

NCHRP 20-123(21): Roadmap to Update Bridge Evaluation

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Acknowledgement and Disclaimer

- **Acknowledgement**

- This work was sponsored by the American Association of State Highway and Transportation Officials (AASHTO), in cooperation with the Federal Highway Administration, and was conducted in the National Cooperative Highway Research Program (NCHRP), which is administered by the Transportation Research Board (TRB) of the National Academies.

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Outline

- 1) Project Overview
- 2) Schedule
- 3) Literature Review and Synthesis
- 4) Survey – Development, Synthesis, and Key Takeaways
- 5) Research Plan
- 6) Roadmap Outline
- 7) Roadmap Options
- 8) Selected Option

Project Objectives and Deliverables

- Objective: Develop a roadmap to update, optimize, and restructure the in-service inspection, evaluation, and load rating requirements for highway bridges.
- Deliverables: Roadmap, Problem Statements, Final Report, Technical Memo “Implementation of Research Findings and Products”
- Overall Plan:
 1. Survey Stakeholders
 2. Review Literature
 3. Synthesize Info
 4. Identify Key Decisions
 5. Outline Tasks/Actions/Activities
 6. Assemble Deliverables

Schedule

	Task Number	Title	Due Date
PHASE I	"0"	Survey Development and Distribution	7/30/2025
	"0"	Survey Response	8/29/2025
	1 & 2	Literature Review, Synthesis and Gaps	9/8/2025
	n/a	S&E/AM Committee Meetings	10/8/2025
	3, 4, & 5	Propose Research Plan, Roadmap Outline, and Interim Report 1	12/9/2025
		Interim Report 1 Panel Meeting	1/15/2026
PHASE II	6	Panel Meeting	3/16/2026
		Panel Meeting	4/23/2026
		Develop Roadmap	6/10/2026
	7	Problem Statements, Draft Final Deliverables	6/10/2026
	8	AASHTO COBS Meeting	7/2/2026
		Final Deliverables	9/9/2026

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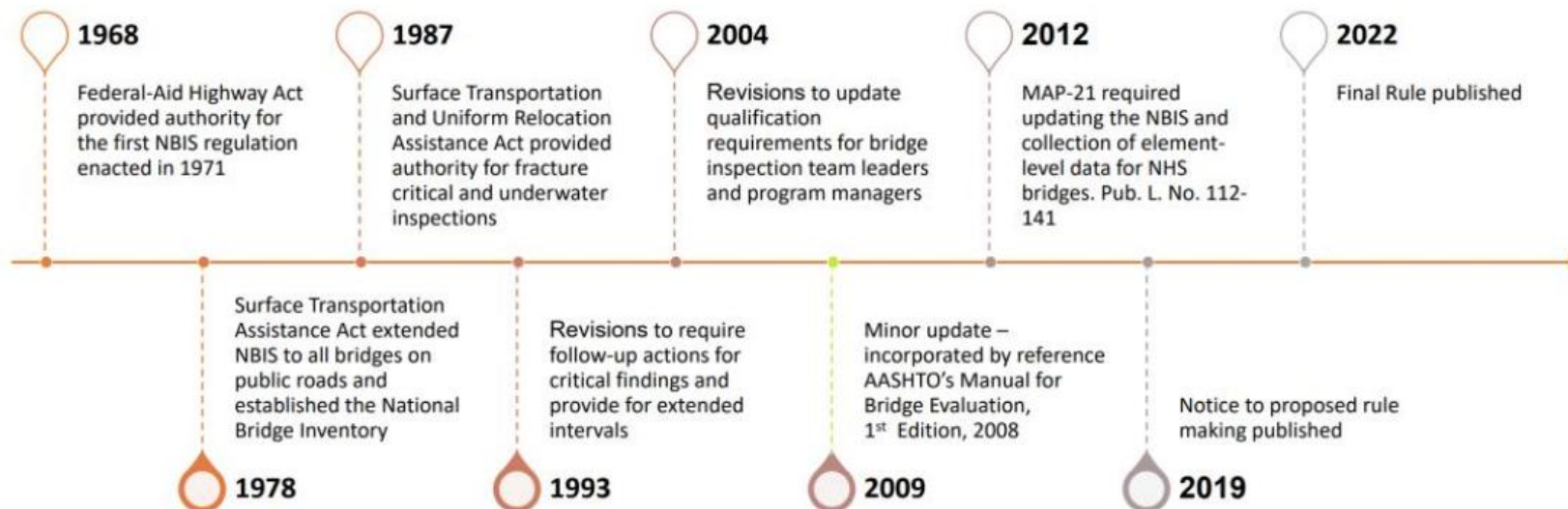
Literature Review - History of Bridge Evaluation



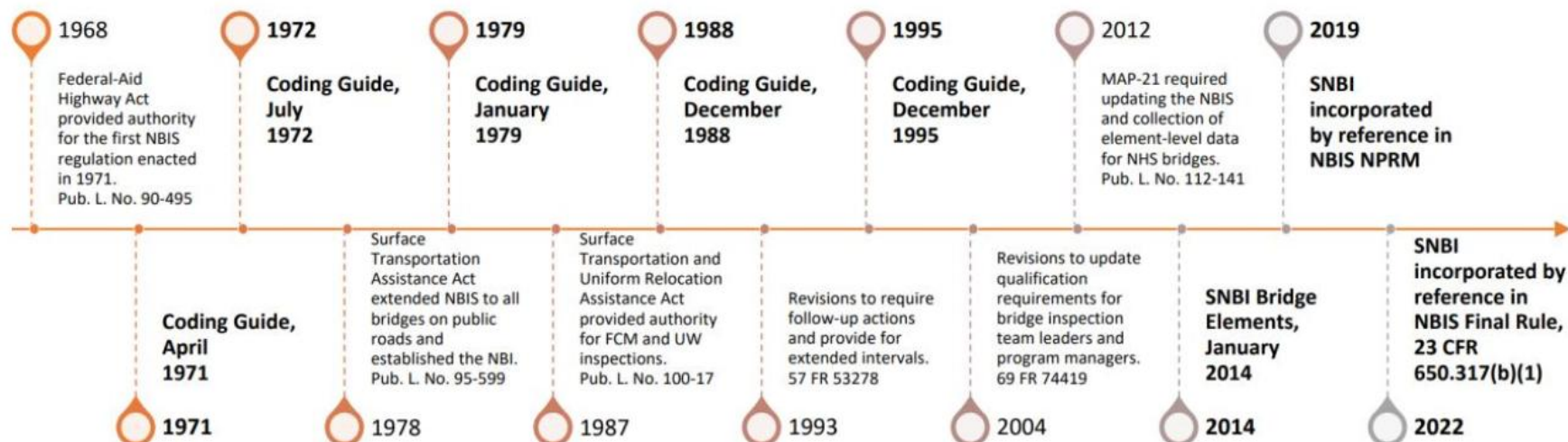
1967 – Silver Bridge

Literature Review - History of Bridge Evaluation

NBIS

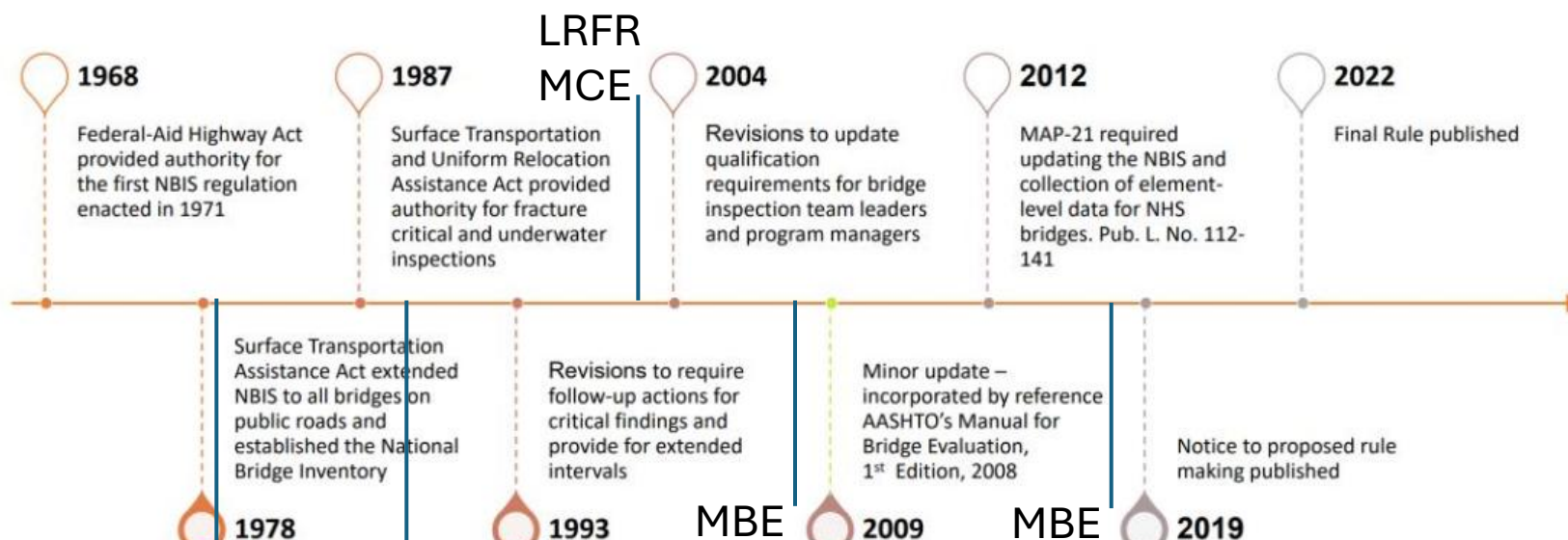


SNBI



Literature Review - History of Bridge Evaluation

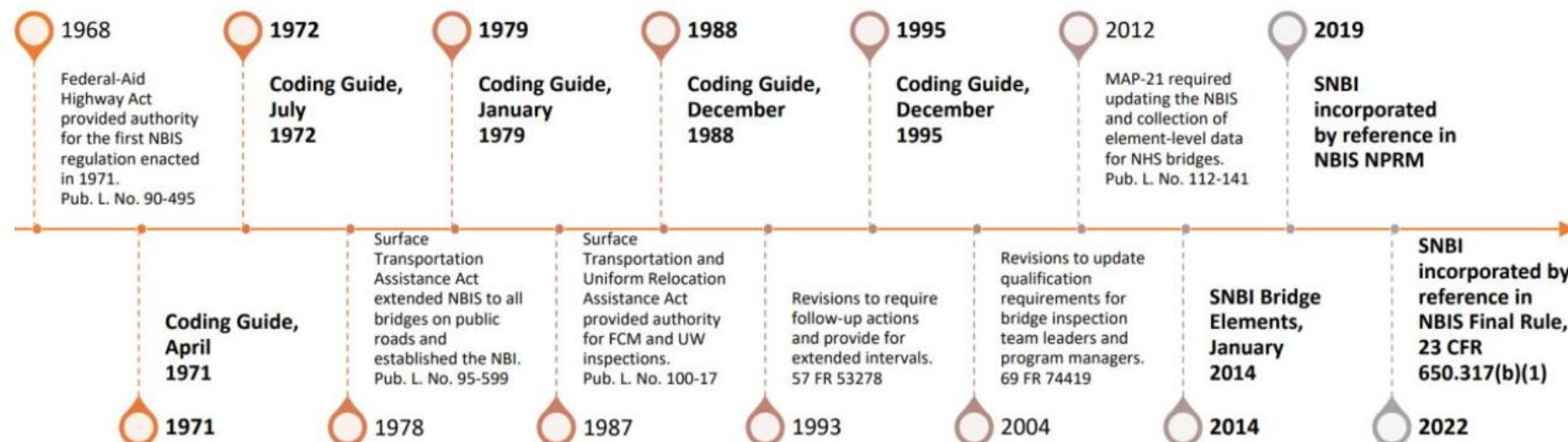
NBIS



MCE

GS
Strength
Eval.

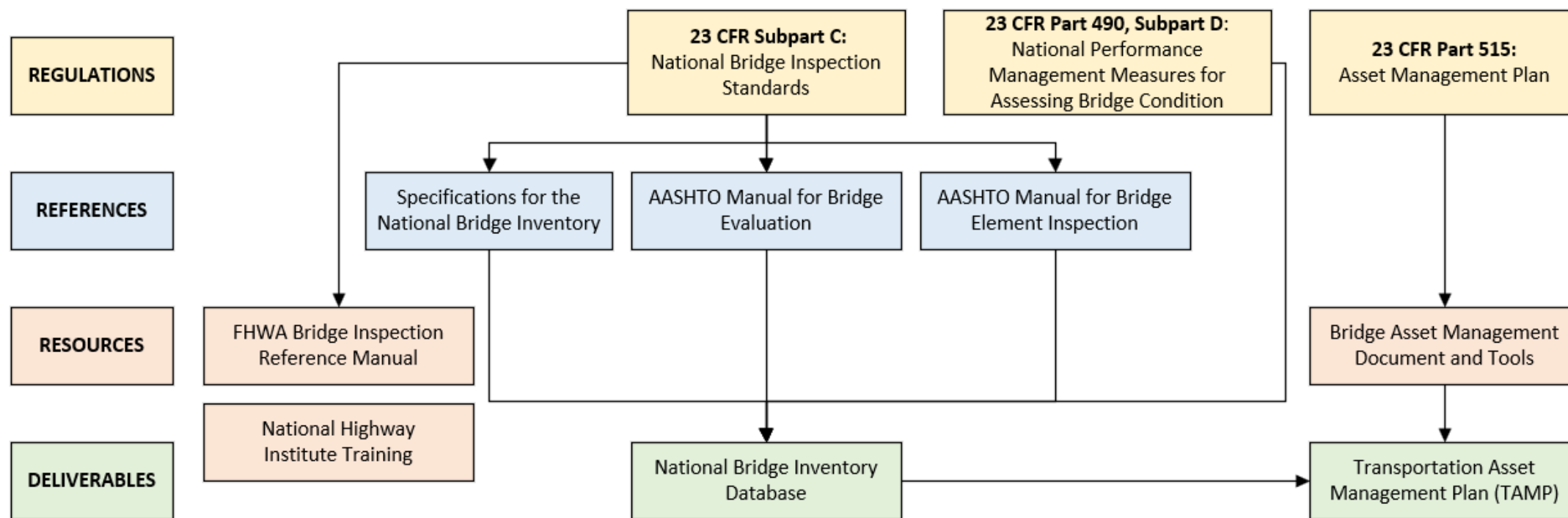
SNBI



Literature Review - Current MBE (3rd Edition) Content

	<u>SECTION</u>	<u>SECTION PROVIDES....</u>
AASHTO Manual for Bridge Evaluation (MBE)	1. Introduction	...overall purpose, scope, applicability, definitions, QA/QC discussion
	2. Bridge Files and Documentation	...provisions for proper documentation to be included in a bridge file to support NBIS requirements
	3. Bridge Management Systems	...overview of bridge management systems and key elements.
	4. Inspection	...assist owners in developing procedures to meet NBIS requirements, and provide supplemental inspection practice information
	5. Material Testing	...overview of various inspection and evaluation testing methods
	6. Load Rating	...nationally recognized specification for load rating of bridges (LRFR, LFR, ASR)
	7. Fatigue Evaluation of Steel Bridges	 provisions for evaluation of existing steel bridges for fatigue.
	8. Nondestructive Load Testing	...field-performed load test procedures.
	Appendix A: Illustrative Examples	...examples of load rating calculations.

Literature Review - AASHTO MBE Document Map



Literature Review - Summary

- **History of Bridge Evaluation**
 - Regulations and resources
- **Overview of MBE and associated documents**
 - ‘Deliverables’ required by states and resources
 - CFRs, other CFR references
- **Load Rating and Posting**
 - Development in the US
 - State specific information – compare & contrast
 - International practices
- **Inspection and Condition Assessment**
 - Development in the US
 - International practices
 - Emerging technologies
- **Bridge Asset Management**
 - General topics
 - Resources (extensive list)
- **Previous roadmap projects**
 - Topics, format/layout, etc.

Survey

- Goal:

Identify usage, usefulness, and clarity of different sections, and better understand how the content can be improved, expanded, or reorganized.

Survey

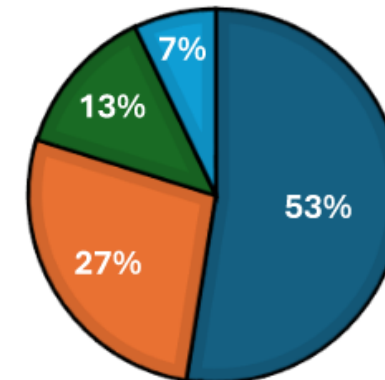
- Goal:

Identify usage, usefulness, and clarity of different sections, and better understand how the content can be improved, expanded, or reorganized.

- 90 total response fields in 4 sections
- 75 total survey responses
- 56 responses coming from 48 different state agencies

WHO USES MBE?

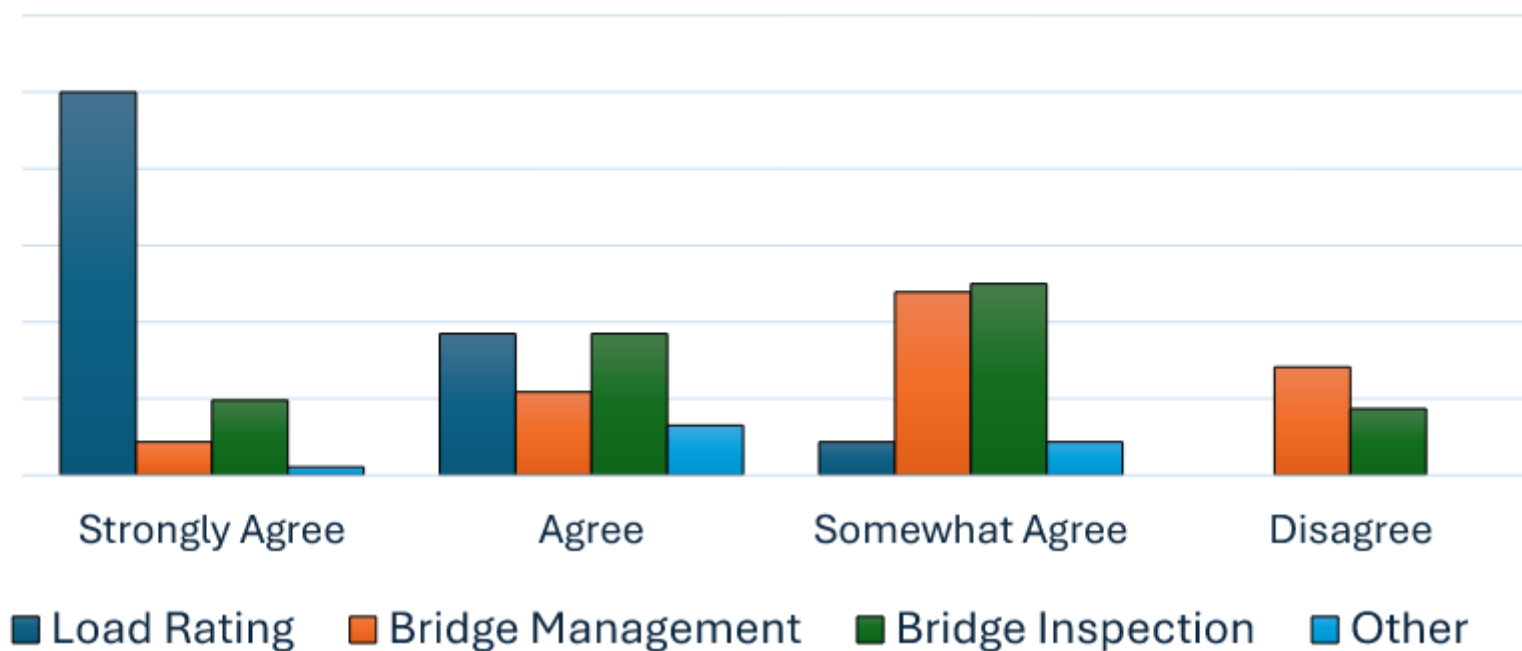
■ Bridge Design/Load Rating Staff ■ Bridge Asset Management Staff
■ Bridge Inspection Staff ■ Other



Survey – General Section

- MBE as ‘primary’ or ‘secondary’ resource?

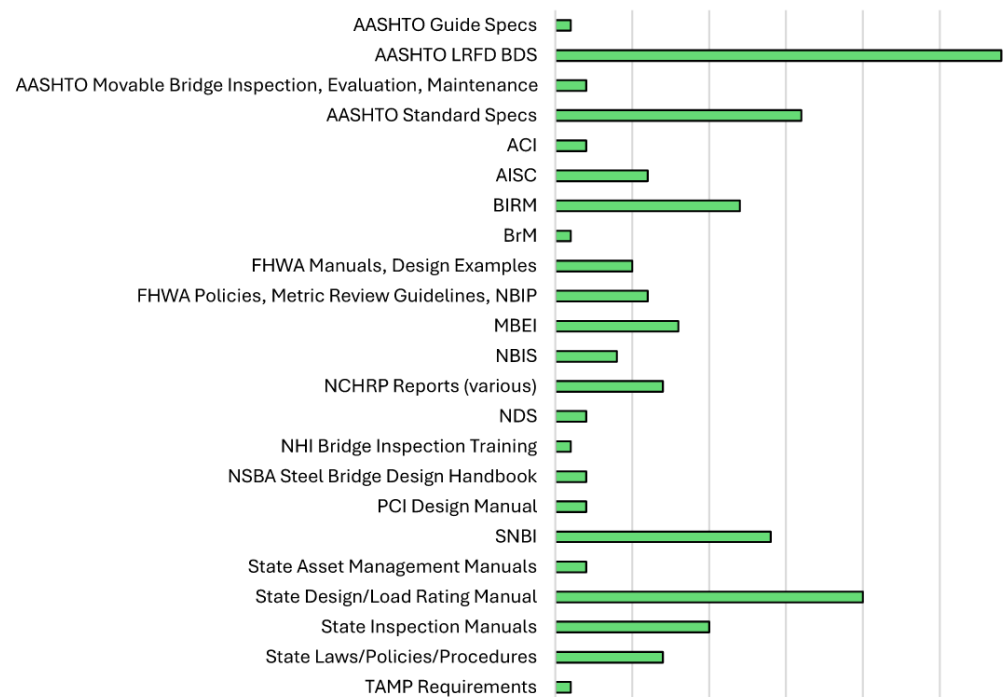
MBE PRIMARY RESOURCE?



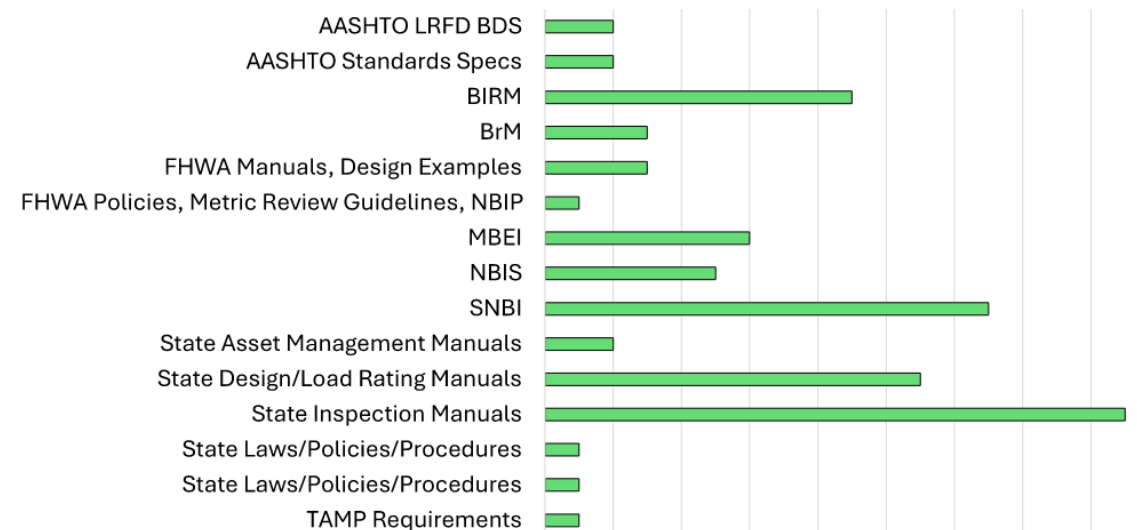
Survey – General Section

- MBE as ‘primary’ or ‘secondary’ resource?

Secondary Resources to the MBE



Primary Resources



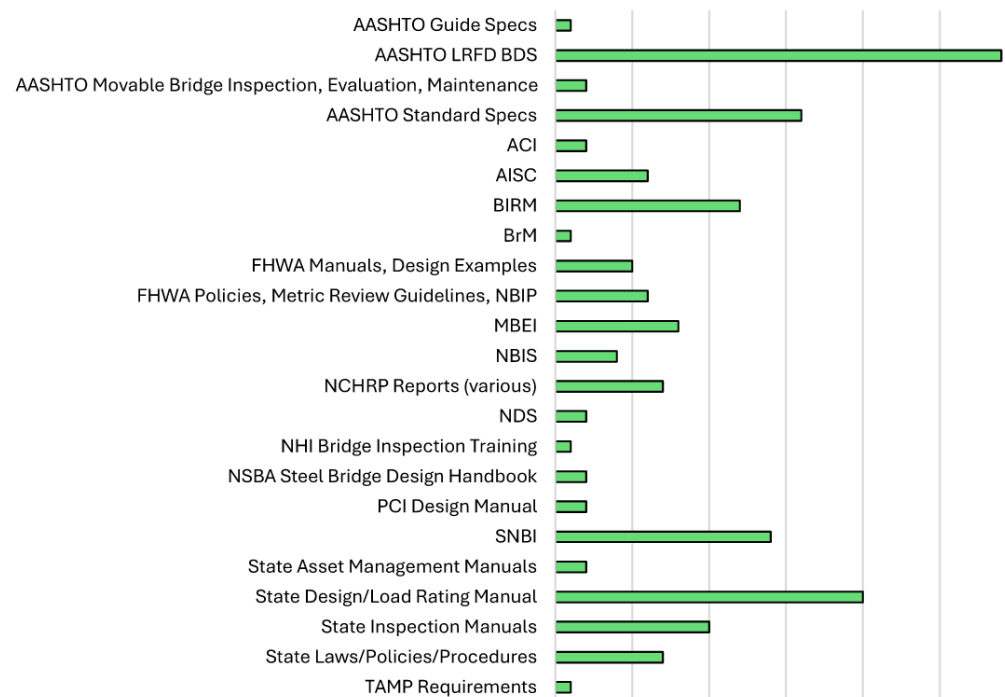
Survey – General Section

- MBE as ‘primary’ or ‘secondary’ resource?

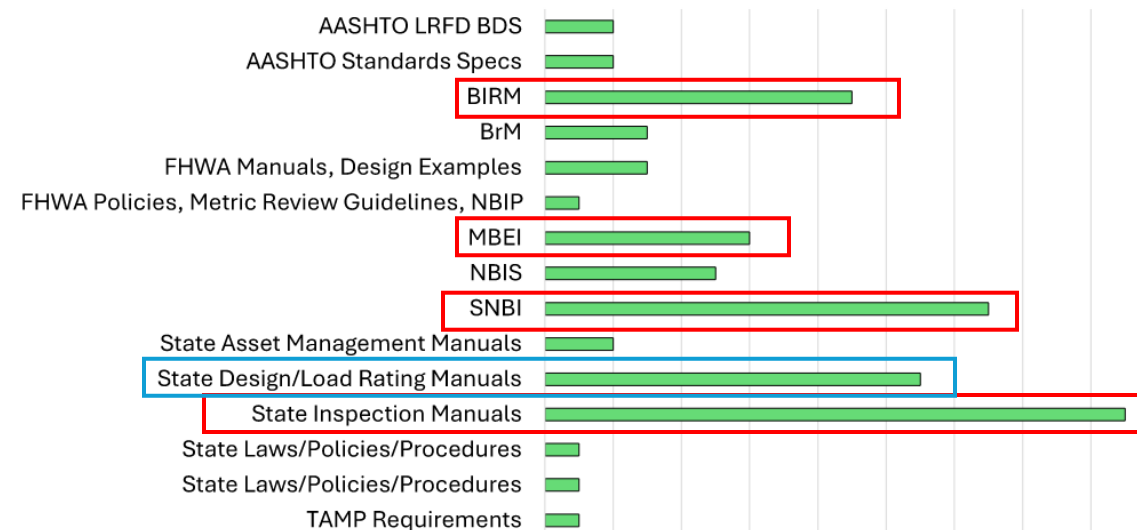
Inspection related

Rating related

Secondary Resources to the MBE



Primary Resources



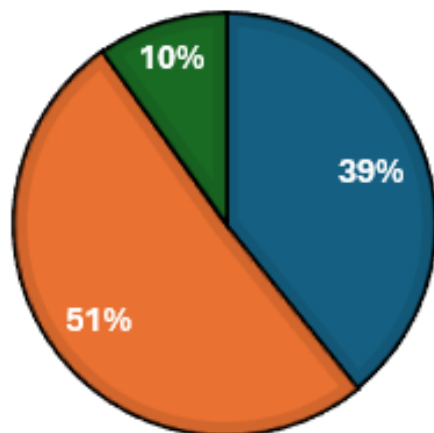
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Michael Baker
INTERNATIONAL 85 YEARS

Survey – General Section

MBE PROPERLY ORGANIZED?

■ Yes ■ No ■ Other or N/A

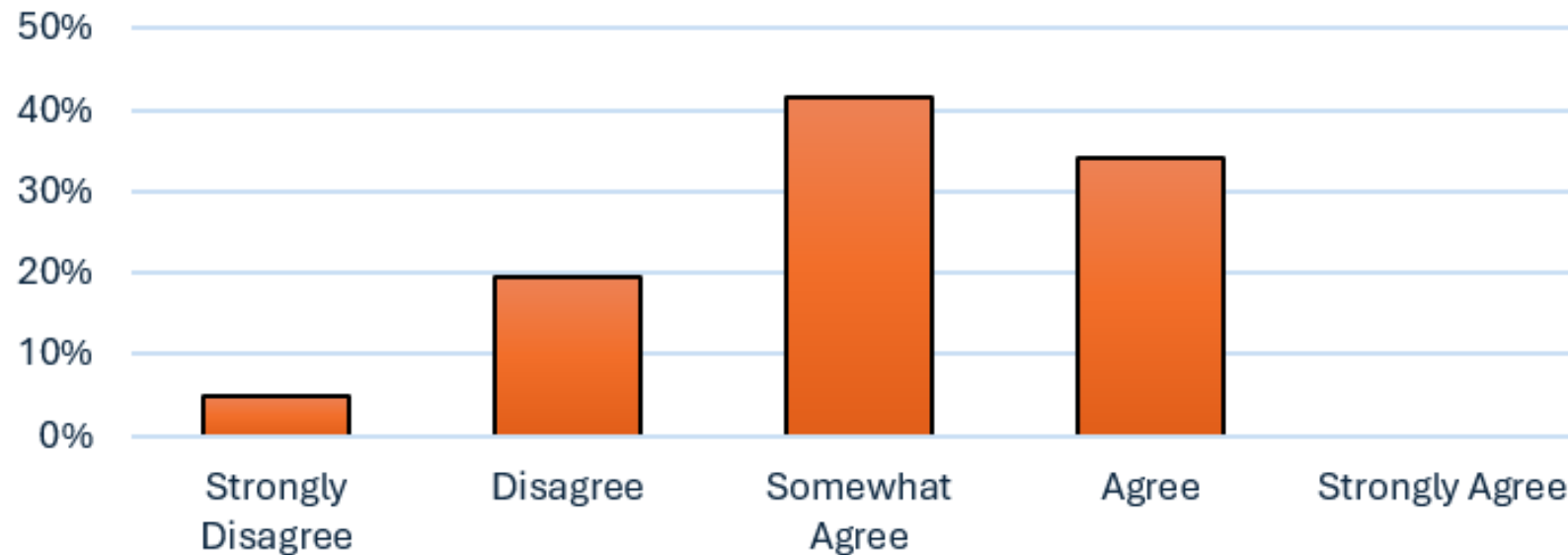


Ranked Reorganization Suggestions

Separate topics/sections (into different documents)
Reorganize Section 6: Load Rating
Keep manual content organized as is
Reorganize illustrative examples
Combine Section 7: Fatigue Evaluation with Section 6: Load Rating
Consider audience for content
Organize content by material type
Remove redundant content from Section 4: Inspection
Change the format and remove commentary section

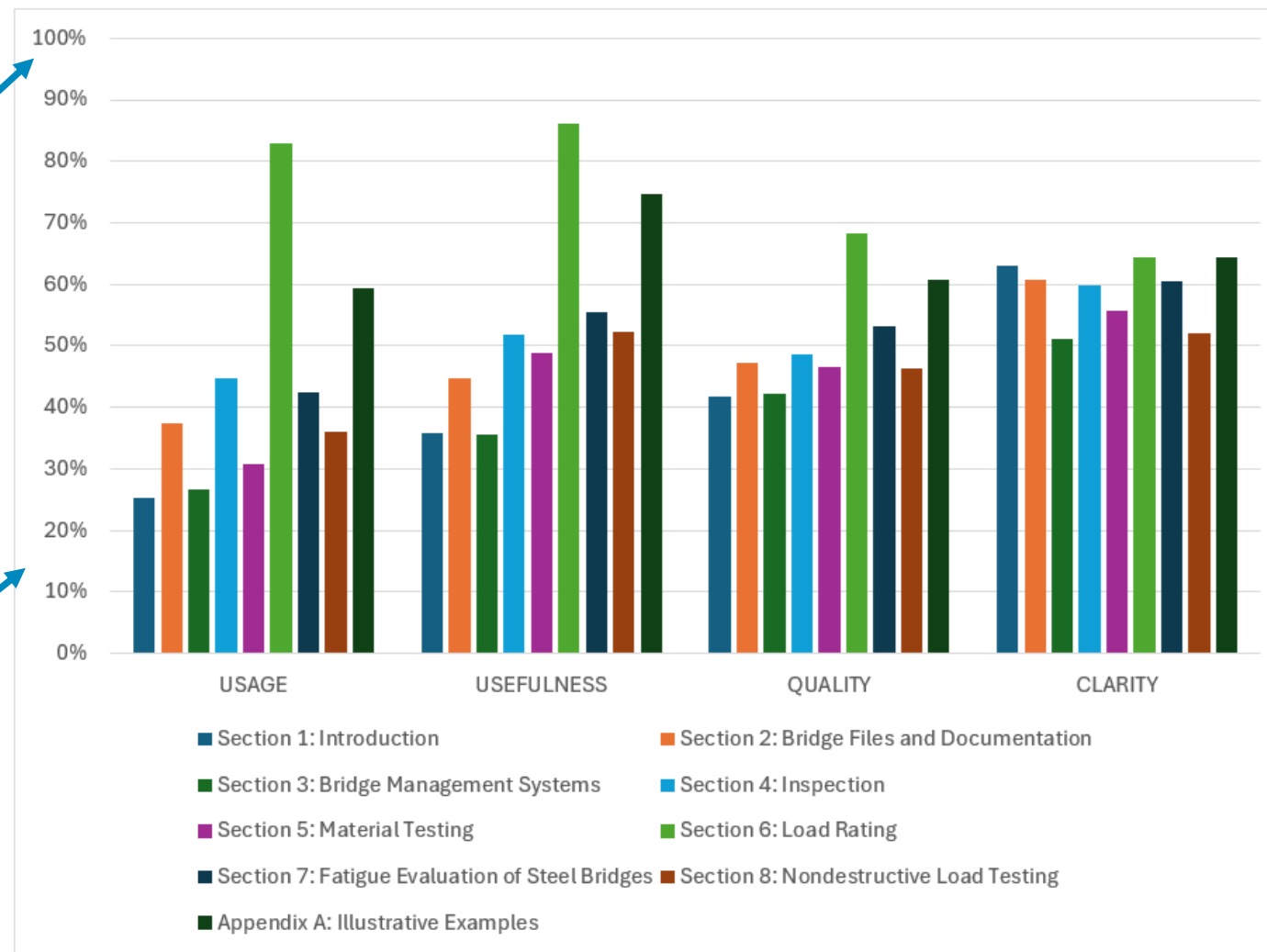
Survey – General Section

MBE meet NBIS standards?



Survey – General Section

- Very frequently used, very useful, very good quality, very clear
- Not used, not useful, poor quality, not clear



Survey – General Section – Recommended Topics/Suggestions

<u>MBE Section</u>	<u>Suggested Additional Content</u>
1. Introduction	QA/QC
2. Bridge Files and Documentation	Alignment with CFR, SNBI, Asset Management, Performance management measures, FHWA requirements
	NBIS Program Overview
	Definition of Minimum Standards and Best Practices
3. Bridge Management Systems	Alignment with CFR, SNBI, Asset Management, Performance Management Measures, FHWA requirements
	Addition of New/Innovative Technologies and Guidance on Usage
	Asset Management, Life Cycle Cost Analysis, Examples
4. Inspection	Alignment with CFR, SNBI, Performance management measures, FHWA requirements
	New/Innovative Technologies
	Min. Standards, Qualifications, and Notable Practices
5. Material Testing	Addition of New/Innovative Technologies and Guidance on Usage
6. Load Rating	Alignment with CFR, SNBI, Performance Management Measures, FHWA requirements
	Substructures Evaluation
	Accounting for Deterioration in Load Rating
	Posting
	Buried Structures, Tunnels
	Maintenance Recommendations, Emergency Repairs
	Scour
	Complex Bridges
	Truck Trains
7. Fatigue Evaluation of Steel Bridges	Guidance on Rating for Combined Axial and Flexure
8. Nondestructive Load Testing	Enhance Content
Appendix A: Illustrative Examples	Enhance Content
	Provide more examples

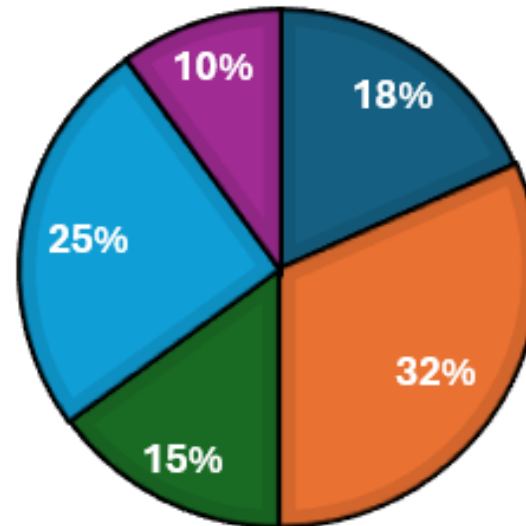
Survey – General Section – Key Takeaways

- **Inspection and Testing** – Not aligned with CFR/FHWA Metrics and no info on RBI. Information in many documents (NBIS, SNBI, BIRM, MBEI). New technologies and testing methods not incorporated. Many states use their own developed guidance.
- **Bridge Files/Bridge Asset Management** – Only provides basic information. No guidance on TAMP. There is access to many references and tools, but no framework or guidance. Lack of deterioration and risk models.
- **Load Rating** – Most frequently used, overall good/great user satisfaction, long list of gaps and room for improvement, need to expand the examples.

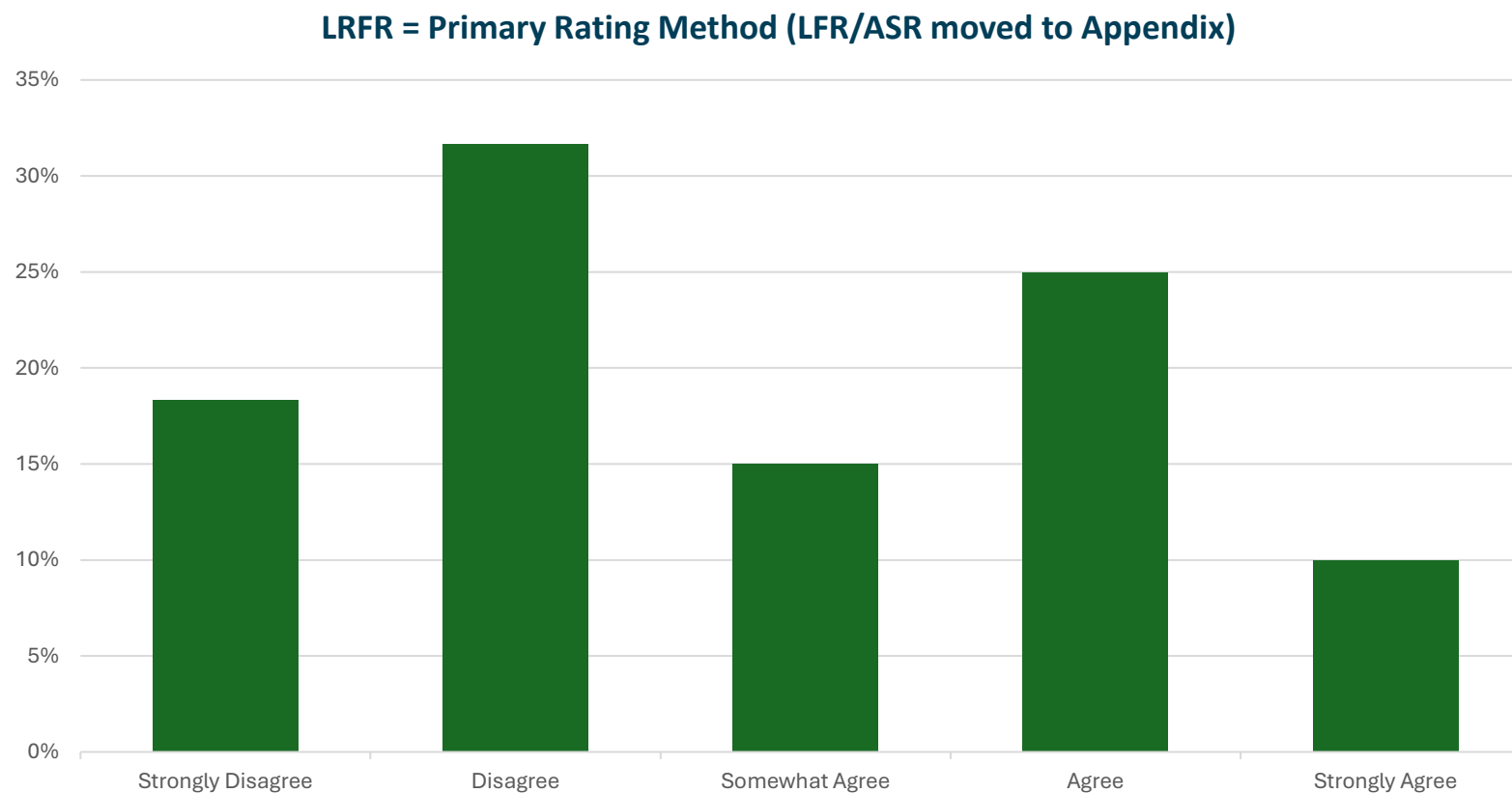
Survey – Load Rating Section

LRFR PRIMARY RATING METHOD?

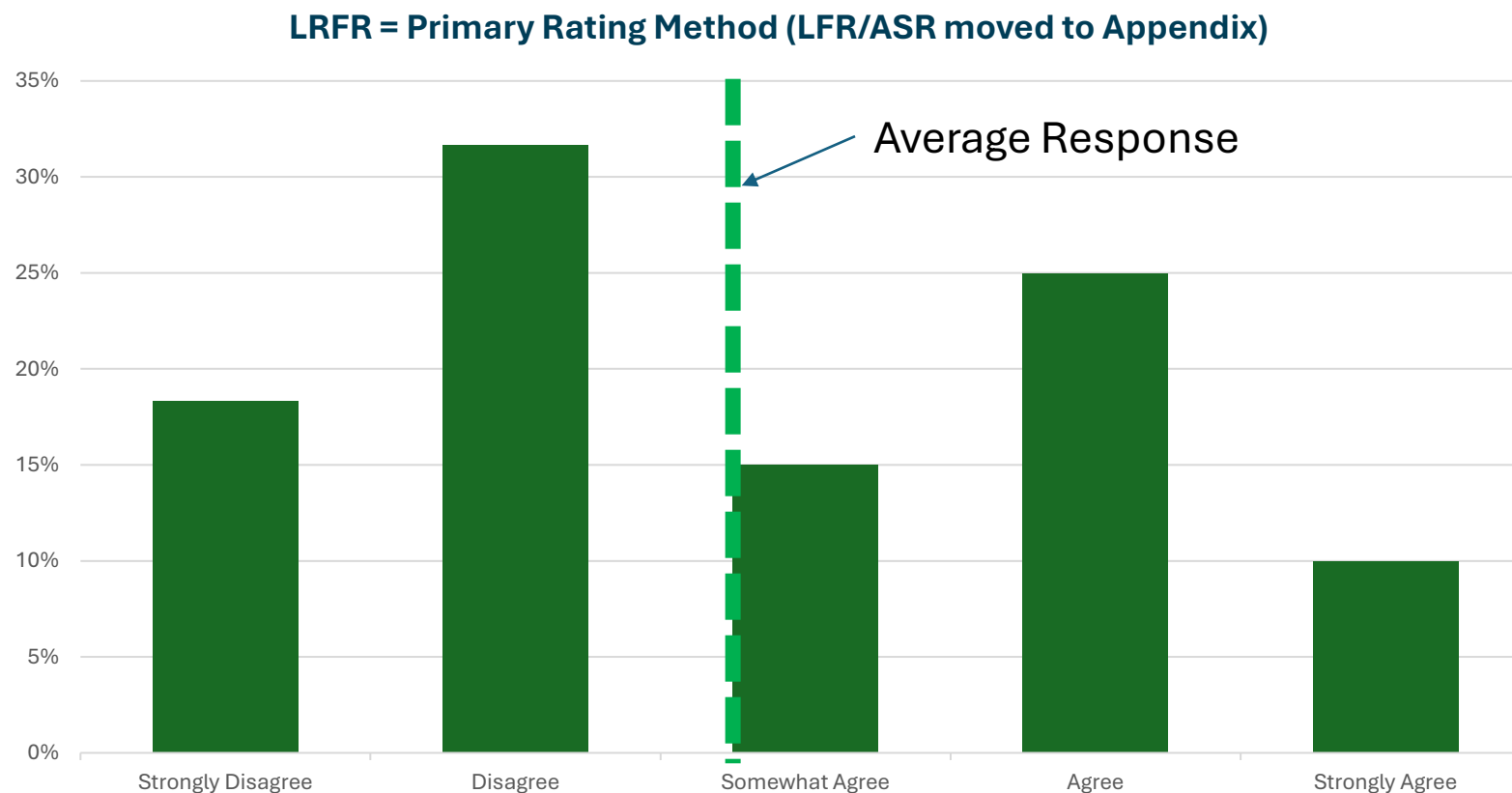
■ Strongly Disagree
■ Disagree
■ Somewhat Agree
■ Agree
■ Strongly Agree



Load Rating



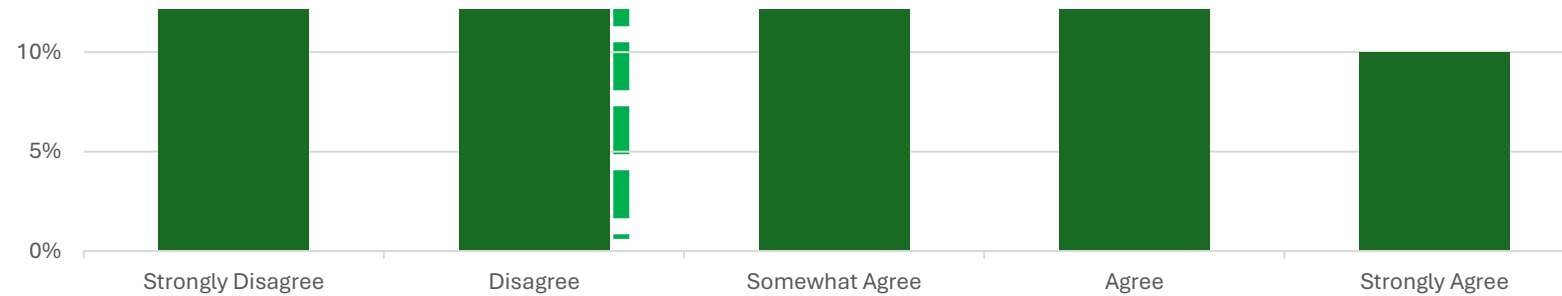
Load Rating



Load Rating

LRFR = Primary Rating Method (LFR/ASR moved to Appendix)

“Retire LFR/ASR altogether or retain those scrolls by reference.”



Load Rating

LRFR = Primary Rating Method (LFR/ASR moved to Appendix)

“Retire LFR/ASR altogether, or retain those scrolls by reference.”



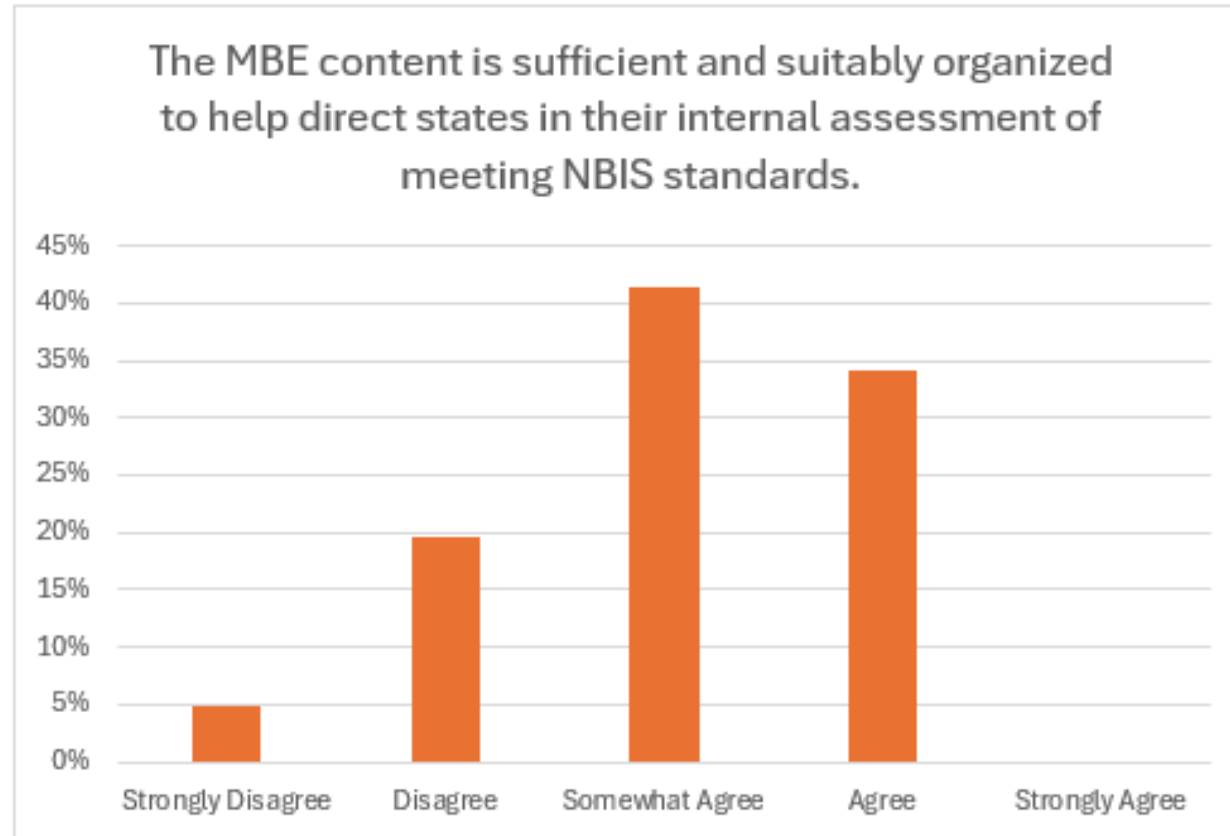
Survey – Load Rating Section – Key Takeaways

- No clear separation between LFR and LRFR
- Mandatory versus optional criteria are not consistently defined
- Decision-making procedures for unusual bridge/traffic are not defined
- Insufficient direction on refined rating methods and posting
- Limited guidance on unusual loading, long-span bridges, decks, substructures, and unknown details
- No unified procedure for developing state-specific permit and legal load rating and posting methods
- Ambiguity in terminology, such as “span length” versus “influence length.”
- No standardized approach for assessing deteriorated members, including incorporation of condition factors
- QC/QA requirements are not defined
- Improved alignment with design specifications needed

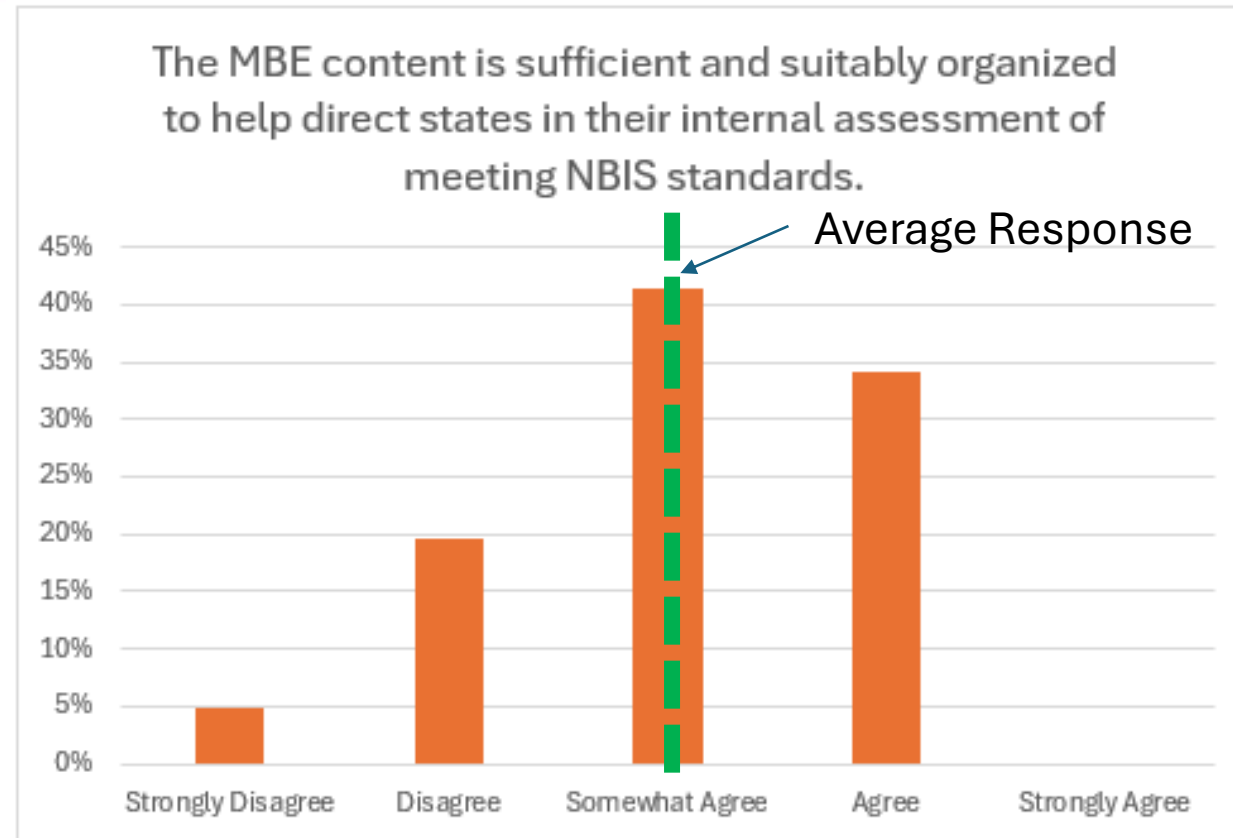
Survey – Load Rating Section – Key Takeaways

- No guidance on pedestrian loads
- Examples lack figures, clarity, and modern bridges/details
- Incomplete coverage of materials and structure types (steel, concrete, prestress, buried)
- Insufficient number of examples, and need for:
 - Full worked-out rating example
 - LRFR for permit traffic (overloads and superloads)
 - Modern fatigue detail examples
 - Staged/curved bridges
 - Rating of damaged or deteriorated members
 - Substructure and deck rating examples
 - More guidance on posting decisions included in examples
 - Examples using AASHTO BrR or practical tools (Excel/Mathcad)

Survey - Inspection and Testing



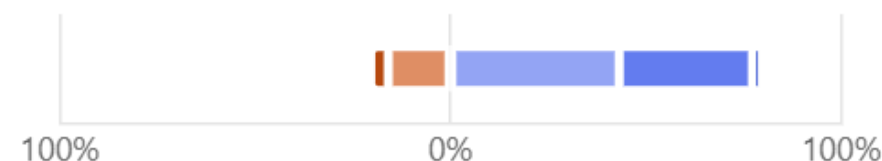
Survey - Inspection and Testing



Survey - Inspection and Testing

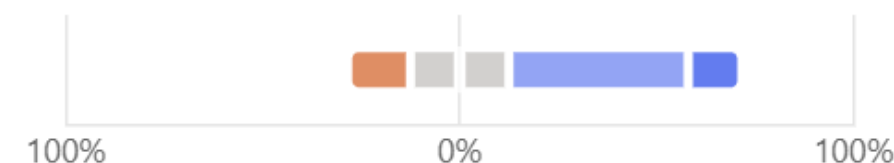
It would be useful if the MBE contained information aligned with the FHWA Metrics

● Strongly Disagree
● Disagree
● Somewhat Agree
● Agree
● Strongly Agree
● N/A



There is a need for guidance on appropriate NDE/NDT/materials testing to supplement bridge inspection

● Strongly Disagree
● Disagree
● Somewhat Agree
● Agree
● Strongly Agree



Survey - Inspection and Testing Section – Key Takeaways

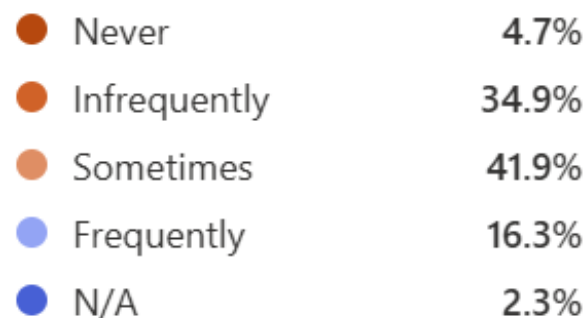
- Could improve detail to serve as an NBIS reference; not aligned with current CFR
- Fragmented info guidance across MBE, NBIS, SNBI, BIRM, and MBEI; no standalone document
- Omits advances in NDE technologies
- Limited guidance on material properties based on age, region, as well as new materials
- Material testing methods lack sufficient detail for practical application

Overall, much of the info present was indicated as being “slightly useful/infrequently relied upon”

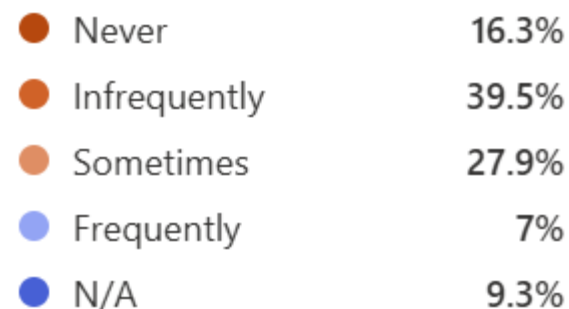
Survey - Bridge Files/Bridge Asset Management

The sections below are utilized:

Section 2: Bridge Files and Documentation

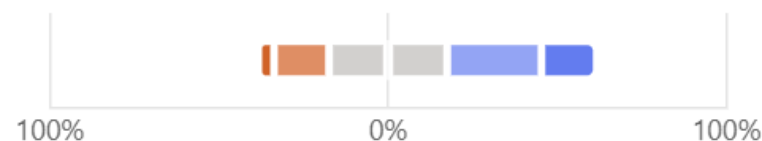


Section 3: Bridge Management Systems



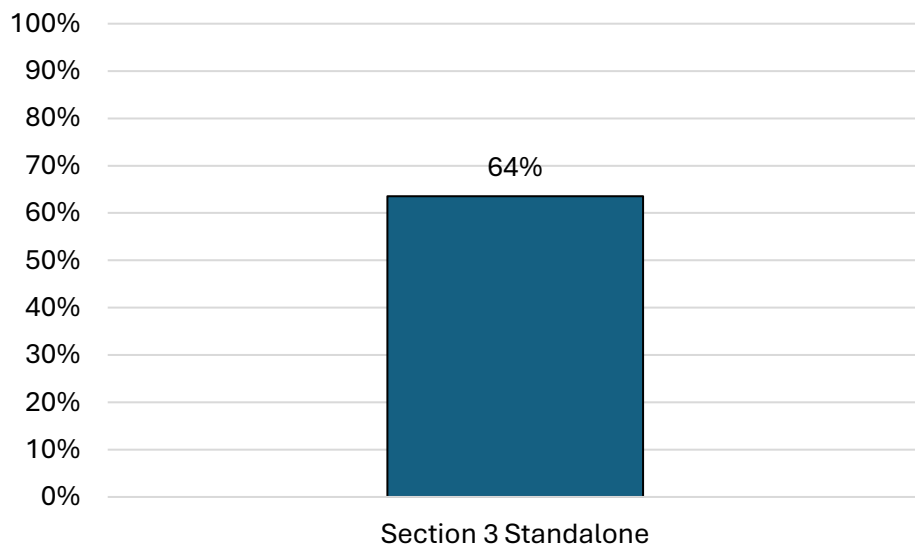
National guidelines on transportation structures asset management should be developed.

Strongly Disagree Disagree Somewhat Agree Agree Strongly Agree

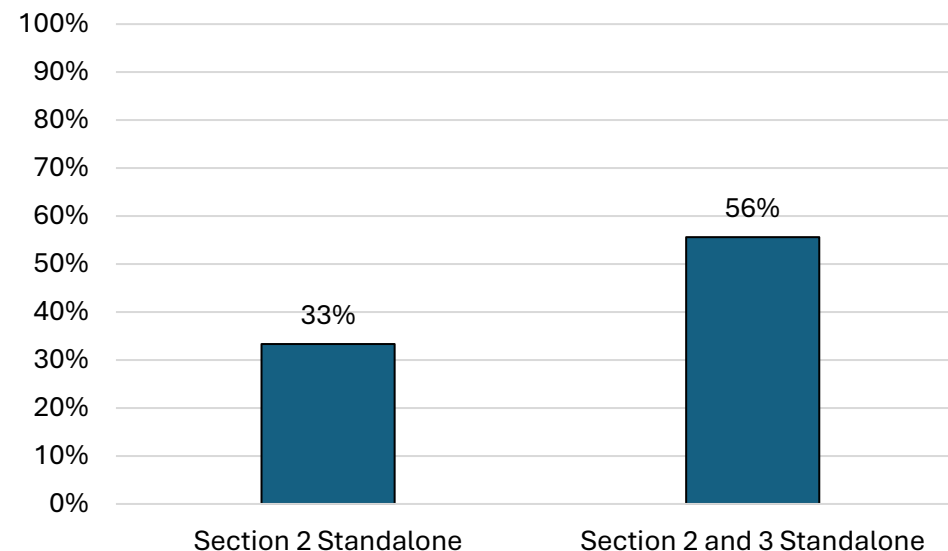


Survey - Bridge Files/Bridge Asset Management

Section 3: Bridge Management Systems should be its own standalone document.



Section 2: Bridge Files and Documentation should be in a....



Survey - Bridge Files/Bridge Asset Management

If Sections 2 and 3 were to be updated, what types of information would be helpful (please rank)



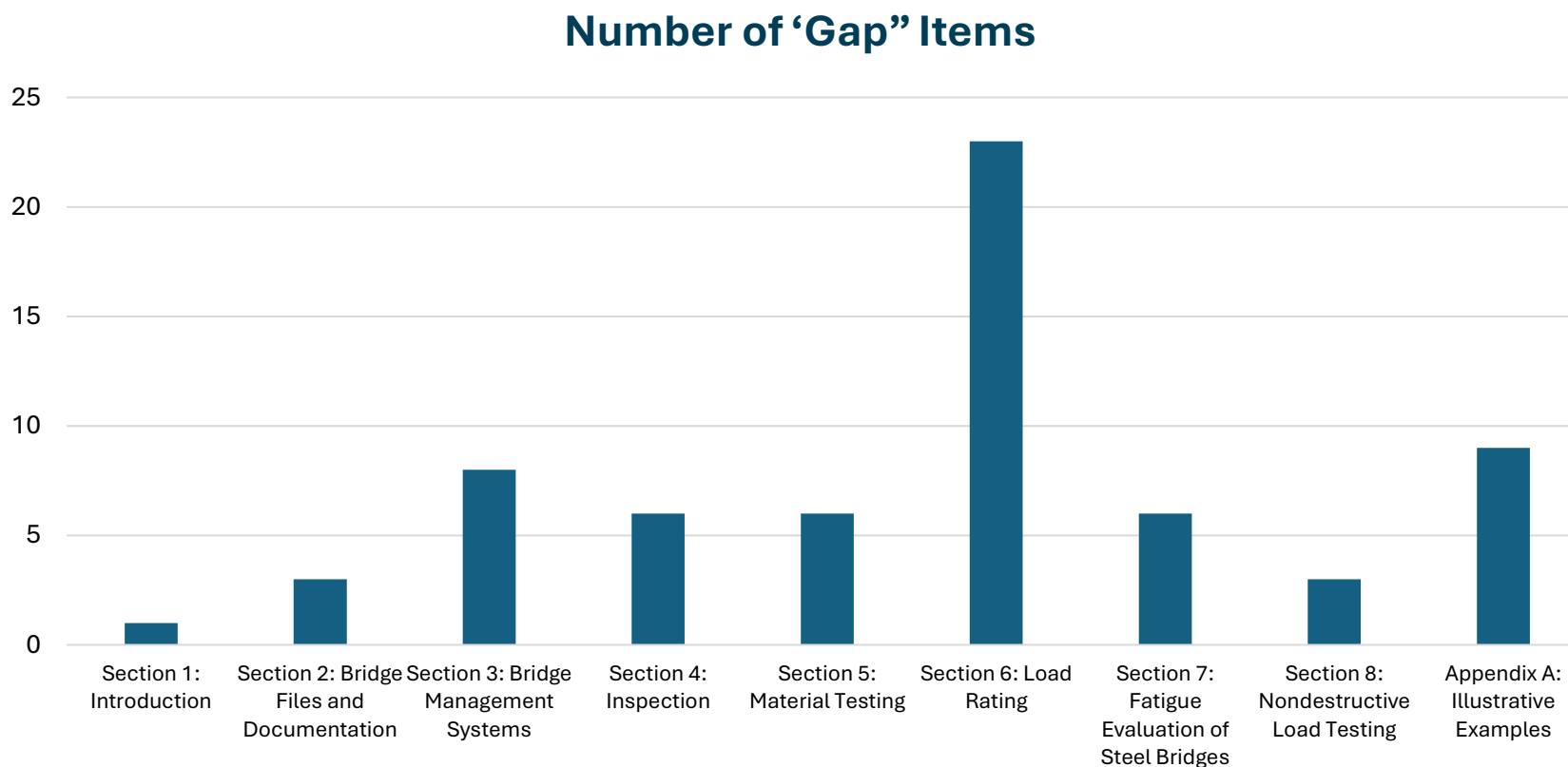
Survey – Bridge Files/Bridge Asset Management

Section – Key Takeaways

- Generic content with insufficient detail to support states in TAMP delivery
- No dedicated guide for asset management, lacking documentation of current best practices
- Resources and tools are dispersed across multiple documents/platforms
- Lack of framework, and preferred measures
- Refined deterioration models not provided
- No standardized risk analysis framework
- Content not updated to reflect SNBI changes
- Lack of examples

Survey – Overall Synthesis

- Combined with Literature Review, developed a roughly 2.5-page list of ‘gaps’ (grouped by sections of the current MBE) which could be used to revamp the current content.



Research Plan

- Step 1: Literature Review
- Step 2: Survey Development, Distribution, Summary and Synthesis
- Step 3: Review and Categorization of Current MBE, Associated Documents, and Gaps
- Step 4: Expand Current Document Map
- Step 5: Define Draft Roadmap Options
- Step 6: Create Draft Roadmaps
- Step 7: Create Complete Roadmap for Preferred Option

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Research Plan – Step 3

Step 3.1. Initial Scan and Categorization

Criterion	Options	Explanation
Target Audience / Users	Inspector	
	Engineer	Bridge Designers and Raters, Technician
	Manager	Responsible for federal requirement deliverables.
Purpose, as Related to Federal Requirements	Regulation	Mandatory requirements
	Guideline	Recommended approach
	Reference	Explanatory notes or background information
Usefulness, as Related to Federal Requirements	Yes	Yes: Required content for submission
	Supports	Supports: Helpful but not mandatory (background, calculations, examples)
	No	No: Irrelevant to federal submission
Alignment With Federal Requirements	Fully aligned and compliant	
	Partially aligned	
	Misaligned or contradicts	
Duplicates	Provide other sections or documents that include duplication	Provide name of the document or section with repetitive information

Research Plan – Step 3

Step 3.1. Initial Scan and Categorization

AASHTO Manual for Bridge Evaluation		Regulation	Guideline	Reference	Alignment with SNBI	Potential Duplicates	Target Audience / Users	Notes
Section 7 - Fatigue Evaluation of Steel Bridges								
7.1	Load-Induced Versus Distortion-Induced Fatigue			X			Engineer	It is really not clear when a fatigue evaluation is required. Language throughout section reads as a requirement in regards to how to perform it, but it is not stated "when"
7.2	Load-Induced Fatigue Damage Evaluation		X				Engineer	Guidance on choosing detail fatigue category
7.2.1	Application		X				Engineer	
7.2.2	Estimating Stress Ranges	X	X			LRFD BDS	Engineer	
7.2.3	Determining Fatigue Prone Details	X	X			LRFD BDS	Engineer	Here it states when fatigue damage needs to be evaluated
7.2.4	Infinite-Life Check	X	X			LRFD BDS	Engineer	
7.2.5	Estimating Finite Fatigue Life	X	X			LRFD BDS	Engineer	
7.2.6	Fatigue Serviceability Index	X	X				Engineer	Bridge owners should develop a uniform methodology for recommended actions using serviceability index, but MBE does not provide any guidance on it.
7.2.7	Strategies to Increase Fatigue Serviceability Index		X				Manager	No definition what is acceptable serviceability index?
7.3	Distortion-Induced Fatigue Evaluation						Engineer	
7.3.1	Methods to Assess Distortion-Induced Cracking		X	X			Engineer	No guidance provided in the MBE, the title of sub-section is not accurate
7.3.2	Retrofit Options for Distortion-Induced Fatigue Cracking		X	X			Engineer	Softening and stiffening was presented as retrofit option, but no examples, nor elaboration how to do it. It seems more details would be beneficial.
7.4	Fracture-Control for Older Bridges			X			Engineer	No guidance provided, more actionable items should be specified - what to do with older bridges prone to fracture.
7.5	Alternate Analysis Methods			X			Engineer	No guidance on alternative analysis
7.6	References			X			Engineer	Update if any new documents, research was used to update this section

Research Plan – Step 3

Step 3.2. Detailed Evaluation of MBE

Criterion	Explanation
Usefulness	Relevant to user needs/Supports federal submission/Provides actionable guidance/Not useful/outdated/redundant
Quality	Poor, confusing, inaccurate/Adequate but needs improvement/Clear, accurate
Clarity	Logical/Unambiguous instructions/Too much room for interpretation/Steps unclear or not implementable/Partially usable instructions/Clear, sequential, practical instructions
Completeness	Missing essential info/Partially complete/Fully complete/Requires examples/calculations
Level of Detail	Too high-level/Too detailed/Not appropriate/appropriate for intended users
Consistency/Redundancy	Inconsistent/consistent with other documents, Repetitive/Redundant with other documents
Format	Clear/Consistent/Organized/Not clear/ information spread in different sections of documents
Missing Content	Missing guidance/federal references/ scope/etc.
Survey Gaps	Gaps identified in the survey, prioritized by the importance
Emerging Topics/Next Steps	Does not address new standards or technologies/Partially addresses emerging issues/Fully reflects current and upcoming changes/More research required

Research Plan – Step 3

Step 3.2. Detailed Evaluation of MBE

6.2.5. Material Testing

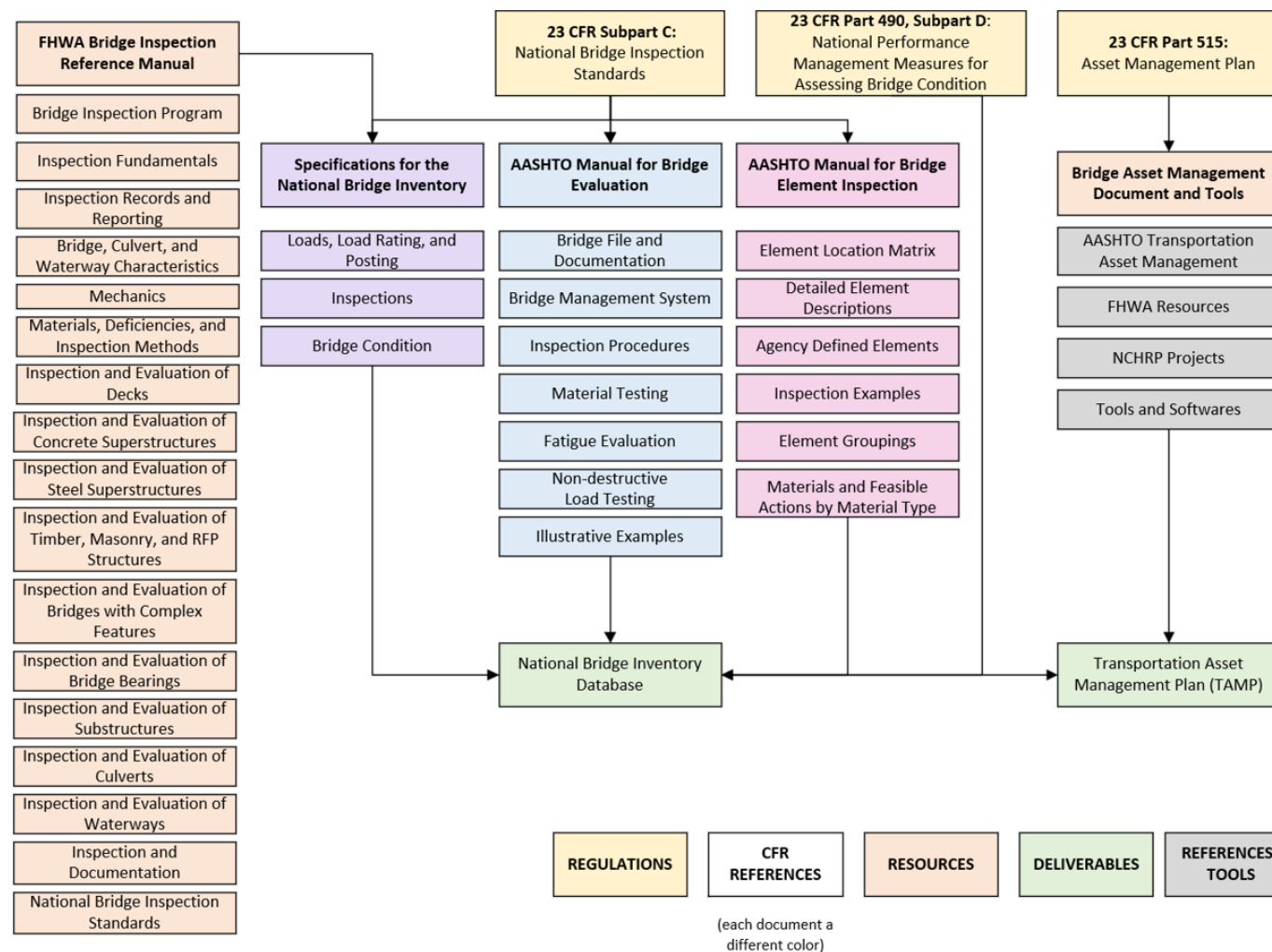
- **Usefulness**
 - Limited usefulness: The section lacks details on testing types, their advantages and disadvantages, outcomes, application in load rating evaluation, and costs. It also does not address emerging and commonly used testing technologies, reducing its practical value.
- **Quality**
 - Poor: Content is descriptive but lacks actionable guidance. Additional emphasis is needed on available and emerging testing technologies, criteria for selecting appropriate testing methods, and expected outcomes of different tests.
- **Clarity**
 - Generally clear: The language present is generally clear and understandable; however, some content appears outdated and does not explain how material testing should be applied in practice.
- **Completeness**
 - Incomplete: The section covers material testing basics, but it lacks practical guidance on test selection, implementation, and decision making. Also, all material testing needs to be documented as part of bridge file, so there should be a description of requirements and guidance associated with those efforts.
- **Level of Detail**
 - Not appropriate: It is too high-level to support decision-making. Guidance is lacking on test selection, interpretation of results, and potential benefits of testing, including when testing is warranted and how it can reduce uncertainty in bridge evaluation.

Research Plan – Step 3

- **Step 3.3. Define Potential Action Items for MBE Sections and Gaps**
- Based on the initial scan and detailed evaluation, each section will be assigned with an appropriate action item(s), and description of the action(s). Potential actions include:
 - Revise
 - Reformat
 - Remove
 - Keep
 - Move
 - Merge
 - New research
- MBE sections may receive multiple action items. These classifications will serve as the basis for constructing alternative roadmap scenarios, and paths forward.

Research Plan – Step 4

- Step 4. Expand Current Document Map



Research Plan – Step 5

- **Step 5. Define Draft Roadmap Options**
 - Prepare roadmap options (no more than 5).
 - For each option, define the primary objective, vision, and scope.
 - Roadmap options will summarize changes being considered and provide the basic rationale for each direction.
 - Roadmap options presented to the panel
 - Discussion with panel in a dedicated meeting or a workshop to gather feedback prior to launching into developing the roadmap drafts.
 - From that feedback, three alternatives could be carried forward to the next step.

Research Plan – Step 6

- **Step 6. Create Draft Roadmaps**

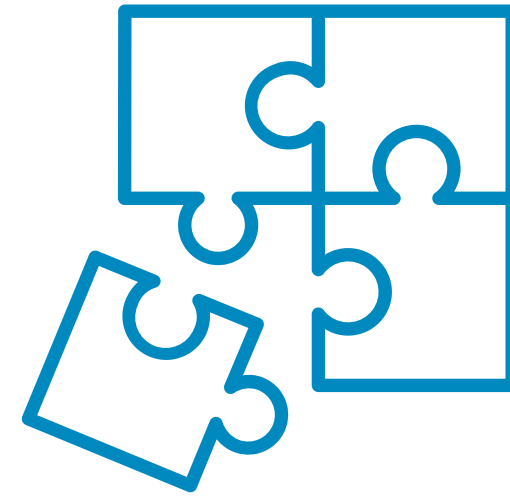
- For each option, the vision and objectives will be expanded and refined, and a detailed list of action items will be assigned to each section, and key stakeholders will be identified and mapped into relevant tasks.
- The draft roadmaps will present various strategic directions, outlining the rationale, anticipated impacts, and implementation steps for each scenario. These drafts will provide a structured basis for evaluation and comparison of alternatives.
- Again, discuss with panel to understand what should be the preferred alternative

Research Plan – Step 7

- **Step 7. Create Complete Roadmap for Preferred Option**

- In the final step, the research team will incorporate panel feedback to develop a complete roadmap of the preferred alternative.
- This roadmap will serve as a practical guide for planning and implementing future updates to the MBE.
- The final roadmap will include tables and figures to support informed decision-making for future updates to the MBE.

Roadmap Outline

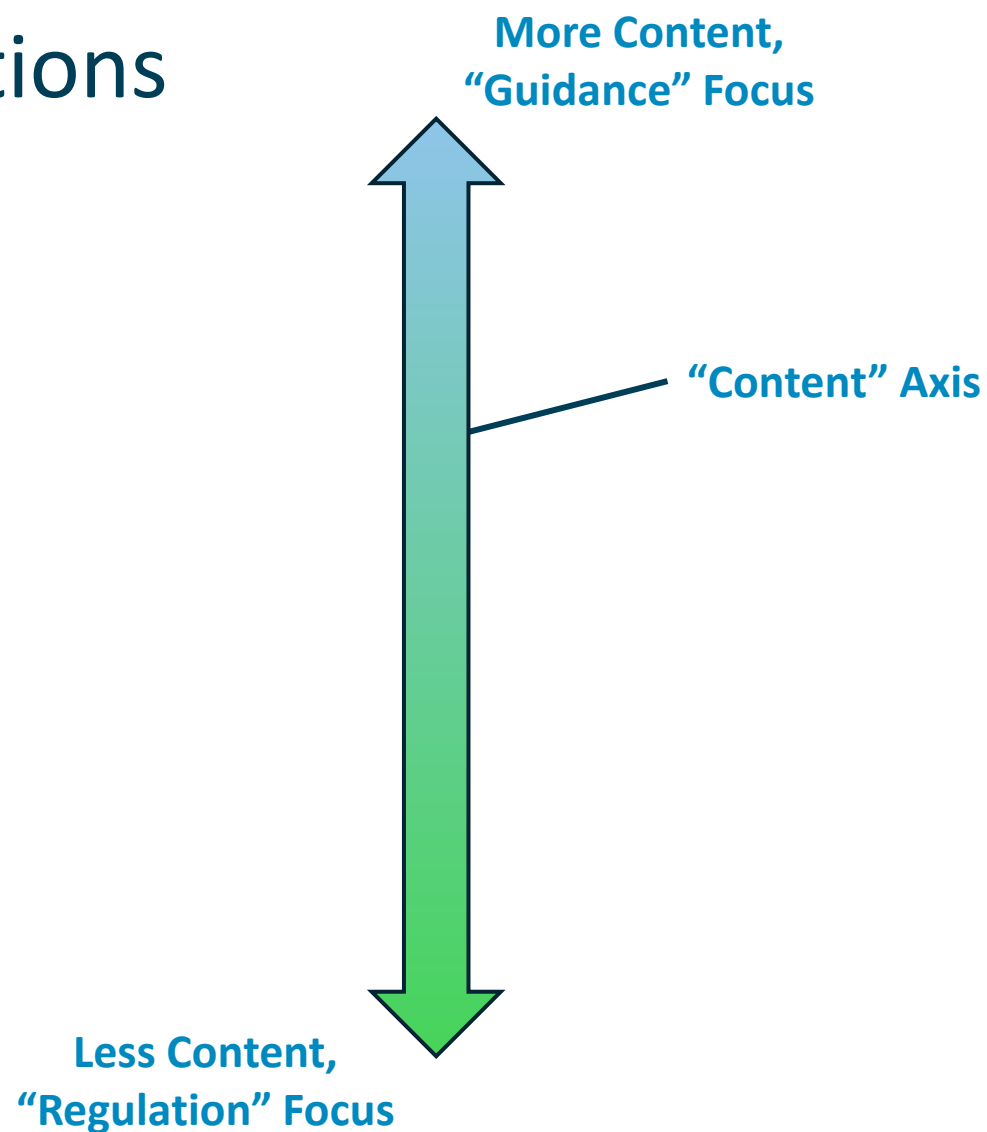


- Overview
- Document Map
- Document Outlines, Narratives, and Gaps
- Implementation Framework
- Timeline
- Costs
- Stakeholder Impact
- Problem Statements
- Additional Considerations
- Supporting categorization info
- Summary

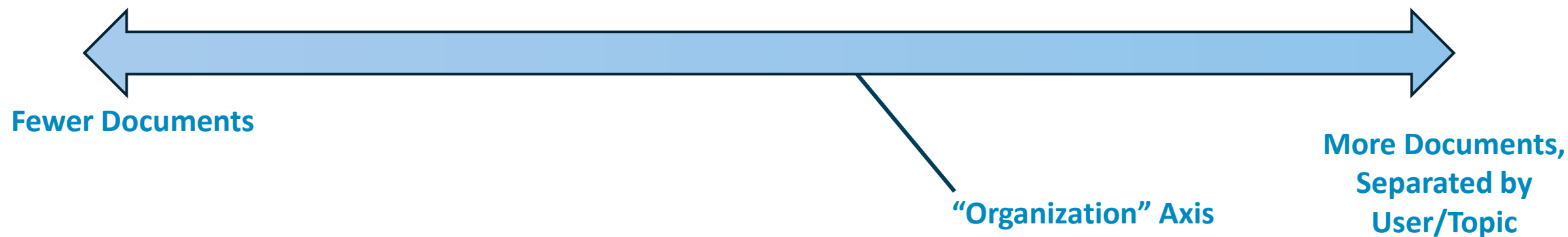


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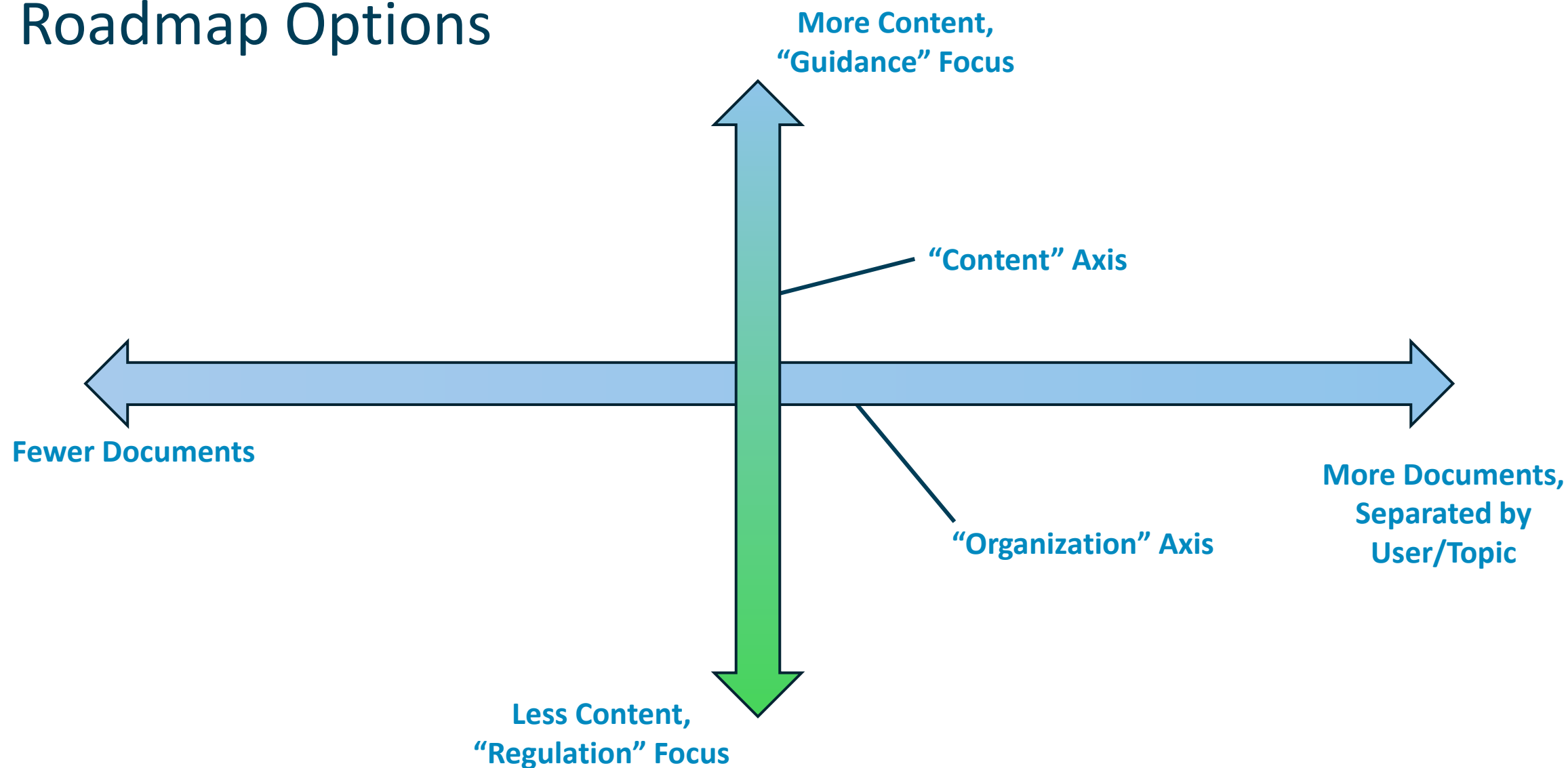
Roadmap Options



Roadmap Options



Roadmap Options



Roadmap Options

- Roadmap Option 1: Keep the current AASHTO MBE outline
- Roadmap Option 2: AASHTO MBE includes only load rating and posting content
- Roadmap Option 3: MBE includes only the minimum federal requirements.
- Roadmap Option 4: AASHTO MBE is a three-volume or separate documents that addresses Inspection, Load Rating and Posting and Bridge Asset Management.
- Roadmap Option 5: AASHTO MBE is a five-volume or separate documents that addresses Inspection, Load Rating and Posting, Bridge Files/BIM, Bridge Asset Management, and Load Testing/Material Testing.

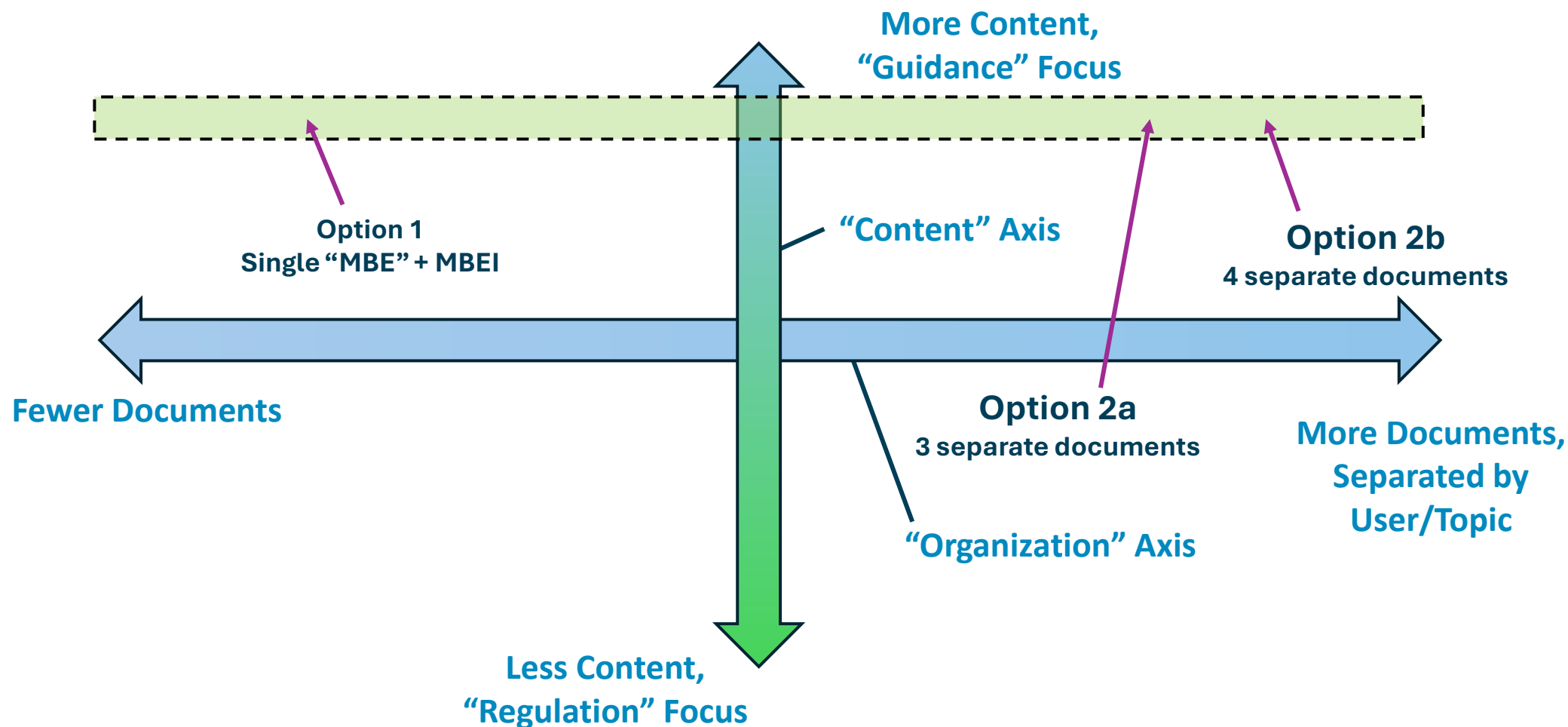
Roadmap Options

- Roadmap Option 1: Keep the current AASHTO MBE outline
- Roadmap Option 2: AASHTO MBE includes only load rating and posting content
- Roadmap Option 3: MBE includes only the minimum federal requirements.
- Roadmap Option 4: AASHTO MBE is a three-volume document or three separate documents that addresses Inspection, Load Rating and Posting and Bridge Asset Management.
- Roadmap Option 5: AASHTO MBE is a five-volume or separate documents that addresses Inspection, Load Rating and Posting, Bridge Files/BIM, Bridge Asset Management, and Load Testing/Material Testing.

Considered Roadmap Options

- **Roadmap Option 1:** Keep the current AASHTO MBE outline
- **Roadmap Option 2a:** AASHTO MBE becomes three documents:
 - Manual for Bridge Inspection
 - Manual for Bridge Evaluation
 - Asset Management Manual
- **Roadmap Option 2b:** AASHTO MBE becomes four documents:
 - Manual for Bridge Inspection
 - Manual for Bridge Evaluation
 - Asset Management Manual
 - Digital (BIM) Information Manual

Considered Roadmap Options



Roadmap Option 1

- **Vision/Goal:** Keep the current AASHTO MBE outline - 2 documents support bridge evaluation and asset management

- **Outline:**

AASHTO Manual for Bridge Evaluation	
Section	Name
1	Introduction
2	Bridge Files and Documentation
3	Bridge Management Systems
4	Inspection Procedures
5	Material Testing
6	Load Rating
7	Fatigue Evaluation of Steel Bridges
8	Nondestructive Load Testing
A1	Illustrative Examples

- **Pros and Cons:**

- **Pros:**

- Single-document format enables easier consistency control
 - Fewest impacts on existing documents and references
 - Minimal reorganization effort required

- **Cons:**

- Does not resolve the organizational gap identified by stakeholders
 - Three distinct user groups and two committees still share one document structure
 - Difficult to improve usability for inspection and asset management without structural change

Roadmap Option 1 Timeline

OPTION 1- Keep current MBE outline

Year	2026				2027				2028				2029				2030				2031				2032			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MBE 4th Edition Published																												
Rewrite MBE - incorporating short term gaps																												
Perform Research for long term gaps																												
Development of Digital File Standards																												
Development of Asset Management Content																												
Other miscellaneous research projects																												
MBE 5th Edition Published																												
MBE 6th Edition Published, digital files and asset management info added																												

Roadmap Option 2a

- **Vision/Goal:** 3 documents support bridge evaluation and asset management
- **Outlines:**

AASHTO Manual for Rating	
Section	Name
1	Introduction
2	Bridge Files
3	QA/QC
4	Load Rating Methods
5	Load and Resistance Factor Rating
6	Load Factor Rating
7	Allowable Stress Rating
8	Deteriorated Capacity Evaluation
9	Material Testing
10	Nondestructive Load Testing
11	Safe Posting Load
12	Posting Types
13	Posting Signs
14	Fatigue Evaluation
A1	Illustrative Examples

AASHTO Manual for Bridge Inspection	
Section	Name
1	Introduction
2	Bridge Files and BIM
3	Inspection Methods
4	NBIS Requirements
5	Nonregulatory Inspection Practices
6	Element Inspection (MBEI)
7	Scour Appraisal
8	Material Testing
A1	Appendix

AASHTO Bridge Asset Management Manual	
Section	Name
1	Introduction
2	Objectives of Asset Management
3	TAMP Requirements
4	Risk
5	Resiliency
6	Life Cycle Cost
7	Cross Asset Allocation and Programming
8	Components of a Bridge Management System
A1	Illustrative Examples

Roadmap Option 2b

- **Vision/Goal:** 4 documents support bridge evaluation and asset management
- **Outlines:**

AASHTO Manual for Rating	
Section	Name
1	Introduction
2	QA/QC
3	Load Rating Methods
4	Load and Resistance Factor Rating
5	Load Factor Rating
6	Allowable Stress Rating
7	Deteriorated Capacity Evaluation
8	Material Testing
9	Nondestructive Load Testing
10	Safe Posting Load
11	Posting Types
12	Posting Signs
13	Fatigue Evaluation
A1	Illustrative Examples

AASHTO Manual for Bridge Inspection	
Section	Name
1	Introduction
2	Inspection Methods
3	NBIS Requirements
4	Nonregulatory Inspection Practices
5	Element Inspection (MBEI)
6	Scour Appraisal
7	Material Testing
A1	Appendix

AASHTO Bridge Asset Management Manual	
Section	Name
1	Introduction
2	Objectives of Asset Management
3	TAMP Requirements
4	Risk
5	Resiliency
6	Life Cycle Cost
7	Cross Asset Allocation and Programming
8	Components of a Bridge Management System
A1	Illustrative Examples

AASHTO Bridge Digital Information Manual	
Section	Name
1	Introduction
2	Provisions to Support the NBIS Requirements
3	Supplemental Inventory Documentation
4	BIM National Standards
5	Digital Files
6	Digital Delivery
7	Digital Twin
A1	Illustrative Examples

Roadmap Options 2a and 2b

Pros:

- **Better alignment with user needs**
 - MBE is primarily used for Load Rating (53%); Inspection (13%) and Bridge Files/Management show minimal use. Each document tailored to its target users.
- **Improved usability and access**
 - Load rating is rated very useful, good quality, and clear, while other sections are infrequently used, only slightly useful, and fair quality. Separation would make it easier to find/add/update relevant information
- **Clearer structure and guidance**
 - Enables deeper technical content, examples, and workflows per audience.
- **Opportunity for users and industry**
- **Easier Maintenance and Updates**

Clear ownership by dedicated committees/working groups.
Easier to expand or add new volumes without disrupting others.

Cons:

- **Major reorganization effort**
- **Implementation coordination**
- **Transition period challenges**
 - Users and organizations will need time to adapt to the new structure, update internal references and training materials, and build familiarity with multiple documents.
- **Cross-referencing complexity**

Requires strong linking between documents to maintain continuity.
- **Separation of content in overall workflow**
 - Can be advantageous to have info 'at hand' which is from other 'disciplines'

Roadmap Option 2b Timeline

OPTION 2 - Current MBE Broken Up into Separate Documents

Year	2026				2027				2028				2029				2030				2031				2032			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MBE 4th Edition Published																												
Rewrite MBE - incorporating short term gaps																												
Rewrite MBEI - incorporating MBE inspection content																												
Perform Research for long term gaps																												
Development of Digital File Standards																												
Development of Asset Management Manual																												
Other miscellaneous research projects																												
MBE 5th Edition Published																												
MBEI 3rd Edition Published																												
Digital File Standards Published																												
MBE 6th Edition Published																												
Asset Management Manual Published																												

Options Comparison

No .	Option	# Docs	Primary Audience	User Benefit	Impact on Guidance	Ownership	Consistency Risk	Implementation Complexity	Adoption Effort	Flexibility (Updates)	Research /Gaps
1	Keep MBE Outline	2	Mixed users	Low-Moderate (general guidance)	Limited improvement; AM info remains high-level; Inspection info in MBE is still just “CFR reference”, still relies on MBEI/BIRM	Single ownership (centralized)	Low (single source)	Low	Low	Low (full doc updates required)	Gaps remain unaddressed
2a	3-Document Format	3	Targeted users	High (focused, easier to use)	Significant improvement in clarity and applicability	Defined ownership per document (discipline-based)	Moderate (requires coordination)	Moderate/High	Moderate	High (independent updates)	AM + Inspection manuals needed
2b	4-Document Format	4	Targeted users	High (specialized guidance)	Comprehensive coverage incl. inventory data, digital workflows	Defined ownership per document (discipline-based)	Moderate (requires coordination)	Moderate/High	Higher	High (modular independent updates)	AM + Inspection + Digital Framework BIM needed

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Selected Roadmap

- **AASHTO MBE becomes three separate documents:**
 - 1) AASHTO Manual for Load Rating of Highway Structures (MLRHS)
 - 2) AASHTO Manual for Inspection of In-Service Highway Structures (MIIHS)
 - 3) AASHTO Manual for Asset Management of Highway Structures (MAMHS)
- **It requires:**
 - MBE Rewrite to develop the **MLRHS**
 - MBEI and MBE Inspection Section Rewrite to develop the **MIIHS**
 - Development of a new Asset Management Manual, using MBE Section 3, the AASHTO Transportation Asset Management Hub, and/or other available resources to create **MAMHS**
- **The goal is to:**
 - Better alignment with target user needs
 - Improve usability and access
 - Clearer structure and guidance
 - Easier maintenance and updates

AASHTO Manual for Load Rating of Highway Structures (MLRHS)

Section	Name
1	Introduction
2	Load Rating Procedures
3	Loads
4	Concrete Structures
5	Steel Structures
6	Other Structures
7	Material Testing
8	Nondestructive Load Testing
9	Posting of Structures
10	Bridge Files
A	Illustrative Examples

No.	Section Name	Source Document	
1	Introduction	MBE	6A.1
2	Load Rating Procedures	MBE	6A.1
2.1	QA/QC	New	
2.2	LRFR	MBE	6A
2.2.1	Introduction	MBE	6A.1
2.2.2	Limit States	MBE	6A.1
2.2.3	Rating Levels	MBE	6A.1, 6A.4
2.2.4	Design Load Rating	MBE	6A.1, 6A.4
2.2.5	Legal Load Rating	MBE	6A.1, 6A.4
2.2.6	Permit Load Rating	MBE	6A.1, 6A.4
2.2.7	Load Rating Equation	MBE	6A.1, 6A.4
2.2.8	Condition Factor	MBE	6A.1, 6A.4
2.2.9	System Factor	MBE	6A.1, 6A.4
2.2.10	Structural Analysis	MBE	6A.3
2.3	LFR/ASR	MBE	6B
2.3.1	Introduction	MBE	6B.1
2.3.2	Rating Methods	MBE	6B.3
2.3.3	Rating Levels	MBE	6B.2
2.3.4	Design Load Rating	MBE	6B.6
2.3.5	Legal Load Rating	MBE	6B.6
2.3.6	Permit Load Rating	MBE	6B.6
2.3.7	Load Rating Equation	MBE	6B.4
2.3.8	Structural Analysis	MBE	-
3	Loads	MBE	6A.2, 6B.6
3.1	LRFR	MBE	6A.2
3.1.1	Dead Loads	MBE	6A.2
3.1.2	Permanent Loads	MBE	6A.2
3.1.3	Vehicular Live Loads	MBE	6A.2
3.1.3.1	Application of Vehicular Live Load	MBE	6A.2.3.2

AASHTO Manual for In-Service Inspection of Highway Structures (MIIHS)

No.	Section Name
1	Introduction
2	NBIS Requirements
3	QA/QC for Bridge Inspection
4	Nonregulatory Inspection Practices
5	Element Inspection (MBEI)
6	Scour Appraisal
7	Nondestructive Testing and Evaluation Methods
8	Bridge Files
A1	Agency-Defined Elements (MBEI)
B1	Element-level Inspection Example (MBEI)
C1	Component-level Inspection Example
D1	Element Grouping (MBEI)
E1	List of Feasible Action by Material Type (MBEI)
F1	QC/QA Frameworks
H1	Risk Based Inspection Example Risk Models

No.	Section Name	Source Document	
1	Introduction	MBE	Section 1
2	NBIS Requirements	23 CFR	650 Subpart C
2.1	Bridge Inspection Organization	MBE	Section 4
2.2	Qualifications of Personnel	MBE	Section 4
2.3	Inspection Types	MBE	Section 4
2.4	Inspection Intervals	MBE	Section 4
2.5	Risk-Based Inspection Practices	MBE	Section 4
2.6	Required Inspection Procedures	MBE	Section 4
3	QA/QC for Bridge Inspection	New	-
3.1	NBIS Requirements for QC/QA	New	-
3.2	Quality dimensions and tolerance	New	-
4	Nonregulatory Inspection Practices	MBE	Section 4
5	Element Inspection (MBEI)	MBEI	Section 1
5.1	Introduction to Element-Level Inspection	MBEI	Section 2
5.2	Element Location Matrix	MBEI	Section 2
5.3	Detailed Element Descriptions	MBEI	Section 3
6	Scour Appraisal	HEC	18 and 20
7	Nondestructive Testing and Evaluation Methods	MBE	Section 8
8	Bridge Files	MBE	Section 2
A1	Agency-Defined Elements (MBEI)	MBEI	Appendix A
B1	Element-level Inspection Example (MBEI)	MBEI	Appendix B
C1	Component-level Inspection Example	New	-
D1	Element Grouping (MBEI)	MBEI	Appendix C
E1	List of Feasible Action by Material Type (MBEI)	MBEI	Appendix D
F1	QC/QA Frameworks	New	-
H1	Risk Based Inspection Example Risk Models	New	-

AASHTO Manual for Asset Management of Highway Structures (MAMHS)

No.	Section Name	Source Document	
1	Introduction	MBE	Section 3
2	Objectives of Highway Structures Asset Management	MBE	Section 3
3	TAMP Requirements for Highway Structures	23 CFR	Part 515
4	Components of Highway Structures Asset Management	New	
5	Inventory Management	New	
6	Condition Assessment	New	
7	Risk	New	
8	Resiliency	New	
9	Preservation Policy	New	
10	Performance Measures	New	
11	Deterioration Models	New	
12	Life Cycle Cost	New	-
13	Cross Asset Allocation and Programming	New	-
14	Components of a Structures Asset Management System	MBE	Section 3
A1	Illustrative Examples	New	-

Roadmap Timeline

Year	2026				2027				2028				2029				2030				2031			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MBE 4th Edition Published																								
Rewrite MBE																								
MRHS, 1st Edition – Published, but not referenced by CFR																								
Research of long-term rating gaps																								
Rewrite MBEI																								
MIHS, 1st Edition – Published, but not referenced by CFR																								
Development of Asset Management Manual																								
MAMHS, 1st Edition - Published; MRHS, MIHS, MAMHS - Referenced by CFR																								
AASHTO MBE 4th Edition and AASHTO MBEI 2nd Edition - Retired																								

Abbreviations:

MBE – Manual for Bridge Evaluation

MRHS – Manual for Rating of Highway Structures

CFR – Code of Federal Regulations

MBEI – Manual for Bridge Element Inspection

MIHS – Manual for Inspection of Highway Structures

MAMHS – Manual for Asset Management of Highway Structures

Impact

- **Improved usability:** Separate manuals for rating, inspection, and asset management aligned with the needs of inspectors, engineers, and managers.
- **Greater clarity and consistency:** Users rely on discipline-specific guidance, improving compliance, safety, and decision-making.
- **Streamlined governance:**
 - Rating Manual → AASHTO COBS Safety and Evaluation Committee
 - Asset Management Manual → AASHTO Asset Management Committee
 - Inspection Manual → Joint support from both committees
- **Better subject-matter focus:** Committees maintain content aligned with their expertise, improving efficiency and quality. Successful implementation requires collaboration: NCHRP panels, State DOTs, FHWA/federal agencies, and industry experts working together to support a smooth transition.

Problem Statements

1. Rewrite of AASHTO Manual for Bridge Evaluation
2. Rewrite of AASHTO MBEI
3. Development of AASHTO Manual for Asset Management of Highway Structures
4. Framework to Use WIM Data to Calibrate Live Load Factors
5. Guidance on permit rating, and posting types and signs

DISCUSSION



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THE MANUAL FOR BRIDGE EVALUATION

