# APPENDIX B

## Supplemental Bridge Inspection Information and Inspection Conclusions

## Supplemental New York State Thruway Inspection Information

In New York State, to serve, protect and preserve the health, safety and welfare of the public, the State Department of Transportation (NYSDOT) was legislatively directed to establish a Uniform Code of Bridge Inspections (UCBI). The Authority adheres to these NYSDOT methods for measurement of bridge performance. Further, the Authority frequently commits additional resources to obtain data for the purposes of developing a more robust and comprehensive in-depth inspection process to inform the bridge asset management program for these structures.

Some aspects of the UCBI and Authority detailed and rigorous bridge inspections practices which exceed the NBI procedural requirements include:

- Inspector qualifications in New York for the inspection Team Leader are more rigorous than the minimum standards required by the NBI, including the requirement that the Team Leader have a Professional Engineering license, and
- Bridge inspectors in New York are required to assign a condition rating for up to 47 structural elements of each bridge, including 25 components of each span of a bridge. For example, New York inspections includes miscellaneous superstructure elements such as bearings, joints, paint system, etc. that the NBI inspections do not require, and
- Inspections in New York require greater use of photographs, illustrations and detailed drawings indicating specific deterioration conditions and methods of reporting deterioration, and
- Prior to finalization of the inspection report, more assertive QC/QA requirements are applied to ensure consistency and reliability of findings, and
- The Authority more often completes In-Depth or interim interval inspections for structures at risk than occurs under the NBI process.

In New York State, the inspector conducts an NBI inspection and simultaneously is responsible for evaluating each element and assigning to it a descriptive Condition State (CS) assessment of “Good”, “Fair”, “Poor”, “Severe”, or “Unknown.”

| New York State Bridge Inspection Condition Scoring | | |
|---|---|---|
| **Condition State** | **Condition Type** | **General Condition Guideline** |
| CS-1 | Good | That portion of the element that has either no deterioration or the deterioration is insignificant to the management of the element, meaning that portion of the element has no condition based preventive maintenance needs or repairs. Areas of an element that have received long lasting structural repairs that restore the full capacity of the element with an expected life equal to the original element may be coded as good condition. |
| CS-2 | Fair | That portion of the element that has minor deficiencies that signify a progression of the deterioration process. This portion of the element may need condition based preventive maintenance. Areas of the element that have received repairs that improve the element, but the repair is not considered equal to the original member may be coded as fair |
| CS-3 | Poor | That portion of the element that has advanced deterioration but does not warrant structural review. This portion of the element may need condition based preventative maintenance or other remedial action. |
| CS-4 | Severe | That portion of the element that warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge; OR a condition where that portion of the element is no longer effective for its intended purpose. |
| CS-5 | Unknown | That portion of the element not assessable due to lack of access. |

For the Grand Island Structures, special emphasis inspections are routinely performed at the following locations.

| Special Emphasis Detail | South Grand Island Northbound Feature Description and Location | South Grand Island Southbound Bridge Feature Description and Location |
|---|---|---|
| Non-redundant or Fracture-Critical Elements | Girders (Spans 2-15 & 21-28), Floorbeams (Spans 16-20), Truss (Spans 16-20). | Girders (Spans 2-15 & 21-28), Floorbeams (Spans 16-20), Truss (Spans 16-20) |
| Pin-and-hanger details | Truss at L7-U7, L23-U23, M24,M25, M33, M34, L35-U35 &L51-U51. | Truss at L7-U7, L23-U23, M24, M25, M33, M34, L35-U35 & L51-U51. |
| Details vulnerable to fatigue cracks | Stringer web copes in Spans 16-20 | Stringer web copes in Spans 16-20. |

## Bridge Inspection Conclusions

Overall, the South Grand Island Bridge trusses are in fair to poor condition and gusset plates are in good to poor condition. With a non-redundant superstructure, the failure of one component of the primary support system can bring the entire bridge to a failure mode.

From inspection findings, the primary issue with the Grand Island Bridges is the deterioration of truss members and gusset plates due to salt laden ice, snow, and debris from the roadway surface. This debris accumulates in the crevices of the built-up sections of the primary members and within the gusset panel points. As a result, section loss can be difficult to assess due to multiple built-up plate members and crevice corrosion.

As illustrated in the table below, the 2020 AASHTO Element inspections have found approximately 6% of the SGIB NB bridge trusses to be in poor condition and approximately 46% of the SB bridge trusses to be in poor condition. The extent of deterioration has increased over multiple years.

### Periodic Inspection Deterioration Findings for Steel Truss Members

| Element 120 - Steel Truss | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MP 914.35 - SGIB NB | | | | | MP 914.99 - SGIB SB | | | | |
| Year | CS-1 | CS-2 | CS-3 | CS-4 | Year | CS-1 | CS-2 | CS-3 | CS-4 |
| 2016 | 0 | 2681 | 39 | 0 | 2016 | 0 | 2520 | 200 | 0 |
| 2018 | 0 | 2673 | 47 | 0 | 2018 | 0 | 2520 | 200 | 0 |
| 2020 | 21 | 2498 | 171 | 30 | 2020 | 0 | 1459 | 1261 | 0 |

As shown in the table below, the 2020 AASHTO Element inspections have found approximately 16% of the SGIB NB bridge gusset plates to be in poor condition and approximately 60% of the SB bridge gusset plates to be in poor condition. Similar to the bridge trusses, the rate of deterioration has increased over multiple years.

### Periodic Inspection Deterioration Findings for Steel Gusset Plate Members

| Element 162 - Steel Gusset Plate | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MP 914.35 - SGIB NB | | | | | MP 914.99 - SGIB SB | | | | |
| Year | CS-1 | CS-2 | CS-3 | CS-4 | Year | CS-1 | CS-2 | CS-3 | CS-4 |
| 2016 | 0 | 230 | 28 | 0 | 2016 | 0 | 255 | 3 | 0 |
| 2018 | 107 | 127 | 24 | 0 | 2018 | 70 | 170 | 18 | 0 |
| 2020 | 101 | 115 | 42 | 0 | 2020 | 26 | 79 | 153 | 0 |

The NBIS and New York State Bridge Inspection Manual has methodology for determining section loss and developing condition ratings based on observations and measurements of the primary members. For truss structures, the rating is based on each linear foot of the member and for gusset plates, each panel point is assessed. The AASHTO element level inspections help identify specific areas of concern. When the deterioration reaches a more significant point and becomes a flag as part of the inspection report, repairs are initiated. This

situation has presented itself to the Authority on the North Grand Island bridges (located approximately 5 miles north), which required immediate repairs. A project of similar scope is planned for the North Grand Island bridges in Spring 2023. This project will inform the design and construction of the SGIB's contract.

Addressing condition related issues identified under the Authority's inspection program and seismically retrofitting the SGIB's will retain these large structures as functional essential mobility elements for regional and local patrons.

Additional summary findings from the 2020 inspection, which identify the existing state of repair for superstructure and sidewalk areas, are provided in the tables below:

**South Grand Island Bridge (Northbound) Element Assessment Summary Table (BIN: 5043981)**

| Element | Total Quantity | Unit | CS-1 (Good) | CS-2 (Fair) | CS-3 (Poor) | CS-4 (Poor) | CS-5 Unknown |
|---|---|---|---|---|---|---|---|
| 107 - Steel Open Girder/Beam | 3228 | ft | | 2917 | 311 | | 0 |
| 113 - Steel Stringer | 11260 | ft | 4820 | 4660 | 1780 | | 0 |
| 120 - Steel Truss | 2720 | ft | | 1459 | 1261 | | 0 |
| 141 - Steel Arch | 800 | ft | | 612 | 188 | | 0 |
| 152 - Steel Floor Beam | 7748 | ft | 4193 | 2791 | 764 | | 0 |
| 161 - Steel Pin and Pin & Hanger Assembly or both | 24 | each | 2 | 10 | 12 | | 0 |
| 162 - Steel Gusset Plate | 258 | each | 26 | 79 | 153 | | 0 |
| 231 - Steel Pier Cap | 46 | ft | | 46 | | | 0 |
| 310 - Elastomeric Bearing | 84 | each | 69 | 11 | 4 | | 0 |
| 311 - Movable Bearing | 22 | each | 6 | 9 | 7 | | 0 |
| 313 - Fixed Bearing | 12 | each | | 12 | | | 0 |
| 330 - Metal Bridge Railing | 13676 | ft | 12170 | 1366 | 140 | | 0 |
| 810 - Sidewalk | 14460 | sf | | 152 | 14308 | | 0 |
| 830 – Secondary Members | 27 | each | | 25 | 2 | | |

**South Grand Island Bridge (Southbound) Element Assessment Summary Table (BIN: 5043982)**

| Element | Total Quantity | Unit | CS-1 (Good) | CS-2 (Fair) | CS-3 (Poor) | CS-4 (Poor) | CS-5 Unknown |
|---|---|---|---|---|---|---|---|
| 107 - Steel Open Girder/Beam | 3228 | ft | | 2748 | 480 | | 0 |
| 113 - Steel Stringer | 15080 | ft | 13433 | 1500 | 147 | | 0 |
| 120 - Steel Truss | 2720 | ft | 21 | 2498 | 171 | 30 | 0 |
| 141 - Steel Arch | 800 | ft | 614 | 160 | 26 | | 0 |
| 152 - Steel Floor Beam | 7973 | ft | 5602 | 2027 | 343 | 1 | 0 |
| 161 - Steel Pin and Pin & Hanger Assembly or both | 24 | each | | 11 | 13 | | 0 |
| 162 - Steel Gusset Plate | 258 | each | 101 | 115 | 42 | | 0 |
| 310 - Elastomeric Bearing | 84 | each | 79 | 2 | 3 | | 0 |
| 311 - Movable Bearing | 22 | each | | 6 | 16 | | 0 |
| 313 - Fixed Bearing | 12 | each | | 11 | 1 | | 0 |
| 330 - Metal Bridge Railing | 13750 | ft | 10436 | 3282 | 32 | | 0 |
| 810 - Sidewalk | 14672 | sf | 12700 | 1442 | 530 | | 0 |
| 830 - Secondary Members | 27 | each | 12700 | 24 | 3 | | 0 |
| 831 - Steel Beam End | 88 | each | | 82 | 6 | | |