AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2018)

01 - BRIDGE COMPONENTS

42 Agencies Responding

<table>
<thead>
<tr>
<th>QUESTION NO.</th>
<th>QUESTION</th>
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<tbody>
<tr>
<td>3. BC3.</td>
<td>AASHTO LRFD Bridge Construction Specifications, 4th Edition, Article 19.3.2 requires that “Modular Bridge Joint Systems (MBJS) shall be pre-qualified by satisfying all testing requirements detailed in Appendix A19, which are designed to allow approved MBJS to be used for a limited range of applications.” The pre-qualification tests include the Opening Movement Vibration (OMV), Seal Push-out, and Fatigue tests. Does your Agency require such pre-qualification tests for MBJS applications in a project?</td>
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<td></td>
<td>15 (35.7%) Yes</td>
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<td></td>
<td>27 (64.3%) No</td>
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IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BC5.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

<table>
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<tr>
<th>4. BC4.</th>
<th>Which pre-qualification tests does your Agency require for the use of MBJS applications? (Check all that apply)</th>
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<tbody>
<tr>
<td></td>
<td>6 (21.4%) Opening Movement Vibration (OMV) test</td>
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<td></td>
<td>8 (28.6%) Seal Push-out test</td>
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<tr>
<td></td>
<td>11 (39.3%) Fatigue test</td>
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<td>3 (10.7%) Other</td>
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END BRANCH

<table>
<thead>
<tr>
<th>5. BC5.</th>
<th>Has your Agency experienced any warping issues when galvanizing the sole and masonry plates of elastomeric or multi-rotational bearings?</th>
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<tbody>
<tr>
<td></td>
<td>0 (0.0%) This is a frequent issue</td>
</tr>
<tr>
<td></td>
<td>1 (1.4%) This is an occasional issue</td>
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<tr>
<td></td>
<td>5 (11.9%) This is a rare issue</td>
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<tr>
<td></td>
<td>20 (47.6%) No, this is not an issue</td>
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<td></td>
<td>16 (38.1%) We do not use galvanized bearings</td>
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<tr>
<th>6. BC6.</th>
<th>Does your Agency have an approval process for project-specific bridge railing modifications for historic bridges?</th>
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<tr>
<td></td>
<td>11 (26.2%) Yes</td>
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<tr>
<td></td>
<td>31 (73.8%) No</td>
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IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BC9.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.
7. BC7. Who has approval authority for project-specific bridge railing modifications for historic bridges? (Check all that apply)

- 6 (19.4%) (Federal Highway Administration) FHWA
- 9 (29.4%) Historical/Preservation Organization
- 1 (3.2%) Politician/Legislature
- 1 (3.2%) Director/Commissioner
- 1 (3.2%) Planning Personnel
- 1 (3.2%) Program Management Personnel
- 11 (35.5%) Bridge Engineer/Bridge Management Personnel
- 1 (3.2%) Other

8. BC8. What aspects of the design does your Agency consider for the approval process for project-specific bridge railing modifications for historic bridges?

- 7 (18.9%) Stability
- 8 (21.6%) Snag
- 9 (24.3%) Capacity
- 5 (13.5%) Clearance between rails
- 6 (16.2%) Conformance with Manual for Assessing Safety Hardware (MASH) criteria
- 2 (5.4%) Other

END BRANCH

9. BC9. For new construction, does your Agency certify the use of bridge rails/barriers which were not fully crash tested per MASH criteria or crash tested in accordance to National Cooperative Highway Research Program (NCHRP) Report 350 “Recommended Procedures for the Safety Performance Evaluation of Highway Features” criteria?

- 0 (0.0%) Yes
- 0 (0.0%) On a project-specific basis
- 4 (9.5%) Design Exceptions permitted on project-specific basis
- 11 (26.2%) No; rails/barriers shall be fully crash tested per MASH
- 18 (42.9%) No; rails/barriers shall be fully crash tested per NCHRP 350
- 9 (21.4%) Other

10. BC10. For rehabilitation projects, does your Agency certify the use of bridge rails/barriers which were not fully crash tested per MASH criteria or crash tested in accordance to National Cooperative Highway Research Program (NCHRP) Report 350 “Recommended Procedures for the Safety Performance Evaluation of Highway Features” criteria?

- 1 XX.X% Yes
- 2 (XX.X%) On a project-specific basis
- 8 (XX.X%) Design Exceptions permitted on project-specific basis
- 9 (XX.X%) No; rails/barriers shall be fully crash tested per MASH
- 18 (XX.X%) No; rails/barriers shall be fully crash tested per NCHRP 350
- 4 (XX.X%) Other
11. BC11. If your Agency permits the certification of bridge rails/barriers which were not fully crash tested, briefly explain how the process of certification.

- Do not use the word “certify”; eligible. Third party, independent testing as alternative to FHWA eligibility letter. For example, TTI could review and concur with.
- Maine DOT does not have a formal written process.

12. BC12. How does your Agency plan on implementing Bridge Rails, Barriers, and Traffic Support Structure breakaway devices that are compliant with the Manual for Assessing Safety Hardware (MASH) by 12/31/2019? (check all that apply)

16 (15.8%) Crash tests for Agency-specific devices (barrier/breakaway); as many as practical
26 (25.7%) Participate in pooled-fund study and implement tested devices
31 (30.7%) Use Federal Highway Administration (FHWA) eligibility list
21 (20.8%) Wait for the National Cooperative Highway Research Program (NCHRP) research results
7 (6.9%) Other

13. BC13. Does your Agency plan to self-certify MASH compliant barriers?

18 (42.9%) Yes
24 (57.1%) No

14. BC14. What will be the most common barrier for new construction on Interstates and limited access highways?

26 (61.9%) TL-4 concrete barrier
10 (23.8%) TL-5 concrete barrier
0 (0.0%) TL-6 concrete barrier
0 (0.0%) Some other concrete barrier
3 (7.1%) Steel only barrier
1 (2.4%) Combination steel and concrete barrier
2 (4.8%) Other

15. BC15. What will be the most common barrier for new construction on highways that are NOT Interstates and limited access highways?

27 (64.3%) TL-4 concrete barrier
3 (7.1%) TL-5 concrete barrier
0 (0.0%) TL-6 concrete barrier
1 (2.4%) Some other concrete barrier
5 (11.9%) Steel only barrier
4 (9.5%) Combination steel and concrete barrier
2 (4.8%) Other
16. BC16. If a TL-5 concrete barrier has been used, to what height does your Agency intend to construct it?
   27 (77.1%) 42” height  
   2 ( 5.7%) 45” height (to allow for future wearing surface)  
   6 (17.1%) Other 

17. BC17. Does your Agency participate in pooled-fund studies with Texas A&M Transportation Institute (TTI) or the Midwest Roadside Safety Facility (MwRSF) as part of Manual for Assessing Safety Hardware (MASH) implementation?
   13 (31.7%) No  
   8 (19.5%) TTI  
   9 (22.0%) MwRSF  
   5 (12.2%) Both  
   6 (14.6%) Other 

18. BC18. Does your Agency plan to join any pooled fund studies for MASH testing of bridge rail?
   11 (27.5%) No  
   7 (17.5%) TTI  
   8 (20.0%) MwRSF  
   2 ( 5.0%) Both  
   12 (30.0%) Other 

19. BC19. In January 2017, a truss member on an interstate bridge fractured; the fracture initiated misdrilled holes in a jumbo W- shape tension chord which had been plugged and welded. The jumbo W-shape was made of proprietary steel with a high carbon content. [link to ASCE Article]

   Does your Agency intend to identify members with high carbon content and welds on fracture critical bridges?
   3 ( 7.1%) Yes  
   29 (69.0%) No  
   10 (23.8%) Other 

20. BC20. Which of the following utilities does your agency allow on your bridges? (Check all that apply)
   6 ( 3.5%) Petroleum lines  
   22 (12.9%) Natural gas lines  
   33 (19.3%) Electric supply lines  
   38 (22.2%) Water lines  
   26 (15.2%) Sewer lines  
   38 (22.2%) Fiber Optic lines  
   8 ( 4.7%) Other 

21. BC21. Does your Agency have any restrictions on maximum voltage for electric lines on bridges?
   10 (24.4%) Yes. Please explain _______________________________  
   31 (75.6%) No
22. BC22. Does your Agency require utilities to submit design calculations for utility supports (e.g. size and spacing of hangers and pads) in bridges? (Check all that apply)

- 6 (4.3%) Petroleum lines
- 18 (12.8%) Natural gas lines
- 24 (17.0%) Electric supply lines
- 29 (20.6%) Water lines
- 24 (17.0%) Sewer lines
- 24 (17.0%) Fiber Optic lines
- 8 (5.7%) No
- 8 (5.7%) Other

23. BC23. What does your Agency require utilities to provide? (Check all that apply)

- 28 (23.5%) Encroachment permit (i.e., ROW permit) application plans
- 24 (20.2%) Casing
- 16 (13.4%) Shut off valves and devices
- 29 (24.4%) Special connections to structure
- 12 (10.1%) Specified clearances between pipeline and structure
- 10 (8.4%) Other

24. BC24. For which utilities does your Agency require installing automatic shut-off valves? (Check all that apply)

- 28 (56.0%) N/A
- 1 (2.0%) Petroleum lines
- 8 (16.0%) Natural gas lines
- 5 (10.0%) Water lines
- 4 (8.0%) Sewer lines
- 4 (8.0%) Other

25. BC25. What information does your Agency require to be included in the encroachment permit application? (Check all that apply)

- 5 (2.2%) Professional Engineer stamped seismic calculations
- 25 (11.2%) Pipeline installation plans
- 29 (11.2%) Carrier pipe size and material
- 27 (13.0%) Casing pipe size
- 33 (12.1%) Supports—cradles, hangers, types and spacing
- 30 (14.8%) Details at abutments, bents, hinges, and diaphragms
- 2 (0.9%) The seismic movement used in the design
- 9 (4.0%) Casing vents
- 13 (5.8%) Corrosion protection
- 13 (5.8%) Operating pressure
- 15 (6.7%) Shutoff valves and their locations (if located within state right-of-way).
- 12 (5.4%) A list of codes and standards used for the design
- 10 (4.5%) Other
26. BC26. Please provide an internet link to your Agency’s natural gas and volatile liquid requirements, if applicable.


27. BC27. For which utilities does your Agency require utility companies to design for seismic movements? (Check all that apply)

35 (71.4%) N/A
1 (2.0%) Petroleum lines
3 (6.1%) Natural gas lines
1 (2.0%) Electric supply lines
3 (6.1%) Water lines
3 (6.1%) Sewer lines
1 (2.0%) Fiber Optic lines
2 (4.1%) Other

28. BC28. Does your Agency perform an independent Quality Control (QC) or Quality Assurance (QA) check of the utility company’s designs?

17 (40.5%) Yes
21 (50.0%) No
4 (9.5%) Other

29. BC29. What codes and standards does your Agency require gas line utilities to follow?

4 (11.4%) Natural Gas Pipeline Safety Act
11 (31.4%) Title 49 of the Code of Federal Regulations
20 (57.1%) Other

30. BC30. Does your Agency have any restrictions on pipe diameter of gas lines located on bridges?

29 (72.5%) N/A
2 (5.0%) Less than 8” dia.
2 (5.0%) 8” dia. to 12” dia.
0 (0.0%) 12” dia. to 16” dia.
1 (2.5%) 16” dia. to 20” dia.
6 (15.0%) Other

31. BC31. Does your Agency have any restrictions on pipe pressure of gas line on bridges?

30 (73.2%) N/A
3 (7.3%) Less than 150 psi
0 (0.0%) 150 psi to 200 psi
0 (0.0%) 200 psi to 300 psi
8 (19.5%) Other
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32. BC32. Does your Agency have any pipe testing requirements for gas line?
  31 (59.6%) N/A
  3 (5.8%) Purging
  1 (1.9%) Strength Tests
  5 (9.6%) Leak Tests
  5 (9.6%) Pressure Tests
  4 (7.7%) Weld Tests
  3 (5.8%) Other

33. BC33. What does your Agency require for minimum vertical clearances for traffic signal mast arms and signal heads?
  15 (37.5%) 17’
  6 (15.0%) 17’-6”
  1 (2.5%) 18’
  3 (7.5%) 18’-6”
  1 (2.5%) 19’
  14 (35.0%) Other

CONTINUE TO NEXT SURVEY: BRIDGE MANAGEMENT
### 02 - BRIDGE MANAGEMENT

#### 40 Agencies Responding

<table>
<thead>
<tr>
<th>QUESTION NO.</th>
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<tr>
<td>TOTAL BM</td>
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<th>QUESTION</th>
<th>BM</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>34. BM3.</td>
<td></td>
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<td></td>
<td></td>
<td>18 (45.0%)</td>
<td>Yes</td>
</tr>
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<td></td>
<td></td>
<td>22 (55.0%)</td>
<td>No</td>
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<td>IF ANSWERED <strong>NO</strong> TO PREVIOUS QUESTION, SKIP TO <strong>BM5</strong>.</td>
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<td>IF ANSWERED <strong>YES</strong> TO PREVIOUS QUESTION, CONTINUE.</td>
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35. BM4. What is your Agency’s specified minimum vertical clearance for vulnerable structures, (i.e., fracture critical structures, straddle bents, integral caps, etc.) to mitigate over height vehicle impacts?

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>BM</th>
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<tr>
<td>0 (0.0%)</td>
<td>15 ft - 0 in</td>
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<tr>
<td>0 (0.0%)</td>
<td>15 ft - 6 in</td>
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<tr>
<td>1 (5.3%)</td>
<td>16 ft - 0 in</td>
</tr>
<tr>
<td>5 (26.3%)</td>
<td>16 ft - 6 in</td>
</tr>
<tr>
<td>1 (5.3%)</td>
<td>17 ft - 0 in</td>
</tr>
<tr>
<td>2 (10.5%)</td>
<td>17 ft - 6 in</td>
</tr>
<tr>
<td>2 (10.5%)</td>
<td>18 ft - 0 in</td>
</tr>
<tr>
<td>1 (5.3%)</td>
<td>18 ft - 6 in</td>
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<tr>
<td>7 (36.8%)</td>
<td>Other</td>
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<tr>
<td>21</td>
<td>Unanswered</td>
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**END BRANCH**

36. BM5. What type of posting sign does your Agency use on state highways? (check all that apply)

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<th>TOTAL</th>
<th>BM</th>
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<tr>
<td>26 (29.2%)</td>
<td>MUTCD R12-1</td>
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<tr>
<td>11 (12.4%)</td>
<td>MUTCD R12-2</td>
</tr>
<tr>
<td>3 (3.4%)</td>
<td>MUTCD R12-3</td>
</tr>
<tr>
<td>5 (5.6%)</td>
<td>MUTCD R12-4</td>
</tr>
<tr>
<td>11 (12.4%)</td>
<td>MUTCD R12-5 exclusively</td>
</tr>
<tr>
<td>9 (10.1%)</td>
<td>MUTCD R12-5 plus something</td>
</tr>
<tr>
<td>11 (12.4%)</td>
<td>Variation of MUTCD R12-5</td>
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<tr>
<td>13 (14.6%)</td>
<td>Other</td>
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<td>3</td>
<td>Unanswered</td>
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37. BM6. Has your Agency identified any pattern of overweight Specialized Hauling Vehicles (SHV)?

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<th>TOTAL</th>
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<tr>
<td>7 (17.5%)</td>
<td>Yes</td>
</tr>
<tr>
<td>33 (82.5%)</td>
<td>No</td>
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</table>
38. BM7. What software does your Agency use for permitting overweight vehicles? (Check all that apply)
   - 9 (20.5%) Bentley Superload
   - 7 (15.9%) ProMiles
   - 28 (63.6%) Other
   - 1 Unanswered

39. BM8. What software does your Agency use for permitting overweight vehicles where in-depth analysis is required? (Check all that apply)
   - 24 (42.1%) AASHTOWare Bridge Rating (BrR)
   - 2 (3.5%) DESCUS
   - 6 (10.5%) LARS Bridge
   - 5 (8.8%) CSiBridge
   - 20 (35.1%) Other
   - 1 Unanswered

40. BM9. Does your Agency have any routine permit vehicles that are used to approve permit requests?
   - 18 (45.0%) Yes
   - 22 (55.0%) No

   IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM11.
   IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

41. BM10. What are your Agency’s configurations for routine permit vehicles? Please provide web link to vehicle definition OR provide no. of axles, axle weight, gross weight, and distance between each axle.

   Virginia: http://www.virginiadot.org/business/resources/bridge/Manuals/IIM/SBIIM86.1.pdf


END BRANCH
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42. **BM11.** How does your Agency consider impact factor for routine permit analysis?
   - 5 (12.8%) Reduced impact factor
   - 17 (43.6%) Full-calculated impact in accordance with Load Factor Rating (LFR) code
   - 8 (20.5%) Full-calculated impact in accordance with Load and Resistance Factor Rating (LRFR) code
   - 9 (23.1%) Other
   - 1 Unanswered

43. **BM12.** If your agency considers it standard practice to load rate prestressed concrete bridges for Service I Limit State in Load Factor rating method for design and legal loads only (not for permit vehicles), is your Agency following the MBE example no. 3 to rate prestressed concrete bridge for Service I limit state?
   - 11 (32.4%) Yes
   - 23 (67.6%) No
   - 6 Unanswered

44. **BM13.** Does your Agency have age and/or condition criteria which are used as aids to determine when an overlay and/or which overlay is placed?
   - 20 (50.0%) Yes
   - 20 (50.0%) No

   **IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM15.**
   **IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

45. **BM14.** At what age and/or condition rating does your Agency consider decks to be candidates to receive an overlay? (Check all that apply)
   - 0 (0.0%) N/A
   - 0 (0.0%) Maximum age of 10 years
   - 0 (0.0%) Maximum age of 15 years
   - 1 (2.3%) Maximum age of 20 years
   - 0 (0.0%) Cycle of every 10 years
   - 2 (4.5%) Cycle of every 15 years
   - 1 (2.3%) Cycle of every 20 years
   - 2 (4.5%) National Bridge Inspection Standards (NBIS) condition rating of 4 or less
   - 7 (15.9%) National Bridge Inspection Standards (NBIS) condition rating of 5
   - 7 (15.9%) National Bridge Inspection Standards (NBIS) condition rating of 6
   - 5 (11.4%) National Bridge Inspection Standards (NBIS) condition rating of 7 or more
   - 12 (27.3%) Evaluated on a case by case basis
   - 7 (15.9%) Other
   - 20 Unanswered

   **END BRANCH**
46. BM15. Does your Agency have a Federal Highway Administration (FHWA) approved “Bridge Preservation Policy” which allows the use of Federal Funding for bridge maintenance?

- Yes: 25 (62.5%)
- No: 10 (25.0%)
- Other: 5 (12.5%)

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM18.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

47. BM16. Has your Agency implemented a bridge preservation program, which consists of work that is planned and performed to improve or sustain the condition of the transportation facility in a state of good repair? Preservation activities generally do not add capacity or structural value, but do restore the overall condition of the transportation facility.

- Yes: 31 (77.5%)
- No: 9 (22.5%)

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM18.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

48. BM17. How does your Agency complete this work?

- Contract out: 16 (51.6%)
- Complete it with State Forces: 2 (6.5%)
- Other: 13 (41.9%)
- Unanswered: 9

END BRANCH

49. BM18. Does your Agency prepare a summary report on Bridge Conditions or your Agency’s Bridge Preservation Program each year?

- Yes: 19 (47.5%)
- No: 21 (52.5%)

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM20.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

50. BM19. Please provide a link(s) to your Agency’s summary report on your state’s Bridge Conditions or Bridge Preservation Program.

- Virginia DOT:

- New York DOT:
  - www.dot.ny.gov/divisions/engineering/structures/manuals/graber_report

- Michigan DOT:
  - https://www.michigan.gov/tamc/
  - https://www.michigan.gov/mdot/0,4616,7-151-9622_11045_25024_75677---00.html

- California DOT:

- New Hampshire DOT:
  - NH is currently developing our first.

END BRANCH
51. **BM20.** Does your Agency have standards, procedures, or requirements for retaining wall inspections?

- **Yes** 9 (22.5%)
- **No** 31 (77.5%)

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM24.**

**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

52. **BM21.** Does your Agency perform safety inspections of retaining walls on a scheduled basis?

- **Yes** 9 (100.0%)
- **No** 0 (0.0%)
- **Unanswered** 31

53. **BM22.** Are safety inspections of retaining walls conducted by certified Bridge Safety Inspectors?

- **Yes** 6 (66.7%)
- **No** 3 (33.3%)
- **Unanswered** 31

54. **BM23.** Would your Agency be willing to share sample inspection forms for retaining walls?

- **Yes** 8 (88.9%)
- **No** 1 (11.1%)
- **Unanswered** 31

**END BRANCH**

55. **BM24.** Does your Agency incorporate retaining walls into an inventory database?

- **Yes** 13 (32.5%)
- **No** 27 (67.5%)

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM29.**

**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

56. **BM25.** How does your Agency catalog retaining walls into your inventory database? (check all that apply)

- **Single software system** 4 (23.5%)
- **Multiple, individualized records** 0 (0.0%)
- **Regional database** 0 (0.0%)
- **Statewide database** 6 (35.3%)
- **Database containing retaining walls only** 5 (29.4%)
- **Integrated structures database** 1 (5.9%)
- **Other** 1 (5.9%)
- **Unanswered** 27
57. BM26. Approximately what percentage of your Agency’s retaining walls are inventoried?
   2 (15.4%) Less than 5%
   0 ( 0.0%) 10%-15%
   1 ( 7.7%) 15%-20%
   0 ( 0.0%) 20%-30%
   0 ( 0.0%) 30%-40%
   3 (23.1%) 40%-60%
   1 ( 7.7%) 60%-80%
   4 (30.8%) 80%-90%
   2 (15.4%) Greater than 90%
   0 ( 0.0%) Other
   27 Unanswered

58. BM27. What division or organizational entity is responsible for retaining wall maintenance? (check all that apply)
   1 ( 4.5%) Bridge Design Engineers
   2 ( 9.1%) District Bridge Engineers
   8 (36.4%) Maintenance Division
   2 ( 9.1%) Bridge Inspectors
   4 (18.2%) On-Call Contracts
   4 (18.2%) State Forces
   1 ( 4.5%) Other
   27 Unanswered

59. BM28. Do state forces perform maintenance activities for retaining walls?
   11 (84.6%) Yes
   2 (15.4%) No
   27 Unanswered

END BRANCH

60. BM29. Does your Agency distinguish between retaining walls at abutments in a fill section and retaining structures at abutment in a cut section?
   5 (12.5%) Yes
   35 (87.5%) No

61. BM30. What are the most common causes of retaining wall damage or failure (check all that apply)
   28 (26.4%) Drainage system failures
   24 (22.6%) Erosion
   18 (17.0%) Rotation
   18 (17.0%) Settlement
   1 ( 0.9%) Sliding
   2 ( 1.8%) Unforeseen loading (live or surcharge)
   8 ( 7.5%) Vegetation damage
   7 ( 6.6%) Other
   2 Unanswered
62. **BM31.** How does your Agency manage inventory and inspection of steel plate pipe (SPP), concrete pipe, steel pipe, and box culverts?

- **14 (35.9%)** National Bridge Inventory (NBI) and the required inspection intervals for all other bridges
- **6 (15.4%)** Develop own routine, proactive, comprehensive and measureable culvert inspection program
- **19 (48.7%)** Other
- **1 Unanswered**

63. **BM32.** What criteria does your Agency use to determine whether to repair, rehabilitate, or replace SPP, concrete pipe, steel pipe, and box culverts? (check all that apply)

- **32 (21.1%)** Structural capacity
- **31 (20.4%)** Hydraulic functionality
- **21 (13.8%)** Safety and convenience of the traveling public and adjacent property owners
- **23 (15.1%)** Economic considerations and budgetary constraints
- **13 (8.6%)** Traffic volume and vehicle loading details
- **28 (18.4%)** The feasibility of various repair versus replacement options
- **4 (2.6%)** Other
- **1 Unanswered**

64. **BM33.** Rank the methods used by your Agency in the order of COST-EFFECTIVENESS for repair and rehabilitation of SPP, concrete culverts, steel pipe, and box culverts. Use 1 for least cost-effective and 9 for most cost-effective. Do not rank methods your Agency has not used.

- **1 -** Sandblast and repaint or recoat
- **2 -** Other
- **3 -** Apply internal bands or similar repairs to problem joints
- **4 -** Apply a shotcrete or gunnite lining
- **5 -** Stabilize the fill surrounding a culvert or fill isolated voids in the backfill envelope
- **6 -** Repair and modification to culvert end treatment
- **7 -** Install a reinforced concrete invert to repair or replace a deteriorated invert in a corrugated metal culvert pipe
- **8 -** Spot patch and repair
- **9 -** Slip line or install a new internal pipe inside the existing culvert

- **5 Unanswered**
65. BM34. Rank the methods used by your Agency in the order of ENVIRONMENTALLY FRIENDLINESS for repair and rehabilitation of SPP, concrete culverts, steel pipe, and box culverts. Use 1 for least environmentally friendly and 9 for most environmentally friendly. Do not rank methods your Agency has not used.

1 - Other
2 - Sandblast and repaint or recoat
3 - Apply a shotcrete or gunnite lining
4 - Apply internal bands or similar repairs to problem joints
5 - Repair and modification to culvert end treatment
6 - Install a reinforced concrete invert to repair or replace a deteriorated invert in a corrugated metal culvert pipe
7 - Slip line or install a new internal pipe inside the existing culvert
8 - Stabilize the fill surrounding a culvert or fill isolated voids in the backfill envelope
9 - Spot patch and repair

11 Unanswered

66. BM35. Does your Agency consider it reasonable to inspect a bridge in the same month during each inspection cycle?

29 (72.5%) Yes
11 (27.5%) No

67. BM36. If your Agency is experiencing difficulty in hiring and retaining engineers for bridge/structure related positions, please indicate for which positions or divisions you have experienced difficulty. (Check all that apply)

0 (0.0%) N/A
26 (24.5%) Design
22 (20.8%) Load Rating
14 (13.2%) Maintenance
23 (21.7%) Inspection
14 (13.2%) Management
7 (6.6%) Other

1 Unanswered

68. BM37. In your State, who prioritizes/selector the bridges to be programmed for replacement?

1 (2.5%) Politician/Legislature
0 (0.0%) Director/Commissioner
0 (0.0%) Planning Personnel
5 (12.5%) Program Management Personnel
26 (65.0%) Bridge Engineer/Bridge Management Personnel
0 (0.0%) Computer
8 (20.0%) Other
69. **BM38.** When bridge replacement money is distributed at your Agency, what criteria is used to determine where it is spent?
   - 2 (5.0%) Distributed equally to each District/Region
   - 0 (0.0%) Distributed based on worst first
   - 1 (2.5%) Based on route classification or ADT
   - 34 (85.0%) Needs-based assessment based on a combination of factors
   - 3 (7.5%) Other

70. **BM39.** Does your Agency have a dedicated office to perform hydraulic modeling?
   - 32 (80.0%) Yes
   - 8 (20.0%) No

   **IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM41.**
   **IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

71. **BM40.** Is your Agency’s hydraulic modeling office attached to:
   - 20 (62.5%) Bridge/Structures
   - 5 (15.6%) Roadway
   - 2 (6.3%) Preliminary Engineering
   - 0 (0.0%) Planning
   - 5 (15.6%) Other

   **END BRANCH**

72. **BM41.** Does your Agency require structural repair plans to be prepared by licensed professional engineers?
   - 39 (97.5%) Yes
   - 1 (2.5%) No

73. **BM42.** If your Agency is having difficulty meeting inspection frequency requirements for Federal Regulations, please describe?
   - Yes, due to Railroad flagging and other related issues.
   - Yes. While we meet the majority of the inspection interval requirements, unforeseen conditions that sometimes compound and can cause a complete inspection to go beyond the interval plus 4 months. Increased inspection costs simply to meet the frequency requirements are showing little added value.
   - Weather/flooding is greatest obstacle
   - No issues with meeting inspection frequency requirements.
   - NMDOT is not centralized. Districts are having problems staffing bridge inspection program. Are meeting this deficiency with staff from state university who perform about 20% of NMDOT inspections. Occasionally fall behind due to communication issues
74. BM43. Does your Agency feel adjustment to the current deadlines would provide additional safety to the inspection program?
   - 0 (0.0%) Yes, more stringent deadlines are appropriate
   - 13 (33.3%) Yes, more relaxed deadlines are appropriate
   - 19 (48.7%) No, deadlines are appropriate as established
   - 7 (17.9%) Other
   - 1 Unanswered

75. BM44. Does your Agency use Unmanned Aircraft Systems (UASs)/Unmanned Aerial Vehicles (UAVs)/drones for bridge inspection or analysis?
   - 10 (25.0%) Yes
   - 30 (75.0%) No

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM50.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

76. BM45. Is this work performed by your Agency or by a contractor?
   - 2 (20.0%) Agency
   - 6 (60.0%) Contractor
   - 2 (20.0%) Other
   - 30 Unanswered

77. BM46. Does your Agency own an Unmanned Aircraft System (UAS)/Unmanned Aerial Vehicle (UAV)/drone?
   - 5 (50.0%) Yes
   - 5 (50.0%) No
   - 0 (0.0%) Other
   - 30 Unanswered

78. BM47. What are the biggest benefits using this technology has provided?
   - 1 (10.0%) Efficiently and effectively visually inspect a wide variety of structure types in challenging locations
   - 0 (0.0%) Carry a wide range of imaging technologies including still, video and infrared sensors
   - 6 (60.0%) Safety risks associated traffic control, working at height and in traffic could be minimized
   - 3 (30.0%) Other
   - 30 Unanswered

79. BM48. What usable information has your Agency gained? (check all that apply)
   - 10 (35.7%) Still images
   - 8 (28.6%) Video
   - 4 (14.3%) Infrared images
   - 3 (10.7%) Site maps
   - 2 (7.1%) 3D models of bridge elements
   - 1 (3.6%) Other
   - 30 Unanswered
80. BM49. What are the biggest challenges faced by your Agency in using this technology? (check all that apply)
   3 (15.0%) Time required to obtain approvals from Federal Aviation Administration (FAA)
   4 (20.0%) Tactile functions (e.g., cleaning, sounding, measuring, and testing) equivalent to a hands-on inspection cannot be replicated
   8 (40.0%) Cannot perform inspections independently but can be used as a tool for bridge inspectors
   5 (25.0%) Equipment battery life
   0 (0.0%) Other
   30 Unanswered

END BRANCH

81. BM50. What are your Agency’s criteria for making the decision between rehabilitation or replacement of a bridge/culvert? (check all that apply)
   3 (14.3%) Element level ratings/Health index
   9 (42.9%) Cost of rehabilitation exceed a certain percentage of cost of replacement
   8 (38.1%) Service life
   1 (4.8%) Other
   30 Unanswered

82. BM51. What tools/software does your Agency use to prioritize bridge projects?
   0 (0.0%) Smartsheet
   0 (0.0%) Workfront-Project Management Software
   0 (0.0%) Asana
   29 (72.5%) Agency-developed decision tool
   11 (27.5%) Other
   1 Unanswered
### BM52. What performance measures does your Agency use for bridges? (check all that apply)

<table>
<thead>
<tr>
<th>Measure Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge Condition – Performance measures that are based on NBI general condition</td>
<td>36 (40.4%)</td>
</tr>
<tr>
<td>ratings, bridge health index, or state-specific condition data, and that are</td>
<td></td>
</tr>
<tr>
<td>reported as network average values of condition, or as counts or percentages of</td>
<td></td>
</tr>
<tr>
<td>bridges meeting or exceeding a threshold value of condition or health.</td>
<td></td>
</tr>
<tr>
<td>Bridge Program – Performance measures that are based on completions, commitments,</td>
<td>11 (12.4%)</td>
</tr>
<tr>
<td>or backlog of projects for bridge repair or replacement.</td>
<td></td>
</tr>
<tr>
<td>Bridge Status – Performance measures that are based on counts or percentages of</td>
<td>23 (25.8%)</td>
</tr>
<tr>
<td>bridges in a population that are structurally deficient, functionally obsolete or</td>
<td></td>
</tr>
<tr>
<td>weight-restricted.</td>
<td></td>
</tr>
<tr>
<td>Bridge Maintenance and System Operations – Performance measures that are based on</td>
<td>10 (11.2%)</td>
</tr>
<tr>
<td>the accomplishments or backlog in bridge maintenance and minor repairs, and;</td>
<td></td>
</tr>
<tr>
<td>Performance measures that are based on level-of-service grades for roadside</td>
<td></td>
</tr>
<tr>
<td>maintenance.</td>
<td></td>
</tr>
<tr>
<td>Sufficiency Rating – Performance measures that are based on average sufficiency</td>
<td>7 (7.9%)</td>
</tr>
<tr>
<td>rating or on the count or percentage of bridges in a population the meet or exceed</td>
<td></td>
</tr>
<tr>
<td>a threshold value of sufficiency rating.</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2 (2.2%)</td>
</tr>
</tbody>
</table>

### BM53. How are your Agency’s performance measures being used to prioritize and     |            |
| program future projects?                                                           |            |

<table>
<thead>
<tr>
<th>Use of Performance Measures</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying investment strategy</td>
<td>1 (2.5%)</td>
</tr>
<tr>
<td>Identify work needs</td>
<td>15 (37.5%)</td>
</tr>
<tr>
<td>Determine the optimum approach to address needs</td>
<td>6 (15.0%)</td>
</tr>
<tr>
<td>Forecast future performance</td>
<td>8 (20.0%)</td>
</tr>
<tr>
<td>Other</td>
<td>10 (25.0%)</td>
</tr>
</tbody>
</table>

### BM54. Has your Agency developed a bridge condition performance measure (such as   |            |
| “health index”) used to program bridge work that is based on AASHTO element       |            |
| inspection information?                                                           |            |

<table>
<thead>
<tr>
<th>Answer</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>13 (32.5%)</td>
</tr>
<tr>
<td>No</td>
<td>27 (67.5%)</td>
</tr>
</tbody>
</table>

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM57.**

**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**
AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2018)

86. BM55. What bridge performance measures does your Agency use? (check all that apply)
   5 (19.2%) Bridge Condition Index
   3 (11.5%) Bridge Health Index
   1 (3.8%) Repair Index
   3 (11.5%) Sufficiency Rating
   3 (11.5%) Other numerical index
   7 (26.9%) Number of Deficient Bridges
   4 (15.4%) Other
   27 Unanswered

87. BM56. Please provide link to your Agency’s documentation related to bridge performance measures.
   - http://www.virginiadot.org/business/resources/bridge/Manuals/Part2/Chapter32.pdf; begins at File 32.00-2
   - http://www.dot.state.mn.us/bridge/scoping.html
   - http://www.dot.ri.gov/accountability/index.php

   END BRANCH

88. BM57. Has the use of the AASHTO Manual for Bridge Element Inspection had any effect on your Agency’s bridge inspection program costs?
   27 (67.5%) Increase
   0 (0.0%) Decrease
   8 (20.0%) No Impact
   5 (12.5%) Other

89. BM58. Has the use of the AASHTO Manual for Bridge Element Inspection had any effect on your Agency’s bridge inspection program quality?
   23 (57.5%) Increase
   1 (2.5%) Decrease
   13 (32.5%) No impact
   3 (7.5%) Other

90. BM59. Does your Agency use software for collecting and managing bridge inventory/inspection data?
   38 (95.0%) Yes
   2 (5.0%) No

   IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM62.
   IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

91. BM60. What software does your Agency use for collecting and managing bridge inventory/inspection data?
   0 (0.0%) Pontis
   17 (44.7%) AASHTOWare Bridge Management Systems
   21 (55.3%) Other
   2 Unanswered
92. BM61. How satisfied is your Agency with the Asset Management software currently in use?
   1 (2.6%) Very Satisfied
   14 (36.8%) Satisfied
   17 (44.7%) Somewhat Satisfied
   3 (7.9%) Somewhat Dissatisfied
   2 (5.3%) Dissatisfied
   0 (0.0%) Very Dissatisfied
   1 (2.6%) Other
   2 Unanswered

END BRANCH

93. BM62. Does your Agency perform Non-Destructive Examination (NDE) (i.e., chain-drag) of bridge decks prior to or during the design stage to estimate class 2 preparation (i.e., partial depth removal) quantities to include in the contract documents?
   35 (87.5%) Yes
   5 (12.5%) No

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM64.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

94. BM63. Which NDE methods do your Agency recommend to estimate delaminated areas for partial depth removal? (check all that apply)
   17 (19.1%) Infrared Thermography (IR)
   23 (25.8%) Ground Penetrating Radar (GPR)
   10 (11.2%) Impact Echo
   29 (32.6%) Chain Drag
   3 (3.4%) Half-cell Potential
   1 (1.1%) Electrical Resistivity
   2 (2.2%) Ultrasonic Surface Waves
   4 (4.5%) Other
   5 Unanswered

END BRANCH

95. BM64. Please indicate the most important outcome your Agency would like to see from the Federal Highway Administration (FHWA) Long Term Bridge Performance (LTBP) Program.
   7 (17.9%) Deck deterioration models
   3 (7.7%) Deck inspection/evaluation tools
   17 (43.6%) Practical measures to extend service life of bridge elements
   3 (7.7%) Live load effects on bridge decks
   2 (5.1%) NDE and detailed inspection protocols
   2 (5.1%) LTBP Program results made available on an open web application
   5 (12.8%) Other
   1 Unanswered
96. **BM65.** How would your Agency rate methyl methacrylate based products for sealing concrete bridge deck cracks?
- 2 (5.1%) Very effective
- 14 (35.9%) Effective
- 8 (20.5%) Somewhat effective
- 11 (28.2%) Neutral
- 1 (2.6%) Somewhat ineffective
- 0 (0.0%) Ineffective
- 0 (0.0%) Very ineffective
- 3 (7.7%) Other
- 1 Unanswered

97. **BM66.** How would your Agency rate epoxy overlays for sealing concrete deck cracks?
- 3 (7.5%) Very effective
- 18 (45.0%) Effective
- 8 (20.0%) Somewhat effective
- 5 (12.5%) Neutral
- 1 (2.5%) Somewhat ineffective
- 2 (5.0%) Ineffective
- 0 (0.0%) Very ineffective
- 3 (7.5%) Other

98. **BM67.** Does your Agency use thin polymer/epoxy overlays (+/- 3/8”) as a bridge preservation practice?
- 28 (70.0%) Yes
- 12 (30.0%) No

99. **BM68.** What are your Agency’s preferred/recommended methods to protect/seal concrete bridge decks? (check all that apply)
- 6 (5.9%) N/A (exposed concrete deck)
- 9 (8.8%) Asphalt bituminous overlays
- 14 (13.7%) High performance concrete (rigid) overlay
- 13 (12.7%) Latex-modified concrete overlay
- 10 (9.8%) Polymer-modified concrete (PMC) overlay
- 18 (17.6%) Epoxy polymer concrete overlay
- 16 (15.7%) Polyester Polymer Concrete (PPC) overlay
- 10 (9.8%) Microsillica concrete overlay
- 6 (5.9%) Other
100. BM69. How would your Agency rate non-epoxy maintenance paints, for example Termarust, for quick spot/zone painting projects?

<table>
<thead>
<tr>
<th>Rating</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very effective</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>Effective</td>
<td>4 (11.8%)</td>
<td>4</td>
</tr>
<tr>
<td>Somewhat effective</td>
<td>3 (8.8%)</td>
<td>3</td>
</tr>
<tr>
<td>Neutral</td>
<td>13 (38.2%)</td>
<td>13</td>
</tr>
<tr>
<td>Somewhat ineffective</td>
<td>2 (5.9%)</td>
<td>2</td>
</tr>
<tr>
<td>Ineffective</td>
<td>1 (2.9%)</td>
<td>1</td>
</tr>
<tr>
<td>Very ineffective</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>Neutral</td>
<td>11 (32.4%)</td>
<td>11</td>
</tr>
<tr>
<td>Unanswered</td>
<td>6 (18.7%)</td>
<td>6</td>
</tr>
</tbody>
</table>

101. BM70. Does your Agency utilize bridge-washing contracts?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12 (30.0%)</td>
<td>12</td>
</tr>
<tr>
<td>No</td>
<td>28 (70.0%)</td>
<td>28</td>
</tr>
</tbody>
</table>

IF ANSWERED **NO** TO PREVIOUS QUESTION, SKIP TO **BM75**.  
IF ANSWERED **YES** TO PREVIOUS QUESTION, CONTINUE.

102. BM71. Besides bridge washing, what other types of preventative maintenance contracts are used by your Agency? (check all that apply)

<table>
<thead>
<tr>
<th>Contract Type</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspections</td>
<td>6 (7.7%)</td>
<td>6</td>
</tr>
<tr>
<td>Joint sealing</td>
<td>9 (11.5%)</td>
<td>9</td>
</tr>
<tr>
<td>Spot painting</td>
<td>8 (10.3%)</td>
<td>8</td>
</tr>
<tr>
<td>Overlay (Asphalt Concrete, Rigid, and Flexible)</td>
<td>8 (10.3%)</td>
<td>8</td>
</tr>
<tr>
<td>Joint closures</td>
<td>5 (6.4%)</td>
<td>5</td>
</tr>
<tr>
<td>Bridge repairs</td>
<td>10 (12.8%)</td>
<td>10</td>
</tr>
<tr>
<td>Waterproofing</td>
<td>8 (10.3%)</td>
<td>8</td>
</tr>
<tr>
<td>Drainage repairs</td>
<td>6 (7.7%)</td>
<td>6</td>
</tr>
<tr>
<td>Railing/Barrier (repair/increase heights)</td>
<td>4 (5.1%)</td>
<td>4</td>
</tr>
<tr>
<td>Bearing replacement</td>
<td>7 (9.0%)</td>
<td>7</td>
</tr>
<tr>
<td>Corrosion protection</td>
<td>4 (5.1%)</td>
<td>4</td>
</tr>
<tr>
<td>Acoustic emission monitoring</td>
<td>2 (2.6%)</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>1 (1.3%)</td>
<td>1</td>
</tr>
<tr>
<td>Unanswered</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>
Has your Agency successfully included any of these preventative maintenance activities on a bridge-washing contract? (check all that apply)

- **8 (50.0%)** N/A
- **0 (0.0%)** Inspections
- **1 (6.3%)** Joint sealing
- **1 (6.3%)** Spot painting
- **0 (0.0%)** Overlay (asphalt concrete, rigid, and flexible)
- **1 (6.3%)** Joint closures
- **1 (6.3%)** Bridge repairs
- **0 (0.0%)** Waterproofing
- **1 (6.3%)** Drainage repairs
- **0 (0.0%)** Railing/Barrier (repair/increase heights)
- **1 (6.3%)** Bearing replacement
- **1 (6.3%)** Corrosion protection
- **0 (0.0%)** Acoustic emission monitoring
- **1 (6.3%)** Other
- **29** Unanswered

Has your Agency conducted a comprehensive study of the cost-effectiveness of bridge cleaning and washing measures? (If yes, include document link)

- **0 (0.0%)** Yes __________________________
- **12 (100.0%)** No
- **28** Unanswered

Has your Agency evaluated the effect of a periodic program of bridge cleaning and washing on the service life of bridge elements? (If yes, include document link)

- **0 (0.0%)** Yes __________________________
- **12 (100.0%)** No
- **28** Unanswered

Which is your Agency’s preferred method to replace joints on bridges?

- **33 (82.5%)** Strip Seals
- **10 (25.0%)** Compression Seals
- **4 (10.0%)** EMSEAL Bridge Expansion Joint System
- **2 (5.0%)** Reinforced Elastomeric Joint
- **7 (17.5%)** Modular Joint
- **8 (20.0%)** Other
107. BM76. What methods are most effective to preserve/rehabilitate above the spring line for corrugated metal pipes/arch’s?
   - 17 (43.6%) N/A
   - 2 (5.1%) Concrete cast in place lining
   - 1 (2.6%) Resin based cast in place lining
   - 12 (30.8%) Slip lining
   - 0 (0.0%) Shotcrete with reinforcing
   - 7 (17.9%) Other
   - 1 Unanswered

108. BM77. What methods are most effective to preserve/rehabilitate below the spring line for corrugated metal pipes/arch’s?
   - 15 (39.5%) N/A
   - 7 (18.4%) Reinforced concrete flowlines
   - 0 (0.0%) Resin based cast in place lining
   - 8 (21.1%) Slip lining
   - 1 (2.6%) Shotcrete with reinforcing
   - 7 (18.4%) Other
   - 2 Unanswered

109. BM78. Who completes the National Bridge Inspection Standard (NBIS) inspection of local government-owned bridges (county or municipality) in your state (select most prevalent practice)?
   - 15 (37.5%) State DOT with in-house personnel
   - 10 (25.0%) Consultant personnel contracted by the DOT
   - 3 (7.5%) Local government with in-house personnel
   - 11 (27.5%) Consultant personnel contracted by local government
   - 1 (2.5%) Other

110. BM79. If local government with in-house or consultant personnel contracted by local government completes the NBIS inspection of local government-owned bridges, are the inspection reports reviewed by DOT personnel before submitting to the NBI?
   - 20 (71.4%) Yes
   - 8 (28.6%) No
   - 12 Unanswered

111. BM80. If local government with in-house or consultant personnel contracted by local government completes the NBIS inspection of local government-owned bridges, does your Agency experience quality problems with local bridge inspections?
   - 14 (50.0%) Yes
   - 14 (50.0%) No
   - 12 Unanswered
<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM81</td>
<td>25 (62.5%) Yes, 15 (37.5%) No</td>
</tr>
</tbody>
</table>

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM84.**
**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM82</td>
<td>10 (43.5%) Less than or equal to 2, 12 (52.2%) Less than or equal to 3, 1 (4.3%) Other, 17 Unanswered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM83</td>
<td>1 (4.3%) Yes, 22 (95.7%) No, 17 Unanswered</td>
</tr>
</tbody>
</table>

**END BRANCH**

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM84</td>
<td>17 (43.6%) Yes, 9 (23.1%) No, 9 (23.1%) Policy/process under development, 4 (10.3%) Other, 1 Unanswered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM85</td>
<td>0 (0.0%) Current definition promotes overly aggressive interventions (i.e., component replacement and bridge replacement over rehabilitation with preservation), 19 (47.5%) Bridge in “Good Condition” should not require repair actions; GCR 7 generally meets this standard, 16 (40.0%) Bridge in “Good Condition” should not require repair actions; GCR 6 generally meets this standard, 5 (12.5%) Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM86</td>
<td>19 (50.0%) Yes, 19 (50.0%) No, 2 Unanswered</td>
</tr>
</tbody>
</table>
118. BM87. In the case of the appearance of cracks in a new deck, what does your Agency recommend for repair procedure?
   4 (7.8%) Do nothing for cracks are 0.2 mm or narrower
   22 (43.1%) Seal with epoxy when crack are 0.2 mm or wider
   5 (9.8%) Route and seal for large cracks
   5 (9.8%) Add overlay
   15 (29.4%) Other
   1 Unanswered

119. BM88. The U.S. Department of Transportation was directed by Congress in the 2015 FAST Act to ask the Transportation Research Board (TRB) to undertake an evaluation of the FHWA Innovative Bridge Research and Construction (IBRC) Program which promoted the use of new technologies in bridges through grants to state highway agencies. The IBRC Program provided funding to over 300 projects from 1998 to 2006. All states, as well as the District of Columbia and Puerto Rico, participated in the IBRC Program. TRB has formed a committee to accomplish this task. The TRB questions will greatly assist the committee’s efforts to report the benefits the states received from this bridge specific funding, determine which technologies have been generally accepted and, hopefully, reinforce the need for these kinds of programs in the future.

Please indicate which Concrete Technologies are currently in use by your Agency. (Check all that apply)
   5 (6.3%) N/A
   26 (32.5%) High-Performance Concrete (HPC)
   27 (33.8%) Self-Consolidating Concrete (SCC)
   19 (23.8%) Ultra-High Performance Concrete (UHPC)
   3 (3.8%) Other

IF ANSWERED N/A TO PREVIOUS QUESTION, SKIP TO BM108.

OTHERWISE, CONTINUE.

120. BM89. If your Agency has adopted special provisions or specifications related to High-Performance Concrete (HPC), please indicate which type has been adopted.
   6 (19.4%) N/A
   23 (74.2%) Agency/State-developed
   0 (0.0%) AASHTO
   2 (6.5%) Other
   9 Unanswered
121. BM90. If your Agency has adopted special provisions or specifications related to Self-Consolidating Concrete (SCC), please indicate which type has been adopted.
   - 8 (24.2%) N/A
   - 23 (69.7%) Agency/State-developed
   - 1 (3.0%) AASHTO
   - 1 (3.0%) Other
   - 7 Unanswered

122. BM91. If your Agency has adopted special provisions or specifications related to Ultra-High Performance Concrete (UHPC), please indicate which type has been adopted.
   - 15 (46.9%) N/A
   - 11 (34.4%) Agency/State-developed
   - 1 (3.1%) AASHTO
   - 5 (15.6%) Other
   - 8 Unanswered

END BRANCH

123. BM92. Please indicate which Fiber Reinforced Polymer (FRP) Technologies are currently in use by your Agency. (Check all that apply)
   - 3 (4.2%) N/A
   - 31 (43.7%) Externally Bonded (EB) FRP reinforcement (e.g. FRP wraps or laminates)
   - 9 (12.7%) FRP deck elements
   - 5 (7.0%) FRP superstructure elements
   - 15 (21.1%) FRP reinforcing bars for concrete
   - 6 (8.5%) FRP prestressing tendons, bars, or strands
   - 2 (2.8%) Other
   - 5 Unanswered

IF ANSWERED N/A TO PREVIOUS QUESTION, SKIP TO BM98.

OTHERWISE, CONTINUE.

124. BM93. If your Agency has adopted special provisions or specifications related to Externally Bonded (EB) FRP reinforcement (e.g. FRP wraps or laminates), please indicate which type has been adopted.
   - 5 (16.1%) N/A
   - 21 (67.7%) Agency/State-developed
   - 1 (3.2%) AASHTO
   - 4 (12.9%) Other
   - 10 Unanswered
125. BM94. If your Agency has adopted special provisions or specifications related to FRP deck elements, please indicate which type has been adopted.
   23 (74.2%) N/A
   7 (22.6%) Agency/State-developed
   0 (0.0%) AASHTO
   1 (3.2%) Other
   9 Unanswered

126. BM95. If your Agency has adopted special provisions or specifications related to FRP superstructure elements, please indicate which type has been adopted.
   25 (83.3%) N/A
   4 (13.3%) Agency/State-developed
   0 (0.0%) AASHTO
   1 (3.3%) Other
   10 Unanswered

127. BM96. If your Agency has adopted special provisions or specifications related to FRP reinforcing bars for concrete, please indicate which type has been adopted.
   17 (54.8%) N/A
   11 (35.5%) Agency/State-developed
   2 (6.5%) AASHTO
   1 (3.2%) Other
   9 Unanswered

128. BM97. If your Agency has adopted special provisions or specifications related to FRP prestressing tendons, bars, or strands, please indicate which type has been adopted.
   26 (83.9%) N/A
   3 (9.7%) Agency/State-developed
   1 (3.2%) AASHTO
   1 (3.2%) Other
   9 Unanswered

END BRANCH
129. BM98. Please indicate which Corrosion Control Technologies (reinforcement, coating, or anodes) are currently in use by your Agency. (check all that apply)

3 (3.2%) N/A
9 (9.5%) ASTM A1035/A1035M Alloy Type 1035 CS steel rebar with a minimum chromium content of 9.2%
9 (9.5%) Galvanized rebar
21 (22.1%) Stainless steel (SS) rebar (solid or clad)
12 (12.6%) Metalizing
21 (22.1%) Cathodic Protection Anodes
14 (14.7%) Galvanic Protection
6 (6.3%) Other
5 Unanswered

IF ANSWERED N/A TO PREVIOUS QUESTION, SKIP TO BM105.
OTHERWISE, CONTINUE.

130. BM99. If your Agency has adopted special provisions or specifications related to ASTM A1035/A1035M Alloy Type 1035 CS steel rebar, please indicate which type has been adopted.

19 (61.3%) N/A
7 (22.6%) Agency/State-developed
3 (9.7%) AASHTO
2 (6.5%) Other
9 Unanswered

131. BM100. If your Agency has adopted special provisions or specifications related to galvanized rebar, please indicate which type has been adopted.

20 (62.5%) N/A
10 (31.3%) Agency/State-developed
1 (3.1%) AASHTO
1 (3.1%) Other
8 Unanswered

132. BM101. If your Agency has adopted special provisions or specifications related to Stainless Steel (SS) rebar (solid or clad), please indicate which type has been adopted.

12 (37.5%) N/A
18 (56.3%) Agency/State-developed
1 (3.1%) AASHTO
1 (3.1%) Other
8 Unanswered

133. BM102. If your Agency has adopted special provisions or specifications related to metalizing, please indicate which type has been adopted.

15 (48.4%) N/A
15 (48.4%) Agency/State-developed
1 (3.2%) AASHTO
0 (0.0%) Other
9 Unanswered
134. BM103. If your Agency has adopted special provisions or specifications related to Cathodic Protection Anodes, please indicate which type has been adopted.

15 (46.9%) N/A
16 (50.0%) Agency/State-developed
0 (0.0%) AASHTO
1 (3.1%) Other
8 Unanswered

135. BM104. If your Agency has adopted special provisions or specifications related to Galvanic Protection, please indicate which type has been adopted.

17 (53.1%) N/A
13 (40.6%) Agency/State-developed
1 (3.1%) AASHTO
1 (3.1%) Other
8 Unanswered

END BRANCH

136. BM105. Please indicate which other IBRC Technologies are currently in use by your Agency. (Check all that apply)

2 (3.4%) N/A
24 (41.4%) High Performance Steel (HPS Gr. 50 or 70)
31 (53.4%) Accelerated Bridge Construction (ABC) technologies, methods, or procedures
1 (1.7%) Other
5 Unanswered

IF ANSWERED N/A TO PREVIOUS QUESTION, SKIP TO BM108. OTHERWISE, CONTINUE.

137. BM106. If your Agency has adopted special provisions or specifications related to High Performance Steel (HPS Gr. 50 or 70), please indicate which type has been adopted.

8 (24.2%) N/A
11 (33.3%) Agency/State-developed
13 (39.4%) AASHTO
1 (3.0%) Other
7 Unanswered

138. BM107. If your Agency has adopted special provisions or specifications related to Accelerated Bridge Construction technologies, methods, or procedures, please indicate which type has been adopted.

4 (12.1%) N/A
22 (66.7%) Agency/State-developed
3 (9.1%) AASHTO
4 (12.1%) Other
7 Unanswered

END BRANCH
### BM108. Does your Agency have a policy addressing effects of climate change related to your activities?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>(20.0%)</td>
<td>32</td>
</tr>
</tbody>
</table>

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO BM111.**

**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

### BM109. Does your Agency’s policy address funding issues related to: (check all that apply)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>(16.7%)</td>
<td>Sea level rise/fall</td>
</tr>
<tr>
<td>1</td>
<td>(8.3%)</td>
<td>Changes in annual rainfall (inches/year)</td>
</tr>
<tr>
<td>2</td>
<td>(16.7%)</td>
<td>Changes in intensity of rain (inches/hour)</td>
</tr>
<tr>
<td>1</td>
<td>(8.3%)</td>
<td>Changes in annual snowfall (inches/year)</td>
</tr>
<tr>
<td>1</td>
<td>(8.3%)</td>
<td>Changes in severe weather intensity (tornadoes, hurricanes, other severe storms)</td>
</tr>
<tr>
<td>1</td>
<td>(8.3%)</td>
<td>Changes in severe weather frequency (tornadoes, hurricanes, other severe storms)</td>
</tr>
<tr>
<td>4</td>
<td>(33.3%)</td>
<td>Other</td>
</tr>
<tr>
<td>33</td>
<td>Unanswered</td>
<td></td>
</tr>
</tbody>
</table>

### BM110. Does your Agency’s policy address engineering issues related to: (check all that apply)

<p>| | | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>(46.7%)</td>
<td>Sea level rise/fall</td>
</tr>
<tr>
<td>3</td>
<td>(20.0%)</td>
<td>Changes in annual rainfall (inches/year)?</td>
</tr>
<tr>
<td>2</td>
<td>(13.3%)</td>
<td>Changes in intensity of rain (inches/hour)?</td>
</tr>
<tr>
<td>0</td>
<td>(0.0%)</td>
<td>Changes in annual snowfall (inches/year)?</td>
</tr>
<tr>
<td>1</td>
<td>(6.7%)</td>
<td>Changes in severe weather intensity? (tornadoes, hurricanes, other severe storms)</td>
</tr>
<tr>
<td>1</td>
<td>(6.7%)</td>
<td>Changes in severe weather frequency? (tornadoes, hurricanes, other severe storms)</td>
</tr>
<tr>
<td>1</td>
<td>(6.7%)</td>
<td>Other</td>
</tr>
<tr>
<td>32</td>
<td>Unanswered</td>
<td></td>
</tr>
</tbody>
</table>

**END BRANCH**
142. BM111. **What is the relative change in annual rainfall in inches per year?**

<table>
<thead>
<tr>
<th>Change</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>18.9%</td>
<td>N/A</td>
</tr>
<tr>
<td>21</td>
<td>56.8%</td>
<td>Unknown</td>
</tr>
<tr>
<td>2</td>
<td>5.4%</td>
<td>Decrease by less than 5 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 5 – 10 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 10 – 15 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 15 – 20 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by greater than 20 inches/year</td>
</tr>
<tr>
<td>3</td>
<td>8.1%</td>
<td>Increase by less than 5 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 5 – 10 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 10 – 15 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 15 – 20 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by greater than 20 inches/year</td>
</tr>
<tr>
<td>3</td>
<td>8.1%</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Unanswered</td>
</tr>
</tbody>
</table>

143. BM112. **What is the annual relative change in rainfall intensity per hour?**

<table>
<thead>
<tr>
<th>Change</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>21.6%</td>
<td>N/A</td>
</tr>
<tr>
<td>25</td>
<td>67.6%</td>
<td>Unknown</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by less than 1 inch/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 1 – 2 inches/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 2 – 3 inches/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 3 – 4 inches/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by greater than 5 inches/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by less than 1 inch/hour</td>
</tr>
<tr>
<td>3</td>
<td>8.1%</td>
<td>Increase by 1 – 2 inches/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 2 – 3 inches/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 3 – 4 inches/hour</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by greater than 5 inches/hour</td>
</tr>
<tr>
<td>1</td>
<td>2.7%</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Unanswered</td>
</tr>
</tbody>
</table>

144. BM113. **What is the relative change in annual snowfall per year?**

<table>
<thead>
<tr>
<th>Change</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>35.1%</td>
<td>N/A</td>
</tr>
<tr>
<td>21</td>
<td>56.8%</td>
<td>Unknown</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by less than 5 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 5 – 10 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by 10 – 15 inches/year</td>
</tr>
<tr>
<td>1</td>
<td>2.7%</td>
<td>Decrease by 15 – 20 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Decrease by greater than 20 inches/year</td>
</tr>
<tr>
<td>1</td>
<td>2.7%</td>
<td>Increase by less than 5 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 5 – 10 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 10 – 15 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by 15 – 20 inches/year</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
<td>Increase by greater than 20 inches/year</td>
</tr>
<tr>
<td>1</td>
<td>2.7%</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Unanswered</td>
</tr>
</tbody>
</table>
145. BM114. **What is the annual relative change in snowfall intensity per hour?**

14 (37.8%) N/A

22 (59.5%) Unknown

0 (0.0%) Decrease by less than 1 inch/hour

0 (0.0%) Decrease by 1 – 2 inches/hour

0 (0.0%) Decrease by 2 – 3 inches/hour

0 (0.0%) Decrease by 3 – 4 inches/hour

0 (0.0%) Decrease by greater than 5 inches/hour

0 (0.0%) Increase by less than 1 inch/hour

0 (0.0%) Increase by 1 – 2 inches/hour

0 (0.0%) Increase by 2 – 3 inches/hour

0 (0.0%) Increase by 3 – 4 inches/hour

0 (0.0%) Increase by greater than 5 inches/hour

1 (2.7%) Other

3 Unanswered

146. BM115. **When did your Agency’s climate change policy go into effect?**

147. BM116. **Where can your Agency’s climate change policy be located?** (Please provide web link)

- transportation.ky.gov
- There is no official policy for Climate Change. Only Sea Level Rise in Florida.

148. BM117. **Please provide the contact information for your Agency point of contact who can discuss this climate change policy.**

- **Name (Climate Change POC for Agency):** Junyi Meng  
  Phone Number: 804-786-3817  
  E-mail: Junyi.meng@vdot.virginia.gov

- **Name (Climate Change POC for Agency):** Larry Tolfa  
  Phone Number: (518)485-7265  
  E-mail: Larry.Tolfa@dot.ny.gov

- **Name (Climate Change POC for Agency):** Tracey Frost  
  E-mail: tracey.frost@dot.ca.gov

- **Name (Climate Change POC for Agency):** Jennifer Carver  
  E-mail: jennifer.carver@dot.state.fl.us

- **Name (Climate Change POC for Agency):** Charles Hebson  
  Phone Number: 207-557-10525  
  E-mail: charles.hebson@maine.gov

CONTINUE TO NEXT SURVEY: CONSTRUCTION
AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2018)

03 – CONSTRUCTION

41 Agencies Responding

<table>
<thead>
<tr>
<th>QUESTION NO.</th>
<th>QUESTION</th>
<th>TOTAL</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>149. C3.</td>
<td>Does your Agency use open-ended steel shell piles for foundation elements?</td>
<td>26</td>
<td>(63.4%) Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>(36.6%) No</td>
</tr>
</tbody>
</table>

IF ANSWERED **NO** TO PREVIOUS QUESTION, SKIP TO **C7**.

IF ANSWERED **YES** TO PREVIOUS QUESTION, CONTINUE.

150. C4. Does your Agency restrict the diameters of open-ended steel shell piles for foundation elements?

14 (53.8%) No
5 (19.2%) Yes, less than 24” dia.
0 (0.0%) Yes, greater than or equal to 24” dia.
1 (3.8%) Yes, less than 36” dia.
2 (7.7%) Yes, greater than or equal to 36” dia.
4 (15.4%) Other
15 Unanswered

151. C5. What process does your Agency use for capacity verification of open-ended steel shell piles? (Check all that apply)

8 (15.4%) Static Load Testing
16 (30.8%) Dynamic Load Testing
19 (36.5%) Wave Equation Analyses with Signal Matching
7 (13.5%) Dynamic Formula (e.g., Gates formula)
2 (3.8%) Other
15 Unanswered

152. C6. Does your Agency require open-ended steel shell piling to be filled with concrete?

6 (23.1%) Yes, full length after removing material inside pile
6 (23.1%) Yes, partial length after removing some material inside pile
5 (19.2%) No
9 (34.6%) Other
15 Unanswered

END BRANCH
153. **C7.** How does your Agency obtain Saturated Surface Dry (SSD) condition of the hidden shear pockets when using Ultra-High Performance Concrete (UHPC) for the joint connection? (check all that apply)
   - 5 (16.1%) Soaker hoses in formwork overnight
   - 7 (22.6%) Hand-held sprayer prior to pour
   - 2 (6.5%) Formwork with access (e.g., removable top form)
   - 17 (54.8%) Other
   - 14 Unanswered

154. **C8.** Does your Agency include sacrificial steel thickness on weathering steel plate girder bridges?
   - 7 (17.1%) Yes
   - 34 (82.9%) No

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO C12.**
**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

155. **C9.** What location criteria does your Agency provide for inclusion of sacrificial steel thickness on weathering steel plate girder bridges? (check all that apply)
   - 6 (85.7%) All weathering steel bridges
   - 0 (0.0%) Freeway Overpasses
   - 0 (0.0%) Overpass ON Rural Principal Arterial
   - 0 (0.0%) Overpass ON Rural Minor Arterial
   - 0 (0.0%) Overpass ON Rural Collector Road
   - 0 (0.0%) Overpass ON Rural Local Road
   - 0 (0.0%) Overpass ON Urban Principal Arterial
   - 0 (0.0%) Overpass ON Urban Minor Arterial
   - 0 (0.0%) Overpass ON Urban Collector
   - 0 (0.0%) Overpass ON Urban Local Street
   - 0 (0.0%) Bridges OVER Rural Principal Arterial
   - 0 (0.0%) Bridges OVER Rural Minor Arterial
   - 0 (0.0%) Bridges OVER Rural Collector Road
   - 0 (0.0%) Bridges OVER Rural Local Road
   - 0 (0.0%) Bridges OVER Urban Principal Arterial
   - 0 (0.0%) Bridges OVER Urban Minor Arterial
   - 0 (0.0%) Bridges OVER Urban Collector
   - 0 (0.0%) Bridges OVER Urban Local Street
   - 0 (0.0%) Overpasses with Average Daily Truck Traffic (ADTT) dependency for route under the bridge
   - 0 (0.0%) Set ADTT thresholds (i.e., structures on routes with ADTT more than set limit)
   - 0 (0.0%) Overpasses within city limits
   - 1 (14.3%) Other
   - 34 Unanswered
What thickness of sacrificial steel does your Agency specify for weathering steel plate girder bridges?

- 5 (71.4%) 1/16” total
- 2 (28.6%) 1/8” total
- 0 (0.0%) 1/16” per surface exposed to air
- 0 (0.0%) Other
- 34 Unanswered

Where does your Agency include sacrificial steel thickness for weathering steel plate girders? (Check all that apply)

- 5 (41.7%) All surfaces
- 0 (0.0%) All surfaces exposed to air
- 1 (8.3%) Exterior girders only
- 1 (8.3%) All girders
- 0 (0.0%) Other combination of interior and exterior girders
- 1 (8.3%) All girder surfaces (top and bottom flange and web)
- 0 (0.0%) Bottom flange surface
- 1 (8.3%) Web surface
- 0 (0.0%) Top flange surface
- 2 (16.7%) Entire girder length
- 0 (0.0%) Overpasses, only spans over roads (includes partial spans not over roads due to splice locations
- 1 (8.3%) All Main Members
- 0 (0.0%) Secondary members
- 0 (0.0%) Other
- 34 Unanswered

Does your Agency tie bridge approach slabs to movable abutments (e.g. integral abutments, semi-integral abutments) such that the approach slab moves with the bridge thermal movements?

- 33 (80.5%) Yes
- 8 (19.5%) No

What is the longest length of approach slab tied to a movable bridge abutment? (If skew makes one side of the approach slab longer than the other consider longest approach slab dimension.)

- 22 (66.7%) Less than or equal to 25’
- 5 (15.2%) 25’ to 35’
- 4 (12.1%) 35’ to 55’
- 1 (3.0%) 55’ to 75’
- 1 (3.0%) Greater than 75’
- 8 Unanswered
160.  C14.  What techniques does your Agency use to reduce friction/binding between the tied approach slab and the supporting soil? (Check all that apply)
   9 (19.6%)  Material selection for supporting soil
   1 (2.2%)  Smoothness requirements for supporting soil
   8 (17.4%)  Compaction requirements for supporting soil
   0 (0.0%)  Precast approach slabs
   8 (17.4%)  1 layer of polyethylene sheeting between cast-in-place (CIP) approach slab and soil
   7 (15.2%)  2 or more layers of polyethylene sheeting between cast-in-place (CIP) approach slab and soil
   7 (15.2%)  Transverse and/or longitudinal intermediate sleeper slabs (intermediate approach slab support points)
   6 (13.0%)  Other
   10  Unanswered

END BRANCH

161.  C15.  In recent years, many newly constructed bridge decks demonstrate transverse, full-depth, through cracking shortly after the bridge is open to traffic. The number of the cracks varies among bridges. No obvious reasons have been found that cause the cracks. Has your Agency experienced the same issue?
   27 (65.9%)  Yes
   14 (34.1%)  No

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO C17.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

162.  C16.  In your Agency’s experience, what have the major causes of transverse, through cracks in bridge decks been?
   2 (7.4%)  High Performance Concrete (HPC) for concrete bridge decks
   0 (0.0%)  Excessive slump
   1 (3.7%)  Excessive concrete content
   1 (3.7%)  Excessive compressive strength
   0 (0.0%)  Insufficient fiber reinforcement content
   0 (0.0%)  Pour sequence
   5 (18.5%)  Inadequate curing (plastic shrinkage cracking)
   2 (7.4%)  Construction practices
   0 (0.0%)  Structural design factors
   16 (59.3%)  Other
   14  Unanswered

END BRANCH
163. C17. Does your Agency have any field or research experience related to the performance (corrosion resistance) of UNS S24100 (XM-28) stainless steel rebar?
   3 (7.7%) Yes, its performance is satisfactory.
   0 (0.0%) Yes, its performance is not as good as other stainless rebar.
   7 (17.9%) No, but it is allowed by our Agency’s specifications. Future use is anticipated.
   21 (53.8%) No, it is not allowed by our Agency’s specifications.
   8 (20.5%) Other
   2 Unanswered

164. C18. Does your Agency classify stainless rebar according to their corrosion resistance?
   3 (8.6%) Yes; corrosion resistant rebar (including stainless rebar) is classified into multiple classes.
   3 (8.6%) Yes; permitted stainless rebar is specified according to application.
   19 (54.3%) No; only permitted types of stainless rebar are specified.
   3 (8.6%) No; it is planned to study the corrosion resistance of stainless rebar.
   7 (20.0%) Other
   6 Unanswered

165. C19. How does your Agency determine the liquefaction potential of soils that do not have any grain size analyses or Atterberg Limit information available?
   15 (40.5%) Obtain additional information in order to run the tests and obtain values.
   4 (10.8%) Estimate the values based solely on boring log descriptions
   10 (20.7%) Both of the above
   8 (21.6%) Other
   4 Unanswered

166. C20. Does your Agency use galvanized anchor rods to hold down expansion devices?
   22 (53.7%) Yes
   19 (46.3%) No

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO C22.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.
167.  C21. If your Agency has experienced issues during tightening the galvanized anchor rods, select all that apply from the list below. (check all that apply)

4 (8.7%) Loosening of tightened anchor rod
4 (8.7%) Zinc coating that is too thick
7 (15.2%) Vertical misalignment of projected end of anchor rods out of tolerance (leading to repairs)
8 (17.4%) Anchor rods bent or cracked during construction (leading to repairs)
10 (21.7%) Projecting end of anchor rods that are too short
10 (21.7%) Baseplate holes not aligned with anchor holes
3 (6.5%) Other
23 Unanswered

END BRANCH

168.  C22. What does your Agency require for prequalification of steel fabricators? (check all that apply)

35 (19.8%) AISC Certification Program for Structural Steel Fabricators certified shop
15 (8.5%) Certification Standard for Shop Application of Complex Protective Coating Systems
14 (7.9%) Facilities located within the continental limits of the US
2 (1.0%) Three reference letters from other State agencies of customers
6 (3.4%) List of bridge projects completed within specified amount of time
28 (15.8%) Welding procedure qualifications
27 (15.3%) Qualified welders
22 (12.4%) Qualified inspection personnel
5 (2.8%) Fabricator questionnaire completed
16 (9.0%) Facility audit
7 (4.0%) Other
2 Unanswered
169. C23. What requirements does your Agency include in Contract Documents to ensure that Contractors provide for safe inspections, erection and demolition plans, and operation of equipment which satisfy both DOT and railroad requirements for structures crossing railroads? (check all that apply)

35 (6.9%) Calculations signed/sealed by Professional Engineer (PE)  
34 (6.7%) Erection plans signed/sealed by PE  
33 (6.5%) Demolition plans signed/sealed by PE  
 9 (1.8%) Pre-qualification  
8 (1.6%) Proof of similar experience  
12 (2.4%) Stability analysis for demolition sequence  
15 (3.0%) Work area plan  
26 (5.1%) Traffic control plan  
22 (4.3%) Pre-erection meeting  
 9 (1.8%) Transportation and shipping plans  
 9 (1.8%) Transportation and shipping calculations  
18 (3.5%) Main member lifting analysis  
21 (4.1%) Rigging details, including weight, capacity, and arrangements  
15 (3.0%) Main member adequacy and stability analyses  
27 (5.3%) Erection sequence  
25 (4.9%) Use of temporary supports (i.e., hold cranes, falsework, etc.)  
27 (5.3%) Temporary support locations, details, etc.  
25 (4.9%) Temporary support calculations, including foundations  
24 (4.7%) Equipment locations (i.e., crane, etc.)  
13 (2.6%) Potential obstructions (above and below-ground) for equipment  
12 (2.4%) Crane capacity calculations  
21 (4.1%) Crane capacity charts  
17 (3.3%) Crane support requirements (i.e., mats, work bridge, barge, etc.)  
21 (4.1%) Temporary bracing requirements (including installation and removal sequence)  
 9 (1.8%) Contingency plans  
16 (3.1%) Manufacturer’s data for pre-engineered devices  
 5 (1.0%) Other

170. C24. What guidance does your Agency specify for design and construction of Accelerated Bridge Construction projects? (check all that apply)

15 (20.8%) Agency-specific guide  
20 (27.8%) AASHTO or FHWA guide  
 5 (6.9%) Industry guide  
29 (40.3%) On project-specific basis  
 3 (4.2%) Other
171. C25. During fabrication, has your Agency experienced cracking at the ends of prestressed beams greater than 0.008”?
   - 22 (53.7%) Yes
   - 19 (46.3%) No

   **IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO C32.**
   **IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

172. C26. Has your Agency set criteria for limits of repairs which can be made to damaged prestressed strands before a beam replacement is required?
   - 5 (22.7%) Yes
   - 17 (77.3%) No
   - 19 Unanswered

173. C27. What percentage of prestressed strands can be damaged and repaired before beam replacement is required by your Agency?
   - 4 (20.0%) Less than or equal to 5% of strands
   - 1 (5.0%) Greater than or equal to 5% of strands
   - 0 (0.0%) Less than or equal to 10% of strands
   - 0 (0.0%) Greater than or equal to 10% of strands
   - 0 (0.0%) Less than or equal to 12% of strands
   - 0 (0.0%) Greater than or equal to 12% of strands
   - 0 (0.0%) Less than or equal to 15% of strands
   - 0 (0.0%) Greater than or equal to 15% of strands
   - 0 (0.0%) Less than or equal to 20% of strands
   - 15 (75.0%) Greater than or equal to 20% of strands
   - 21 (10.5%) Other
   - 22 Unanswered

174. C28. What is the typical size of these cracks at the ends of prestressed beams?
   - 11 (52.4%) Less than 0.008”
   - 5 (23.8%) 0.008” to 0.012”
   - 1 (4.8%) Greater than 0.012”
   - 4 (19.0%) Other
   - 20 Unanswered

175. C29. If your Agency typically uses epoxy injection to repair beam ends, at what size crack does your Agency start using epoxy injection?
   - 1 (5.3%) Less than 0.004”
   - 15 (78.9%) 0.004” to 0.016”
   - 2 (10.5%) 0.016” to 0.125”
   - 0 (0.0%) 0.125” to 0.250”
   - 1 (5.3%) Greater than 0.250”
   - 22 Unanswered

176. C30. Is your Agency aware of beam deterioration resulting from splitting cracks that are leading to accelerated deterioration of beams?
   - 4 (18.2%) Yes
   - 18 (81.8%) No
   - 19 Unanswered
177. C31. Is your Agency conducting any research to address beam deterioration resulting from splitting cracks?
   - 3 (7.3%) Yes
   - 38 (92.7%) No

**END BRANCH**

178. C32. Has your Agency experienced any bursting or “Y” vertical splitting cracks at the ends of the beams? (See attached diagram)
   - 13 (31.7%) Yes
   - 28 (68.3%) No

*Figure 1-1. Typical anchorage zone stresses [top] and crack nomenclature [bottom] (adapted from CEB 1987).*

*Figure 1-2. Example anchorage zone crack patterns (adapted from Oliva and Okumus 2011).*

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO C36.**
**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**
179. C33. What does your Agency do to control these bursting cracks?
   - 0 (0.0%) Use vertical post-tensioning
   - 3 (27.3%) Used additional reinforcement stirrup bars significantly exceeding AASHTO LRFD Bridge Design Specifications, 7th Edition, requirements noted in subsection 5.10.10
   - 8 (72.7%) Other
   - 30 Unanswered

180. C34. Is the AASHTO LRFD Bridge Design Specifications, 7th Edition, requirements in subsection 5.10.10.1 Splitting Resistance adequate?
   - 3 (27.3%) Yes
   - 5 (45.5%) No
   - 3 (27.3%) Other
   - 30 Unanswered

181. C35. How does your Agency typically handle girders exhibiting these cracks?
   (check all that apply)
   - 6 (17.6%) Epoxy injection (horizontal web cracks; 0.004” to 0.010”)
   - 8 (23.5%) Epoxy injection (inclined cracks 0.004” to 0.010”)
   - 4 (11.8%) Epoxy injection (bottom flange Y-crack up to 0.006”)
   - 3 (8.8%) Epoxy injection (bottom flange vertical 0.004” to 0.010”)
   - 4 (11.8%) Penetrating corrosion inhibitor
   - 5 (14.7%) Surface Sealant
   - 1 (2.9%) Reject girders with cracks near strands
   - 3 (8.8%) Other
   - 29 Unanswered

END BRANCH

182. C36. Which methods of non-destructive testing does your Agency prefer for the non-destructive examination (NDE) of drilled shafts? (check all that apply)
   - 24 (35.3%) Cross-hole Sonic Logging (CSL), always
   - 16 (23.5%) Cross-hole Sonic Logging (CSL), sometimes
   - 1 (1.5%) Thermal Integrity Profiling (TIP), always
   - 17 (25.0%) Thermal Integrity Profiling (TIP), sometimes
   - 1 (1.5%) Gamma-Gamma Logging, always
   - 2 (3.0%) Gamma-Gamma Logging, sometimes
   - 0 (0.0%) Embedded Data Collector, always
   - 1 (1.5%) Embedded Data Collector, sometimes
   - 6 (8.8%) Other
### 183. C37. Does your Agency permit compaction rollers to be used in the vibratory mode for asphalt concrete pavement on a bridge deck?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12.2%</td>
</tr>
<tr>
<td>No</td>
<td>43.9%</td>
</tr>
<tr>
<td>Asphalt concrete pavement NOT USED on bridges</td>
<td>43.9%</td>
</tr>
</tbody>
</table>

**IF ANSWERED NO or NOT USED TO PREVIOUS QUESTION, SKIP TO C41.**

**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

### 184. C38. Does your Agency limit the level (intensity) or direction (vertical, horizontal) of vibration permitted?

<table>
<thead>
<tr>
<th>Limitation</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Intensity</td>
<td>0.0%</td>
</tr>
<tr>
<td>Direction</td>
<td>0.0%</td>
</tr>
<tr>
<td>Both</td>
<td>40.0%</td>
</tr>
<tr>
<td>Neither</td>
<td>20.0%</td>
</tr>
<tr>
<td>Other</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

36 Unanswered

### 185. C39. Are your Agency’s requirements the same for all bridge types?

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Percentage</th>
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<tr>
<td>Yes</td>
<td>80.0%</td>
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<tr>
<td>No</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

36 Unanswered

### 186. C40. Has your Agency conducted any research on compaction of asphalt concrete pavement on bridges in your State?

<table>
<thead>
<tr>
<th>Research</th>
<th>Percentage</th>
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<tr>
<td>Yes</td>
<td>40.0%</td>
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<tr>
<td>No</td>
<td>60.0%</td>
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</tbody>
</table>

36 Unanswered

**END BRANCH**

### 187. C41. Which methyl methacrylate product has your Agency found to be most effective for sealing bridge deck cracks?

<table>
<thead>
<tr>
<th>Product</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Masterprotect H400/H1000</td>
<td>3.3%</td>
</tr>
<tr>
<td>Baracade WB 244</td>
<td>0.0%</td>
</tr>
<tr>
<td>Vexcon Powerseal 40</td>
<td>3.3%</td>
</tr>
<tr>
<td>Tammscrete (Euclid Chemical)</td>
<td>3.3%</td>
</tr>
<tr>
<td>MasterSeal 630 (formerly Degadeck CSP)</td>
<td>10.0%</td>
</tr>
<tr>
<td>MMA-25</td>
<td>0.0%</td>
</tr>
<tr>
<td>Transpo T-78 Polymer Crack Healer/Sealer</td>
<td>6.7%</td>
</tr>
</tbody>
</table>

22 (73.3%) Other

11 Unanswered

### 188. C42. Are shop drawings for prestressed beams required to be submitted and approved?

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No; shop drawings are not required</td>
<td>4.9%</td>
</tr>
<tr>
<td>Yes, shop drawings are submitted for Approval</td>
<td>68.3%</td>
</tr>
<tr>
<td>Shop drawings are submitted for Review only</td>
<td>14.6%</td>
</tr>
<tr>
<td>Shop drawings are submitted for Informational Purposes only</td>
<td>2.4%</td>
</tr>
<tr>
<td>Other</td>
<td>9.8%</td>
</tr>
</tbody>
</table>

CONSTRUCTION - 11
189. C43. Do the design drawings for the prestressed beams have sufficient detail to eliminate shop drawings?
   6 (14.6%) Yes
   35 (85.4%) No

190. C44. Does your Agency use straight precast box culvert end sections as opposed to wingwalls?
   6 (14.6%) Yes
   35 (85.4%) No

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO C46.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

191. C45. Does your Agency experience any problems when using straight precast box culvert end sections as opposed to wingwalls? (check all that apply)
   6 (100.0%) No
   0 ( 0.0%) Construction issues related to pipe inlet requirements
   0 ( 0.0%) Inadequate design loads on excessive fill heights
   0 ( 0.0%) Design and fabrication need to be closely monitored
   0 ( 0.0%) Other
   35 Unanswered

   END BRANCH

192. C46. Does your Agency bid alternates for precast and cast-in-place box culverts?
   6 (14.6%) Yes
   27 (65.9%) No
   8 (19.5%) Other

193. C47. What does your Agency use to connect precast box culvert segments?
   3 ( 6.1%) Cast-in-place transition
   19 (38.8%) Shear key
   5 (10.2%) RAM-NEK® material
   2 ( 4.1%) Doweling, drilling, or embedment
   11 (22.4%) Mechanical connector
   9 (18.4%) Other
   3 Unanswered

194. C48. What type of asphalt does your Agency recommend for use in the vicinity of the bridge ends when integral abutments are used?
   30 (76.9%) Regular asphalt
   0 ( 0.0%) Rubberized asphalt
   0 ( 0.0%) Special-design asphalt
   0 ( 0.0%) Expansion dam
   9 (23.1%) Other
   2 Unanswered
195. C49. Has your agency conducted research into the use of High Wattage Lasers for Coating Removal on metallic and/or non-metallic elements? If yes, provide study link(s).
   1 (2.5%) Yes
   39 (97.5%) No
   1 Unanswered

196. C50. Does your agency have project specifications for the removal of concrete using robotic hydro-demolition equipment? If yes, provide document link(s).
   9 (22.0%) Yes
   32 (78.0%) No

197. C51. What does your Agency specify for curing requirements for bridge decks and approach slabs?
   17 (40.5%) Wet cure with burlap, Burlene, Poly Burlap, Curelap during normal weather conditions
   1 (2.4%) Insulated curing blankets/electric concrete curing blankets, cold weather protection systems for cold-weather curing
   2 (4.8%) Moist-cured with white polyethylene (PE) sheeting, with or without the use of wet burlap, for at least 7 days and until 0.70 f'c is achieved
   3 (7.1%) Fogging or misting after screeding and until covered with PE sheeting.
   19 (45.2%) Other

198. C52. What is the maximum bridge width your agency permits before an open longitudinal joint is required to be added in the deck?
   22 (55.0%) No limit
   0 (0.0%) Less than 80’
   8 (20.0%) Deck width from 80’ to 120’
   1 (2.5%) Deck with greater than 120'
   9 (22.5%) Other
   1 Unanswered

199. C53. What is the maximum allowable bridge width above which a longitudinal open joint is required?
   4 (11.4%) Deck width less than 80’
   4 (11.4%) Deck width from 80’ to 90’
   0 (0.0%) Deck width from 90’ to 100’
   2 (5.7%) Deck width from 100’ to 110’
   0 (0.0%) Deck width from 110’ to 120’
   2 (5.7%) Deck width greater than 120’
   23 (65.7%) Other
   6 Unanswered
200. C54. If open longitudinal joints or sealed joints are not required for very wide bridges (greater than 80’), what mitigation requirements have to be met?

- 1 (3.1%) Low shrinkage concrete
- 17 (53.1%) Superstructure designed for transverse expansion (in addition to longitudinal expansion)
- 14 (43.8%) Other
- 9 Unanswered

201. C55. Does your agency allow the use of adhesive anchors for the attachment of portable concrete barriers to bridge decks?

- 21 (52.5%) Yes – temporary condition
- 0 (0.0%) Yes – permanent condition
- 3 (7.5%) Yes – temporary and permanent conditions
- 13 (32.5%) No
- 3 (7.5%) Other
- 1 Unanswered

202. C56. In the event that a cap was poured such that the elevation of the bearing seat was incorrect, would your agency allow grinding to obtain the required plan seat elevation?

- 32 (78.0%) Yes
- 9 (22.0%) No

203. C57. For steel bridge girders which the Contractor has selected to use Numerically Controlled (N/C) drilling, as, AASHTO LRFD Bridge Construction Specifications, 4th Ed., Article 11.5.2.3 requires that “…a check assembly shall be required for each major structural type of each project, unless otherwise designated in the contract documents, and shall consist of at least three contiguous shop sections or, in a truss, all members in at least three contiguous panels but not less than the number of panels associated with three contiguous chord lengths (i.e., length between field splices).”

For N/C drilled girders, what does your Agency require for the check assembly?

- 5 (13.9%) Sequential shop assembly for single girder line
- 14 (38.9%) Shop assembly (lay down) for 3 contiguous shop sections in 2-3 adjacent girder lines
- 7 (19.4%) Full assembly
- 10 (27.8%) Other
- 5 Unanswered

CONTINUE TO NEXT SURVEY: DESIGN
04 – DESIGN

41 Agencies Responding

<table>
<thead>
<tr>
<th>QUESTION NO.</th>
<th>QUESTION</th>
</tr>
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<td>D1.</td>
<td>Person Responding to Survey:</td>
</tr>
<tr>
<td></td>
<td>Name: ___________________________</td>
</tr>
<tr>
<td></td>
<td>E-mail Address: ___________________________</td>
</tr>
<tr>
<td></td>
<td>Phone No.: ___________________________</td>
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<tr>
<td>D2.</td>
<td>State: Choose State.</td>
</tr>
<tr>
<td>204.</td>
<td>Does your Agency design pier protection to protect piers located within 30ft of the roadway for a 600-kip minimum load in accordance with AASHTO LRFD Bridge Design Specifications, 8th Edition, Article 3.6.5.1?</td>
</tr>
<tr>
<td></td>
<td>28 (68.3%) Yes</td>
</tr>
<tr>
<td></td>
<td>13 (31.7%) No</td>
</tr>
<tr>
<td></td>
<td>IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO D5.</td>
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<tr>
<td></td>
<td>IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.</td>
</tr>
<tr>
<td>205.</td>
<td>What design criteria does your Agency specify for pier protection systems? (check all that apply)</td>
</tr>
<tr>
<td></td>
<td>24 (32.4%) Barrier type</td>
</tr>
<tr>
<td></td>
<td>19 (25.7%) Height</td>
</tr>
<tr>
<td></td>
<td>14 (18.9%) Absolute minimum distance to protected objects</td>
</tr>
<tr>
<td></td>
<td>14 (18.9%) Absolute minimum distance to roadway</td>
</tr>
<tr>
<td></td>
<td>3 (4.1%) Other</td>
</tr>
<tr>
<td></td>
<td>13 Unanswered</td>
</tr>
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<td></td>
<td>END BRANCH</td>
</tr>
</tbody>
</table>

206. D5. Does your Agency use the Strut-and-Tie Method given in Article 5.8.2, AASHTO LRFD Bridge Design Specifications, 8th Edition (Article 5.6.3, previous editions) to design Deep Components (i.e. D-regions) such as Bent Caps? |
|              | 4 (9.8%) Always |
|              | 6 (14.6%) Often |
|              | 17 (41.5%) Sometimes |
|              | 7 (17.1%) Rarely |
|              | 7 (17.1%) Never |
|              | IF ANSWERED NEVER TO PREVIOUS QUESTION, CONTINUE. |
|              | OTHERWISE, SKIP TO D7. |
207. D6. Which procedure does your Agency use to determine the shear resistance of Deep Components?

4 (66.7%) Simplified Procedure for Non-prestressed Sections per Article 5.7.3.4.1, AASHTO LRFD Bridge Design Specifications, 8th Edition (Article 5.8.3.4.1, previous editions), i.e. $\beta=2.0$, $\theta=45^\circ$.

1 (16.7%) General Procedure per Article 5.7.3.4.2, AASHTO LRFD Bridge Design Specifications, 8th Edition (Article 5.8.3.4.2, previous editions)

0 (0.0%) Appendix B5, AASHTO LRFD Bridge Design Specifications, 8th Edition

1 (16.7%) Other

35 Unanswered

END BRANCH

208. D7. When detailing Bent/Pile Cap sections over supports, what type of transverse reinforcement does your Agency provide?

30 (73.2%) Closed stirrups or lapped U-stirrups satisfying Article 5.10.8.2.6d, AASHTO LRFD Bridge Design Specifications, 8th Edition (5.11.2.6.4 previous editions)

3 (7.3%) U-stirrups detailed with the anchorage required by Article 5.10.8.2.6b, AASHTO LRFD Bridge Design Specifications, 8th Edition (5.11.2.6.2 previous editions)

4 (9.8%) Simple U-stirrups without anchorage

4 (9.8%) Other

209. D8. What does your Agency specify as a minimum compressive strength for concrete at detensioning of prestressed I-beams? (check all that apply)

18 (43.9%) Cylinder strength is sufficient to meet the specified transfer strength required without cracking the tension face

10 (24.4%) $0.8 \times f'_c$

1 (2.4%) $1.0 \times f'_c$

12 (29.3%) Other

2 Unanswered

210. D9. What does your Agency specify as a maximum final compressive strength for prestressed I-beams? (check all that apply)

1 (1.9%) 6 ksi AASHTO Type

9 (17.0%) 8 ksi AASHTO Type

7 (13.2%) 10 ksi AASHTO Type

0 (0.0%) 6 ksi Bulb-T Girder

7 (13.2%) 8 ksi Bulb-T Girder

12 (22.6%) 10 ksi Bulb-T Girder

17 (32.1%) Other

3 Unanswered
AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
ANNUAL STATE BRIDGE ENGINEERS SURVEY (2018)

211. **D10.** Is your Agency routinely utilizing ASTM A706 Grade 80 or higher bar reinforcement in bridge superstructures?
   
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>38</td>
</tr>
<tr>
<td>(7.3%)</td>
<td>(92.7%)</td>
</tr>
</tbody>
</table>

   **IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO D13.**
   **IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

212. **D11.** To which elements has your Agency applied ASTM A706 Grade 80 or higher bar reinforcement?
   
<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deck</td>
<td>1</td>
</tr>
<tr>
<td>Girder</td>
<td>0</td>
</tr>
<tr>
<td>Stringer</td>
<td>0</td>
</tr>
<tr>
<td>Arch</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Pier Cap</td>
<td>0</td>
</tr>
<tr>
<td>Pier Columns</td>
<td>1</td>
</tr>
<tr>
<td>Footings</td>
<td>0</td>
</tr>
<tr>
<td>Drilled Shafts</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>38</td>
</tr>
</tbody>
</table>

   **END BRANCH**

213. **D12.** Is your Agency’s use of ASTM A706 Grade 80 or higher bar reinforcement in bridge superstructures for pilot projects or all?
   
<table>
<thead>
<tr>
<th>Projects Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Projects</td>
<td>2</td>
</tr>
<tr>
<td>All Projects</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

   **END BRANCH**

214. **D13.** Is your Agency routinely utilizing ASTM A706 Grade 80 or higher bar reinforcement in bridge substructures?
   
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>38</td>
</tr>
<tr>
<td>(7.3%)</td>
<td>(92.7%)</td>
</tr>
</tbody>
</table>

   **IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO D17.**
   **IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

215. **D14.** To which elements has your Agency applied ASTM A706 Grade 80 or higher bar reinforcement?
   
<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pier Cap</td>
<td>0</td>
</tr>
<tr>
<td>Pier Columns</td>
<td>1</td>
</tr>
<tr>
<td>Abutment Neat</td>
<td>0</td>
</tr>
<tr>
<td>Footings</td>
<td>0</td>
</tr>
<tr>
<td>Drilled Shafts</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>38</td>
</tr>
</tbody>
</table>

   **END BRANCH**

216. **D15.** Is your Agency’s use of ASTM A706 Grade 80 or higher bar reinforcement in bridge substructures for pilot projects or all?
   
<table>
<thead>
<tr>
<th>Projects Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Projects</td>
<td>1</td>
</tr>
<tr>
<td>All Projects</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

   **END BRANCH**
217. D16. What type of reinforcing steel does your Agency specify in substructures? (check all that apply)
   2 (40.0%) Black rebar
   2 (40.0%) Epoxy Coated
   0 ( 0.0%) ASTM A1035 Low-Carbon, Chromium, Steel (UNS S24100)
   0 ( 0.0%) AASHTO MP 18M 18-15 Uncoated, Corrosion-Resistant, Chromium Alloyed, Billet-Steel Bars (UNS 32101)
   0 ( 0.0%) AASHTO MP 18M 18-15 Uncoated, Corrosion-Resistant, Chromium Alloyed, Billet-Steel Bars (UNS S24000, S30400, S31603, S31653, S310803, S32304)
   1 (20.0%) Other
   38 Unanswered

END BRANCH

218. D17. Does your Agency have design criteria for temporary bridges?
   23 (56.1%) Yes
   18 (43.9%) No

IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO D20.
IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.

219. D18. How many years of design life does your Agency require for temporary bridges?
   0 ( 0.0%) 2 years
   2 ( 8.7%) 5 years
   0 ( 0.0%) 10 years
   13 (56.5%) On project-by-project basis
   8 (34.8%) Other
   18 Unanswered

220. D19. What design load is used for temporary bridge design?
   2 ( 8.7%) HS-20
   1 ( 4.3%) HS-25
   13 (56.5%) HL-93
   0 ( 0.0%) No criteria but follow temporary bridge manufacturer/fabricator’s Suggestions
   7 (30.4%) Other
   18 Unanswered

END BRANCH
221. **D20.** During the construction of integral abutments that exceed 10ft in total height, at what stage does your Agency typically recommend that the abutment stem is backfilled?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to the erection of the superstructure’s main members</td>
<td>7 (17.9%)</td>
</tr>
<tr>
<td>After the erection of the superstructure’s main members but prior to the main members being encased in concrete</td>
<td>1 (2.6%)</td>
</tr>
<tr>
<td>After the superstructure’s main members have been encased in concrete but prior to the deck being poured</td>
<td>4 (10.3%)</td>
</tr>
<tr>
<td>After the superstructure’s main members have been encased in concrete and the deck has been cast</td>
<td>9 (23.1%)</td>
</tr>
<tr>
<td>Other</td>
<td>18 (46.2%)</td>
</tr>
<tr>
<td>Unanswered</td>
<td>2</td>
</tr>
</tbody>
</table>

222. **D21.** Has Geosynthetic Reinforced Soil-Integrated Bridge System (GRS-IBS) been utilized by your Agency?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>21 (51.2%)</td>
</tr>
<tr>
<td>No</td>
<td>20 (48.8%)</td>
</tr>
</tbody>
</table>

**IF ANSWERED NO TO PREVIOUS QUESTION, SKIP TO D24.**

**IF ANSWERED YES TO PREVIOUS QUESTION, CONTINUE.**

223. **D22.** How long has your Agency been using GRS-IBS?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>2 (9.5%)</td>
</tr>
<tr>
<td>1 – 2 years</td>
<td>3 (14.3%)</td>
</tr>
<tr>
<td>2 – 3 years</td>
<td>5 (23.8%)</td>
</tr>
<tr>
<td>3 – 4 years</td>
<td>4 (19.0%)</td>
</tr>
<tr>
<td>4 – 5 years</td>
<td>3 (14.3%)</td>
</tr>
<tr>
<td>Greater than 5 years</td>
<td>3 (14.3%)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (4.8%)</td>
</tr>
<tr>
<td>Unanswered</td>
<td>20</td>
</tr>
</tbody>
</table>

224. **D23.** What is the estimated service life of GRS-IBS?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10 years</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>10 – 20 years</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>20 – 30 years</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>30 – 40 years</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>40 – 50 years</td>
<td>1 (4.8%)</td>
</tr>
<tr>
<td>Greater than 50 years</td>
<td>16 (76.2%)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (19.0%)</td>
</tr>
<tr>
<td>Unanswered</td>
<td>20</td>
</tr>
</tbody>
</table>

**END BRANCH**
225. D24. How does your Agency deal with down-drag for driven-friction pile foundation design?

- **26 (63.4%)** Treat down-drag as a permanent load and account for all down-drag in the pile design.
- **3 (7.3%)** Assume that once the pile undergoes its design loading, the down-drag load is eliminated through an acceptable displacement of the pile.
- **1 (2.4%)** Re-tap the piles before the cap/footing is poured, assuming that down-drag load has already been in effect.
- **11 (26.8%)** Other

226. D25. For foundation design, does your Agency make any scour adjustments based on the presence of cohesive material?

- **17 (42.5%)** Yes
- **23 (57.5%)** No
- **1 Unanswered

227. D26. For drilled shaft foundations of cantilevered ancillary structures, which design method is used for torsional design?

- **11 (0.0%)** BROMS (Allowable Stress Method)
- **14 (0.0%)** FHWA $\alpha-\beta$ Method (Ultimate Strength Method, Formula FHWA IF-99-025)
- **3 (0.0%)** Don’t use drilled shaft foundations
- **3 (0.0%)** Don’t use cantilevered ancillary structures
- **6 (0.0%)** Other
- **4 Unanswered

228. D27. Does your Agency armor the exterior bottom flange of prestressed girders to reduce the effects of over height vehicle impact damage?

- **2 (4.9%)** Yes
- **38 (92.7%)** No
- **1 (2.4%)** Other

229. D28. Does your Agency use advanced (2D or 3D) software for hydraulic analysis of bridges and culverts?

- **1 (2.4%)** Always
- **7 (17.1%)** Often
- **28 (68.3%)** Sometimes
- **5 (12.2%)** Never

**IF ANSWERED NEVER TO PREVIOUS QUESTION, SKIP TO D34.**
**OTHERWISE, CONTINUE.**

230. D29. Do the bridge design engineers in your Agency perform any hydraulic modeling?

- **13 (36.1%)** Yes
- **10 (27.8%)** No
- **7 (19.4%)** Modeling performed by others
- **6 (16.7%)** Other
- **5 Unanswered
231. D30. Has your Agency received any information from your local FHWA office on the application and use of 2D hydraulic modeling?
   28 (82.4%) Yes
   4 (11.8%) No
   2 (5.9%) Other
   7 Unanswered

232. D31. What software has your Agency used for the analyses of bridges and culverts? (check all that apply)
   21 (15.6%) FHWA Hydraulic Toolbox
   30 (22.2%) HY 8 Culvert Hydraulic Analysis Program
   35 (25.9%) Hydrologic Engineering Center’s River Analysis System (HEC-RAS) 1D
   18 (13.3%) Hydrologic Engineering Center’s River Analysis System (HEC-RAS) 2D
   23 (17.0%) Surface Water Modeling System (SMS)
   8 (5.9%) Other
   6 Unanswered

233. D32. How many physical models has your Agency performed in the past 10 years?
   25 (75.8%) N/A
   2 (6.1%) 1
   1 (3.0%) 2
   0 (0.0%) 3
   0 (0.0%) 4
   1 (3.0%) 5
   4 (12.1%) Other
   8 Unanswered

234. D33. Under what conditions does your Agency require 2D modeling over traditional 1D modeling for hydraulic analysis of bridges and culverts? (check all that apply)
   9 (11.4%) River bends
   11 (13.9%) Skewed bridge crossings (skewed to direction of flow)
   16 (20.3%) Multiple bridge openings
   8 (10.1%) Bridges located in floodplains
   14 (17.7%) Analysis of wider floodplain behavior
   21 (26.6%) Other
   9 Unanswered

END BRANCH

235. D34. Has your Agency developed additional guidelines and procedures for determination of when countermeasures have been properly designed and implemented such that National Bridge Inspection (NBI) Item 113 may be re-coded from 3 (scour critical) to 7 (mitigated)?
   14 (35.0%) Yes
   25 (62.5%) No
   1 (2.5%) Other
   1 Unanswered
236. D35. Does your Agency allow observed scour to refine scour depth calculations?
   13 (33.3%) Yes
   22 (56.4%) No
   4 (10.3%) Other
   2 Unanswered

237. D36. Does your Agency use the performance of properly designed and implemented countermeasures during measured storm events to re-evaluate National Bridge Inspection (NBI) Item 113?
   14 (35.9%) Yes
   24 (61.5%) No
   1 (2.6%) Other
   3 Unanswered

238. D37. What criteria does your Agency use in determining whether to use integral or semi-integral abutments on a project? (Check all that apply)
   34 (17.6%) Bridge length
   28 (14.5%) Bridge skew
   21 (10.9%) Thermal movement
   11 (5.7%) Main member material
   6 (3.1%) Main members parallel
   8 (4.1%) Presence and type of retaining wall in front of abutment
   5 (2.6%) Scour limits
   13 (6.7%) Subsurface materials
   14 (7.3%) Pile type
   17 (8.8%) Proposed pile length
   9 (4.7%) Proposed pile penetration depth into undisturbed soil
   19 (9.8%) Final pile configuration (would a single row of H-piles be adequate)
   8 (4.1%) Other

239. D38. Does your Agency allow the use of Method B to design elastomeric bearing pads?
   24 (58.5%) Yes
   10 (24.4%) No
   7 (17.1%) Only for special projects

240. D39. Has your Agency experienced any difficulties with testing of elastomeric bearings designed using Method B?
   7 (18.4%) Yes
   31 (81.6%) No
   3 Unanswered
Has your Agency experienced any difficulties with QA/QC of elastomeric bearings designed using Method B?

- 5 (13.5%) Yes
- 32 (86.5%) No
- 4 Unanswered

END SURVEY, THANK YOU. BACK TO DIRECTIONS