DIRECTIONS:

1. Surveys shall be submitted via Survey Planet links below by ***Friday, June 2, 2017***, no later than 8:00pm EDT.
2. The PDF version has been provided for your convenience for the review of questions prior to completion of the survey via Survey Planet.
   - Bookmarks within this document will permit ease of movement between individual sections.
   - **Questions in bold text and marked with boxes are required questions.**
     - If NO is selected, skip ahead in the survey as indicated.
     - If YES, continue with the next question in the survey.
   - ***NOTE: The electronic survey does not have the ability to go back to a previous question.***
     - You may find it helpful to mark your answers on the .pdf prior to completion of the online survey.
     - If you miss a question or would like to make a correction, please send an e-mail with the correction to Complexbridgehelp@vdot.virginia.gov.
3. Electronic Survey (via Survey Planet)
   - This survey has been separated into smaller, individual sections for increased convenience and flexibility during completion.
   - Submit surveys online using provided links to the individual survey sections (e.g. DESIGN, CONSTRUCTION, etc.)

BOOKMARKS & LINKS:		
SURVEY TOPIC	**LINKS**	
BRIDGE SAFETY, REHABILITATION AND MANAGEMENT	BRIDGE SAFETY, REHABILITATION AND MANAGEMENT	**.pdf**
	https://surveyplanet.com/58e3f6f5a5f6826890f4decd	**web**
RESEARCH AND TECHNOLOGY	RESEARCH AND TECHNOLOGY	**.pdf**
	https://surveyplanet.com/58e68499db6be04a90f79afe	**web**
DESIGN	DESIGN – Part 1	**.pdf**
	https://surveyplanet.com/58e405b7176c1868be8e6046	**web**
	DESIGN - Part 2	**.pdf**
	https://surveyplanet.com/5918f93be5ccf336f816583d	**web**
BRIDGE COMPONENTS AND ANCILLARY STRUCTURES	BRIDGE COMPONENTS AND ANCILLARY STRUCTURES	**.pdf**
	https://surveyplanet.com/58fdb01476cf420d93df36cd	**web**
CONSTRUCTION	CONSTRUCTION	**.pdf**
	https://surveyplanet.com/58e684a44ed6ba0a5f0cc088	**web**

AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2017)

BRIDGE SAFETY, REHABILITATION AND MANAGEMENT SURVEY

45 Agencies Responding

QUESTION NO.		QUESTION
TOTAL	MGMT	
1.	M1.	Person Responding to **BRIDGE SAFETY, REHABILITATION AND MANAGEMENT** Survey: Name: _____ E-mail Address: _____ Phone No.: _____
2.	M2.	State: Choose State.
3.	**M3.**	**Does your agency have written requirements for material storage beneath bridges?** **4 (8.9%) YES** **41 (91.1%) NO** **IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO M8.** **IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**
4.	M4.	Which of your agency's construction contract specifications permit material storage beneath bridges? **1 (25.0%)** Standard Specifications Special Provisions **2 (50.0%)** Project-Specific Special Provisions Special Provision Copied Notes Supplementary Specifications Construction Manual **1 (25.0%)** Other **Lease Stipulations**
5.	M5.	Do your agency's written requirements explicitly address flammable and/or combustible materials? (check all that apply) No **3 (75.0%)** Flammable **3 (75.0%)** Combustible **1 (25.0%)** Other
6.	M6.	To whom do the written requirements for material storage beneath bridges apply? (check all that apply) **4 (100.0%)** Contractors **1 (25.0%)** State **3 (75.0%)** Air space lease holders Other

7. M7. Does your agency have written guidelines for bridge inspectors to look for material storage concerns under or adjacent to bridges during their biennial inspections? If yes, please explain any special circumstances.

1 (25.0%) Yes
3 (75.0%) No

END BRANCH

8. M8. What types of vehicles are permitted to park under your agency's bridges? (check all that apply)

30 (66.7%) Passenger Vehicles
22 (48.9%) Buses
19 (42.2%) Tractor Trailer Trucks
20 (44.4%) Box Trucks
16 (35.6%) Single Unit Tanker Trucks
8 (17.8%) Parking Not Allowed Under Bridges
13 (28.9%) Other:

- **No restrictions/regulations.**
- **No specific prohibitions.**
- **All vehicle types allowed.**
- **No restrictions where parking allowed by lease or other owner of property.**
- **No restrictions other than vertical clearance at limited locations.**
- **Parking lot facilities and easements have only been developed for a very few bridges.**
- **Some agency facilities have parking under bridges.**
- **Only under special circumstances.**
- **Adjusting lease agreement language to prevent tractor trailers from parking under bridges.**
- **Railroad trains.**

1 (2.2%) No response.

9. M9. Does your agency allow the construction of buildings UNDER or bridges OVER existing bridges? (check all that apply)

8 (17.8%) Yes, buildings UNDER
13 (28.9%) Yes, bridges OVER
19 (42.2%) Special circumstances only
15 (33.3%) No
2 (4.4%) No response.

10. M10. If your agency requires inspections by external fire agencies of state-owned or leased air space facilities beneath bridges, who provides inspections?

39 (86.7%) N/A
3 (6.7%) State Fire Agency
3 (6.7%) Local Fire Agency
Other

11. M11. What is the basis of your agency's protocol detailing when to address deck deterioration?

2 (4.4%) N/A
1 (2.2%) Crack density (linear foot of crack per square foot of deck)
19 (42.2%) Percentage of deck area
2 (4.4%) Life of the deck
20 (44.4%) Other:

- **Percentage of deck area and NBI Item 58.**
- **Practice considers condition state of 3 for approximately 50% of the deck area.**
- **General condition of the deck.**
- **All of the above based on inspection data.**
- **Engineering judgement.**
- **Ideally, every 20 years, but in reality when deck has been in condition state 6 for about 10 years.**
- **Visual inspection**
- **Engineering judgement combined with preventative maintenance measures selected with BrM.**
- **NBI condition**
- **When funding is available.**
- **ADTT, crack orientation, efflorescence, chain sounding material sampling (compressive strength, chlorides).**
- **Combination of several considerations including cyclic preservation of good condition bridges.**
- **Structural deficiency determination.**
- **Current Bridge Inspection Condition rating.**
- **NBI condition rating and chloride ion measurements.**

1 (2.2%) No response.

12. M12. Other than chain drag, what NDE method does your agency use to assess the bridge decks?

13 (28.9%) Infrared thermography
26 (57.8%) Ground Penetrating Radar (GPR)
1 (2.2%) Time-Lapse Thermography
12 (26.7%) Other:

- **Research in progress for GPR, IR, and automated acoustic (by University of Nebraska).**
- **Used infrared thermography and ground penetrating radar (GPR).**
- **None**
- **Currently evaluating impact echo.**
- **Impact echo.**
- **All of the above.**
- **High resolution video.**
- **Other visual inspection, GPR used experimentally.**
- **High density video in combination with the above.**
- **Impact Echo**

7 (15.6%) No response.

13. M13. If your agency has a program for cleaning and washing bridge or structure elements, check each bridge or structure element type below for which your agency has a cleaning and washing program; indicate the frequency of washing for each. (check all that apply)

15 (33.3%) N/A
17 (37.8%) Decks
19 (42.2%) Bearings
21 (46.7%) Expansion joints
17 (37.8%) Beam ends
19 (42.2%) Substructure cap/seats
12 (26.7%) Other:

- **No formal statewide program, but high asset value bridges have all components washed. Some Districts have programs for deck cleaning.**
- **Annual for all; decks – street sweeper only.**
- **Entire beams.**
- **Washing done every spring.**
- **Abutments (face of) including beam ends and substr. caps and seats, where accessible. Frequency = 2 years.**
- **Annual cleaning of decks, bearings, expansion joints, beam ends and substructure caps and seats.**
- **Curb barrier.**
- **2 years recommended for the above activities, but rarely achieved.**
- **Bridge trusses; non-lead coatings.**
- **Limited – when needed for inspection.**
- **Only for major river bridges.**
- **Part of preventive maintenance program. We perform necessary maintenance repairs and wash the above elements on a 10 year cycle.**

1 (2.2%) No response.

14. M14. What percentage of your agency's inventory has substructures for which plans are not available?

22 (48.9%) 0 – 5%
6 (13.3%) 6 – 10%
4 (8.9%) 11 – 15%
5 (11.1%) > 15%
8 (17.8%) Unknown

15. M15. How often does your agency reuse substructures for which plans are not available?

Preferred, as project constraints allow
9 (20.0%) Some of the time
22 (48.9%) Rarely
14 (31.1%) Never, not permitted
Other

16. M16. How does your agency rate the structural capacity of substructures for which plans are not available?

25 (55.6%) Engineering judgement
5 (11.1%) Proof Load testing
1 (2.2%) Modeling
4 (8.9%) Don't Know
10 (22.2%) Other:

- **Engineering judgement and modeling.**
- **Policy re-used must satisfy LRFD Code provisions.**
- **Based on data collected through inspection.**
- **Historical performance.**
- **This has never been one.**
- **Engineering judgement, proof load testing and structural modeling have all been used.**
- **Engineering judgement and review of inspection reports; note any settlement deterioration and/or issues over time.**
- **Take probes to establish the geometry of the back of the abutment, test pits to establish if there are piles and the condition, take borings to establish geotechnical capacity and then perform a structural analysis of the substructure to be re-used.**
- **Steel or timber field measure and assume allowable values. Concrete – use judgement.**
- **Substructures not load rated.**

17. M17. Rank the following bridge components in the order most frequently repaired/replaced by your agency. (1= most frequent; 8 = least frequent)

__7__ Deck (including parapet/railing)

__6__ Parapet/railing (excluding deck, except as minimally necessary to replace parapet/railing)

__3__ Superstructure (complete replacement from bearings up)

__4__ Partial superstructure (cut out and replace or reinforce beam end)

__2__ Piers, walls and/or abutments

__1__ Foundations

__8__ Joints (including minimal deck work, as required)

__5__ Bearings

____ Other _____

2 (4.4%) No response.

18. M18. What is your agency's recommended procedure for the repair of steel beam ends? (check all that apply)

15 (33.3%) Weld individual steel plates or steel tee section
29 (64.4%) Bolt plates
17 (37.8%) Embed in concrete
4 (8.9%) Support at diaphragms/cross frames
2 (4.4%) Fiber Reinforced Polymer (FRP)
6 (13.3%) Other:

- **Decided on a case-by-case basis.**
- **Patch material.**
- **It depends on the type of deterioration and the location. Procedures vary based on the location.**
- **N/A**

2 (4.4%) No response.

19. M19. What is your agency's recommended procedure for the repair of concrete columns (after removal of deteriorated concrete)?

4 (8.9%) Place shotcrete
7 (15.6%) Place self-consolidating concrete (SCC)
14 (31.1%) FRP wrap over patch materials
15 (33.3%) Other:

- **Regular repair concrete mix. Starting to do more FRP wraps.**
- **Structural concrete or concrete patching material, depending on depth.**
- **Conventional concrete is preferred.**
- **Formed and placed conventional concrete.**
- **Determined on a case-by-case basis.**
- **Encase with concrete.**
- **All of the above.**
- **Patch material.**
- **Concrete patch repair.**
- **Place concrete patching material in small placements or use SCC.**
- **Place conventional concrete back with small aggregate.**
- **Place regular concrete with 3/8" aggregate.**
- **Cast-in-place concrete patches with one inch build-out if rebar is shallow.**

1 (2.2%) No response.

20. M20. Which evaluation activities are required to be completed to develop substructure repair plans during a superstructure replacement? (check all that apply)

41 (91.1%) Visual inspection
29 (64.4%) Engineering judgement
14 (31.1%) Concrete cores
14 (31.1%) Non-destructive Evaluations (NDE)
8 (17.8%) Other :

- **Sounding the concrete.**
- **As needed.**
- **If loads are not increased by more than 10% and the substructure does not show signs of distress, only a visual inspection is required.**
- **Don't typically reuse substructure.**
- **Structural evaluation.**
- **Sound surfaces with hammer tap.**

1 (2.2%) No response.

21. M21. Does your agency inspect privately or locally-owned, non-highway structures over highways?

27 (60.0%) Yes
17 (37.8%) No
1 (2.2%) No Response

22. M22. Check all statements that apply to your agency's laws related to the inspection of railroad bridges not owned by your agency. (check all that apply)

22 (48.9%) N/A
2 (4.4%) Are supplementary to recently-imposed FRA regulations
3 (6.7%) Are complementary to recently-imposed FRA regulations
13 (28.9%) Pre-date recently-imposed FRA regulations
2 (4.4%) Were passed after recently-imposed FRA regulations
3 (6.7%) Other:

- **No recent activity or policy changes.**
- **Confirm vertical and horizontal clearances.**
- **Only if they cross state-owned routes. We do not inspect RR bridges that cross local routes.**

2 (4.4%) No Response

23. M23. Other than provisions for Emergency Vehicles on Interstate Highways included in the FAST Act, does your agency have statutes or provisions to allow emergency vehicles (for example, fire trucks or ambulances) unregulated access on State and Local routes?

22 (48.9%) YES
23 (51.1%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO M28.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

24. M24. Has your agency collected any information/knowledge related to adverse effects or to the probability of overstressing bridge inventory related to the unregulated access of emergency vehicles? If yes, provide additional details.

4 (18.2%) Yes
18 (81.8%) No

YES Comments:

- Parametric study of simple beam bridges.
- Some preliminary parametric analysis.
- Have started to collect data.

NO Comments:

- Load rating review for Emergency Vehicles is in progress on and near Interstate. Vehicle sizes and configurations have been collected for all Emergency Vehicles in Nebraska.
- No damage from emergency vehicles has been documented or suspected.

25. M25. Using the initial screening as outlined in the FHWA Technical Guidance for Emergency Vehicles, does your agency anticipate posting bridges on the Interstate Highways or within the 1 mile radius of interchanges?

16 (72.7%) Yes
6 (27.3%) No

26. M26. If your agency anticipates posting bridges on the Interstate, does your agency envision routing these emergency vehicles around posted Interstate bridges using overload permits on other State or Local Routes?

10 (45.5%) Yes
11 (50.0%) No
1 (4.5%) No Response

27. M27. Would your agency support research and determination of new load factors for the Manual of Bridge Evaluation (MBE) based on probability of occurrence and the population of emergency vehicles on the Interstates or other State Highways?

21 (100.0%) Yes
No
1 (4.5%) No Response

END BRANCH

28. M28. If your agency has developed procedures or criteria that have been approved by FHWA to perform bridge (not culvert) safety inspections beyond the 24 month requirement, what percentage of bridges are inspected based upon this extended criteria?

30 (66.7%) N/A
3 (6.7%) < 5%
6 (13.3%) 5% - 15%
3 (6.7%) 16% - 25%
2 (4.4%) > 25%
Other
1 (2.2%) No response

29. M29. What specialized programs/procedures has your agency developed and/or implemented for the safety inspections of larger, more complex structures (e.g., post-tensioned box girders, steel tub girders, etc.) which may not meet federal definition for complex bridges? (check all that apply)

19 (42.2%) N/A
3 (6.7%) Specialized training program for inspectors of these structures
2 (4.4%) Require more frequent training for inspectors of these structures
4 (8.9%) Increased inspection frequency of these structures
13 (28.9%) More in-depth safety inspection for these structures
6 (13.3%) NDE (e.g., thermography, GPR, etc.) integrated into safety inspections for these structures
5 (11.1%) Destructive testing, as needed, for these structures
7 (15.6%) Other :

- **No additional requirements for non-complex major bridges.**
- **Utilize consultant inspections for specialized structures.**
- **Bridge Inspection Manual.**
- **Require individual inspection manual for each box girder bridge.**
- **Make use of qualified consultant inspection teams.**
- **IF fracture critical, lead inspector must have taken and passed fracture critical inspection course.**

2 (4.4%) No response

30. M30. What type of posting sign does your agency use for posted bridges on your Interstate Highways? (check all that apply)

10 (22.2%) N/A
14 (31.1%) MUTCD R12-5 (Truck Silhouettes)
19 (42.2%) MUTCD R12-1 (Weight Limit)
2 (4.4%) MUTCD R12-2 (Axle Wt.)
4 (8.9%) MUTCD R12-4 (Axle Wt. & Gross Wt.)
10 (22.2%) Other:

- **MUTCD R12-3**
- **We don't post Interstate highway bridges.**
- **R 12-5**
- **Combination of R12-5 and R12-2.**
- **Text only, gross weight of single unit, combo with 3 or 4 axles, combo with 5+ axles.**

2 (4.4%) No response

31. M31. What remote controlled devices and/or activities does your agency use for bridge inspection and/or maintenance? (check all that apply)

31 (68.9%) None
Drones, routinely
5 (11.1%) Drones, piloted
Robots, routinely
3 (6.7%) Robots, piloted
Laser (e.g., for paint removal), routinely
2 (4.4%) Laser (e.g., for paint removal), piloted
4 (8.9%) Other:
- **Currently investigating the use of drones.**
- **Have tested out the use of drones on two large bridges for inspection.**

2 (4.4%) No response

32. M32. When attempting to identify corroding post-tensioning strands which are embedded in concrete (either internal tendons or anchorage zones of external tendons), what methods are employed by your agency? (check all that apply)

7 (15.6%) N/A
34 (75.6%) Visual inspection for signs of corroding PT (e.g., cracking in the concrete, corrosion stains on the concrete, spalling of the concrete cover, etc.)
11 (24.4%) Visual observation after concrete removal (drill into anchorage only)
10 (22.2%) Visual observation after concrete removal (drill directly into tendon)
1 (2.2%) Non-destructive evaluations in metal ducts (e.g., GPR, Impact Echo, radiography, etc.)
7 (15.6%) Non-destructive testing in metal ducts is not evaluated.
4 (8.9%) Non-destructive evaluations in plastic ducts (e.g., GPR, Impact Echo, radiography, etc.)
5 (11.1%) Non-destructive testing inside plastic ducts is not evaluated
4 (8.9%) Acoustic emission monitoring for wire breaks
Electrical isolation and monitoring
3 (6.7%) Other:
- **Have cut open some ducts, inspected and then resealed duct.**
- **Grout chemical sampling.**
- **Borescope inspection at high stress locations.**

2 (4.4%) No response.

33. M33. How does your agency identify corroding strands in external tendons in prestressed and post-tensioned members? (check all that apply)

- **16 (35.6%)** N/A
- **27 (60.0%)** Visual inspection for signs of corroding strands (e.g., cracking in the concrete, corrosion stains on the concrete, spalling of the concrete cover, etc.)
- **19 (42.2%)** Visual inspection for failed external tendons
- **5 (11.1%)** Nondestructive evaluations (e.g., GPR, Impact Echo, radiography, etc.)
- **2 (4.4%)** Acoustic emission monitoring for wire breaks
  Electrical isolation and monitoring
- **1 (2.2%)** Other:
  - **We have some external tie-rod used for post-tensioning, which are inspected visually.**
- **2 (4.4%)** No response.

34. M34. If your agency uses Acoustical Imaging for Underwater Bridge Inspection for cases with dangerous conditions/diver safety concerns, was FHWA concurrence considered prior to its use?

- **8 (17.8%)** Yes
- **7 (15.6%)** No
- **28 (62.2%)** N/A
- **2 (4.4%)** No Response

35. M35. Has your agency observed any shear cracking issues in your reinforced, Prestressed concrete or post-tensioned concrete bridges?

- **26 (57.8%)** Yes
- **18 (40.0%)** No
- **1 (2.2%)** No Response

36. M36. What will the financial impact to your agency be with the implementation of the new National Tunnel Inspection Standards and Specifications for National Tunnel Inventory?

- **12 (30.0%)** No increase
- **11 (25.0%)** < $50,000
- **6 (10.0%)** <$100,000
- **7 (15.0%)** < $500,000
- **8 (20.0%)** Other :
  - **No state-owned tunnels.**
  - **>$50M in rehabilitation projects.**
  - **n/a; agency does not have any tunnels.**
  - **$3.5M**
  - **Approximately $1M**
  - **No real increase because we were performing an extensive tunnel inspection program already.**
  - **No response.**
- **1 (2.2%)** No Response

37. M37. Does your agency have concerns or issues with load rating deck elements in tunnels? If yes, please explain.

- **37 (82.2%)** No, there are no tunnels with deck elements in our state
- **5 (11.1%)** No concerns or issues related to load rating deck elements in tunnels
- **2 (4.4%)** Yes
- **1 (2.2%)** No response

38. M38. With which of the National Bridge Inspection Program's 23 Metrics does your agency have difficulty complying? (check all that apply)

1. Bridge inspection organization
2. Qualification of personnel – Program Manager
- **2 (4.4%)** 3. Qualification of personnel – Team Leader(s)
4. Qualification of personnel – Load Rating Engineer
5. Qualification of personnel – UW Bridge Inspection Diver
- **19 (42.2%)** 6. Inspection Frequency – Routine – Lower risk bridges
- **13 (28.9%)** 7. Inspection Frequency – Routine – Higher risk bridges
- **3 (6.7%)** 8. Inspection Frequency – Underwater– Lower risk bridges
- **2 (4.4%)** 9. Inspection Frequency – Underwater – Higher risk bridges
- **8 (17.8%)** 10. Inspection Frequency – Fracture Critical Member
- **5 (11.1%)** 11. Inspection procedures – Frequency Criteria
- **3 (6.7%)** 12. Inspection procedures – Quality Inspections
- **13 (28.9%)** 13. Inspection procedures – Load Rating
- **6 (13.3%)** 14. Inspection procedures – Post or Restrict
- **6 (13.3%)** 15. Inspection procedures – Bridge Files
- **2 (4.4%)** 16. Inspection procedures – Fracture Critical Members
- **1 (2.2%)** 17. Inspection procedures – Underwater
- **5 (11.1%)** 18. Inspection procedures – Scour Critical Bridges
- **1 (2.2%)** 19. Inspection procedures – Complex Bridges
- **1 (2.2%)** 20. Inspection procedures – QC/QA
- **4 (8.9%)** 21. Inspection procedures – Critical Findings
- **1 (2.2%)** 22. Inventory – Prepare and Maintain
- **5 (11.1%)** 23. Inventory – Timely Updating of Data
- **7 (15.6%)** No response

39. M39. What failure mode(s) for culverts does your agency most frequently observe?

1 (2.2%) Overstress – flexure
Overstress – shear
19 (42.2%) Scour
2 (4.4%) Overtopping
5 (11.1%) Breach (wash-out)
17 (37.8%) Other:

- **Corrosion; corrosion at waterline; corrosion at invert.**
- **Corrosion of asphalt coated metal pipes.**
- **Rarely fail; scour, overtop during extreme flood events.**
- **Wall deterioration causing loss of fill behind wall.**
- **Loss of section leading to overstress/scour.**
- **Deterioration.**
- **Flexure overstress due to extreme corrosion or vehicular impact flattening corrugations.**
- **Joint separation; failure of bolted joints.**

2 (4.4%) No response

40. M40. If your agency completes bridge inspections of railroad tunnels under highways to comply with NBIS 23 CFR Part 650, has the FHWA Division in your state determined that railroad tunnels under highways meet the definition of a highway bridge?

(Note: The Federal Railroad Administration (FRA) does not require railroads to inspect railroad tunnels under 49 CFR Part 237.)

38 (84.4%) N/A
2 (4.4%) Yes
4 (8.9%) No
1 (2.2%) No Response

41. M41. How is your agency tracking the load rating values for the Specialized Hauling Vehicle (SHV) fleet?

12 (26.7%) Modification of Br|M
10 (22.2%) Addition of appropriate fields in other software platforms
9 (20.0%) Use of Access / Excel to store data
13 (28.9%) Other:

- **Under development.**
- **State legal loads envelope SHV.**
- **NRL value in inventory database, others in documentation.**
- **Additions of fields and store data in database.**
- **TBD.**
- **Parameter study showing ratings not necessary.**
- **Through permitting process.**
- **Analyzed as Legal Load, not kept separate.**

1 (2.2%) No Response

42. M42. For the FAST Act Emergency Vehicles, FHWA has recommended posting for these vehicles by other metrics (Single Axle and Tandem Axles) besides Gross Vehicle Weight. How will your agency maintain this posting data?

15 (33.3%) Agency supported modification of Br|M to include additional applicable data fields
14 (31.1%) Addition of appropriate fields in other software platforms
8 (17.8%) Use of Access / Excel to store data
7 (15.6%) Other:

- **Under development.**
- **Agency BMS system.**
- **Combination of second and third option.**
- **Addition of fields and store data in database.**
- **TBD.**
- **Won't post for axle weights.**

1 (2.2%) No Response

43. M43. Currently, most software platforms return load ratings as a rating factor representing a multiplier of the Gross Vehicle Weight of the vehicle that is rated. The FHWA has recommended posting for these vehicles by their single axle or tandem axle weights. How will your agency determine the appropriate posting values for these vehicles?

11 (25.0%) Gross Vehicle Weight Rating Factor multiplied by the Single or Tandem
5 (11.1%) Axle Weights to establish the posting
4 (8.9%) Support modification Br|R to match FHWA's guidance
1 (2.2%) Request other software platforms to modify output to match FHWA's guidance
8 (17.8%) Post bridges using guidance other than FHWA's
14 (31.1%) Other:

- **Under development.**
- **Not following FHWA guidelines.**
- **Will follow latest guidance and post single and tandem axles as well as gross vehicle weight. Will post single and tandem axles as RF multiplied by 16.75 tons or 31 tons, respectively.**
- **State established guidelines.**
- **Have not addressed yet.**
- **Value = (single/tandem ratio of GVW)*GVW**
- **Not yet determined.**
- **Will not post for axle weight.**

2 (4.4%) No Response

44. M44. Prior to the introduction of LRFD, did your agency design continuous steel beam or girder structures using the Alternate Load Factor (Autostress) Design Procedures?

4 (8.9%) YES
41 (91.1%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION M48.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

45. M45. How many structures did your agency design and construct using the Alternate Load Factor (Autostress) Design Procedures?

1 (25.0%) 1 - 5
6 - 10
1 (25.0%) 11 - 15
16 – 20
1 (25.0%) > 20
1 (25.0%) Other

46. M46. What software does your agency use to perform Load Ratings for the structures and bridges designed using Autostress? (check all that apply)

3 (75.0%) AASHTOWare Br|R
LARS Bridge
1 (25.0%) BRASS
STAAD
LARSA 4D
1 (25.0%) MIDAS Civil
1 (25.0%) SAP2000/CSi Bridge
Agency-Developed proprietary software
1 (25.0%) Other

47. M47. How are these bridges, which were designed with Autostress, analyzed for Overweight Permit Vehicles?

2 (75.0%) LRFR Analysis
1 (25.0%) LFR Analysis
Plastic Analysis
No Plastic Analysis
1 (25.0%) Other: **Depends upon how overweight the vehicle is.**
END BRANCH

48. M48. Which of the following procedures does your agency recommend for the performance of load ratings?

Verify adequacy of concrete decks for axle and tandem loads (allowed as legal loads by FAST Act)
34 (75.6%) Evaluate main structural components (e.g., girders)
8 (17.8%) Verify adequacy of concrete decks for axle and tandem loads (allowed as legal loads by FAST Act) AND Evaluate main structural components (e.g., girders)
2 (4.4%) Other:
- **Deck not rated for emergency vehicles.**

1 (2.2%) No Response

49. M49. How does your agency load rate corrugated metal pipe (CMP), with less than the recommended minimum design fill, to arrive at a realistic load carrying capacity?

- **5 (11.1%)** Ignore the minimum fill criteria
- **6 (13.3%)** Use a strength based on research
- **15 (33.3%)** Use reductions due to a small fill height and load post if required by the resulting calculations
- **14 (31.1%)** Other:
  - **Engineering judgement.**
  - **Use spreadsheet analysis developed by another state.**
  - **We only have one CMP that is bridge size on the state highway system.**
  - **We have until 2019 to complete.**
  - **N/A**
- **5 (11.1%)** No Response

50. M50. Does your agency have a notional/exclusion truck as per the Federal Formula B or State specific legal loads which result in higher load effects than SHVs in your state?

- **16 (35.6%)** Yes
- **28 (62.2%)** No
- **1 (2.2%)** No Response

51. M51. Is it normal practice for your agency to load rate timber decks?

- **23 (51.1%)** Yes
- **21 (46.7%)** No
- **1 (2.2%)** No Response

52. M52. How does your agency load rate timber decks with running boards?

- **7 (15.6%)** Assume the running boards distribute the load to additional boards at a 45 degree distribution.
- **6 (13.3%)** Assume the running boards distribute the load to additional boards using another method of distribution
- **14 (31.1%)** Assume the running boards do not distribute the load further
- **12 (26.7%)** Other:
  - **Don’t load rate timber decks.**
  - **No timber decks.**
  - **No further distribution; thickness of runner and deck determine LLDF.**
  - **Distribute loads to girder.**
- **6 (13.3%)** No Response

53. M53. What is your agency's recommended procedure for rehabilitation of a deteriorated deck? (check all that apply)

32 (71.1.%) Patching only
16 (35.6%) Patching with waterproof sealer
25 (55.6%) Patching, followed by thin epoxy overlay
16 (35.6%) Patching, followed by thin polyester overlay (<1" total)
26 (57.8%) Patching, followed by thick concrete overlay (> 1½" total)
9 (20.0%) Patching, followed by bituminous concrete overlay with waterproofing membrane
10 (22.2%) Patching, followed by bituminous concrete overlay (no waterproofing)
32 (71.1%) Replace the deck
8 (17.8%) Other:

- **Partial deck replacement.**
- **Hydro-demolition to sound concrete and place a silica fume overlay to original thickness or greater for more cover.**

54. M54. What criteria is your agency using to decide between rehabilitation of a bridge (or culvert) vs. replacement of a bridge?

5 (11.1%) Element level ratings
Health Index
30 (66.7%) Cost of rehabilitation as a percentage of replacement cost (e.g., Rehabilitate if cost is 20% of replacement cost and extends service life 7 to 10 years)
10 (22.2%) Other:

- **Impacts to resources.**
- **Summary rating.**
- **Element and cost percentage and corridor assessment.**
- **If rehabilitation is feasible.**
- **Prepare alternative analysis evaluation life cycle, costs, environment impacts, design requirements, ADT, loadings.**
- **Case-by-case decisions depending on condition of the structure and service needs.**
- **Use all above.**
- **Combination of element level ratings and cost of rehab as percentage of replacement cost. Also analyze existing bridge to determine if it meets current code.**
- **Element level ratings, cost or rehabilitation as a percentage of replacement cost, and a detailed scope is done comparing fixes.**

55. M55. If your agency has implemented a Bridge Preservation Program, How does your agency complete work under this program? (check all that apply)

34 (75.6%) Contracted out
21 (46.7%) State Maintenance Forces
6 (13.3%) N/A
2 (4.4%) Other:
- **Awaiting internal approval.**

2 (4.4%) No response

56. M56. Does your agency require the use of Galvanic Anodes when patching bridge elements? If sometimes, please explain.

2 (4.4%) Yes, for decks
3 (6.7%) Yes, for other elements
1 (2.2%) Only in harsh environments
14 (31.1%) Sometimes
22 (48.9%) No
6 (13.3%) Other:
- **Zinc metalizing with patching to eliminate halo effect.**
- **While they are not required, we have used them.**
- **No formal policy.**
- **We are considering this requirement for decks and some other elements.**

57. M57. Does your agency have a specification for Galvanic Anodes?

11 (24.4%) Yes
18 (40.0%) No
16 (35.6%) Project-specific special provision
Other

58. M58. Does your agency allow for the use of Galvanic Anodes that contain chloride or bromide? If sometimes, please explain.

3 (6.7%) Yes
16 (35.6%) No
1 (2.2%) Sometimes
24 (53.3%) Don't know
1 (2.2%) No response

59. M59. What are the most common durability problems experienced by your agency in relation to CONCRETE Superstructure girders, beams, truss members, etc.?

- **29 (64.4%)** Corrosion of reinforcement
- **1 (2.2%)** Freeze-thaw attack
- **1 (2.2%)** Alkali aggregate reaction
- Chemical damage
- Abrasion
- **1 (2.2%)** Poor detailing (leading to poor performance or difficult maintenance and inspection)
- **9 (20.0%)** Impact damage
- Fire damage
- **5 (11.1%)** Other:
  - **Corrosion of reinforcement, freeze-thaw, ASR, chemical and impact damage.**

60. M60. What are the most common durability problems experienced by your agency in relation to CONCRETE Piers, walls and abutments?

- **32 (71.1%)** Corrosion of reinforcement
- **1 (2.2%)** Freeze-thaw attack
- **2 (4.4%)** Alkali aggregate reaction
- Chemical damage
- **2 (4.4%)** Abrasion
- **1 (2.2%)** Poor detailing (leading to poor performance or difficult maintenance and inspection)
- **1 (2.2%)** Impact damage
- Fire damage
- **7 (15.6%)** Other:
  - **Corrosion of reinforcement, freeze thaw attack, alkali aggregate reaction, impact damage, chemical damage.**

61. M61. What are the most common durability problems experienced by your agency in rel CONCRETE Foundations?

- **17 (37.8%)** Corrosion of reinforcement
- **2 (4.4%)** Freeze-thaw attack
- **1 (2.2%)** Alkali aggregate reaction
- Chemical damage
- **1 (2.2%)** Abrasion
- **4 (8.9%)** Poor detailing (leading to poor performance or difficult maintenance and inspection)
- Impact damage
- Fire damage
- **15 (33.3%)** Other:
  - **Scour.**
  - **Scour and settlement.**
  - **Scour and undermining.**
  - **Slope stability.**
  - **Corrosion and freeze-thaw.**
  - **Construction quality.**
  - **Not an issue.**
- **5 (11.1%)** No response

62. M62. What are the most common durability problems experienced by your agency in relation to CONCRETE Bridge Decks?

- **29 (64.4%)** Corrosion of reinforcement
- **4 (8.9%)** Freeze-thaw attack
- Alkali aggregate reaction
- **1 (2.2%)** Chemical damage
- **1 (2.2%)** Abrasion
- **1 (2.2%)** Poor detailing (leading to poor performance or difficult maintenance and inspection)
- **1 (2.2%)** Impact damage
- Fire damage
- **7 (15.6%)** Other:
  - **Cracks**
  - **Corrosion of reinforcement, freeze thaw, chemical damage.**
  - **Corrosion, freeze thaw, ASR, chemical damage, and abrasion.**
- **1 (2.2%)** No response

63. M63. What are the most common durability problems experienced by your agency in relation to STEEL Superstructure girders, beams, truss members, etc.?

34 (75.6%) Corrosion
4 (8.9%) Fatigue
Chemical damage
1 (2.2%) Abrasion
1 (2.2%) Poor detailing (leading to difficult maintenance and inspection)
2 (4.4%) Impact damage
Fire damage
5 (11.1%) Other:

- **Corrosion, chemical, impact.**

CONTINUE TO RESEARCH AND TECHNOLOGY SURVEY.

RESEARCH AND TECHNOLOGY SURVEY

45 Agencies Responding

QUESTION NO. TOTAL	QUESTION NO. RES.	QUESTION
	R1.	Person Responding to **RESEARCH AND TECHNOLOGY** Survey: Name: _____ E-mail Address: _____ Phone No.: _____
	R2.	State: Choose State.
64.	R3.	For what purpose(s) does your agency use 3D models (for purposes other than advanced structural analysis) during the development of construction documents (plans, etc.)? (check all that apply) *Note: This question is not related to the use of 3D structural models used for the purposes of evaluating forces, stresses and deflections.* **34 (75.6%)** Visualization **4 (8.9%)** Fabrication **6 (13.3%)** Construction **12 (13.3%)** Other: • **Excavation and Fill Quantities** • **None.** • **N/A** • **Check rebar interference during detailing.** • **Moving towards using all of the above.** • **Recently used in the fabrication of a movable bridge tower.** • **Check for interference with other highway appurtenances.** **3 (6.7%)** No response.
65.	R4.	With regard to building information modeling (BIM) for bridges and structures during the development of construction documents, please indicate the status of your agency. (check all that apply) **5 (11.1%)** Used/piloted and plan to continue to use Used/piloted and do NOT plan to continue to use **7 (15.6%)** Plan on using/piloting **20 (44.4%)** No plan to use or pilot **11 (24.4%)** Potentially interested in pilot project if technical support is available **2 (4.4%)** Other **1 (2.2%)** No response.

66. R5. Has your agency performed, or is your agency in the process of performing, research related to the effectiveness of galvanic anodes? If yes, provide POC and/or link to documentation.

4 (8.9%) Yes
39 (86.7%) No
2 (4.4%) Do not know

67. R6. What Service Life Prediction Software does your agency use to manage the deck maintenance program?

33 (73.3%) N/A
SIMCO's STADIUM
4 (8.9%) dTIMS
Proprietary software
8 (73.3%) Other:

- **Not used.**
- **Addressed by internal asset management software.**
- **Deterioration Modeling in BMS.**
- **Deterioration curves developed from historic NBI data.**
- **BrM**
- **Use dTIMS – did not provide valuable results. Trying BrM.**
- **In-house deterioration modelling and AASHTO BrM.**
- **In-house program.**

1 (2.2%) No response.

68. R7. Has your agency evaluated High Wattage Lasers for Coating Removal?

2 (4.4%) YES
43 (95.6%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION R10.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

69. R8. Check your agency's highest level of use for High Wattage Lasers for Coating Removal.

Routine coating removal projects on metallic elements
Routine coating removal projects on non-metallic elements
Experimental project(s)
2 (100.0%) Laboratory environment with project specimens
Other

70. R9. Does your agency have Special Provisions developed for your agency's use of High Wattage Lasers for Coating Removal? If yes, provide link to document(s).

Yes
2 (100.0%) No

END BRANCH

71. R10. Has your agency used robotic hydro-demolition equipment for removing concrete on substructures?

4 (8.9%) YES
41 (91.1%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION R13.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

72. R11. Check highest level for which your agency has used robotic hydro-demolition equipment for removing concrete on substructures:

	No related experience
	Routine concrete patching projects
3 (75.0%)	Experimental project(s)
	Laboratory environment
1 (25.0%)	Other:

- **Repair.**

73. R12. Provide approximate number of projects your agency has worked on which involved the use of robotic hydro-demolition equipment for removal of concrete on substructures.

	N/A
4 (100.0%)	< 5
	6 – 10
	11 – 15
	> 15

END BRANCH

74. R13. Has your agency used any remote sensing techniques (e.g., satellites, drones, LIDAR, etc.) for bridge inspection and management?

26 (57.8%) YES
19 (42.2%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO R16.

IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE

75. R14. Has your agency utilized any of the following advanced technology for monitoring bridge inventory? (check all that apply)

Satellite Monitoring for settlement
Satellite Monitoring for dead load deflection
5 (19.2%) Infrared thermography
12 (46.2%) Mobile LiDAR and Imaging Sensors
6 (23.1%) Commercial Remote Sensors
8 (30.8%) Acoustic monitoring for fatigue cracks
3 (11.5%) Acoustic monitoring for corrosion
5 (19.2%) Vibration monitoring
5 (19.2%) Weigh-in-Motion for Load Monitoring
10 (38.5%) Scour Monitoring or detection system
3 (11.5%) Flood/overtopping detection
8 (30.8%) Drones
2 (7.7%) Other:

- **Infrared deck testing**
- **Bridgewatch for flood monitoring.**

76. R15. Has your agency performed a cost-benefit analysis for using these remote sensing techniques?

1 (2.2%) Yes
25 (55.6%) No

END BRANCH

77. R16. Does your agency have any current or past research projects related to bridge durability and service life? If yes, provide project name(s) and link to relevant documents.

9 (20.0%) Yes
35 (77.8%) No
1 (2.2%) No Response.

CONTINUE TO DESIGN SURVEY.

DESIGN SURVEY – Part 1

45 Agencies Responding

QUESTION NO. TOTAL	QUESTION NO. DES.	QUESTION
[redacted]	D1-1.	Person Responding to **DESIGN** Survey – Part 1: Name: _____ E-mail Address: _____ Phone No.: _____
	D1-2.	State: Choose State.
78.	D1-3.	In the marine environment or other corrosion-prone environment, what material does your agency recommend for use in primary superstructure members? (check all that apply)

27 (60.0%) Prestressed concrete beam with carbon steel strands
2 (4.4%) Prestressed concrete beam with stainless steel strands
2 (4.4%) Prestressed concrete beam with carbon fiber strands
1 (2.2%) Post-tensioned concrete girder with carbon fiber strands and grouted tendons
1 (2.2%) Post-tensioned concrete girder with stainless steel strands and grouted tendons
5 (11.1%) Post-tensioned concrete girder with carbon steel strands and flexible filler
2 (4.4%) Stainless steel (A1010)
11 (24.4%) Metallized A709/A992 non-weathering grade steel
9 (20.0%) Galvanized A709/A992 non-weathering grade steel
14 (31.1%) Other:

- **N/A**
- **No written guidance, policies, etc.**
- **Epoxy coating of deck reinforcing.**
- **Calcium Nitrite Corrosion Inhibitor added to prestressed concrete girders.**
- **No recommended superstructure type in a marine environment; require corrosion mitigation measures. Increased concrete cover, lower w/c ratio, epoxy coated rebar, use of supplemental entry materials for concrete structures and sacrificial thickness for steel.**
- **Corrosion resistant rebar for stirrups in prestressed girders.**
- **Epoxy coated reinforcement in decks.**
- **A709 painted.**

2 (4.4%) No Response.

79. D1-4. In marine environments, or other corrosion-prone environments, what type of reinforcement does your agency recommend for use in substructures? (check all that apply)

- **9 (20.0%)** Uncoated A615 or A706 reinforcing steel
- **26 (57.8%)** Epoxy-coated A615 or A706 reinforcing steel
- **7 (15.6%)** Galvanized A615 or A706 reinforcing steel
- **12 (26.7%)** Stainless reinforcing steel
- **1 (2.2%)** A1035 reinforcing steel
- **1 (2.2%)** Carbon Fiber Reinforced Polymer (CFRP) reinforcement
- **2 (4.4%)** Other Fiber Reinforced Polymer reinforcement (e.g., aramid, glass, basalt)
- **9 (20.0%)** Other:
  - **N/A**
  - **Stainless steel and CFRP are only recommended for prestressed piles in certain locations.**
  - **Utilize stainless steel reinforcement in PSC piling.**
  - **Calcium Nitrite Corrosion Inhibitor and Silica Fume added to concrete.**
  - **A615**
- **1 (2.2%)** No Response.

80. D1-5. With regard to your agency's experience with metalizing superstructure structural steel, please check all that apply:

- **26 (57.8%)** Have not used
- **6 (13.3%)** Used: field applied
- **16 (35.6%)** Used: shop applied
- **1 (2.2%)** Other:

81. D1-6. For what applications has your agency used fiber reinforced concrete? (check all that apply)

N/A

4 (8.9%) Replacement for High Strength, Non-shrink grout in shear keys

Replacement for High strength, Non-shrink grout in anchorages

13 (28.9%) Deck overlay

4 (8.9%) Link slabs

1 (2.2%) Grout

6 (13.3%) Deck closure pour between construction stages

4 (8.9%) Shotcrete patches

21 (46.7%) Other:

- **N/A**
- **Controlling shrinkage in rehabilitation of concrete structures.**
- **Using on bridge rail to help with cracking; slope paving.**
- **Cast-in-place decks.**
- **Drainage structures.**
- **Bridge decks.**
- **Closure pours for precast decks.**
- **Marine docks.**
- **Approach slabs.**
- **Culvert linings**

8 (17.8%) No Response.

82. D1-7. Indicate for which applications your agency has developed policies, standards, and/or specifications for the use of fiber reinforcing to reduce or control cracking in specialty applications? (check all that apply)

27 (60.0%) N/A
Replacement for High Strength, Non-shrink grout in shear keys
Replacement for High strength, Non-shrink grout in anchorages
11 (24.4%) Deck Overlay
2 (4.4%) Link slabs
1 (2.2%) Deck closure pours between construction stages
1 (2.2%) Shotcrete patches
9 (20.0%) Other:

- **We are working on this.**
- **Bridge rail and slope paving.**
- **Cast-in-place decks.**
- **Drainage structures.**
- **Closure pours for precast decks**
- **Caltrans uses fiber reinforcement in all decks.**
- **Culvert lining specifications.**
- **Decks and approach slabs; can be used for other elements.**

83. D1-8. Indicate for which applications your agency has developed policies, standards, and/or specifications for the use of fiber reinforcing to reduce anchorage or joint size in specialty applications? (check all that apply)

37 (82.2%) N/A
7 (15.6%) Connecting ABC bridge elements using Ultra High Performance Concrete (17 ksi < f'c < 22 ksi)
Connecting ABC bridge elements using Very High Performance Concrete (12 ksi < f'c < 17 ksi)
2 (4.4%) Link slabs
1 (2.2%) Closure pours between construction stages
1 (2.2%) Other

84. D1-9. What specified strength does your agency establish as the lowest permissible specified compressive strength prior to de-tensioning prestressed bulb-tees?

11 (24.4%)	N/A
7 (15.6%)	5 ksi
2 (4.4%)	6 ksi
3 (6.7%)	7 ksi
1 (2.2%)	8 ksi
	9 ksi
	10 ksi
	0.4 f'c ksi≤ f'ci < 0.5 f'c ksi
1 (2.2%)	0.5 f'c ksi≤ f'ci < 0.6 f'c ksi
2 (4.4%)	0.6 f'c ksi≤ f'ci < 0.7 f'c ksi
2 (4.4%)	0.7 f'c ksi≤ f'ci < 0.8 f'c ksi
5 (11.1%)	0.8 f'c ksi≤ f'ci < 0.9 f'c ksi
	0.9 f'c ksi≤ f'ci < 1.0 f'c ksi
11 (24.4%)	Other:

- **4 ksi**
- **4.5 ksi**
- **f'ci = .75 to .85 f"c < 6.8 ksi**
- **Beam-specific with 4.5ksi min.**
- **As required by design.**
- **No specific limits; based on allowable concrete stress limits.**
- **0.65 *fci per AASHTO 5.9.4.1.1**

1 (2.2%) No Response.

85. D1-10. **Has your agency developed policy(ies), standards, and/or specifications for the use of corrosion resistant prestressing strands in Prestressed or Post-tensioned members, i.e. carbon fiber reinforced polymer (CFRP) strands, another FRP strand type or stainless steel (SS) strands?**

7 (15.6%) YES
38 (84.4%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION D1-18.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

86. D1-11. In what types of members has your agency successfully incorporated CFRP strands? (check all that apply)

- **2 (28.6%)** N/A
- **3 (42.9%)** Solid prestressed piles
- **1 (14.3%)** Voided prestressed piles (e.g., static cast cylinder piles)
- Spuncast Post-Tensioned piles
- **2 (28.6%)** Prestressed Bulb-tees
- **2 (28.6%)** Prestressed cored slabs, voided slabs or box beams
- **2 (28.6%)** Transversely Post-tensioned elements (e.g., decks)
- **1 (14.3%)** Longitudinally Post-Tensioned elements (e.g., decks)
- Vertically Post-tensioned elements (e.g., pier columns)
- Longitudinally Post-Tensioned elements (e.g., Segmental box girders)
- Longitudinally Post-Tensioned elements (e.g., spliced precast girders)
- Cable stays or suspension cables
- **1 (14.3%)** Other

87. D1-12. How many structures has your agency successfully constructed incorporating CFRP strands as a substitute for, or in combination with, steel prestressing strands?

- **1 (14.3%)** 0
- **5 (71.4%)** 1 - 2
- 3 - 4
- **1 (14.3%)** 5 - 10
- >10

88. D1-13. How many structures has your agency successfully constructed incorporating CFRP strands or large diameter CFRP tendons as a substitute for steel or, in combination with, steel PT bars or strands in post-tensioning applications?

- **6 (85.7%)** 0
- **1 (14.3%)** 1 - 2
- 3 - 4
- 5 - 10
- > 10

89. D1-14. In what types of members has your agency successfully used stainless steel strands as a substitute for, or in combination with, conventional steel prestressing strands? (check all that apply)

3 (42.9%)	N/A
4 (57.1%)	Solid prestressed piles
2 (28.6%)	Voided prestressed piles (e.g., static cast cylinder piles)
	Spuncast Post-Tensioned piles
	Prestressed Bulb-tees
	Prestressed cored slabs, voided slabs or box beams
	Transversely Post-tensioned elements (e.g.,decks)
	Longitudinally Post-Tensioned elements (e.g.,decks)
	Vertically Post-Tensioned elements (e.g., pier columns)
	Longitudinally Post-tensioned elements (e.g., Segmental box girders)
	Longitudinally Post-Tensioned elements (e.g., spliced precast girders)
	Cable stays or suspension cables
	Other

90. D1-15. How many structures has your agency successfully constructed incorporating stainless steel strands in prestressed applications?

4 (57.1%)	0
2 (28.6%)	1 - 2
1 (14.3%)	3 - 4
	5 - 10
	>10

91. D1-16. How many structures has your agency successfully constructed incorporating stainless steel strands in post-tensioned applications?

7 (100.0%)	0
	1 - 2
	3 - 4
	5 - 10
	> 10

92. D1-17. When using corrosion-resistant prestressing strands, does your agency require confinement reinforcement (spirals or ties) made out of the same material or other corrosion-resistant material?

1 (14.3%) N/A
2 (28.6%) CFRP strand requires CFRP confinement reinforcing
CFRP strand requires another non-ferrous confinement reinforcing
3 (42.9%) CFRP strand requires corrosion-resistant confinement, but CFRP not required
CFRP strand does not require corrosion-resistant confinement
SS strand requires CFRP confinement reinforcing
SS strand requires another non-ferrous confinement
1 (14.3%) SS strand requires a corrosion-resistant steel confinement
SS strand does not require corrosion-resistant confinement
2 (28.6%) Other:
- **SS strand requires SS confinement.**

END BRANCH

93. D1-18. Within your agency's provisions/details for corrosion resistant piles (if applicable), do the chemical conditions of the ground (with respect to corrosion) dictate the choice of strand type?

4 (8.9%) YES
41 (91.1%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION D1-25.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

94. D1-19. How does your agency determine whether a corrosion-resistant prestressed pile is required?

2 (50.0%) On-site soil testing
On-site water testing
1 (25.0%) Region designated by mapping
1 (25.0%) Other:
- **On-site and on-water testing.**

95. D1-20. If your agency has more than one corrosion-resistant prestressing strand choice for use in piles, how is the final selection of the strand type made for prestressed piles? (check all that apply)

1 (25.0%) Local testing results of soil
1 (25.0%) Local testing results of water
Regional area and/or local hot spots pre-determined and designated on maps or on lists
2 (50.0%) Contractor selects strand type based on price and his means and methods after the contract has been awarded
1 (25.0%) Other:
- **Currently use only stainless steel.**

96. D1-21. When soil testing is required (see for instance AASHTO LRFD Bridge Specification 10.7.5), what corrosion evaluations does your agency require to be performed? (check all that apply)

- **2 (50.0%)** Resistivity less than 2,000 ohm-cm
- **2 (50.0%)** pH less than 5.5
- **2 (50.0%)** pH between 5.5 and 8.5 in soils with high organic content
- **2 (50.0%)** Sulfate concentrations greater than 1,000 ppm
- **2 (50.0%)** Landfills and cinder fills
- **2 (50.0%)** Soils subject to mine or industrial drainage
- **2 (50.0%)** Areas with a mixture of high resistivity soils and low resistivity high alkaline soils
- **3 (75.0%)** Other:
  - **We don't require soil testing.**
  - **Determination is made by Geotechnical Engineer.**
  - **Chlorides.**

97. D1-22. When water testing is required (see for instance AASHTO LRFD Bridge Specification 10.7.5), what corrosion evaluations does your agency require to be performed? (check all that apply)

- **3 (75.0%)** Chloride content greater than 500 ppm
- **3 (75.0%)** Sulfate concentration greater than 500 ppm
- **1 (25.0%)** Mine or industrial runoff
- **1 (25.0%)** High organic content
- **3 (75.0%)** pH less than 5.5
- **2 (50.0%)** Piles exposed to wet/dry cycles
- **2 (50.0%)** Full chemical analysis of soil and groundwater samples shall be considered when chemical waste is anticipated
- **3 (75.0%)** Other:
  - **We don't require soil testing, but items checked may be assessed if DBE wants to consider regular strands vs. SS or CFRP.**
  - **Determined by Geotechnical Engineer.**
  - **Marine borers for timber.**

98. D1-23. If your agency uses CFRP or stainless steel strands in prestressed piles, have you performed any monitoring of the pile's driving performance? (Check all that apply).

- **1 (25.0%)** N/A
- **2 (50.0%)** External strain gages
- **2 (50.0%)** Embedded sensors
- Other

99. D1-24. Has your agency identified any durability concerns (e.g. cracking or spalling during fabrication or driving, premature failure of strand in fabrication, failure of strand to meet elongation requirements, etc.) with corrosion-resistant pile during any of the following? (Check all that apply).

	Casting
1 (25.0%)	Handling
1 (25.0%)	Shipping
1 (25.0%)	Driving
	In-service
1 (25.0%)	Other:

- **Not for piles; for a bulb-T, 3 strands failed.**

END BRANCH

100. D1-25. Has your agency developed policy(ies), standards, and/or specifications for the use of flexible filler (i.e. microcrystalline wax) in lieu of grout for Post-tensioned members?

2 (4.4%) YES
43 (95.6%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION D1-28.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

101. D1-26. What type of filler does your agency use with Corrosion-Resistant Strands for post-tensioned applications? (Check all that apply).

1 (50.0%)	N/A
1 (50.0%)	Grout
	Flexible filler
	Ungrouted
	Other

102. D1-27. Has your agency successfully replaced tendons which have been filled with flexible filler?

	Yes
	No
2 (100.0%)	N/A

END BRANCH

103. D1-28. Does your agency recommend the use of Ultra High Performance Concrete (UHPC) (17 ksi< f'c <22 ksi) for applications other than joints? (check all that apply)

34 (24.4%) N/A
Decks
1 (2.2%) Bulb-Tee Girders
Slabs
Box beam
2 (4.4%) Overlay
7 (15.6%) Other:

- **No.**
- **We have a pilot project in construction to use it as an overlay.**
- **External diaphragms for New England Deck Double Tee Beams.**
- **Link slabs.**
- **Deck closure and Abutment.**
- **Not yet; but CALTRANS is looking at using UHPC for Bulb-Tee girders and overlays.**

2 (4.4%) No response.

104. D1-29. When does your agency require intermediate diaphragms (steel or CIP concrete) in Prestressed concrete beam spans?

15 (33.3%) All spans greater than 40'
All spans greater than 60'
4 (8.9%) All spans greater than 80'
8 (17.8%) No set limit – intermediate diaphragm use based on analysis
3 (6.7%) Intermediate diaphragms are not required for Prestressed concrete beams spans
14 (31.1%) Other:

- **For spans $\geq$ 160'.**
- **Generally, all spans have mid-span diaphragms.**
- **All prestressed concrete girder bridges require intermediate diaphragms.**
- **Not required except for spans over vehicular spans/roadways and spans on curved girder, and spans with extreme lateral and uplifting loads.**
- **All spans greater than 65'.**
- **All spans.**
- **One at mid-span.**
- **All spans 45' and longer.**
- **Spans up to 90', diaphragms are placed at $^1/_3$ points; spans greater than 90', diaphragms are placed at ¼ points.**

1 (2.2%) No response.

105. D1-30. Has your agency used UHPC for deck overlay material?

1 (2.2%) Yes, as a pilot project
1 (2.2%) Yes, and will use again
Yes, and will not use again
39 (86.7%) No
3 (6.7%) Planning to try as a pilot
Other
1 (2.2%) No response

106. D1-31. Has your agency experienced cracking in UHPC closure pours of approach slabs?

1 (2.2%) Yes
22 (48.9%) No
15 (33.3%) Other:
- **We have not done this for approach slabs.**
- **Do you really mean "approach" slabs?**
- **We have not yet used UHPC.**

7 (15.6%) No response

107. D1-32. Does your agency bid alternates for precast and cast-in-place (CIP) box culverts?

7 (15.6%) Yes
35 (77.8%) No
2 (4.4%) Other:
- **Culverts are bid cast-in-place, but some standards can be substituted by approved precast.**
- **Precast can be substituted for CIP box culverts.**

1 (2.2%) No response

108. D1-33. What is the minimum web thickness for steel plate girder bridges allowed by your agency?

8 (17.8%) $^{3}/_{8}$"
13 (28.9%) $^{7}/_{16}$"
16 (35.6%) ½"
$^{5}/_{8}$"
¾"
6 (13.3%) Other:
- **AASHTO minimum, $^{5}/_{16}$".**
- **½" for depths greater than 33"; $^{3}/_{8}$" for depths less than 33".**
- **Not specified.**
- **Follow AASHTO/NSBA design guidelines; past practice was ½" minimum.**

2 (4.4%) No response

109. D1-34. What type of concrete does your agency use in bridge decks? (check all that apply)

34 (75.6%) ≥ 4 ksi normal weight concrete
6 (13.3%) ≥ 4 ksi lightweight concrete
1 (2.2%) ≤ 4ksi normal weight concrete (based on agency exception)
≤ 4ksi lightweight concrete (based on agency exception)
12 (26.7%) ≥ 4ksi low shrinkage, normal weight concrete
≤ 4ksi low shrinkage, normal weight concrete (based on agency exception)
5 (11.1%) Other:

- 3ksi High performance concrete, 3ksi lightweight concrete, 3ksi internal curing high performance concrete.
- High Performance Concrete.
- 4ksi High Performance Concrete.

1 (2.2%) No response

CONTINUE TO DESIGN SURVEY - Part 2.

AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2017)

DESIGN SURVEY – Part 2

44 Agencies Responding

QUESTION NO.		QUESTION
TOTAL	DES.	
	D2-1.	Person Responding to **DESIGN** Survey – Part 2: Name: _____ E-mail Address: _____ Phone No.: _____
	D2-2.	State: Choose State.
110.	D2-3.	For grade separation structures, check the element types below for which your agency requires increased vertical clearances. (check all that apply)

33 (75.0%) No increase in vertical clearance required based on structure type
5 (11.4%) Steel straddle bent or cross girder
5 (11.4%) Concrete straddle bent or cross girder
5 (11.4%) Post-tensioned concrete straddle bent or cross girder
Conventionally reinforced concrete beam or girder
Steel beam or girder
1 (2.3%) Prestressed concrete beam or girder (AASHTO, bulb tee, etc.)
2 (4.5%) Steel truss or tied arch
7 (15.9%) Other:

- **Typically any bridge over the interstate provide 17'-0" clearance.**
- **Specialty structures.**
- **Pedestrian bridges.**
- **Pedestrian bridges, sign bridges.**
- **Non-redundant elements – includes PT substructure elements overhanging traffic lanes and shoulders; bridge with two or fewer girders; pedestrian and shared use and multi-use structures.**
- **Prestressed concrete straddle bent or cross girder.**

111. D2-4. Regardless of any increased vertical clearance requirements for prestressed concrete girders, does your agency have other requirements to mitigate effects of overheight collision on prestressed concrete girders? (check all that apply)

- **34 (77.3%)** No
- Overheight notification system or headache bar
- **4 (9.1%)** CIP diaphragms required to distribute impact load
- **1 (2.3%)** Mild steel confinement required
- Lower prestressing required to improve ductility under impact
- **5 (11.4%)** Other:
  - **Primarily relying on redundancy**
  - **CIP or steel intermediate diaphragm is required.**
  - **Minimum vertical clearance postings.**
  - **Additional steel diaphragms in exterior bay to distribute the impact load.**

112. D2-5. What measures, if any, does your agency utilize in an effort to reduce noise due to traffic on overhead bridge structures? (check all that apply)

- Use of concrete girders, in lieu of steel girders
- **9 (20.5%)** Longitudinal (instead of transverse) deck grooving
- **2 (4.5%)** Parapets > 42”
- **2 (4.5%)** Eliminate joints
- Use of a preferred joint type
- **13 (29.5%)** Soundwall
- **11 (25.0%)** Other:
  - **None.**
  - **Eliminate joints and soundwall.**
  - **Longitudinal deck grooving and eliminate joints.**
  - **Asphalt wearing surface.**
- **7 (15.9%)** No response.

113. D2-6. Has your agency used a formalized service life design process?

- **35 (79.5%)** No
- **3 (6.8%)** Yes, as a pilot
- Yes, on smaller projects
- **3 (6.8%)** Yes, on a major signature bridge
- **1 (2.3%)** Planning to try as a pilot
- **2 (4.5%)** Would use as a guide specification, if available
- **1 (2.3%)** Other:
  - **Yes as a pilot; would use as a guide specification, if available.**

114. D2-7. Considering the provided definitions, how does your agency define the end of service life for its bridges?

Definitions:

Design life – the period of time for which the statistical derivation of transient loads is based.

Service life – the period of time for which the bridge is expected to be in operation (given proper maintenance).

32 (72.7%) Level of deterioration
10 (22.7%) Cost-benefit study on repair/rehabilitation vs. replacement
1 (2.3%) Structure has reached a life equal to the duration of the design limit state (e.g., 75 years)
Functional Obsolescence (structure no longer meets required geometric (sight distance, lane or shoulder width) or other safety standard (parapet or railing)
4 (9.1%) Other:

- **Level of deterioration, cost benefit study, functional obsolescence.**
- **Meets definition of Structural Deficiency.**

115. D2-8. Rank the following **environmental** factors in the order your agency considers to have the most significant impact on bridge service life. (1 = most significant; 5 = least significant)

_1_ Precipitation

2/3 Temperature

2/3 Proximity to the coast or other body of water

_5_ Pollution

_4_Other

116. D2-9. Rank the following **design** factors in the order your agency considers to be of the most significant impact on bridge service life. (1 = most significant; 10 = least significant)

_7_ Span length

_1_ Joints/structural continuity

_2_ Superstructure type

_5_ Deck type (e.g., grid, concrete, orthotropic)

_8_ Deck type (non-composite vs. composite deck)

_4_ Girder stiffness

_9_ Number, spacing of girders

_3_ Skew

_6_ Bridge Profile (clear distance from bottom of bridge to top of water)

10 Other

117. D2-10. Rank the following **loading** factors in the order your agency considers to be of the most significant impact on bridge service life. (1 = most significant; 4 = least significant)

_2_ Frequency (ADT, ADTT)

_1_ Axle weights/spacing

_4_ Speed

_3_ Other

118. D2-11. Rank the following **Owner Actions** in the order your agency considers to be of the most significant impact on bridge service life. (1 = most significant; 10 = least significant)

_5_ Selection of Materials

_1_ Application of de-icing salts on bridge

_7_ Application of de-icing salts below bridge

_6_ Type of de-icing salts applied

_2_ Frequency with which de-icing salts applied

_3_ Frequency of maintenance

_8_ Frequency of cleaning

10 Load permitting

_4_ Bridge preservation activities

_9_ Other

119. D2-12. What is the average age (years) of a bridge that is replaced in your agency primarily due to deterioration?

	< 40 years
	41 – 45 years
2 (4.5%)	46 -50 years
5 (11.4%)	51 – 55 years
10 (22.7%)	56 – 60 years
4 (9.1%)	61 – 65 years
9 (20.5%)	66 – 70 years
4 (9.1%)	71 – 75 years
6 (13.6%)	>75 years
4 (9.1%)	No response.

120. D2-13. How many years should be required for the target service life (based upon the following definitions) for each of the following replaceable bridge components?

Definitions:

Design life – the period of time for which the statistical derivation of transient loads is based.

Service life – the period of time for which the bridge is expected to be in operation (given proper maintenance).

- Replaceable Component
- Joints
- Bearings
- Deck
- Paint
- Parapet

REFER TO APPENDIX A FOR RESULTS.

121. D2-14. What type of specifications does your agency use when designing for durability? Provide link to specification(s) in comments.

20 (45.5%)	N/A
12 (27.3%)	Agency specific, prescriptive specifications
3 (6.8%)	Performance based specifications
6 (13.6%)	Combination
3 (6.8%)	Other
1 (2.3%)	No response.

122. D2-15. Has your agency experienced issues resulting in reduced durability which could have been avoided if AASHTO or State design specifications included additional durability design requirements? If yes, please explain.

4 (9.1%)	Yes
37 (84.1%)	No
3 (6.8%)	No response.

123. D2-16. How detailed are your agency's structural steel quantity bid tab calculations for lettings of typical steel plate I-girder bridges (e.g., typical means and methods, without floor beams)?

If your agency requires "More detailed structural steel weight calculations", indicate for which items your agency calculates weight in the structural steel quantity bid tab calculation for lettings of typical steel plate I-girder bridges (e.g. typical means without floor beams). (check all that apply)

Note: For the purposes of this question, ignore other structural steel components such as expansion joints, bearings, metal railings, drains, etc.

- **21 (47.7%)** Lump Sum
- **1 (2.3%)** Weight (lbs. of steel) of main girders only
- **6 (13.6%)** Weight (lbs. of steel) of main girders with set percentage to cover all other steel members and components (e.g., splice plates, diaphragms, cross frames, transverse stiffeners, bearing stiffeners, connection plates, longitudinal stiffeners, lateral bracing, etc.)
- **22 (50.0%)** More detailed structural steel weight calculations
- **25 (56.8%)** *Main girders*
- **26 (59.1%)** *Secondary components (e.g., splice plates, transverse stiffeners, bearing stiffeners, connection plates, longitudinal stiffeners, etc.)*
- **25 (56.8%)** *Secondary members (e.g., diaphragms, cross-frames, lateral bracing, etc.)*
- **20 (45.5%)** *Shear studs*
- **15 (34.1%)** *Bolts, nuts, and washers*
- **4 (9.1%)** *Welds*
- **3 (6.8%)** *Deduct for bolt holes*
- **5 (11.4%)** *Deduct for clips, copes, cuts and other holes*
- **5 (11.4%)** Other:
  - **Bid by lump sum, but weight of indicated items are given in the plans.**
  - **Lump sum for all structural components but also provide weight as supplemental information.**
  - **Additional 1.5% calculated weight for welds and bolts.**
  - **Bid as lump sum; provide estimated pounds of steel (as indicated above) in the contract documents.**

124. D2-17. From a FHWA H&H process review, FHWA has suggested showing the estimated scour on bridge General Plan and Elevation (GPE). Does your agency show estimated scour depth on bridge GPE drawings?

- **18 (40.9%)** Yes
- **26 (59.1%)** No

125. D2-18. Does your agency allow the use of modular block retaining walls in seismic areas? (check the highest level permitted for each bridge classification) If modular blocks are not allowed as part of a bridge structure, check the first box and then only the highest categories where they are allowed to be used as retaining walls ONLY.

24 (54.5%) N/A
8 (18.2%) Modular block walls are not allowed for bridges
2 (4.5%) Seismic 1 critical bridges/retaining walls
3 (6.8%) Seismic 2 critical bridges/retaining walls
Seismic 3 critical bridges/retaining walls
1 (2.3%) Seismic 4 critical bridges/retaining walls
1 (2.3%) Seismic 1 essential bridges/retaining walls
2 (4.5%) Seismic 2 essential bridges/retaining walls
Seismic 3 essential bridges/retaining walls
2 (4.5%) Seismic 4 essential bridges/retaining walls
5 (11.4%) Seismic 1 other bridges/retaining walls
5 (11.4%) Seismic 2 other bridges/retaining walls
2 (4.5%) Seismic 3 other bridges/retaining walls
3 (6.8%) Seismic 4 other bridges/retaining walls
5 (11.4%) Other:

- **Modular block walls are not allowed for bridges; WisDOT does not have seismic restrictions for these walls – generally low seismic zone.**
- **NH allows modular block as a part of the bridge structure. Our pre-approval process considers soil type, although not specifically seismic.**
- **No restriction.**
- **Allowed as part of bridge structure with GRS abutments only – Seismic 4 Essential and other.**
- **Case-by-case but infrequently used.**

1 (2.3%) No Response.

126. D2-19. If your agency has implemented thresholds for acceptable approach embankment settlements due to liquefaction during a seismic event, which of the following mitigating measures have been considered? (check all that apply)

37 (84.1%) N/A
3 (6.8%) Lengthened/strengthened approach slabs
4 (9.1%) Compaction grouting
5 (11.4%) Aggregate piers
1 (2.3%) Other:

- Piles.

127. D2-20. Is your agency modifying your design loads to reflect the heavier loads allowed as legal loads by the FAST Act?

5 (11.4%) Yes
39 (88.6%) No

128. D2-21. Does your agency use longitudinal closure pours to mitigate complications due to differential deflections between phases of staged construction?

10 (22.7%) Always
4 (9.1%) Always, for DL deflections greater than 2”
Always, for DL deflections greater than 4”
1 (2.3%) Always, for DL deflections greater than 6”
14 (31.8%) Dependent upon other factors than just deflection
5 (11.4%) No
11 (25.0%) Other:

- **Steel bridges with staged construction and widening of reinforced concrete T-beams which were built with falsework.**
- **Typically not a separate pour; more concerned with vibration issues.**
- **Most of the time this is done, may also depend on exact design issue for each project.**
- **Almost always. Exception is when there is not enough room for a closure pour – NYC.**
- **For prestressed concrete superstructures with staged construction, detail a closure pour the entire bridge length if any span exceeds 85 feet in length or the non-composite deflection due to the deck slab is greater than ½". For structural steel superstructures with staged construction always detail a closure pour regardless of the span length.**
- **Only in steel girder and post-tensioned box girders.**
- **N/A; staged construction is rare in our state.**

129. D2-22. Does your agency allow the use of proprietary trusses (e.g., a truss designed and manufactured by US Bridge, Big R, Contech or similar fabricator/manufacturer)?

34 (77.3%) YES
10 (22.7%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION D2-25.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

130. D2-23. Does your agency allow the use of proprietary trusses on the following road classifications? (check all that apply)

- **2 (5.9%)** Freeways
- **3 (8.8%)** Rural Principal Arterial System
- **6 (17.6%)** Rural Minor Arterial System
- **5 (14.7%)** Rural Collector Road System
- **13 (38.2%)** Rural Local Road System
- **3 (8.8%)** Urban Principal Arterial System
- **5 (14.7%)** Urban Minor Arterial System
- **5 (14.7%)** Urban Collector Street System
- **9 (26.5%)** Urban Local Street System
- **30 (88.2%)** Pedestrian/Shared Use Facility
- **5 (14.7%)** Other

131. D2-24. What type of material(s) and finishes does your agency permit to be specified for proprietary trusses? (check all that apply)

- **22 (64.7%)** ASTM A709 or A847 Gr50W Uncoated
- **10 (29.4%)** ASTM A709 or A847 Gr50W partially coated to protect areas subject to continual wetness
- **13 (38.2%)** ASTM A709 or A847 Gr50W completely coated
- **20 (58.2%)** ASTM A709 or A500 Gr50 Painted
- **10 (29.4%)** ASTM A709 or A500 Gr50 Metalized before final fit up
- **7 (20.6%)** ASTM A709 or A500 Gr50 Metalized after final fit up
- **16 (47.1%)** ASTM A709 or A500 Gr50 Hot Dip Galvanized before final fit up
- **10 (29.4%)** ASTM A709 or A500 Gr50 Hot Dip Galvanized after final fit up
- **8 (23.5%)** ASTM A709 or A500 Gr50 Duplex system of paint over metalizing
- **4 (11.8%)** ASTM A709 or A500 Gr50 Duplex system of powder coating over metalizing
- **9 (26.5%)** ASTM A709 or A500 Gr50 Duplex system of paint over Hot Dip Galvanizing
- **4 (11.8%)** ASTM A709 or A500 Gr50 Duplex system of powder coating over Hot Dip Galvanizing
- **2 (5.9%)** Other:
  - **Evaluated per Project Special Provisions.**
  - **We rarely use these structures; policy not specified.**

END BRANCH

132. D2-25. If your agency permits the use of Direct Tension Indicators (DTIs), does your agency permit the use of DTIs with weathering steel members?

- **5 (11.4%)** DTIs not permitted for any use
- **3 (6.8%)** DTIs not permitted with weathering steel
- **8 (18.2%)** DTIs permitted with weathering steel
- **20 (45.5%)** DTIs permitted
- **5 (11.4%)** Other:
  - **Pilot project with A709 non-weathering steel**
  - **Non-weathering steel permitted.**
  - **DTI's are mandated for all field connections.**
  - **DTIs are not permitted for any use; Michigan had a few pilot projects where DTIs were used with less than desirable results (washer cracking).**
- **2 (4.5%)** No response.

133. D2-26. With regard to strength of steel section beyond the yield point in the DESIGN of steel girder bridges, which of the following describes your agency's practice(s)? (check all that apply)

- **19 (43.2%)** Plastic moment capacity (Section 6.10.7 and 6.12.2 and as described in Appendix D6) is utilized in design for Strength I computations
- **10 (22.7%)** Plastic analysis as described in Appendix A6 is utilized in design
- **9 (20.5%)** Plastic analysis as described in Appendix B6 is utilized in design
- **16 (36.4%)** Allowing evaluation and utilization of steel sections at strength beyond yield is not permitted.
- **1 (2.3%)** Other:
  - **Second choice, but only on low truck volume bridges, such as on county roads.**
- **4 (9.1%)** No response.

134. D2-27. With regard to strength of steel section beyond the yield point in the LOAD POSTING of steel girder bridges, which of the following describes your agency's practice(s)? (check all that apply)

- **16 (36.4%)** Plastic moment capacity (Section 6.10.7 and 6.12.2 and as described in Appendix D6) is utilized in evaluation of Strength computations when determining the need for load postings
- **1 (2.3%)** Plastic analysis as described in Appendix A6 is utilized when determining the need for load postings
- **1 (2.3%)** Plastic analysis as described in Appendix B6 is utilized when determining the need for load postings
- **15 (34.1%)** Allowing evaluation and utilization of steel sections at strength beyond yield is not permitted.
- **8 (18.2%)** Other
- **3 (6.8%)** No response.

135. D2-28. With regard to strength of steel section beyond the yield point in the evaluation of OVERWEIGHT PERMITS of steel girder bridges, which of the following describes your agency's practice(s)? (check all that apply)

- **17 (38.6%)** Plastic moment capacity (Section 6.10.7 and 6.12.2 and as described in Appendix D6) is utilized in evaluation of Strength computations in the evaluation of OVERWEIGHT PERMITS
- **4 (9.1%)** Plastic analysis as described in Appendix A6 is utilized in the evaluation of OVERWEIGHT PERMITS
- **5 (11.1%)** Plastic analysis as described in Appendix B6 is utilized in the evaluation of OVERWEIGHT PERMITS
- **20 (45.5%)** Allowing evaluation and utilization of steel sections at strength beyond yield is not permitted.
- **3 (6.8%)** Other:
  - **Load posting utilize LFD or ASD. Utilize plastic capacity as allowed by code is acceptable.**
  - **LFD Plastic on State System/Plastic not allowed on Local System.**
  - **MDOT does not post bridges using LRFR; MDOT follows Article 10.48.1 for posting LFR.**
- **4 (9.1%)** No response.

136. D2-29. If your agency is designing crash walls to protect piers located within 30 feet of the roadway for a vehicular collision in accordance with LRFD 3.6.5.1, select the vehicular collision load for which your agency currently designs these piers.

- **7 (15.9%)** N/A
- **5 (11.4%)** 600 kips (6th Edition and later) even if qualifies as exempt
- **26 (59.1%)** 600 kips (6th Edition and later) except as exempted
  400 kips (5th Edition and earlier)
- **2 (4.5%)** Agency specified force or agency specified exempted process
- **2 (4.5%)** Other:
  - **600 kips (6th ed. and later) except where speeds <40mph**
  - **Latest AASHTO guidance.**
- **2 (4.5%)** No response.

137. D2-30. Does your agency require the use of pile driving templates for increased accuracy in location and alignment of driven piles?

- **23 (52.3%)** Never
- **3 (6.8%)** For projects where piles will remain exposed above ground (e.g., a pile bent)
- **2 (4.5%)** For projects where a single line of piles is used, regardless of exposure (e.g., a fully-integral abutment)
- **6 (13.6%)** For all piles on select projects
- **2 (4.5%)** For all piles on all projects
- **7 (15.9%)** Other
- **1 (2.3%)** No response.

138. D2-31. Does your agency require core drilling to verify the integrity of a drilled shaft?

12 (27.3%) YES
32 (72.7%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION D2-34.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

139. D2-32. When core drilling is used to verify the integrity of a drilled shaft, is compressive testing of the core used as acceptance criteria:

- **1 (8.3%)** Always
- **3 (25.0%)** Often
- **3 (25.0%)** Sometimes
- **3 (25.0%)** Never
- **2 (16.7%)** Other
  - **We use core drilling when cross-hole sonic logging (CSL) indicates anomalies.**

140. D2-33. In regards to the compressive testing of the core in the previous question, what minimum compressive stresses are acceptable?

- **2 (16.7%)** 0.75 f'c
  0.85 f'c
- **6 (50.0%)** f'c
- **3 (25.0%)** Other:
  - **N/A**
  - **Evaluated on case-by-case basis.**
- **1 (8.3%)** No response.

END BRANCH

141. D2-34. In the design of pile foundations, if your agency has observed the axial loads for piles under service load combinations that are greater than axial loads in strength combinations, which of the following applies?

27 (61.4%) N/A
10 (22.7%) Size foundation based on strength design; check settlement under service
4 (9.1%) Size foundation based on service design; check settlement under service
3 (6.8%) Other:
- **Have not observed other than extreme event.**
- **Size for strength; settlement is handled differently.**

142. D2-35. If your agency allows uplift in the design of pile foundations, in which limit states is uplift allowed? (check all that apply)

15 (34.1%) Strength Limit State
11 (25.0%) Service Limit State
27 (61.4%) Extreme Limit State
11 (25.0%) No response.

143. D2-36. For the application of vehicle collision load to a pier, which does your agency recommend the design to be based upon?

26 (59.1%) Single shear plane
10 (22.7%) Two shear planes
9 (20.5%) No response.

144. D2-37. For the application of longitudinal load to substructure units, how does your agency recommend distribution of load to each unit?

14 (31.8%) Apply all longitudinal loads to unit with FIXED bearings
8 (18.2%) Tributary length
17 (38.6%) Relative stiffness
4 (9.1%) Other
1 (2.3%) No response.

145. D2-38. For shallow foundations, i.e., abutments on spread footings, on rock embankment fill slopes, how long does your agency preload prior to placing substructure units?

20 (45.5%) Don't preload
6 months to 1 year
1 (4.6%) 1 year to 2 years
More than 2 years
21 (38.6%) Varies depending on settlement rate
2 (4.6%) No response.

146. D2-39. For shallow foundations on rock embankment fill slopes, how long does your agency perform settlement monitoring?

20 (45.5%) Don't monitor
6 months to 1 year
1 (4.6%) 1 year to 2 years
More than 2 years
20 (45.5%) Varies depending on settlement rate
3 (6.8%) No response.

147. D2-40. Does your agency provide design guidance or selection algorithms related to selection of jointless bridge type?

26 (59.1%) YES
18 (40.9%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION D2-43.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

148. D2-41. What criterion does your agency use for the selection of appropriate abutment type (e.g., full integral, semi-integral, etc.)? (Check all that apply if based upon multiple factors)

20 (76.9%) Max. length of Bridge/Unit
4 (15.4%) Max. span length
12 (46.2%) Max. expansion length
19 (73.1%) Max. Skew
8 (42.3%) Max. movement
7 (26.9%) Curvature
5 (19.2%) Continuity
5 (19.2%) Other:

- **Not typically using fully-integral abutment at water crossings.**
- **Typically prefer integral.**
- **Height of abutment, pile geometry, and pile orientation.**
- **Abutment exposure height, superstructure depth.**
- **Stress in piles.**

149. D2-42. If the length of a bridge is beyond the limits set by your agency, does your agency recommend other prescribed options?

8 (42.3%) Place joint behind abutment
1 (3.8%) Deck slab extension (deck slab overhangs back of backwall)
7 (26.9%) Use conventional abutment
5 (19.2%) Joint placement at min. interval
3 (11.5%) Other

- N/A

2 (7.7%) No response.

END BRANCH

150. D2-43. Which of the following requirements related to the reduction of corrosion in bridge decks does your agency have? (Check all that apply)

6 (13.6%) No requirements for reinforcing in bridge decks
4 (9.1%) Use empirical deck reinforcing to reduce steel in top mat
Use top mat of non-ferrous rebar
4 (9.1%) Use top mat of coated rebar
Use top mat of stainless clad rebar
2 (4.5%) Use top mat of corrosion-resistant alloy rebar.
2 (4.5%) Use top and bottom mats of non-ferrous rebar
30 (68.2%) Use top and bottom mats of coated rebar
3 (6.8%) Use top and bottom mats of stainless clad rebar
7 (15.9%) Use top and bottom mats of corrosion-resistant alloy rebar
10 (22.7%) Other
1 (2.3%) No response.

151. D2-44. Does your agency permit welds for temporary attachments (e.g., fall protection weld-on receivers or lugs) to steel beams?

12 (27.3%) YES
32 (72.7%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BRIDGE COMPONENTS AND ANCILLARY SRUCTURES SURVEY.

IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

152. D2-45. Does your agency review welds for temporary attachments to steel beams? (check all that apply)

2 (16.7%) No
6 (50.0%) QC inspection, in accordance with AWS D1.5
4 (33.3%) QA Inspection
6 (50.0%) Shop Drawing review by Engineer of Record
Other

153. D2-46. Does your agency consider welds 2” or greater in length to change the fatigue category, even if the attachment has been removed and subsequently inspected to demonstrate that no flaw remains?

2 (16.7%) Yes
8 (66.7%) No
2 (16.7%) Other

END BRANCH

CONTINUE TO BRIDGE COMPONENTS AND ANCILLARY STRUCTURES SURVEY

AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2017)

BRIDGE COMPONENTS AND ANCILLARY STRUCTURES SURVEY

45 Agencies Responding

QUESTION NO.		QUESTION
TOTAL	BRCOM.	
	BC1.	Person Responding to **BRIDGE COMPONENTS AND ANCILLARY STRUCTURES** Survey: Name: _____ E-mail Address: _____ Phone No.: _____
	BC2.	State: Choose State.
154.	BC3.	Rank joint systems in order of most effective for preventing leakage through joints on decks. (1 = most effective; 6 = least effective) __1__ Jointless deck __3__ Compression Seal __2__ Elastomeric expansion dam __5__ Tooth (finger) joint (with neoprene trough) __6__ Sliding plates __4__ Other **1 (2.2%)** No response.
155.	BC4.	Does your agency allow the use of cotton duck bearings as per AASHTO 14.7.6.1? **10 (22.2%)** Yes **35 (77.8%)** No

156. BC5. If your agency performs in-service safety inspections of high-mast light poles, with what frequency does your agency use robotic devices with cameras to inspect high-mast light poles?

	< 3 years
4 (8.9%)	3 – 4 years
2 (4.4%)	5 - 6 years
	7 - 8 years
	9 - 10 years
6 (13.3%)	> 10 years
16 (28.9%)	N/A
5 (17.8%)	Other:

- **Considering pilot testing use of drones.**
- **Case-by-case when specific issue needs close look at hard-to-reach locations.**
- **Never.**
- **Agency is in the process of developing policy to use drones.**

12 (26.7%) No response.

157. BC6. If your agency analyzes in-service high-mast light poles, what wind return period does your agency use in the analysis of high-mast light poles?

	1 year
4 (8.9%)	10 year
13 (28.9%)	50 year
12 (26.7%)	Other:

- **N/A**
- **Per AASHTO guidance.**
- **Not standardized.**
- **1700 year MRI – AASHTO LRFD Specs for Structural Supports, Luminaires. . .**

16 (35.6%) No response.

158. BC7. If your agency allows the construction of monotube sign structures over traffic, indicate which type structure is permitted. (check all that apply)

10 (22.2%)	N/A
27 (60.0%)	Cantilever
23 (51.1%)	Span structure
2 (4.4%)	Other:

- **No restrictions.**
- **Dual cantilever, butterfly.**

4 (8.9%) No response.

159. BC8. What is your agency's recommended procedure for handling/treatment of joints in existing bridge decks?

3 (6.7%) Closed with asphalt plug joints
4 (8.9%) Closed with link slabs
9 (20.0%) Replace joint material (with existing material type)
18 (40.0%) Replace joint material (with new material type)
2 (4.4%) Routine maintenance only
9 (20.0%) Other:

- **Varies by structure.**
- **Depends on situation.**
- **All of the above.**
- **Depends on many factors; remaining life of the bridge, extent of work planned, etc.**
- **Procedure is dependent on joint thermal design movement.**
- **All of the above (except routine maintenance).**
- **Replace joint with preformed strip seal, if possible.**
- **Closed with asphalt plug joints; replace joint material (with existing or new material type).**

160. BC9. For a bridge with 32" concrete barrier meeting TL-4 (NCHRP 350) and work scheduled to be performed on the bridge after Dec. 31, 2019, for which roadway types does your agency recommend meeting the minimum height (36") for MASH TL-4 barriers? (check all that apply)

6 (13.3%) N/A
25 (55.6%) NHS
19 (42.2%) Primary urban roads
19 (42.2%) Primary rural roads
14 (31.1%) Secondary Roads
8 (17.8%) Other

- **PennDOT uses a TL-5 barrier as the primary type.**
- **Still determining; may use speed, ADT and other factors.**
- **Depends upon the work being performed.**
- **In process of evaluation.**
- **As of May 2017 IDOT has not developed a policy for MASH TL-4 barriers. Be are buying our current barriers evaluated for MASH Test Levels and we are also developing a new MASH TL-4 railing. Our policy will depend upon the results. Our ideal goal is to have on concrete barrier and one steel railing that will satisfy MASH TL-4 and use them consistently on all structures - regardless of the route classification.**
- **Utilize the test level selection tables from 1989 Guide Spec for bridge railing.**

5 (11.1%) No response.

161. BC10. If your agency installs chain-link fence on bridge parapet, how is this chain-link fence mounted?

28 (62.2%) Top-mounted
11 (24.4%) Mounted to the outer face
6 (13.3%) Other:

- **N/A**
- **Designed on a project basis.**
- **On top for new construction or on back of barrier with support brackets for existing bridges.**
- **Use both methods of attachment.**
- **We try to avoid chain link fence mounted directly on a parapet because we do not have a crash test for this combination and we are not aware of others either; however, there are circumstances where we have not been able to avoid it. Railroad agencies typically insist on a debris fence even if accommodations for pedestrian or bicyclists are not provided.**

162. BC11. Is the chain-link fence and parapet combination, in the previous question, crash-tested?

3 (6.7%) N/A
3 (6.7%) Yes
39 (86.7%) No

163. BC12. Does your agency have bridge railing details that are crash tested as per MASH? If yes, please list name and test level.

8 (17.8%) Yes

- **TL-5**
- **Single slope barrier, TL-4**
- **Single slope concrete TL-4 Vertical Face Concrete TL-3**
- **Jersey Barriers**
- **Single slope barrier, Type S (Similar to Texas)**
- **Concrete barrier Type 7325W**
- **Assumption is based on the TL-5 vehicle test conditions being unchanged from NCHRP to MASH. The height will be sufficient to satisfy the new TL-4 height recommendations.**

36 (80.0%) No
1 (2.2%) No response.

164. BC13. What are the current standards and specifications used by your agency for adhesive anchors? (check all that apply)

3 (6.7%) Not permitted
13 (28.9%) Not permitted under direct tension load
25 (55.6%) Not permitted under sustained tension load
7 (15.6%) Permitted under direct tension load
3 (6.7%) Permitted under sustained tension load
11 (24.4%) Other:

- *Not permitted overhead, or upwardly inclined.*
- *For bridge mounted sign support structures only: permitted under sustained tension load (allowable % of nominal resistance of the anchors according to Appendix Q of NCHRP 757, Draft AASHTO Design Specification)*
- *Not permitted for overhead use.*
- *Permitted under direct tension if there is additional failsafe such as passing through concrete diaphragms.*
- *Use at discretion of the Engineer.*
- *Not allowed for structure mounted suspended under deck or soffit. Other sign applications usually require additional creep test.*
- *Not permitted under sustained tensile load overhead applications where failure would risk public safety.*
- *Use of adhesive anchors is covered under Engineering Directive E-10-001 that can be downloaded at this URL: www.massdot.state.ma.us/Portals/8/docs/engineeringDirectives/2010/e-10-001.pdf*
- *No written restrictions. Approved material slit for chemical anchor systems references FHWA Tech Avisory 5140.30 discouraging use for sustained tension application or overhead installation.*

1 (2.2%) No response.

165. BC14. Does the time between inspections for overhead sign structures vary for the same type of structure based upon the condition of the structure?

13 (28.9%) Yes
22 (48.9%) No
8 (17.8%) Do not know
2 (4.4%) No response.

166. BC15. If your agency allows the use of Tuf-bar (Glass Fiber Reinforced Polymer Rebar) in the construction of concrete deck slab and concrete barrier, does your agency use a direct one-to-one replacement for conventional reinforcing steel?

37 (82.2%) N/A
1 (2.2%) Yes
4 (8.9%) No
3 (6.7%) No response.

167. BC16. Does your agency allow the use of galvanized reinforcing bars in the construction of concrete deck slab and concrete barrier?

11 (24.4%) N/A
19 (42.2%) Yes
14 (31.1%) No
1 (2.2%) No response.

168. BC17. If your agency allows the use of adhesive anchors for the attachment of portable concrete barriers to bridge decks, does your agency have signed FHWA approval for use of adhesive anchors with portable concrete barriers?

4 (8.9%) Yes – temporary condition
Yes – permanent condition
1 (2.2%) Yes – temporary and permanent conditions
22 (48.9%) No
10 (22.2%) Other:

- **N/A**
- **Allows adhesive for temporary concrete barriers based on past research and testing.**
- **Do not allow.**
- **Unaware of any approved adhesive anchor systems but would allow if approved by FHWA Division Office.**
- **Use for temporary conditions as long as the barrier with the adhesive attachment was crash-tested.**

8 (17.8%) No response.

169. BC18. How does your agency demonstrate the adhesive anchors have capacity equal to the cast-in-place anchors?

15 (33.3%) N/A
3 (6.7%) Calculations
12 (26.7%) Tension and Shear tests in accordance with ASTM E488
8 (17.8%) Other

- **Manufacturer's literature for pull-out and shear.**
- **Tension test only.**
- **Based on ACI 318 manual.**
- **Anchor tested for a minimum pullout of 32 kips and installed according to manufacturer's recommendations.**
- **NCDOT standard spec 420-13 Pull Test.**
- **Using both calculations and testing per ASTM E488.**
- **Product need to meet ASTM requirements.**
- **Require tension verification testing in certain applications.**

7 (15.6%) No response.

170. BC19. Slip-forming often requires special post-forming placement of expansion joints and contraction joints; forms may not travel at deck level. If your agency allows the use of slip forms during construction of concrete bridge rails, how does your agency ensure proper concrete quality, especially proper consolidation, at these locations?

15 (33.3%) N/A
24 (53.3%) No special process
3 (6.7%) Specialized process (published, provide link)

- *NCDOT Standard Spec 460-3*
- *Slip forming of concrete bridge railing not allowed.*
- *http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Bridges/Bridge-Special-Provisions/GBSP61.pdf*
- *NJDOT STANDARDS SPECS 507.03.05.2*

Other
3 (6.7%) No response.

CONTINUE TO CONSTRUCTION SURVEY.

AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2017)

CONSTRUCTION SURVEY

45 Agencies Responding

QUESTION NO.		QUESTION
TOTAL	CONST.	
	C1.	Person Responding to **CONSTRUCTION** Survey: Name: _____ E-mail Address: _____ Phone No.: _____
	C2.	State: Choose State.
171.	C3.	How does your agency recommend placement of the deck concrete be completed? (check all that apply) **23 (51.1%)** Continuous placement **39 (86.7%)** Phased sequences based on positive and negative moment areas **20 (44.4%)** Volume limit for deck pour **1 (2.2%)** No recommendations made **9 (20.0%)** Other • **We allow pouring to stop at the end of any positive moment region.**

172. C4. If continuous deck concrete placement is permitted, what measures does your agency use to prevent dry shrinkage cracking?

5 (11.1%) Continuous deck concrete not permitted
7 (15.6%) No additional measures
6 (13.3%) Use low shrinkage mix
Steam curing
7 (15.6%) No additional measures during cure; seal any cracks
15 (33.3%) Other:

- **Fogging and 7-day wet cure.**
- **Continuous deck placement is allowed on case-by-case basis as approved by the engineer.**
- **Wet burlap.**
- **Retarding admixtures, 7 or 14 day wet cure, depending on concrete spec.**
- **7-day wet cure.**
- **Curing blankets (double layer wet burlap) placed within 15 minutes of placement.**
- **Limitations on the amount of shrinkage allowed which drives contractors to use shrinkage reducing admixtures, modified curing methods, use of polyolefin macro fibers and water reducing admixtures.**
- **Immediate curing protection.**
- **Require 14 day wet cure.**
- **Low shrinkage mix and/or set retarders.**
- **Analysis for pour rate and weather, evaporation retardants when needed.**
- **Two phase, 7-day continuous wet cure.**

5 (11.1%) No response.

173. C5. Does your agency permit piggy-backing of shear studs, e.g., welding of one stud to the head of another stud?

11 (24.4%) Yes
31 (68.9%) No
3 (6.7%) Other:

- **No policy.**
- **Rarely.**

174. C6. What measures are recommended by your agency for the protection of driven piles? (check all that apply)

18 (40.0%) Corrosion protective coating for steel piles
25 (55.6%) Over-dimensioning piles for steel piles
5 (11.1%) Cathodic protection for steel or P/S concrete piles
5 (11.1%) Increased cover to reinforcing in P/S piles
5 (11.1%) Corrosion resistant reinforcing and strands (e.g., stainless steel, carbon fiber reinforced polymer) in P/S piles
12 (26.7%) Other:

- **N/A**
- **Exposed piling is coated with zinc-rich primer (in-place). Pilot project is underway to pre-coate piling prior to driving.**
- **Limit structural resistance of H-Piles to Grade 36.**
- **Composite steel/concrete.**
- **Cold tar epoxy used to protect piles in corrosive soil or water.**
- **Looking at options.**
- **Occasional fiberglass jackets in waterway.**
- **Admixtures to P/S concrete piles.**
- **Use "rhin" lining or Linex coating on exterior of pipe piles.**

5 (11.1%) No response.

175. C7. Does your agency have policy, details and/or specifications related to Accelerated Bridge Construction (ABC)?

21(46.7%) YES
24 (53.3%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION C10.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

176. C8. What decision-making tool does your agency use to help determine that a specific project is appropriate for ABC? (Check all that apply).

5 (23.8%) FHWA – ABC Analytic Hierarchy Process (AHP)
1 (4.8%) FHWA Questionnaire
1 (4.8%) CALTRANS Questionnaire
12 (57.1%) Agency-developed Questionnaire or tool
5 (23.8%) Other :

- **Project level decision.**
- **Agency knowledge.**
- **WMU developed Mi-ABCE tool to evaluate potential.**

177. C9. What details and/or specifications has your agency developed for use with ABC Projects? (check all that apply)

9 (42.9%) Non-proprietary material specifications for Ultra High Performance Concrete (UHPC)

8 (38.1%) Bridge Girders
- *Folded plate girders.*
- *FIBs, FSBs, FUBs*
- *Next and deck bulb tees, Adjacent box beams, NEXT beams.*
- *Precast/prestressed box sections.*
- *Utah bulb-tee girders.*

12 (57.1%) Bridge Deck Systems
- *Precast deck panel joints*
- *Precast slabs*
- *Full-depth precast decks, Prefabricated Bridge Units (PBUs).*
- *Precast panels (partial and full-depth).*
- *Full-depth precast planks.*

10 (47.6%) Bridge Superstructure System
- *Prefabricated modular superstructure units*
- *Inverted T-beams.*
- *Construct off-line and move into place by slide, SPMT or crane.*
- *Box beams.*

12 (57.1%) Connection details
- *High-strength threaded rod (adjustable) for connection of girder to deck.*
- *UHPC and high-strength grout.*
- *Grouted couplers.*
- *UHPC placement in cap to column connection.*
- *Grouted splice couplers, panel joints.*
- *UHPC substructure units.*

5 (23.8%) Link Slab

10 (47.6%) Semi-integral backwall

8 (38.1%) Deck Overlay

1 (4.8%) Foundation Piles

7 (33.3%) Other:
- **Precast & Prestressed side-by-side modular slabs, box beam superstructures.**
- **Precast approach slabs.**
- **Full-depth precast deck panels, precast abutment caps, wingwalls and pier caps.**
- **Most details developed are project specific.**
- **Developed bridge slide specifications.**

END BRANCH

178. C10. Does your agency have a policy in place which requires the Contractor to provide engineering analysis and details to the agency when there is a construction error made during construction of a bridge?

32 (71.1%) YES
13 (28.9%) NO

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO QUESTION C13.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

179. C11. What does your agency require when a Contractor errs during construction of a bridge designed by **DOT STAFF** which requires additional engineering analysis? (check all that apply)

- **6 (18.75%)** Contractor submit engineering analysis for agency review (no charge to Contractor)
- **6 (18.75%)** Contractor submit engineering analysis for agency review (charged to Contractor)
- **15 (46.9%)** Contractor submit signed and sealed engineering analysis for agency review (no charge to Contractor)
- **12 (37.5%)** Contractor submit signed and sealed engineering analysis for agency review (charged to Contractor)
- **9 (28.1%)** Agency Designer provides engineering analysis (no charge to Contractor)
- **8 (25.0%)** Agency Designer provides engineering analysis (charged to Contractor)
- **2 (6.3%)** Agency Consultant provides engineering analysis (no charge to Contractor)
- **4 (12.5%)** Agency Consultant provides engineering analysis (cost to agency charged to Contractor)
- **10 (31.3%)** Contractor submit Request for Information for review and approval
- **1 (3.1%)** Other:
  - **Case-by-case basis.**

180. C12. What does your agency require when a Contractor errs during construction of a bridge designed by **DESIGN CONSULTANTS** which requires additional engineering analysis? (check all that apply)

- **3 (9.4%)** Contractor submit engineering analysis for agency review (no charge to Contractor)
- **7 (21.9%)** Contractor submit engineering analysis for agency review (charged to Contractor)
- **11 (34.3%)** Contractor submit signed and sealed engineering analysis for agency review (no charge to Contractor)
- **7 (21.9%)** Contractor submit signed and sealed engineering analysis for agency review (charged to Contractor)
- **1 (3.1%)** Agency Designer provides engineering analysis (no charge to Contractor)
- **2 (6.2%)** Agency Designer provides engineering analysis (charged to Contractor)
- **3 (9.4%)** Agency Consultant provides engineering analysis (no charge to Contractor)
- **5 (15.6%)** Agency Consultant provides engineering analysis (cost to agency charged to Contractor)
- **3 (9.4%)** Contractor submit Request for Information for review and approval
- **2 (6.2%)** Other:
  - **All of the above, with the exception of contractor-submitted RFI.**
  - **Each case evaluated individually.**

END BRANCH

181. C13. If your agency has a Construction Inspection Manual/Plan to ensure contractors follow erection plans and safe operation of equipment (e.g., cranes, articulated bucket trucks, etc.) does your agency receive expressed concern from Railroads related to the development of a project-specific inspection plan with provisions for adequate personnel to ensure the Contractors comply with the provisions in the Construction Inspection Manual/Plan and in order to avoid incident?

15 (33.3%) Yes
15 (33.3%) No
8 (17.8%) Other:

- **RR reviews contractor shoring, demolition erection and excavation plans.**
- **RR reviews are independent; some RR requirements are included in Special Provisions.**
- **Contractor to submit project-specific erection plans.**
- **Any concerns on behalf of the RR are worked out during project development and incorporated into the project RR agreement.**
- **Erection plans for each project; NH does not provide these to the RR. The RR is on-site with their own inspectors when work is being done around or over their facility.**
- **RRs require project-specific erection plans, fully developed by designer of record.**

7 (15.6%) No response.

182. C14. Does your agency allow welding of structural steel without removal of paint?

Yes
42 (93.3%) No
3 (6.7%) Other:

- **Only for emergency repairs.**
- **Specs are mute on the subject; Contractor may request permission.**
- **Welding of steel bridges and bridge components is to be peformed in accordance with AASHTO/AWS D1.5 Bridge Welding Code. Unsure if the Bridge welding Code requires the removal of paint. For peening of welds by ultrasonic impact treatment, paint must be removed.**

183. C15. For Design-Build projects, who is responsible for fabrication quality assurance (not QC) of structural elements (e.g., steel plate girders and prestressed concrete girders)?

10 (93.3%) N/A
22 (93.3%) Owner
6 (6.7%) Design Builder
4 (6.7%) Independent Firm
3 (6.7%) Other:
- **First design-build projects are in development.**
- **NSBA and PCI plant certification, Construction Qualification Assurance Manager.**
- **Owner and/or Independent Firm.**

1 (2.2%) No response.

184. C16. What is the value of your bridge construction program let annually? Include new construction, replacement, rehabilitation, and preservation.

9 (20.0%) < $50 million
13 (28.9%) $50 – $100 million
18 (40.0%) $100 - $500 million
5 (11.1%) > $500 million

185. C17. With respect to blasting raw steel material before starting fabrication, which of the following statements is true?

11 (24.4%) Agency REQUIRES raw steel to be blasted before starting fabrication.
23 (51.1%) Agency ALLOWS raw steel to be blasted before starting fabrication.
8 (17.8%) Other
- **Blasting is required either before starting fabrication or after fabrication is complete but before shipping.**
- **FCM blasted before fabrication, non-FCM after fabrication.**
- **Not-addressed.**
- **Final product must be blasted, would allow steel to be blasted before fabrication.**
- **Silent on blasting raw material prior to fabrication, except required prior to epoxy coating steel bridge piles.**
- **Steel is blasted after fabrication.**

4 (8.9%) No response.

186. C18. On bridges under construction, does your agency require the Contractor to provide fire control plans? (e.g., rehabilitation of structural steel bridge involving flame cutting of steel members)

5 (11.1%) Yes
38 (84.4%) No
1 (2.2%) Other:
- **Only in projects with forest service lands.**

1 (2.2%) No response.

RETURN

APPENDIX A
DESIGN SURVEY - PART 2
QUESTION D2-13

Design Survey - Part 2 Question D2-13	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	Florida	Georgia	Idaho	Illinois	Indiana
Replaceable components	20 years	***No response.***	15 years	25 years	75 years	***No response.***	***No response.***	10 years	***No response.***	5 years	***No response.***	40 years	***No response.***
Joints	35 years	20 years	25 years	25 years	15 - 30 years	***See Note 2***	***No response.***	30 years	20 - 30 years	20 years	***No response.***	10 years	5 years
Bearings	40 years	***No response.***	50 years	75 years	75 years	75 years	***No response.***	50 years	50 - 75 years	75 years	***No response.***	30 years	30 years
Deck	65 years	35 years	25 years	75 years	75 years	40 - 75 years	***No response.***	50 years	75 years	50 years	***No response.***	50 years	45 years
Paint	25 years	35 years	25 years	25 years	***See Note 1***	20 years	***No response.***	25 years	20 years	15 years	***No response.***	20 years	15 years
Parapet	70 years	***No response.***	25 years	75 years	75 years	50 - 75 years	***No response.***	50 years	50 - 75 years	50 years	***No response.***	50 years	30 years

Design Survey - Part 2 Question D2-13	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana	Nebraska
Replaceable components	***No response.***	15 - 20 years	***No response.***	75 years	8 - 10 years	20 years	15 years	***No response.***	***No response.***	15 years	***30 years***	30 years	***15 years***
Joints	***No response.***	15 - 30 years	***No response.***	25 years	40 years	20 years	20 years	10-15 years	25 years	10 years	***30 years***	50 years	15 years
Bearings	***No response.***	40 years	***No response.***	30 years	40 years +	80 years	50 years	50-75 years	60 years	25 years	***50 years***	75 years	See Note 3
Deck	***No response.***	40 years	***No response.***	40 years	50 years	40 years	30 years	50-75 years	60 years	25 years	***40 years***	75 years	***See Note 4***
Paint	***No response.***	15 years	***No response.***	25 years	30 years	20 years	20 years	30-40 years	20 years	20 years	***30 years***	60 years	20 years
Parapet	***No response.***	40 years	***No response.***	30 years	40 years +	40 years	75 years	20-30 years	60 years	50 years	***40 years***	75 years	40 years

Note 1: Marine - 15 years; Other - 25 years
Note 2: 15 - 25 years dependent on life cycle cost replacement
Note 3: Life of bridge (80 years)
Note 4: Life of bridge (80 years) by use of waterproofing membrane & asphalt overlays
Note 5: 5 - 25 years based on joint type.
Note 6: Full design life, given preservation
Note 7: 50 years with one overlay included
Note 8: 5 - 30 years, depending on type of joints.
Note 9: 40-80 years depending on bearing type
Note 10: 40 years with conventional materials; 80 years with high performance materials.

APPENDIX A
DESIGN SURVEY - PART 2
QUESTION D2-13

Design Survey - Part 2 Question D2-13	Nevada	New Hampshire	New Jersey	New Mexico	New York	New York State Bridge Authority	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island
Replaceable components	40 years	***No response.***	30 years	15 years	***No response.***	25 years	N/A	10 years	50 years	***No response.***	20 years	50 years	Varies
Joints	20 years	20 years	60 years	20 years	30 years	25 years	***See Note 5***	20 years	50 years	25 years	20 years	20 years	***See Note 8***
Bearings	60 years	40 years	100 years	30 years	50 years	40 years	40 years	75 years	50 years	75 years	40 years	50 years	can be 75 years.
Deck	60 years	60 years	60 years	30 years	40 years	40 years	***See Note 6***	40 years	***See Note 7***	40 years	50 years	60 years	50 years
Paint	40 years	20 years	35 years	25 years	10 years	25 years	25 - 30 years	25 years	25 years	***No response.***	40 years	35 years	15 years
Parapet	40 years	60 years	60 years	30 years	40 years	40 years	Full design life	40 years	50 years	40 years	40 years	60 years	30 years

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Replaceable components	25 years	***No response.***	***No response.***	***No response.***	15+ years
Joints	15 - 25 years	***No response.***	20-40 years	12 years	15+ years
Bearings	75 years	***No response.***	***See Note 9***	50 years	50+ years
Deck	75 years	***No response.***	***See Note 10.***	40 years	30+ years
Paint	35 years	***No response.***	30 years	27 years	30+ years
Parapet	75 years	***No response.***	***See Note 10.***	40 years	30+ years

Note 1: Marine - 15 years; Other - 25 years
Note 2: 15 - 25 years dependent on life cycle cost replacement
Note 3: Life of bridge (80 years)
Note 4: Life of bridge (80 years) by use of waterproofing membrane & asphalt overlays
Note 5: 5 - 25 years based on joint type.
Note 6: Full design life, given preservation
Note 7: 50 years with one overlay included
Note 8: 5 - 30 years, depending on type of joints.
Note 9: 40-80 years depending on bearing type
Note 10: 40 years with conventional materials; 80 years with high performance materials.