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Chapter 22 - Bridge Deck Decision Aid Matrices

22.1 Decision Aid Introduction

This chapter presents decision aid matrices that can be used to quickly look up common defects and the feasible actions available to address the defects. Each feasible action references a previous chapter where the detailed repair procedure can be found. Preventive maintenance activities with recurrence intervals are listed in a separate table for each deck type.

22.2 Reinforced Concrete Deck Decision Aid Matrices

22.2.1 Common Reinforced Concrete Defects and Treatments

Table 22.1 Reinforced Concrete Deck/Slab Condition Based Decision Aid Matrix

Common Deficiency	Feasible Treatments
Cracking	<ul style="list-style-type: none"> • Crack Chase - Use penetrating sealer at individual crack locations. (Sections 5.8.1, 7.2.2, 7.2.4) • Seal - Flood coat the deck with penetrating crack sealer (less than 1/8 inch wide cracks). (Sections 7.2.2, 7.2.4, 20.4.4) • Inject - Epoxy Inject larger isolated cracks (1/8 to 1/4 inches wide). (Sections 7.2.2, 7.2.4) Contact an engineer if cracks exceed 1/4 inch wide. • Overlay - Apply asphalt with waterproofing membrane, thin bonded polymer or concrete overlay. (Sections 7.2.3, 7.2.4, 20.4.4)
Delaminations and Spalling	<ul style="list-style-type: none"> • Patch - Remove unsound concrete, blast clean reinforcing and patch. (Sections 7.2.4, 20.4.4) • Patch and Protect - Remove unsound, blast clean reinforcing, install galvanic anodes and patch. (Sections 7.2.4, 13.1.6, 20.4.4) • Patch Seal and Overlay - Remove unsound concrete, blast clean reinforcing, patch and seal or overlay. (Sections 7.2.4, 20.4.4)
Abrasion	<ul style="list-style-type: none"> • Overlay - Apply asphalt with waterproofing membrane, thin bonded polymer or concrete overlay. (Sections 7.2.4, 20.4.4)
Rutting	<ul style="list-style-type: none"> • Overlay - Apply asphalt with waterproofing membrane, thin bonded polymer or concrete overlay. (Sections 7.2.4, 20.4.4)
Scaling	<ul style="list-style-type: none"> • Overlay - Apply asphalt with waterproofing membrane, thin bonded polymer or concrete overlay. See Chapters (Sections 7.2.4, 20.4.4)
Soffit Efflorescence /Rust	<ul style="list-style-type: none"> • Sealer or Thin Bonded Polymer Overlay - Minimize moisture in the concrete by applying flood coated deck seal or overlay. (Sections 7.2.4, 20.4.4)
Lack of Rebar Cover	<ul style="list-style-type: none"> • Overlay - Apply asphalt with waterproofing membrane , thin bonded polymer or concrete overlay. (Sections 7.2.4, 20.4.4)
ASR	<ul style="list-style-type: none"> • Seal or Overlay - Minimize concrete moisture by applying flood coated deck seal or overlay. (Sections 7.2.4, 20.4.4, 20.4.6) • Repair or Replace - Remove and replace poor quality concrete. (Sections 7.2.4, 20.4.4, 20.4.6)
Lack of Concrete Strength	<ul style="list-style-type: none"> • Overlay - Construct a reinforced concrete deck on top of the existing deck. (Sections 20.4.4, 20.4.6) • Replace deck. (Sections 20.4.4, 20.4.6)
Loss of Surface Friction	<ul style="list-style-type: none"> • Roughen Surface - Grind or steel shot the deck surface to roughen. • Saw cut grooves in deck. • Overlay - Apply asphalt with waterproofing membrane, thin bonded polymer or concrete overlay. (Section 7.2.4)
Impact Damage	<ul style="list-style-type: none"> • Repair - Remove unsound concrete, blast reinforcing clean of any corrosion and patch the damaged area. (Section 7.2.4)

22.2.2 Common Reinforced Concrete Preventive Maintenance Activities***Table 22.2 Reinforced Concrete Deck/Slab Cyclical Preventive Maintenance Activities***

Common Activities	Typical Frequency (Years)
Sweeping, Cleaning and Pressure Washing, including maintaining and cleaning any deck drains	0.5 - 1
Apply Waterproofing Sealer to prevent water intrusion into concrete in good condition (Silane/Siloxanes)	3 - 5
Applying Penetrating Crack Sealer to widespread finely cracked concrete (Epoxy or Methacrylate, etc.)	5 - 10
Applying Crack Filler into concrete with discrete larger width cracks (Healer/Sealer)	5 - 10
Applying Thin Bonded Polymer Overlay	10 - 20
Applying Rigid Concrete Overlays	15 - 30
Applying Bituminous Overlay (asphalt with waterproofing membrane)	10 - 15
Application of Impressed Current Cathodic Protection System	One time / Ongoing Maintenance
Installation of Galvanic Anodes for Corrosion protection	10-20

22.3 Steel Deck Decision Aid Matrices

22.3.1 Common Steel Deck Defects and Treatments

Table 22.3 Steel Deck Condition Based Decision Aid Matrix

Common Deficiency	Feasible Treatments
Steel Corrosion	Repair or replace steel/connection as needed, blast clean and apply protective coating. (Sections 7.3.2, 7.3.3)
Cracked / Broken Fastener	Retrofit or replace steel, blast clean and apply protective coating. (Section 7.3.3)
Bent/Buckled Steel	Repair or replace steel, clean and apply protective coating. (Section 7.3.3)
Loss of Surface Friction	Weld studs on open grid decks or apply overlay to closed decks. (Sections 7.3.3)
Impact Damage	Repair or replace damaged steel, blast clean and apply protective coating. (Section 7.3.3)

22.3.2 Common Steel Deck Preventive Maintenance Activities

Table 22.4 Steel Deck Cyclical Preventive Maintenance Activities

Common Activities	Typical Frequency (Years)
Sweeping, Cleaning and Pressure Washing	0.5 - 1
Clean and Paint or Metalizing	10 - 20
Cathodic Protection (Sacrificial Anodes)	10 - 20

22.4 Timber Deck Decision Aid Matrices

22.4.1 Common Timber Defects and Treatments

Table 22.5 Timber Deck and Slab Condition Based Decision Aid Matrix

Common Deficiency	Feasible Treatments
Checks	Apply sealant, preservative or protective coating. (Sections 7.4.2, 7.4.4)
Splits	Apply sealant, preservative or protective coating. (Sections 7.4.2, 7.4.4)
Decay	Apply preservative or protective coating. Replace timbers members as needed. (Sections 7.4.2, 7.4.4)
Crushing	Remove decayed section and supplement or replace with new timbers spliced or scabbed onto sound material. (Section 7.4.4)
Wear/Abrasion	Replace timber runners or apply overlay. (Sections 7.4.3, 7.4.4)
Pest Infestation	Treat with fumigants if timber is salvageable or replace timber. (Section 7.4.2, 7.4.4)
Nail Laminated Deck Delamination	Stress laminate the delaminated length.
Loose/Missing Fasteners	Tighten or replace fasteners and apply preservative. Consider bolted fasteners with washers when possible in lieu of lag bolts.

22.4.2 Common Timber Preventive Maintenance Activities

Table 22.6 Timber Deck/Slab Cyclical Preventive Maintenance Activities

Common Activities	Typical Frequency (Years)
Sweeping, Cleaning and Pressure Washing	0.5 - 1
Secure Loose or Replace Missing Fasteners	As Needed
Applying Preservatives	3 - 5
Treat with Fumigants	10 - 15
Replace Damaged or Deteriorated Timbers	As Needed
Applying Bituminous Overlay (Asphalt) with Membrane	10 - 15

22.5 Fiber Reinforced Polymer (FRP) Deck Decision Matrices

22.5.1 Common FRP Defects and Treatments

Table 22.7 Fiber Reinforced Polymer (FRP) Deck/Slab Decision Aid Matrix

Common Deficiency	Feasible Treatments
Loose Fasteners	Tighten loose or replace broken or missing fasteners
Delaminations	Remove and replace delaminated FRP area using wet lay-up of new FRP material compatible with the existing. Consult engineer.

22.5.2 Common FRP Preventive Maintenance Activities

Table 22.8 FRP Deck Cyclical Preventive Maintenance Activities

Common Activities	Typical Frequency (Years)
Applying Thin Bonded Polymer Overlay	10 - 20
Applying Rigid Concrete Overlays	20 - 30
Applying Bituminous Overlay (Asphalt with membrane)	15 - 20

22.6 Chapter 22 Reference List

1. Chapters 7 and 20, this manual.
2. FHWA. *Bridge Inspector's Reference Manual (BIRM)*. Publication No. FHWA NHI 12-049. Washington D.C.: United States Department of Transportation, October 2002, Revised December 2006, Revised February 2012.
3. NCHRP. *Guidelines for Selection of Bridge Deck Overlays, Sealers and Treatments*. NCHRP Project 20-07, Task 234, <http://maintenance.transportation.org/Documents/Final%20Report%2020-07%20Task%20234.pdf>