

May 17, 2022

MANAGING YOUR BRIDGE INVENTORY

What can your agencies do to maintain bridges?





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Project Engineer



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OBJECTIVES

Develop a Bridge Asset Management System (BAMS) to:

- Identify **bridge projects**
- **Prioritize** bridge projects
- Prepare for **bridge funding**



PURPOSE OF BAMS - FHWA

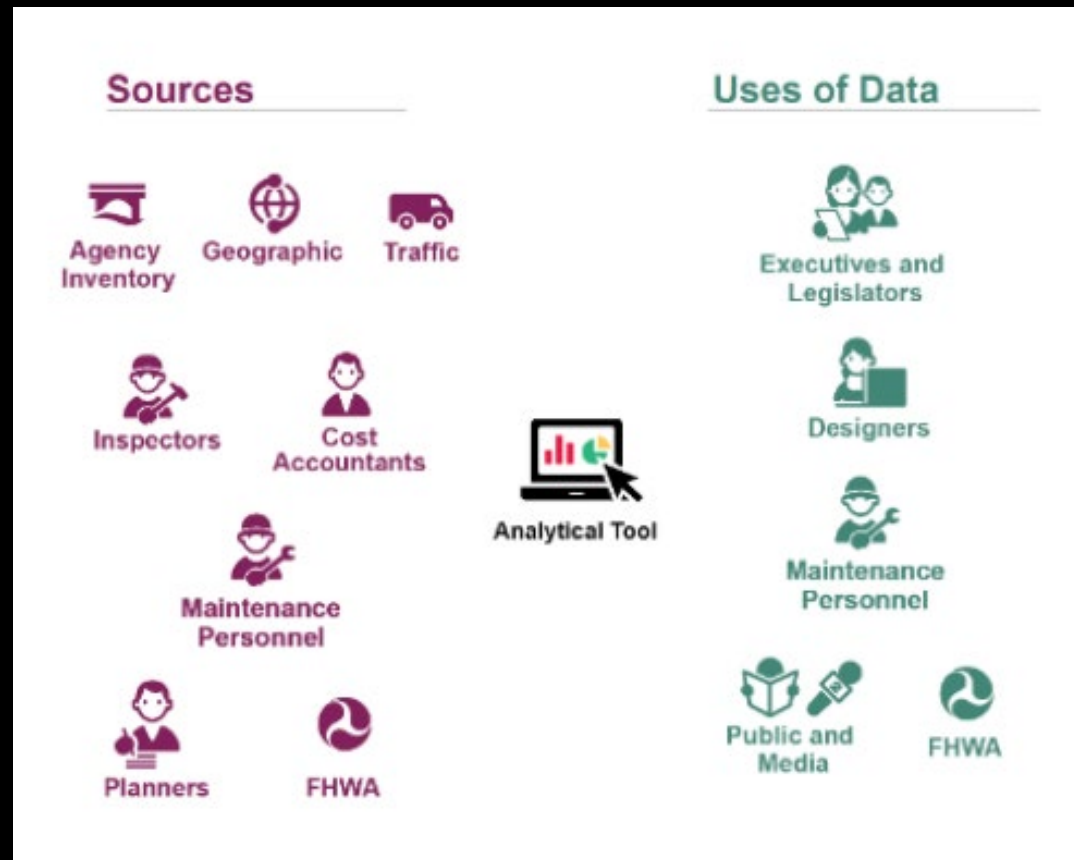


WHAT IS INVOLVED

- What agencies should be involved in developing a BAMS?
- In your agency, who should be involved?

WHAT IS INVOLVED?

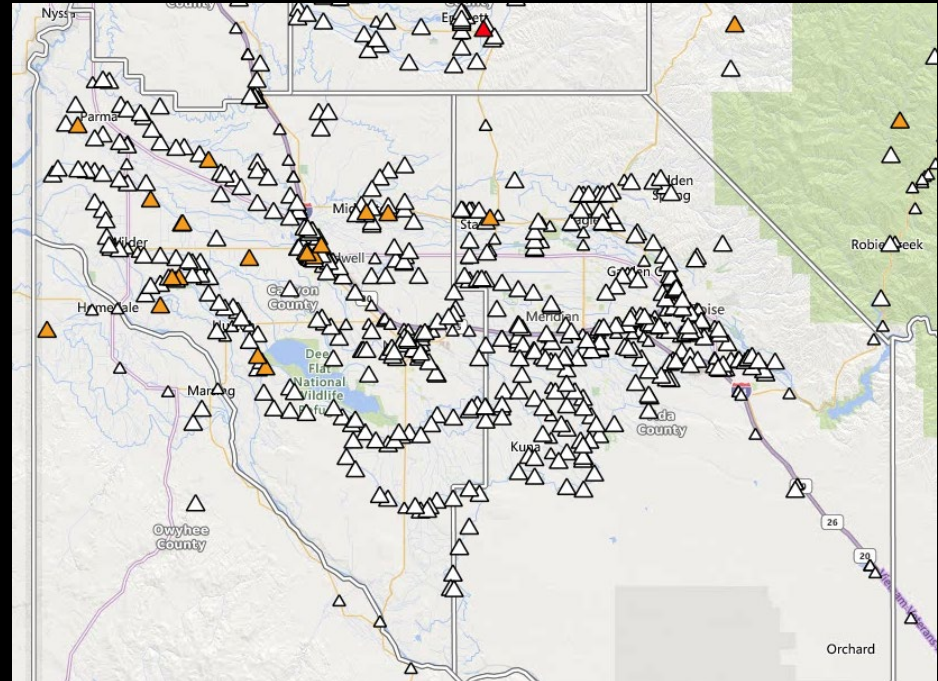
What else
should be
involved in
developing
a BAMS?



Source: FHWA-NHI-130 109A (Bridge Management Fundamentals, NHI https://www.nhi.fhwa.dot.gov/course-search?tab=0&typ=3&srt=4&sf=0&course_no=130 109A)

DATA, SOFTWARE, & USE OF BAMS

- What data is used?
- Where can I find it?



Bridge Key	Highway System	Year Built	Year Reco...	Carries	Crosses Over	Length (Ft)	Post Status	Condition	Lanes On	ADT	Deck	Super	Sub	County	City	Admin Juris	Local Juris	Legisl... District	Date Received
15120	state	1990		SH 69	TEED LATERAL CANAL	22	A Open, no restriction	Good	5	13000	7	7	7	Ada		District 3	Ada County HD	23	2022-03-29
15125	state	1990		SH 69	KUNA CANAL	21	A Open, no restriction	Good	5	19000	7	7	7	Ada		District 3	Ada County HD	23	2022-03-29
15130	state	1990		SH 69	MASON CRK FEEDER CANAL	30	A Open, no restriction	Fair	5	19000	6	6	6	Ada		District 3	Ada County HD	22	2022-03-29
15135	state	1990		SH 69	RAWSON CANAL	23	A Open, no restriction	Fair	5	30000	N	N	N	Ada		District 3	Ada County HD	22	2022-03-29
15760	state	1969	2014	I 84 EBL	UPRR	146	A Open, no restriction	Fair	4	24250	6	6	6	Ada	Boise	District 3	Ada County HD	18	2022-03-29
15765	state	1969	2004	I 84 WBL	UPRR	147	A Open, no restriction	Fair	4	24250	6	5	6	Ada	Boise	District 3	Ada County HD	18	2022-03-29

DATA, SOFTWARE, & USE OF BAMS

IDAHO MANUAL FOR BRIDGE EVALUATION—SECTION 4: INSPECTION APPENDIX 4.5 EXAMPLE STRUCTURAL INVENTORY AND APPRAISAL REPORT



Idaho Transportation Department Bridge Inspection Report

Bridge Key:	12774	Structure Name:	02020C 48.31
(6) Features Intersected:	AMERICANA BLVD;15TH ST.	(9) Location:	IN BOISE: FRONT STREET
Facility Carried/Route:	US 20 WBL	Admin Jurisdiction:	0003 District 3
Xref Structure Name:	97363A 2.12	District:	03

Additional Information

ROADWAY APPROACHES: Concrete approaches are in good condition. Bridge and approaches on a crest vertical curve.

CURBS/SIDEWALKS: None

DRAINS: Several drains are filled with debris.

EMBANKMENT: Mechanically stabilized earth (MSE) walls at both approaches in good condition. Spall with exposed bar in the bottom corner of the MSE wall "cap" on the abutment 2 right approach wall near abutment 2 along with a few other smaller spalls along the other MSE wall "caps."

CHANNEL: Americana Blvd, 15th St, and Rhodes skate park under structure.

SIGNS: Roadway caution signs on top of the parapets.

GUARDRAIL: Concrete jersey type rail with impact attenuator left side on east approach. Rail has numerous tire and scrape marks from vehicles hitting rail on left side.

UTILITIES: Electrical conduit and lighting attached to the underside of the structure in good condition. Street light poles attached to the tops of the parapets on both sides of the roadway in good condition.

NOTES: Confined space inspected by Jim Holland, Amy Bower, and Rene Leon on 7/6/2017.

INSPECTION FREQUENCY: None.

WORK ACCOMPLISHED: Routine roadway maintenance. Expansion joints cleaned (yearly maintenance).

LOAD RATING: None.

Maintenance Recommendations

Recommendation	Priority	Suggested Work Assignment
Clean the expansion joints yearly	Medium	State Forces
Remove rusted/corroded bolts in the portal access cover at abutment 1 right side. Coordinate with bridge inspector.	High	State Forces
Place an epoxy overlay	Medium	Contractor
Clean and clear the deck drains yearly	Medium	State Forces

Inspector's Signature: _____ 07/03/2019
Inspector Number and Name:

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LOAD RATING

(31) Design Load: 9 MS 22.5 (HS 20)
(64) Operating Rating: 50 tons / HS27.5
(66) Inventory Rating: 27 tons / HS15.0
(70) Posting: 5 A/Above Legal Loads
(41) Posting Status: A Open, no restriction

CONDITION

(56) Deck: 8 Satisfactory
(59) Superstructure: 8 Satisfactory
(60) Substructure: 7 Good
(61) Channel/Protection: N N/A (NB)
(62) Culvert: N N/A (NB)

AGE AND SERVICE

(27) Year Built: 1992
(106) Year Reconstructed:
(42a) Type of Service On: 1 Highway
(42b) Type of Service Under: 1 Highway
(28a) Lanes On: 3 (28b) Lanes Under: 6
(29) ADT: 16750
(30) Year of ADT: 2018
(108) Truck ADT: 4%
(19) Detour Length: 0 miles
Speed Limit: 45 MPH

APPRAISAL

(87) Structure Condition: 8 Equal Min Criteria
(66) Deck Geometry: 7 Above Min Criteria
(69) Underclear Vert and Horiz: 8 Equal Minimum
(71) Waterway Adequacy: N Not applicable
(72) Approach Alignment: 8 Equal Desirable Crit
(36) Traffic Safety Features:
(a) Bridge Rail: 1 Meets Standards
(b) Transition: 1 Meets Standards
(c) Approach Rail: 1 Meets Standards
(d) Approach Rail Ends: 1 Meets Standards
(113) Scour Critical: N Not Over Waterway

PROPOSED IMPROVEMENTS

(75a) Type of Work:
(76) Work Done By:
(76) Length of Improvement:
(84) Bridge Improvement Cost:
(95) Roadway Improvement Cost:
(86) Total Project Cost:
(97) Year of Cost Estimate:
(114) Future ADT: 24375
(115) Year of Future ADT: 2038
YEAR PROGRAMMED:

NAVIGATION DATA

(38) Navigation Control: NA-no waterway
(39) Vertical Clearance:
(40) Horizontal Clearance:
(111) Pier Protection:
(116) Bridge Vert Cl:

ENVIRONMENTAL

Environmental Concerns: No

INSPECTION

(80) Inspection Date: 7/3/2019
(82) Supplemental Inspections Frequency:
(a) Fracture Critical Detail: NA
(b) Underwater Inspection: NA
(c) Fatigue Detail (OS) Inspection: NA
(69) BIT Inspection: NA
(e) Confined Space Inspection: 72 months
(91) Inspection Frequency: 24 months
(93) Date of Inspections:
(a) FC Inspection Date:
(b) UW Inspection Date:
(c) Fatigue Detail (OS) Date: 2/5/2001
(e) Confined Space Date: 7/6/2017

Channel Cross Section Year:
Equipment Needed for Regular Inspection? None

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DATA, SOFTWARE, & USE OF BAMS

Maintenance Recommendations

Recommendation	Priority	Suggested Work Assignment
Clean the expansion joints yearly	Medium	State Forces
Remove rusted/corroded bolts in the portal access cover at abutment 1 right side. Coordinate with bridge inspector.	High	State Forces
Place an epoxy overlay	Medium	Contractor
Clean and clear the deck drains yearly	Medium	State Forces



DATA, SOFTWARE, & USE OF BAMS

LOAD RATING

(31)Design Load:	9 MS 22.5 (HS 25)
(64)Operating Rating:	50 tons / HS27.8
(66)Inventory Rating:	27 tons / HS15.0
(70)Posting:	5 At/Above Legal Loads
(41)Posting Status:	A Open, no restriction

DATA, SOFTWARE, & USE OF BAMS

FHWA BMS Workshop

Participant Workbook

D1M4-Slide 13

NBI Major Components – General Condition Ratings (GCRs)		
Rating Number	NBI Descriptor	Performance Measure Classification (23 CFR 490)
9	EXCELLENT CONDITION	GOOD
8	VERY GOOD CONDITION	
7	GOOD CONDITION	
6	SATISFACTORY CONDITION	FAIR
5	FAIR CONDITION	
4	POOR CONDITION	POOR
3	SERIOUS CONDITION	
2	CRITICAL CONDITION	
1	"IMMINENT" FAILURE CONDITION	
0	FAILED CONDITION	

Key Message

GCRs for deck, superstructure, substructure, or culvert are rated on the "zero" to "nine" numerical rating scale, found in the Federal Coding Guide, along with descriptor for each rating, shown in the middle column of the table on this slide.

More recently, the FHWA created national performance measures for NHS bridges, assigning overall classifications to bridges as "good," "fair," or "poor," as shown in the right column of the table on this slide.

- These measures may be extended to non-NHS or smaller bridges at the state's discretion.
- GCRs can be used for network-level bridge management where bridges are put in broad categories of need such as maintenance, preservation, rehabilitation, or reconstruction (replacement).
- However, more specificity and quantification are needed for more detailed analysis.

FHWA BMS Workshop

Participant Workbook

D1M4-Slide 32

Common Performance Measures: Example Good – Fair – Poor Condition Ratings			
NBI Rating Scale (from 0 – 9)	9 8 7 Good	6 5 Fair	4 3 2 1 0 Poor
Deck (Item 58)	≥ 7	5 or 6	≤ 4
Superstructure (Item 59)	≥ 7	5 or 6	≤ 4
Substructure (Item 60)	≥ 7	5 or 6	≤ 4
Culvert (Item 62)	≥ 7	5 or 6	≤ 4

Key Message

Percent Good-Fair-Poor is a condition-based bridge performance measure defined in 23 CFR § 490.409 Measure Calculations. This Federally-required performance measure, is an example based on the NBI GCRs, for the major components. These components are rated:

- Good when the GCR is 7 or above
- Fair when the GCR is rated 5 and 6
- Poor when the GCR is rated 4 or below

Finally, the lowest of these major component ratings is used to assign a "worst-condition component rating" to the entire bridge.

DATA, SOFTWARE, & USE OF BAMS

CONDITION

(58)Deck:	6 Satisfactory
(59)Superstructure:	6 Satisfactory
(60)Substructure:	7 Good
(61)Channel/Protection:	N N/A (NBI)
(62)Culvert:	N N/A (NBI)

DATA, SOFTWARE, & USE OF BAMS

AGE AND SERVICE

(27)Year Built:	1992
(106)Year Reconstructed:	
(42a)Type of Service On:	1 Highway
(42b)Type of Service Under:	1 Highway
(28a)Lanes On: 3	(28b)Lanes Under: 6
(29)ADT:	16750
(30)Year of ADT:	2018
(109)Truck ADT:	4%
(19)Detour Length:	0 miles
Speed Limit:	45 MPH

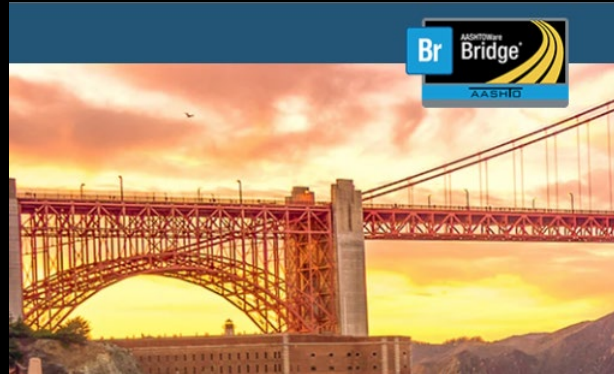
DATA, SOFTWARE, & USE OF BAMS

APPRAISAL

(67)Structure Condition:	6 Equal Min Criteria
(68)Deck Geometry:	7 Above Min Criteria
(69)Undrclear,Vert and Horiz:	6 Equal Minimum
(71)Waterway Adequacy:	N Not applicable
(72)Approach Alignment:	8 Equal Desirable Crit
(36)Traffic Safety Features:	
(a)Bridge Rail:	1 Meets Standards
(b)Transition:	1 Meets Standards
(c)Approach Rail:	1 Meets Standards
(d)Approach Rail Ends:	1 Meets Standards
(113)Scour Critical:	N Not Over Waterway

DATA, SOFTWARE, & USE OF BAMS

What
software is
available,
and which
one is
right for
your
agency?



EXAMPLE OF BAMS SOFTWARE

BRIDGE_KEY	STRUCTURE_NAME	FUNCTIONAL_CLASS	ADT	TRK_ADT_PCT	DETOUR_LENGTH
22315	X991060 0.16	09 Rural Local	250	16	3
22380	X991060 0.49	09 Rural Local	130	15	5
22405	X991060 0.62	09 Rural Local	120	10	1
22450	X991060 0.79	09 Rural Local	150	13	4
22455	X991060 0.82	08 Rural min Collector	310	36	2
22460	X991060 0.88	19 Urban Local	100	5	99
22495	X991060 1.17	09 Rural Local	150	10	5
22510	X991060 1.23	09 Rural Local	200	10	4
22540	X991060 1.32	09 Rural Local	120	8	4
22550	91838A 104.59	07 Rural Mjr Collector	110	27	2
22590	X991060 1.69	09 Rural Local	200	10	2

POST_STATUS	CONDITION	INSPECTION_DATE	DECK	SUPER	SUB	CULVERT	CHANNEL_PROTECTION	SCOUR
P Posted for load	Fair	4/7/2020	7	7	6	N	7	8
P Posted for load	Fair	3/4/2020	7	6	7	N	6	8
P Posted for load	Fair	4/6/2021	7	6	6	N	7	8
P Posted for load	Fair	4/7/2020	7	7	6	N	7	U
P Posted for load	Fair	4/6/2021	7	5	6	N	7	8
P Posted for load	Good	4/8/2020	7	7	7	N	7	8
P Posted for load	Fair	10/2/2020	6	6	6	N	8	8
P Posted for load	Fair	3/6/2020	7	6	7	N	6	8
P Posted for load	Fair	3/4/2020	7	6	6	N	6	5
P Posted for load	Fair	10/4/2021	6	6	6	N	8	8
P Posted for load	Fair	4/8/2020	6	6	7	N	7	8

GOALS FOR BAMS

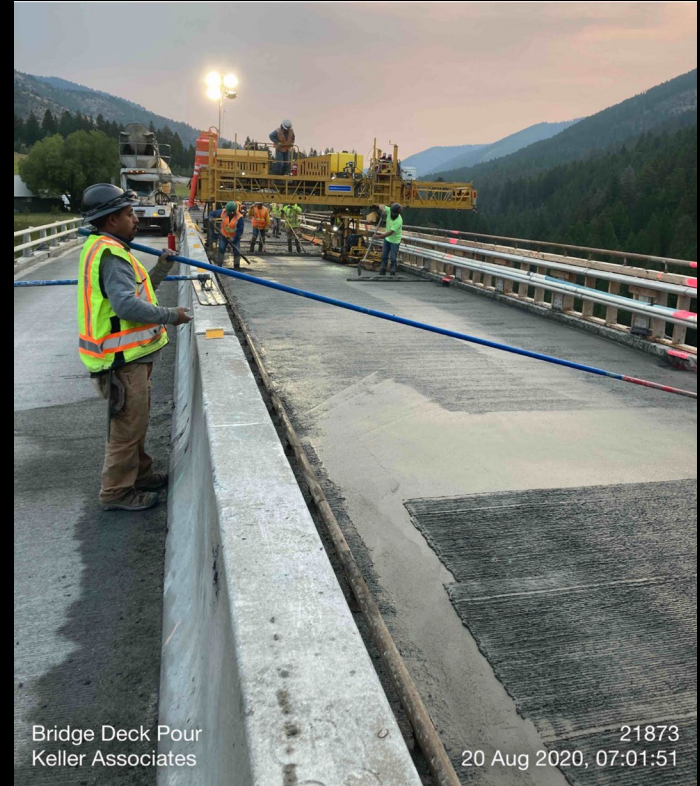
1. What percentage of your bridges do you want in good/fair condition?
2. What percentage of bridges are you willing to accept as structurally deficient?
3. In how many years do you want to achieve these goals?

OBJECTIVES FOR BAMS

1. How many of the poor rated bridges do you plan to raise to fair or higher?
2. What type of repairs will be needed to improve the poor bridges?
3. What type of repairs will be done to preserve bridges rated fair or higher?

MAINTENANCE TREATMENTS

1. Clean deck drains
2. Replace guardrail
3. Clean or replace joints
4. Concrete overlay
5. Epoxy overlay
6. Deck sealer
7. Remove vegetation



PLANNING, SCHEDULING, & FUNDING

PLANNING

- What type of repairs are needed?
- Can the repairs be completed by the agency or do the repairs need to be contracted out to others?
- What is the cost?

SCHEDULING

- What can be done now or in the next 5 years?
- Are resources available to meet the planned schedule?
- What season or type of weather?

FUNDING

- Can the repairs be funded by the agency?
- Are there other funding sources available?
- Example: Federal-Aid funding through LHTAC and typical application requirements

PLANNING, PROGRAMMING, & FUNDING

BRIDGE

Local Federal-aid Program: Bridge FY20 Application

Idaho Local Highway Jurisdictions

Submittal Deadline (Postmark date via FedEx, UPS or USPS): January 2, 2020

Submittal Deadline (Hand Delivered): January 6, 2020 4:30 p.m. MST



Local Highway Technical Assistance Council
3330 Grace Street
Boise, Idaho 83703
208-344-0565 / 1-800-259-6841
Fax 208-344-0789
www.lhtac.org



BRIDGE

3.1.2. ITD 1150 (Revised for LHTAC use) Project Cost Summary Sheet Round Estimate to the Nearest \$1,000

Key Number	Project Number	Date
Location	District	
Segment Code	Begin Mile Post	End Mile Post
		Length in Miles
		Previous ITD 1150
		Initial or Revise To
1a. Preliminary Engineering (PE) (5% of line 15 + 16a + 16b)		
1b. Preliminary Engineering by Consultant (PEC) (20% of line 15 + 16a + 16b)		
2. Right-of-Way: Number of Parcels		
Number of Relocations		
3. Utility Adjustments: Work Materials By State By Others		
4. Earthwork		
5. Drainage and Minor Structures		
6. Pavement and Base		
7. Railroad Crossing:		
Grade/Separation Structure		
At-Grade Signals Yes No		
8. Bridges/Grade Separation Structures:		
New Structure Length/Width (see instruction on next page)		
Location		
Repair/Widening/Rehabilitation Length/Width (contact LHTAC to estimate cost)		
Location		
9. Traffic Items (Delineators, Signing, Channelization, Lighting, and Signals)		
10. Construction Traffic Control (Sign, Pavement Markings, Flagging, and Traffic Separation)		
11. Detours		
12. Landscaping		
13. Mitigation Measures		
14. Other Items (Roadside Development, Guardrail, Fencing, Sidewalks, Curb and Gutter, C.S.S.)		
15. Cost of Construction (Items 3 through 14)		
16a. Mobilization (10 % of Item 15)		
16b. Contingency (30% of Item 15 + 16a)		
17. Construction Engineer and Inspections (CE&I) (20% of Items 15, 16a and 16b)		
18. Total Construction Cost (15 + 16a + 16b + 17)		
19. Total Project Cost (1 + 2 + 18)		
20. Project Cost Per Mile		
N/A		
N/A		
Prepared by:		

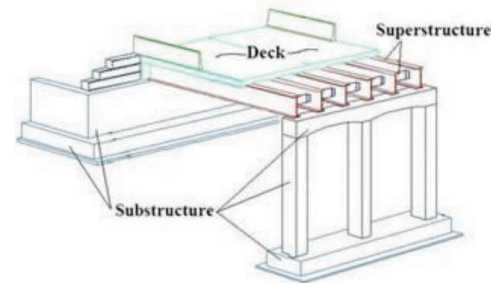
Bridge Application Page 8

PLANNING, PROGRAMMING, & FUNDING

Bridge

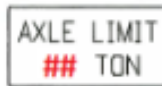
Each bridge has three main components that make up its condition.

- Item 58 Deck (the riding surface carrying the vehicles)
- Item 59 Superstructure (the beams, girders, truss, etc.)
- Item 60 Substructure (the foundation supporting the superstructure above)



Idaho Legal trucks are as follows:

Vehicle	
Single Unit Vehicle	27 tons
Semi Tractor-Trailer Combination	42 tons
Truck-Trailer Combination	45 tons



This is how Item 70 is coded on bridge inspection reports.

Code	Relationship of Operating Rating to Maximum Legal Load
5	Equal to or above legal loads
4	0.1 - 9.9% below
3	10.0 - 19.9% below
2	20.0 - 29.9% below
1	30.0 - 39.9% below
0	> 39.9% below

Please report the tonnages for the bridge – see the photos of your inspection report and indicate those numbers on the applicable signs *if applicable*.

LHTAC FY20 BRIDGE APPLICATION RATIONALE

BRIDGE

3.4 LHTAC FY20 BRIDGE APPLICATION RATING CRITERIA

Please use this guide as a reference. Application packages will be scored based on the following scales.

QUESTION	PTS	SUGGESTED SCORING
1a. Provide a ½ page description of the proposed bridge project. Include the benefit of the project to the community and the LHJ, the current condition of the bridge, any safety concerns, and if the existing bridge meets the community's needs.	15-20 8-14 0-7	Excellent description including agency & financial benefit + safety Adequate description of need/benefit Poor description of need, need/benefit
1b. Provide a ½ page description of the economic impact the bridge crossing has in the area. Discuss freight and commerce use and route criticality to the community.	11-15 6-10 0-5	Excellent description of economic/commerce impact and route criticality Adequate economic/commerce impact and route criticality Poor economic/commerce impact and route criticality
2. Condition of items found on the Bridge Inspection Report. Look for the Item (##) on the report that corresponds to these and report the codes. Condition Deck (58) Condition Super (59) Condition Sub (60) Or Condition Culvert (62)	1-5 1-5 1-5 1-15	Poor scores 5, Fair scores 3, Good worth 1 point Poor scores 5, Fair scores 3, Good worth 1 point Poor scores 5, Fair scores 3, Good worth 1 point Poor scores 15, Fair scores 6, Good scores 1 points
3. Load rating and service items found on the Bridge Inspection Report. Look for the Item (##) on the report that corresponds to these and report the values. a. Bridge Posting (70) b. ADT (29) c. Truck ADT (109) d. Detour Length (19) e. Scour Critical (113)	1-5 1-5 1-5 1-5 1-5	Codes of 0-1 scores 5, Code 2-4 scores 3, Code 5 scores 0 points 400+(5), 300-399(4), 200-299(3), 100-199(2), 0-99(1) 10%+ scores 5, 4-9% scores 3, 0-3% scores 1 point 10+ miles scores 5, 4-9 miles scores 3, 0-3 miles scores 1 point Codes 0-3 scores 5, Codes 4-5 or U scores 3, Codes 6-9 or N scores 1 point
4. Has your Local Highway Jurisdiction received LHTAC funding previously? If so, what program and what year did your jurisdiction last receive funding through LHTAC?	5 4 3 2 1	Never Over 5 years ago 3-5 years ago 1-2 years ago, other than bridge funds 1-2 years ago, bridge funds
5. Are you involved with an active multi-jurisdictional transportation group? (include first page of minutes or attendance for the last 1-2 years of meetings) Was your project ranked in the top 3 projects for your group? List examples of cooperation with other public/private agencies which improve efficiency in maintaining your roads. (List - 1-page max) Include up to 3 letters of support for your project.	5-10 4 2-3 0-1	Involved w/ multi-group, ranked, share resources, minutes, examples, plus 3 quality letters of support Involved w/ multi-group, ranked, share resources, minutes, examples Involved with multi-group, share resources Involved with multi-group or shared resources
6. Has there been a site visit with an LHTAC Engineer? Up to 5 points are given based on application format, completeness, and site visit/coordination with LHTAC staff including Jurisdiction Project Resolution.	5 3 1	Application in proper order including all documents and site visit Application in proper order but missing some documents or visit Application includes instructions and extra materials
7. Is there a plan to cover the estimated construction cost? ITD Form-1150 Line 18. If over \$3M, provide a ½-page explanation of any partnerships with other agencies or funding sources.	10 5 1	Project is under \$3M or over \$3M with a well-defined funding package in place. Project is over \$3M with an idea brought forward about funding as a package Project is over \$3M with no other funding or plan set

Total Possible 105

Bridge Application Page 14

QUESTION	PTS	SUGGESTED SCORING
1a. Provide a ½ page description of the proposed bridge project. Include the benefit of the project to the community and the LHJ, the current condition of the bridge, any safety concerns, and if the existing bridge meets the community's needs.	15-20 8-14 0-7	Excellent description including agency & financial benefit + safety Adequate description of need/benefit Poor description of need, need/benefit
1b. Provide a ½ page description of the economic impact the bridge crossing has in the area. Discuss freight and commerce use and route criticality to the community.	11-15 6-10 0-5	Excellent description of economic/commerce impact and route criticality Adequate economic/commerce impact and route criticality Poor economic/commerce impact and route criticality
2. Condition of items found on the Bridge Inspection Report. Look for the Item (##) on the report that corresponds to these and report the codes. Condition Deck (58) Condition Super (59) Condition Sub (60) Or Condition Culvert (62)	1-5 1-5 1-5 or 1-15	Poor scores 5, Fair scores 3, Good worth 1 point Poor scores 5, Fair scores 3, Good worth 1 point Poor scores 5, Fair scores 3, Good worth 1 point Poor scores 15, Fair scores 6, Good scores 1 points
3. Load rating and service items found on the Bridge Inspection Report. Look for the Item (##) on the report that corresponds to these and report the values. a. Bridge Posting (70) b. ADT (29) c. Truck ADT (109) d. Detour Length (19) e. Scour Critical (113)	1-5 1-5 1-5 1-5 1-5	Codes of 0-1 scores 5, Code 2-4 scores 3, Code 5 scores 0 points 400+(5), 300-399(4), 200-299(3), 100-199(2), 0-99(1) 10%+ scores 5, 4-9% scores 3, 0-3% scores 1 point 10+ miles scores 5, 4-9 miles scores 3, 0-3 miles scores 1 point Codes 0-3 scores 5, Codes 4-5 or U scores 3, Codes 6-9 or N scores 1 point

CONCLUSION

**What can your agencies
do to maintain bridges?**

1. Identify and prioritize bridges
2. Prepare for potential funding opportunities