dragging NDT in lieu of deck scanning. The chain dragging will need to be performed on the entire wearing surface. Chain dragging may be performed on a more frequent basis than the IR frequency, but not less frequent than the IR frequency.
- First IR when deck is 15 years old or when one of the following defect thresholds are recorded on a bridge inspection: $3210(CS2+CS3+CS4) > 1\%$, $3220(CS3+CS4) > 1\%$, or $3220(CS2) > 25\%$.
- Perform an IR every 5 years after initial IR. There is not an upper limit on condition for stopping IRs (do not stop when delamination reaches 25%).
- Frequency or level of IR may be modified based on historical data and projected future work; Level 0 or Level 1 is the default level.



- When a different wearing surface exists, refer to the appropriate IR schedule using the headings below.

When to perform IR on a deck with a thin polymer overlay

- First IR when overlay is 5 years old.
- Perform an IR every 5 years after initial IR. There is not an upper limit on condition for stopping IRs.
- Frequency or level of IR may be modified based on historical data and projected future work; Level 0 or Level 1 is the default level.

When to perform IR on a deck with a concrete or PPC overlay

- Regions may elect to perform chain dragging NDT in lieu of deck scanning. The chain dragging will need to be performed on the entire wearing surface and at the same frequency IR would be required.
- First IR when overlay is 10 years old or when one of the following defect thresholds are recorded on a bridge inspection: $3210(CS2+CS3+CS4) > 1\%$, $3220(CS3+CS4) > 1\%$, or $3220(CS2) > 25\%$ with overlay more than 5 years old.
- Perform an IR every 5 years after initial IR. There is not an upper limit on condition for stopping IRs.
- Frequency or level of IR may be modified based on historical data and projected future work; Level 0 or Level 1 is the default level.

When to perform IR on a deck with an asphalt overlay

- First IR when overlay is 5 years old.
- Perform an IR every 3 years after initial IR. There is not an upper limit on condition for stopping IRs.
- Frequency or level of IR may be modified based on historical data and projected future work; Level 0 or Level 1 is the default level.

When to perform IR on the underside/soffit of a deck

- No requirements defining use at this time.
- Under deck thermography is performed on a trial basis and will be utilized at BOS discretion.
- Under deck thermography results have not been validated, but may help estimate the amount of full depth repair required. This is a level 2 scan.



Chloride Ion Testing

Deliverables (minimum)

- Core location
- Testing depth (must include testing at rebar depth)
- Water soluble chloride by weight of concrete (lb/cy) using either ASTM C1216 or AASHTO T260

When to test a bare deck

- If deck is older than 10 years, BOS may require testing prior to programming a Thin Polymer Overlay application.
- If deck is older than 15 years, BOS may require testing prior to programming a PPC Overlay application.

When to test a deck with a concrete or asphalt overlay

- No testing required.

When to test a deck with a thin polymer or PPC overlay

- Test prior to reapplication of Thin Polymer or PPC Overlay.

Ground Penetrating Radar (GPR)

Deliverables (minimum)

- Date and time of scan
- Weather type at time of scan
- Date of last rain event prior to scan
- Average deck reading (change in amplitude) at top mat of reinforcement (decibels)
- Maximum deck reading (change in amplitude) at top mat of reinforcement (decibels)
- Threshold used to determine deteriorated/contaminated concrete (decibels)
- Quantities and percentage of deck at or above the threshold value
- Plan view of GPR results showing range of deteriorated/contaminated concrete values
- Average overlay thickness (if non-PCC overlay exists)
- Average depth of rebar (top mat)



When to perform GPR on a bridge deck

- No requirements defining use at this time.
- GPR is performed on a trial basis and will be utilized at BOS discretion.
- GPR may be performed within 2 years of any deck-related project work and corresponding Level 2 IR.
- GPR may also be performed earlier in the life cycle to measure predictive abilities of the results.

Impact Echo (IE)

Deliverables (minimum)

- Date and time of scan
- Scan interval spacing in both directions (ft)
- Concrete velocity used in analysis or method that was used to obtain velocity
- Average deck reading (kHz)
- Threshold reading used to determine each defect identified in the scan, such as: shallow delamination, deep delamination, cracks or other deterioration (kHz)
- Quantities and percentage of deck delamination, cracks and other deterioration.
- Plan view of IE results

When to perform IE on a bridge deck

- No requirements defining use at this time.
- Recommend limiting use to cementitious wearing surfaces only.
- IE is performed on a trial basis and will be utilized at BOS discretion.
- IE may be performed within 2 years of any deck-related project work and corresponding Level 2 IR.
- IE may also be performed earlier in the life cycle to measure predictive abilities of the results.
- Limited area IE may be used to validate other deck scanning methods at the discretion of the contractor.