Engineering Quality
Assurance Division
B04-925.104

Port Authority Facility Condition Survey Program

George Washington Bridge
Main Span Lower Level
2011 Biennial Inspection

December 2011

Engineering Department

THE PORT AUTHORITY OF NY & NJ

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December 22, 2011

Mr. C. John Lin, P.E.
Assistant Chief Engineer - Quality Assurance
The Port Authority of New York and New Jersey
100 Mulberry Street
3 Gateway Center, 3rd Floor
Newark, NJ 07102

Attn: Mr. Camille Dagher, P.E., Project Manager

Re: Expert Professional Services for the Performance of 2011 Biennial Inspection of The George Washington Bridge Upper and Lower Level
Call-in Basis (**P.A. Agreement No. 405-11-002; Purchase Order #4900006602**)

2011 FINAL Condition Survey Report / GWB Lower Level

Gentlemen,

We are pleased to submit twelve (12) copies of the Final Condition Survey Report for the 2011 Biennial Inspection of the George Washington Bridge Main Span Lower Level in accordance with Agreement # 405-11-002.

The thoroughness and accuracy of all work on this project has been ensured by independent quality control performed by our senior technical and management staff.

We trust you find this submission to your satisfaction, and please feel free to contact us at 201-528-9067 with any questions regarding this report.

We thank you for the opportunity to provide professional services associated with this project.

Sincerely,

A.William Rutherford, P.E.
Principal-in-Charge

EXECUTIVE SUMMARY

HNTB Corporation in association with PK Engineering, P.C. (PKE), PKB Engineering Corporation (PKB), and Mega Engineering, Inc. (MEGA), performed the 2011 Biennial Inspection of the George Washington Bridge Lower Level (BIN 5522507), from June through September of 2011. The inspection was performed with the assistance of SEMAC personnel. The inspection included lower level roadway and framing, the stiffening trusses (except for the upper gusset plates and upper chord members which were included in the George Washington Bridge Upper Level inspection), the west abutment and travelers, including the traveler support framing and connections. The purpose of this inspection was to determine the overall condition of the structures and to identify structural and non-structural deficiencies.

The George Washington Bridge Lower Level is in overall good condition.

During this inspection, no conditions were found that required immediate action.

Out of a total of the 25 priority repair recommendations at 171 locations identified in the previous inspection report, 5 priority repairs at 9 locations have been completed and 1 priority repair was partially completed at 14 out of 16 locations. There are 20 priority repairs at 148 locations that remain outstanding. A total of 6 new locations were found at 2 outstanding priority repairs. In addition, 2 new priority repairs were found at 11 locations for a total of 22 priority repairs at 165 locations recommended for repair in this report. The majority of these recommendations include the repair of deteriorated steel stringers, diaphragms and truss bottom chord, spalled, cracked and/or undermined concrete bearing pedestals, jammed finger expansion joints and deteriorated traveler support framing members and traveler connection tees.

An In-depth inspection of all gusset plate connections at the lower chord of the stiffening truss was performed and all gusset plates were found to be in good overall condition.

There are also 22 non-structural safety repairs recommended at 294 locations and 98 routine repairs recommended at 2,819 locations. The safety repair recommendations primarily include railing or walkway deficiencies, roadway deficiencies and numerous deficiencies at the travelers. All conditions are listed in the “Inspection Findings and Recommendations” section of this report and located on the “Deficiency and Photo Location Plans”.

The report contains conclusions concerning the causes of the noted deterioration and recommendations for the rehabilitation of the structure. The repair procedures contained in the recommendation section of the report outline the general extent of the required rehabilitation work. The presentation of these conceptual repairs does not preclude the necessity of performing further investigation and preliminary design work for the purpose of establishing the complete scope of work and the final rehabilitation design.

SUMMARY AND CONDITION STATUS TABLE OF PRIORITY REPAIR RECOMMENDATIONS

2011 Biennial Inspection of the George Washington Bridge Lower Level

QAD Repair Reference Number	Repair Recommendation 2009 Inspection	Current Status	Repair Recommendation 2011 Inspection	Dwg. No. *(Photo No.)*
GWB-BR001-021	Replace the severely corroded end diaphragms with holes in span 3 between stringers S3 - S4 and S14 – S15 over floorbeam 1E (2 locations).	Completed	-------	-------
GWB-BR001-011	Replace severely deteriorated rivets (50% loss of section or greater) in the bottom flange of floorbeam 4 (span 6) in the New York Anchorage (1 location).	Completed	-------	-------
GWB-BR001-020	Replace the severely corroded end diaphragms in span 3 between stringers S12 and S14 over floorbeam 1E (2 locations).	Completed	-------	-------
GWB-BR001-018	Repair spalled concrete pedestal at the east end of span 11 in the New York Anchorage (1 location).	Outstanding	Repair spalled concrete pedestal at the east end of span 11 in the New York Anchorage (1 location).	SDU-7 *(Photo 6)*
GWB-BR001-022	Repair ½″ diameter hole in the bottom of web of stringer S4 at panel point 38E (1 location).	Outstanding	Repair ½″ diameter hole in the bottom of web of stringer S4 at panel point 38E (1 location).	SDU-5 *(Photo 7)*
GWB-BR001-024	Repair spalled and cracked concrete pedestal causing minor undermining of the bearing under stringer S10 at the east end of span 10. One anchor bolt is partially exposed (1 location).	Outstanding	Repair spalled and cracked concrete pedestal causing minor undermining of the bearing under stringer S10 at the east end of span 10. Anchor bolts are partially exposed (1 location).	SDU-7 *(Photo 8)*

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2011 Biennial Inspection of the George Washington Bridge Lower Level

QAD Repair Reference Number	Repair Recommendation 2009 Inspection	Current Status	Repair Recommendation 2011 Inspection	Dwg. No. *(Photo No.)*
GWB-BR001-025	Repair twelve (12) up to 6" x 2" holes in the top plate of the south bottom truss chord between panel points 3E* and 3E (1 location).	Outstanding	Repair twelve (12) up to 6" x 2" holes in the top plate of the south bottom truss chord between panel points 3E* and 3E (1 location). Temporary repair performed by filling holes with caulk and repainting.	SDU-7 *(Photo 9)*
GWB-BR001-033	Replace the severely corroded end diaphragms with holes in span 3 between stringers S6 – S7, S11 – S12, S15 – S16 over floorbeam 1E (3 locations).	Completed	-------	-------
GWB-BR001-034	Repair severely corroded stringer webs with holes above the bearings at all stringers above panel point 1E (16 locations).	Partially Completed	Repair severely corroded stringer webs with holes above the bearings at stringers S6 and S14 above panel point 1E (2 locations).	SDU-7 *(Photo 10)*
GWB-BR001-035	Repair spalled and cracked concrete pedestal causing minor undermining of the bearing under stringer S16 at the west end of span 10 and under stringer S14 at the east end of span 11 (2 locations).	Outstanding	Repair spalled and cracked concrete pedestal causing minor undermining of the bearing under stringer S16 at the west end of span 10 and under stringer S14 at the east end of span 11 (2 locations).	SDU-7 *(Photos 11 & 12)*
GWB-BR001-037	Repair the severely corroded stringer S1, between panel points 7E* and 8E, with 50% section loss on the top flange near the quarter point (1 location).	Outstanding	Repair the severely corroded stringer S1, between panel points 7E* and 8E, with 50% section loss on the top flange near the quarter point (1 location).	SDU-7 *(Photo 13)*

SUMMARY AND CONDITION STATUS TABLE OF PRIORITY REPAIR RECOMMENDATIONS

2011 Biennial Inspection of the George Washington Bridge Lower Level

QAD Repair Reference Number	Repair Recommendation 2009 Inspection	Current Status	Repair Recommendation 2011 Inspection	Dwg. No. *(Photo No.)*
GWB-BR001-038	Repair the severely corroded top flange and web with holes in the web at the bearings of stringers S2, S3, S4, S6, S7, S10 and S11, located at the east side of floorbeam 1E (7 locations).	Outstanding	Repair the severely corroded top flange and web with holes in the web at the bearings of stringers S2, S3, S4, S6, S7, S10 and S11, located at the east side of floorbeam 1E (7 locations).	SDU-7 *(Photo 14)*
GWB-BR001-039	Repair the severely corroded webs, with hole near the bearing, of stringers S1, S5 and S8 located at the west end of span 7 and stringers S13, S14 and S15 located at the east end of span 9 (6 locations). (Holes exist in webs of S11, S12 and S13 in Span 9 incorrectly labeled S13, S14 and S15).	Outstanding	Repair the severely corroded webs, with hole near the bearing, of stringers S1, S5 and S8 located at the west end of span 7 and stringers S11, S12 and S13, including an adjacent corrosion crack at stringer S12, located at the east end of span 9 (6 locations).	SDU-7 *(Photo 15 &16)*
GWB-BR001-040	Repair the severely corroded stringers S1 and S18 with web holes and 50% section loss of bottom flange near the 1/3 span between panel points 1E* and 1E (2 locations).	Outstanding	Repair the severely corroded stringers S1 and S18 with web holes and 50% section loss of bottom flange near the 1/3 span between panel points 1E* and 1E (2 locations).	SDU-7 *(Photo 17)*
GWB-BR001-041	Repair the severely corroded web, with holes around the bearing stiffening angles, of stringer S1 at the east side of panel point 26W* (1 location).	Outstanding	Repair the severely corroded web, with holes around the bearing stiffening angles, of stringer S1 at the east side of panel point 26W* (1 location).	SDU-4 *(Photo 18)*
GWB-BR001-042	Repair cracked and spalled concrete pedestals causing undermining of the bearing under stringer S13, S15 and S16 at the west end of span 10 and under stringer S4, S7, S8, S10, S15 and S18 at the east end of span 11 (9 locations).	Outstanding	Repair cracked and spalled concrete pedestals causing undermining of the bearing under stringer S13, S15 and S16 at the west end of span 10 and under stringer S4, S7, S8, S10, S15 and S18 at the east end of span 11 (9 locations).	SDU-7 *(Photo 19 & 20)*

SUMMARY AND CONDITION STATUS TABLE OF PRIORITY REPAIR RECOMMENDATIONS

2011 Biennial Inspection of the George Washington Bridge Lower Level

QAD Repair Reference Number	Repair Recommendation 2009 Inspection	Current Status	Repair Recommendation 2011 Inspection	Dwg. No. *(Photo No.)*
GWB-BR001-043	Repair the 2 of 4 broken anchor bolts at the bearing of stringer S16 located at the east end of span 11 (1 location).	Outstanding	Repair the 2 of 4 broken anchor bolts at the bearing of stringer S16 located at the east end of span 11 (1 location).	SDU-7 *(Photo 21)*
GWB-BR001-044	Repair the severely corroded end diaphragms with holes between stringers S16 and S17 over floorbeam 1E in span 3 (1 location).	Completed	-------	-------
GWB-BR001-047	-------	New	Repair spalled and cracked concrete pedestals, with or without exposed anchor bolts and/or rebar, causing minor undermining of the bearing under stringers S9 and S15 of span 10, under stringer S9 at the east end of span 11, and at 3 locations under stringer S12 in span 11 (6 locations).	SDU-7 *(Photos 22 & 23)*
GWB-BR001-023	Repair/Replace missing expansion joint filler material at span 9 (1 location).	Outstanding	Repair/Replace missing expansion joint filler material at span 9 (1 location).	TD-6 *(Photo 24)*
GWB-BR001-045	Repair the jammed finger joint plates at panel point 1E (1 location).	Outstanding	Repair the jammed finger joint plates at panel point 1E (1 location).	TD-6 *(Photo 25)*
GWB-BR001-026	New Jersey and New York Main Span Travelers - repair greater than 50% section loss in vertical stem of connection tee for south traveler hanger at panel point 40W that supports the track for the Main Span Travelers (1 location).	Outstanding	New Jersey and New York Main Span Travelers - repair greater than 50% section loss in vertical stem of connection tee for south traveler hanger at panel point 40W that supports the track for the Main Span Travelers (1 location).	SDU-5 *(Photo 26)*

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2011 Biennial Inspection of the George Washington Bridge Lower Level

QAD Repair Reference Number	Repair Recommendation 2009 Inspection	Current Status	Repair Recommendation 2011 Inspection	Dwg. No. *(Photo No.)*
GWB-BR001-030	New Jersey Main Span Traveler – repair moderate to severe section loss at main support truss members (12 locations).	Outstanding	New Jersey Main Span Traveler – repair moderate to severe section loss at main support truss members. One new location added. (13 locations).	T-3 *(Photo 27)*
GWB-BR001-028	New York Main Span Traveler – repair moderate to severe section loss at main support truss members (90 locations).	Outstanding	New York Main Span Traveler – repair moderate to severe section loss at main support truss members. Additional 5 new locations added (Total 95 locations).	T-4 *(Photo 28)*
GWB-BR001-031	New Jersey and New York Main Span Travelers - repair 50% section loss in vertical stem of connection tee that supports the south track at panel point 23E and the north track at Panel Point 42W for the Main Span Travelers (2 locations).	Outstanding	New Jersey and New York Main Span Travelers - repair 50% section loss in vertical stem of connection tee that supports the south track at panel point 23E and the north track at Panel Point 42W for the Main Span Travelers (2 locations).	SDU-5 & 6 *(Photos 29 & 30)*
GWB-BR001-046	New Jersey Main Span Traveler – repair moderate to severe section loss at cross bracings between main support truss top chords (6 locations).	Outstanding	New Jersey Main Span Traveler – repair moderate to severe section loss at cross bracings between the main support truss top chords (6 locations).	T-3 *(Photo 31)*
GWB-BR001-048	-------	New	New Jersey Back Span Traveler – repair moderate to severe section loss at main support truss members (5 locations).	T-2 *(Photo 32)*

SUMMARY OF SAFETY REPAIR RECOMMENDATIONS

2011 Biennial Inspection of the George Washington Bridge Lower Level

Repair Recommendation - 2011 Inspection	**Dwg. No. (*Photo No.*)**
1. Replace two detached hangers and repair open joints of the 4-inch diameter electrical conduits with exposed electrical wires near the New Jersey abutment (1 location).	SDU-3 *(Photo 33)*
2. Repair the broken weld at the base of the west handrail of the north safetywalk stairs and broken base at the east handrail of the south safety walk stairs at the New Jersey abutment (2 locations).	SDU-3 *(Photo 34)*
3. Remove section of abandonded 8-inch diameter water main with deteriorated clevis hanger at the New Jersey abutment (1 location).	SDU-3 *(Photo 35)*
4. Replace severely deteriorated steel knee brace support bracket for two 3-inch diameter electrical conduits at stringer S2, west of Floorbeam 3W at span 1 (1 location).	SDU-3 *(Photo 36)*
5. Remove partially detached curb plate (3 locations).	TD-5 & 6 *(Photo 37)*
6. Replace the missing or partially missing railings at the walkways over the open median areas (8 locations).	TD 2, 3 & 5 *(Photo 38)*
7. Repair the detached connections of the safety walk railing or bridge railings (5 locations).	TD 2, 5 & 6 *(Photo 39)*
8. Repair or replace the missing or loose cover to the electrical panel box with exposed wires attached to the back of the barrier (accessible to the public / stranded motorists) along the north and south safety walks (29 locations).	TD 2, 3, 4 5, & 6 *(Photo 40)*
9. Repair or replace the diamond plate safety walk uplifted 1.5 inches creating a tripping hazard at the New York tower (1 location).	TD-5 *(Photo 41)*
10. Repair the severely deteriorated and collapsed section of steel curb at the south side of the eastbound roadway (1 location).	TD-2 *(Photo 42)*

SUMMARY OF SAFETY REPAIR RECOMMENDATIONS

2011 Biennial Inspection of the George Washington Bridge Lower Level

Repair Recommendation - 2011 Inspection	**Dwg. No. (*Photo No.*)**
11. Remove the cable looped through the safety walk grate from below that creates a tripping hazard at the New York tower (1 location).	TD-5 *(Photo 43)*
12. Replace the missing stair grate connection clip at the median catwalk at the New Jersey tower (accessible to the public / stranded motorist) (1 location).	TD-2 *(Photo 44)*
13. Repair the broken conduit at the south safety walk at the New Jersey tower (Accessible to the public / stranded motorists) (1 location).	TD-2 *(Photo 45)*
14. Replace the broken bottom rail of the chain link fence panel at the west end of Span 10 along the westbound roadway and east end of Span 11 along the eastbound roadway (2 locations).	TD-6 *(Photo 46)*
15. Repair or replace the safety netting with large holes at median (6 locations).	TD-2, 4, 5 & 6 *(Photo 47)*
16. Repair the 2' x 2' opening in the north safety walk due to removed conduits and 2' long x 4" wide section of removed safety walk grating at the New Jersey Tower (1 location).	TD-2 *(Photo 48)*
17. Repair the broken aluminum fence posts and rails and repair the welds between the fence fabric connection plates and the posts (11 locations).	T-2, 3, 4 & 5 *(Photo 49)*
18. Replace the missing or broken hinges or hinge screws at access doors in grate floor of the travelers (5 locations).	T-2, T-3 & T-4 *(Photo 50)*
19. Repair or replace the safety netting with large holes at the New York main span traveler (9 locations).	T-4 *(Photo 51)*
20. Repair the moderate to severe section loss at W8's and 3" x 3" L's that support the safety netting for the travelers (35 locations).	T-2, 3, 4 & 5 *(Photo 52)*

SUMMARY OF SAFETY REPAIR RECOMMENDATIONS

2011 Biennial Inspection of the George Washington Bridge Lower Level

Repair Recommendation - 2011 Inspection	**Dwg. No. (*Photo No.*)**
21. Replace the missing horizontal rail angle at the New York back span traveler truss platform below the floor access hatch (1 location).	T-5 *(Photo 53)*
22. Tighten or replace the loose or missing bolts for safety netting straps and replace the missing safety netting straps and bolts (169 locations).	T-2, 3, 4 & 5 *(Photo 54)*

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Location Plan

Sheet of

THE PORT AUTHORITY OF NY & NJ

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

GEORGE WASHINGTON BRIDGE

QUALITY ASSURANCE DIVISION
FACILITY CONDITION SURVEYS

Title

BIN 5522507
LOWER LEVEL

LOCATION PLAN

J.B./R.G./T.K.	V.S.	M.N.
Designed by	Drawn by	Checked by

Date Oct. 2011

Contract Number

Drawing Number L-1

General Plan, Elevation and Cross-Section

I. Scope of Work, Inspection Procedures and Terminology

I. Scope of Work, Inspection Procedures and Terminology

A. SCOPE OF WORK

HNTB Corporation in association with PK Engineering, P.C. (PKE), PKB Engineering Corporation (PKB), and Mega Engineering, Inc. (MEGA), performed the 2011 Biennial Inspection of the George Washington Bridge Lower Level (BIN 5522507), from June through September of 2011. The inspection was performed with the assistance of SEMAC personnel. The inspection included lower level roadway and framing, the stiffening trusses (except for the upper gusset plates and upper chord members which were included in the George Washington Bridge Upper Level inspection), the west abutment and travelers, including the traveler support framing and connections. The purpose of this inspection was to determine the overall condition of the structures and to identify structural and non-structural deficiencies.

The survey included a 100% visual inspection of all unobstructed structural elements and a hands-on inspection of all floorbeams and stringers and of all non-redundant, fracture critical members including steel cap beams and the bottom chord of the stiffening trusses, the gusset plate connections of the stiffening trusses at the bottom chord and the accessible primary traveler main truss members. The NY and NJ Towers (with the exception of the lower level framing across the towers), the anchorages, the stiffening truss upper chord and upper portions of the verticals and diagonals, all bridge mounted signs and lighting structures and a diving inspection of the NJ tower are included with the inspection of the GWB Upper Level.

The inspection was performed in compliance with the latest requirements of the Authority and New York State Department of Transportation and included the preparation and submittal of a state biennial bridge inspection report, as well as this facility condition survey report, which includes verification and status of all priority repairs recommended in the previous report.

B. INSPECTION PROCEDURE

1. Inspection Method

The inspection team was comprised of three individuals. The Team Leader was a Professional Engineer licensed in the State of New York.

Structural deficiencies were recorded, photographed and located on the "Deficiency and Photo Location Plans," which are included in this report.

2. Access Methods

Lower level framing between panel points 3W and 1E* between the traveler beams was accessed from the travelers using scaffolding and ladders set up by SEMAC personnel. Areas outside of the traveler beams and the lower chord gusset plates of the stiffening trusses were inspected with ladders provided by SEMAC set on the travelers.

The lower level framing at the New Jersey abutment between Panel Points 2W and 3W was inspected using extension ladders set on the rock slope in front of the NJ abutment. Lower

level framing between panel points 1E' and Spans 3 to 9 were inspected using a 120 ft. man lift from within the New York anchorage courtyard.

Spans 10 and 11 at the New York anchorage were inspected by crawling, using Tyvek suits and dust masks.

The top of deck in Spans 1 through 3 was inspected from the north and south safety walks. Spans 4 through 11 and the median areas, deck joints and left lanes in Spans 1 through 9 were inspected at night during lower level roadway closings installed for the upper level roadway inspections. A shadow truck was utilized to protect the work areas during all night-time lower level roadway closings.

I. Scope of Work, Inspection Procedures and Terminology

PHOTO A

Location: Span 1, main floorbeam at Panel Point 7W.

Description: Hands-on inspection of main floorbeam and stringers utilizing scaffolding access from traveler platform between support beams.

PHOTO B

Location: Span 1, main floorbeam, stiffening truss lower chord and gusset plate at Panel Point 9W*.

Description: Hands-on inspection of stiffening truss lower chord, floorbeams and stringer with ladders set on traveler.

I. Scope of Work, Inspection Procedures and Terminology

PHOTO C

Location: New York Anchorage Courtyard.

Description: 120’ man lift was utilized within the NY anchorage courtyard to access the superstructure and deck underside in Spans 4 through 9.

PHOTO D

Location: Span 1, main floorbeam and stringers at Panel Point 2W* - 3W.

Description: Hands-on inspection of floorbeams and stringers with ladders near the New Jersey Anchorage.

C. CONDITION SURVEY DEFINITIONS AND TERMINOLOGY

(a) DEFINITIONS OF RECOMMENDATION CATEGORIES

The inspection involves one of the following methods:

Hands-on Inspection Close-up inspection from no further away than arm's length where the member or element can be physically touched.

Visual Inspection The inspection from a reasonable distance of a member or element where initial determination of the condition can be made.

Four categories of recommendations are identified and defined as follows:

Immediate Requires immediate action including possible closing of the structure or areas affected for safety reasons until interim remedial measures, such as shoring or removal of potentially unsafe structures (or elements), can be implemented. These closings or interim remedial actions, if any, always require immediate action upon discovery.

Priority Conditions for which no immediate action may be required or for which immediate action has been completed, but further investigations, design and implementation of interim or long-term repairs should be undertaken on a priority basis, i.e., taking precedence over all other scheduled work.

Safety Conditions that present a potential hazard and which should be repaired as soon as possible.

Routine Conditions requiring further investigation or remedial work, which can be undertaken as part of a scheduled maintenance program, other scheduled project, or routine facility maintenance, depending on the action required.

(b) RATING CRITERIA

Terms used to describe the condition of a structural system or component are listed and defined below. When the term is applied to an overall structure or system, this does not indicate that all elements of the structure or system are in the same condition.

Excellent "As New" Condition

Good The structural system is sound and performing its function, although it shows signs of wear and may require some minor repairs, mostly routine.

Fair The structural system is still performing adequately at this time, but needs "priority" and/or "routine" repairs to prevent future deterioration and to restore it to good condition.

Poor The structural system cannot be relied upon to continue to perform its original function without "immediate" and/or "priority" repair.

(c) INSPECTION TEMINOLOGY

The following terms may be used during inspection to describe the condition of structural members.

1) STEEL MEMBERS

a) **Corrosion**

- Minor (or Light) – A light surface rust.
- Moderate – Rust that is loose and flaking with some pitting. This scaling, or exfoliation, can be removed with some effort by use of a scraper or chipping hammer. Element exhibits measurable but not significant loss of section.
- Severe – Heavy, stratified rust or rust scales with extensive pitting. Removal requires exerted effort and may require mechanical means. Significant loss of section.

b) **Pack Rust** – Rust collected between two interfacing surfaces, usually two steel plates. Pack rust can be minor, moderate, or severe as described above. Pack rust can severely deform the steel members due to the expansive nature of rust.

c) **Pitting** – Formation of cavities due to corrosion. Minor, moderate, and severe pitting categories are used based upon depth and density of cavities.

- Minor – Typically less than ¼ inch diameter and $^1/_{32}$ inch deep.
- Moderate – ¼ inch to ½ inch diameter and up to $^1/_8$ inch deep.
- Severe – Greater than ½ inch diameter and over $^1/_8$ inch deep.

2) **CONCRETE MEMBERS**

a) **Cracking** – A separation into two or more parts with a space between the fractured concrete surfaces.

- Hairline- Crack width less than $^1/_{32}$ inch.
- Fine – Crack width between $^1/_{32}$ inch and $^1/_{16}$ inch.
- Medium – Crack width between $^1/_{16}$ inch and $^1/_8$ inch.
- Wide – Crack width greater than $^1/_8$ inch.

The above definitions for cracks can be modified, depending on the type of structural element. Other terminology, such as map cracking, pattern cracking, etc., may be used as appropriate.

b) **Efflorescence** – A white deposit caused by crystallization of soluble salts brought to the surface by moisture leaching through concrete.

c) **Delamination** – A layered separation of the concrete. When a delaminated area of concrete is struck (sounded) with a hammer, a hollow sound will be emitted.

d) **Leaching** – The dissolution and washing away of the calcium hydroxide in concrete. The moisture enters the concrete through exposed cracks in the surface.

e) **Spall** – A roughly circular, oval, or elongated depression in the surface of a concrete element caused by separation of a portion of the surface concrete.

- Small (Pop-out) – Less than 6 inches in diameter and 1 inch deep.
- Medium – Between 6 inches and 12 inches in diameter and up to 2 inches deep.
- Large – Over 12 inches in diameter and any depth.

f) **Scaling** – The gradual loss of surface mortar and aggregates.

- Light Scaling – Loss of surface mortar up to ¼ inch deep.
- Medium Scaling – Loss of surface mortar between ¼ inch and ½ inch deep, including loss between large aggregate.
- Heavy Scaling – Loss of mortar greater than ½ inch in depth significantly exposing large aggregate.

g) **Hollow area** – An area of concrete which emits a hollow sound when struck with a hammer and indicates the existence of a fracture plane beneath the surface.

h) **Honeycomb** – Typically small pocket voids formed by the entrapment of air during the placement of the concrete.

3) **TIMBER MEMBERS**

a) **Fungus decay** – generally appears as a moist area with stain or discoloration. Fungi produce conks, which are fruiting bodies, usually fan-like in shape, and which grow horizontally from the wood. They shed spores which propagate the fungus. Conks are a sure sign of advanced decay and they vary from a fraction of an inch to several inches in length. Sapstain fungi have small black, globular fruiting bodies which smear like soft carbon when brushed with the hand.

- Molds – cottony powdery circular growths varying from white or light colors to black. Molds themselves do not cause decay but their presence is an indication that conditions favorable to growth of fungi exist.
- Stains – specks, spots, streaks, or patches, varying in color, which penetrate the sap wood. Sapstain is harmless to wood. It is usually a surface phenomenon and like molds, implies conditions where harmful fungi can flourish.
- Soft rot – attack the wood, making it soft and spongy. Only the surface wood is affected, and thus it does not significantly weaken the member.
- Brown rot – feeds upon the cellulose and makes the wood dark brown and crumbly.
- White rot – feeds upon both the cellulose and the lignin and makes the wood white and stringy.

Brown and white rots are responsible for structural damage to wood, while the other fungi types simply provide a sign that favorable conditions exist for growth.

b) **Checks** – separation of the wood fibers, normally occurring across the annual growth rings.

c) **Splits** – similar to checks except the separations of the wood fibers extend completely through the piece of wood.

d) **Shakes** – separations along the grain, which usually occur between the annual growth rings.

e) **Damage by parasites** – damage is generally inside the surface of the wood and is therefore not visible, but sagging, crushing, small holes or the accumulation of sawdust may be observed.

Parasites tunnel in and hollow out the insides of timber members for food and shelter. Some common types of parasites include:

- Termites – termites are pale-colored, soft-bodied insects that feed on wood. All damage is inside the surface of the wood; hence it is not visible. The only visible signs of infestation are white mud shelter tubes or runways extending up from the earth to the wood and on the side of masonry substructures.

- Carpenter ants – Carpenter ants are large, black ants that gnaw galleries in soft or decayed wood. The ants may be seen in the vicinity of the infested wood, but the accumulation of sawdust on the ground at the base of the timber is also an indicator of their presence.

- Powder-post beetles – Powder-post beetles also hollow out the insides of timber members and leave the outer surface pierced with small holes about 1/16" in diameter filled with dry pulverized wood. Often a powdery wood dust is dislodged from the holes. The inside may be completely excavated.

II. History and Structure Description

II. History and Structure Description

A. HISTORY

The George Washington Bridge is a 4760' long suspension bridge that spans the Hudson River between upper Manhattan in New York and Fort Lee in New Jersey. The bridge serves as an important link in the I-95 corridor, carrying approximately 300,000 vehicles per day, making it one of the busiest in the world.

The bridge was originally designed to carry a 90′ wide upper roadway with 10′ wide sidewalks on each side and four electric railway tracks on a lower level. The bridge was opened to traffic on October 25, 1931. Originally the upper level carried only six lanes of traffic and the center portion was unpaved. In 1946, the upper level was expanded to accommodate eight lanes of traffic. The six lane lower level was added and opened to traffic on August 29, 1962 (original contract Dwg. No. GWB-190.008). The new addition made the George Washington Bridge the only fourteen lane suspension bridge in the world. In 2001, the Port Authority prohibited all trucks from using the lower level of the bridge at all times.

B. STRUCTURE DESCRIPTION

For the purpose of recording inspection findings and ratings, the lower level is made up of eleven spans: the New Jersey Side Span (Span 1), the Main Center Span (Span 2), the New York Side Span (Span 3) and the New York Anchorage Spans (Spans 4 through 11).

The stiffening (Warren type) trusses are 30′ deep from the center of the top chord to the center of the bottom chord. The top and bottom chords are comprised of built-up riveted steel box sections. The top chord dimensions are 30″ deep by 30″ wide; and the bottom chord dimensions are 24″ deep by 30″ wide. The vertical chord members are built-up riveted steel sections that consist of a web plate (31″x½″) and flanges made up of angles (8″x8″x¾″); the diagonals vary in size and cross section.

The lower level framing comprising Spans 1, 2 and 3 consists of main floorbeams, intermediate floorbeams, roadway stringers and a concrete filled steel deck. The floorbeams are 7′ deep riveted steel plate girders and are located at each main panel point and intermediate panel point (30′ on center). The main floorbeams of the lower level are supported by the stiffening truss verticals located directly below and supported by a total of sixteen suspension ropes anchored to the four main bridge suspension cables. The intermediate floorbeams of the lower level are supported by the stiffening truss diagonals and verticals (see General Plan, Elevation and Cross-Section, Page No. xii). The floorbeams are built-up sections that consist of a web plate (84″x½″), a built-up top flange that consists of two angles (8″x8″x¾″) and a top cover plate (22″x⅝″) and a built-up bottom flange that consists of two angles (8″x8″x¾″), a bottom cover plate (22″x⅝″) and two additional bottom cover plates (22″x½″). The typical roadway stringers are 24 WF sections and are bolted to the top flange of the floorbeams. The roadway consists of a concrete filled steel deck (4¼″ I-beams at 6″ on center welded to the roadway stringers). The deck is reinforced with

¾″ diameter reinforcing rods and there are expansion joints at each panel point (60′ on center). The underside of deck has stay-in-place (S.I.P.) metal forms.

The lower level framing in Spans 4 to 9, within the New York Anchorage, is comprised of a similar floorbeam and stringer system. The floorbeams are supported on steel columns or on the walls of the New York anchorage. Spans 10 and 11 are comprised of a series of stringers and diaphragms supported on concrete pedestals bearing on the top of the New York anchorage.

There are two electrically powered travelers situated below the main span and one under each back span. Each traveler is hung from support beams and consists of a box shape truss providing a grated work area of 8'-0" x 116'-0". The top and bottom chords of the trusses are horizontal vierendeel trusses and the two side support trusses are 4'-0" deep by 116'-0" long. The truss members are comprised of steel angles and channels. Each platform's grated work area is extended on both sides and both ends with a sloping wide wing covered with safety netting consisting of a chain link fabric to safeguard personnel on the traveler.

III. Inspection Findings, Conclusions and Recommendations

III. Inspection Findings, Conclusions and Recommendations

A. OVERALL CONDITION

The overall condition of the deck, superstructure, substructure and travelers is good. An in-depth inspection of all gusset plate connections at the lower chord of the stiffening truss was performed and all gusset plates were found to be in good overall condition. During the inspection, there were no conditions found that required immediate action.

Out of a total of the 25 priority repair recommendations at 171 locations identified in the previous inspection report, 5 priority repairs at 9 locations have been completed and 1 priority repair was partially completed at 14 out of 16 locations. There are 20 priority repairs at 148 locations that remain outstanding. A total of 6 new locations were found at 2 outstanding priority repairs. In addition, 2 new priority repairs were found at 11 locations for a total of 22 priority repairs at 165 locations recommended for repair in this report. The majority of these recommendations include the repair of deteriorated steel stringers, diaphragms and truss bottom chord, spalled, cracked and/or undermined concrete bearing pedestals, jammed finger expansion joints and deteriorated traveler support framing members and traveler connection tees.

There are also 22 safety repairs recommended at 293 locations and 98 routine repairs recommended at 2,786 locations. The safety repair recommendations primarily include railing or walkway deficiencies, roadway deficiencies and numerous deficiencies at the travelers.

B. UNDERSIDE OF DECK (SPANS 1 THROUGH 11)

Bottom Chord of Stiffening Truss

The “box shaped” bottom chords of the stiffening trusses are generally in good condition. Water ponding was noted on top of the bottom chord at approximately one third of the truss chord panels, mostly adjacent to the panel points. Various rivet heads located along the top of the bottom chords exhibit greater than 50% section loss at isolated locations, generally where water ponding occurs. Pack rust remains between the flange plates and the side plates of the box shaped chords resulting in minor warping and curling of the flange plate edges at the corners of the box member resulting in isolated rivet fractures. To prevent further deterioration, the pack rust beneath the warped top flange plate edges was previously cleaned and caulking was applied to fill the resulting void to seal out water. Caulking is missing or deteriorated along several lengths of the top chord plate allowing water infiltration, exacerbating the condition. Areas of pack rust remains along the lower corners of the box shaped chords. Minor to moderate pitting up to 3/16" deep was evident along the top plate of the bottom chord of the stiffening truss. A 1" diameter hole remains in the top flange plate of the south truss between panel points 8E* and 9E and a 3" x 1" hole remains in the top plate of the south truss between panel points 14E* and 15E. Twelve holes in the top flange plate, up to 6" x 2" in size, remain in the south bottom truss chord between panel points 3E* and 3E (see Photo No. 9). A temporary repair has been

performed by filling the holes with caulk and painting over the deteriorated area. Paint failure has also been noted at localized areas.

Main and Intermediate Floorbeams

The main and intermediate floorbeams comprising Spans 1 through 3 are generally in good condition. The top flange of the floorbeams is typically covered with roadway debris and sand blasting material below the median openings and the curb lines. As of result of the debris accumulation a large number of rivet heads (approximately 1500 total rivets) exhibit greater than 50% section loss and the top flange exhibits moderate to severe corrosion with minor losses. The rivet heads at the bottom flange of the floorbeams below the median areas also exhibit a large number of rivet heads with greater than 50% section loss (approximately 1000 total rivets). Numerous floorbeams exhibit moderate to severe corrosion with localized pitting up to 3/16" deep along the top and bottom flanges below the deck joints. The paint system along the floorbeams directly below the median opening is in fair condition. The main floorbeams exhibit areas of peeling paint, spot rust and moderate to severe corrosion with minor section losses and the intermediate floorbeams between panel points exhibit similar conditions but to a lesser extent.

There are six steel floorbeams/capbeams within the New York Anchorage that are in generally good condition. The areas of corrosion and pitting along the lower flange, bottom of web and web stiffener angles of floorbeam/capbeam 4 was cleaned and painted and numerous deteriorated rivets were replaced with high strength bolts.

Stringers

- Spans 1, 2, and 3

The stringers and diaphragms in Spans 1 through 3 are generally in good condition. Horizontal cracks were previously noted at the ends of various stringers typically occurring at the web/top flange interface. Crack arrestor holes were drilled at the end of most cracks. No additional crack propagation was observed during this inspection, including locations with arrestor holes. (Refer to Appendix A for documentation and location of the five cracked interior stringers without crack arrestor holes).

At the west side of floorbeam 38E in Span 2, the bottom of stringer S4 web is severely corroded and exhibits a 1/2" diameter hole (see Photo No. 7). Above floorbeam 1E in Span 3, stringers S6 and S14 exhibit severe corrosion to the ends of webs with up to 3" x 1" holes (see Photo No. 10). Severe corrosion with a large 2" x 10" hole was found along the top flange of fascia stringer S1 between floorbeams 7E* and 8E in Span 3 (see Photo No. 13). Also, severe corrosion with up to 50% loss and large holes was found at the web and both flanges of fascia stringers S1 and S18 between floorbeams 1E* and 1E in Span 3 (see Photo No. 17).

The paint system for fascia stringers S1 and S18 remains in fair to poor condition in all three spans. Moderate to severe corrosion was noted in the web at the ends of many fascia stringers and at the stringer support angels, end diaphragms and vertical floorbeam stiffeners at the floorbeam connections. Numerous fascia stringers exhibit

moderate to severe corrosion holes varying in size from 1/2" diameter to 6" long x 5/8" wide, and crack arrestor holes were previously drilled at 15 stringer locations. Since the fascia stringers do not carry roadway live load and only support half of the safety walk load, these conditions were recommended to be repaired on a routine basis. (Refer to Appendix C for documentation and location of severely corroded stringers with crack arrestor holes).

At the east end of Span 3, all the previously deteriorated end diaphragms over floorbeam 1E were replaced with new diaphragms. Numerous diaphragms supporting the safety walks and median catwalks exhibit moderate to severe corrosion with small holes at several locations and the diaphragms under the median area in Spans 1 and 3 are severely corroded.

An extensive heavy accumulation of debris remains on top of bridge seat at the New Jersey anchorage with up to 3 inches of debris accumulated on the top of bottom flange of stringers S1, S2, S8, S9, S15, and S16 between floorbeams 2W and 3W in span 1. Extensive debris accumulation was also observed on the top of all floorbeams directly below the safety walks and median opening in spans 1 through 3. The debris creates a corrosive environment and advances the deterioration rate of the bearings, stringers, floorbeams, and connections.

- Spans 4 through 9

The stringers and diaphragms in Spans 4 through 9 are generally in good condition. Long-term water leakage below expansion joints at the end of spans 3, 6, and 9 has caused advanced deterioration to the stringers below. Above floorbeam 1E in Span 4, the ends of stringers exhibit severe corrosion with large holes in the web and top flange at stringers S2, S3, S4, S6, S7, S10 and S11 (see Photo No. 14). Above Capbeam 4, at the west end of Span 7, the web of stringers S1, S5 and S8 exhibit severe corrosion with up to 11" high x 4" wide hole (see Photo No. 15). At the east end of stringers S11, S12, and S13 in Span 9, severe corrosion was noted at the bottom of web over the bearing with up to 1.5" high x 4" wide holes and an adjacent 5" long corrosion crack was also evident in the base of web at stringer S12 (see Photo No. 16). All stringers at the east end of span 9 bear on small concrete pedestals, several of which exhibit small corner spalls and fine cracking, however, no undermining of the bearing plates were evident.

- Spans 10 and 11

The stringers and diaphragms in Spans 10 and 11 are generally in good condition. Concrete pedestals on the top on New York Anchorage support each of the continuous stringers. Cracks and spalls were observed at approximately 30% of the 126 pedestals in these two spans. Nineteen pedestals exhibit moderate to severe spalls and small voids with up to 10% undermining below stringer bearing plate. In addition, the concrete pedestals exhibit disintegrated and severely scaled concrete in

the remaining portion, most notably below stringers S10 and S16 in span 10 (see Photo Nos. 6, 8, 11, 12, 19, 20, 22 and 23). There are two out of four anchor bolts sheared at the stringer S16 bearing pedestal in Span 11 (see Photo No. 21).

There is extensive debris accumulation on the top of the New York Anchorage in Span 10 and 11. The debris creates a corrosive environment for the steel superstructure and partially restricts access for maintenance and inspection activities.

Underside of Deck

The underside of the concrete filled steel grid deck in Spans 1 through 3 is generally in good condition. The stay-in-place (S.I.P.) forms observed at the underside of deck in Spans 1 through 3 exhibit peeling paint with light to moderate corrosion and few locations exhibit up to 100% section loss. These areas typically occur at drain tubes, at the short cantilevered sections of the deck over the fascias along median stringers, and at other random locations. Voids were observed in the underside of the steel grid deck particularly at the short cantilevered sections of the deck over the fascia and median stringers and at few other random locations. The voids have exposed the main steel bearing bars and distribution bars of the steel grid, many of which exhibit light to moderate corrosion. At one location, spalling of the concrete filled steel grid deck was observed, however, since the integrity of the steel grid decking has not been compromised, these concrete deficiencies are not structurally significant. The underside of deck exhibits a large spall 2’ x 2’ x 2” deep east of panel point 16E*.

The steel finger joint plates at panel point 1E remain jammed against each other restricting movement (see Photo No. 25).

The underside of deck in the New York Anchorage (Spans 4 through 11) is in generally in good condition. The S.I.P. forms exhibit areas of 100% section loss exposing deteriorated concrete at several locations in Spans 7 and 8, however, the reinforced concrete deck is in good condition.

Miscellaneous Framing

The miscellaneous framing is in generally good condition. The lateral bracing gusset plates, the roadway curbs and barriers, the open median area framing and the closed “turn around” framing exhibit localized areas of moderate to heavy corrosion with light to moderate pitting.

III. Inspection Findings, Conclusions and Recommendations

C. TOP OF DECK (SPANS 1 THROUGH 11)

Wearing Surface and Roadway Elements

The wearing surface is in overall good condition. An asphalt-wearing surface exists throughout both directions of the lower level roadways with the exception of Spans 4 through 9, 10 and 11 of the westbound roadway which have a bare concrete wearing surface. The asphalt-wearing surface in both roadways is generally in good condition. Spans 1 through 3 exhibit numerous potholes and areas of raveling in the eastbound asphalt wearing surface, mostly near the deck joints. The westbound asphalt wearing surface was repaved since the previous inspection. The concrete wearing surface in Spans 4 through 9 is in generally good condition. Several areas of the concrete wearing surface within the westbound roadway of Spans 10 and 11 were patched with asphalt, but still exhibit spalled and cracked areas.

The deck joints are in overall good condition. The expansion joints at the eastbound and westbound roadways exhibit portions of missing or deteriorated joint filler material. For further detail of these expansion joints and missing/deteriorated lengths, refer to the "Deficiency and Photo Location Plans" (see Dwg. Nos. TD-2 through TD-6). At the east end of Span 9, the joint filler material is missing for nearly the entire width of the bridge (see Photo No. 24). The expansion joint deficiencies discussed above allow water to infiltrate onto the structural elements below.

The north and south safety walks along the fascias and the access catwalks and stairs are generally in good condition. The north and south safety walk grating is crushed and broken over areas of less than 3 sq. ft. at numerous locations and the hold down clips connecting the grating to the steel beam below are missing or loose at several locations. At the New York tower, the north safety walk plate has uplifted up to 1-1/2" due to pack rust and a steel cable is looped through the north safety walk grating, both creating tripping hazards (see Photo Nos. 41 and 43). One of three steel grate steps for the medium access at the New Jersey Tower is loose due to missing connection clips (see Photo No. 44). There is a 2' x 2' opening in the south safety walk and a 2' long x 4" wide section of the grating was cut out at the New Jersey Tower (See Photo No. 48).

The steel traffic barriers and rails with integrally constructed steel curbs are generally in good to fair condition. The north and south traffic barriers and curbs exhibit areas of moderate to severe pitting with localized through holes in Spans 1 through 3. An area of collapsed curb with severe corrosion and numerous holes remain at Panel Point 14W near the New Jersey Tower (see Photo No. 42). Curb plates, used to close the space between the base of the steel curb and the deck were found detached or partially detached at 3 locations (see Photo No. 37). Several previously noted loose curb plates were removed at 6 locations since the last inspection. The south railing is detached from the rail post due to collision at Panel Point 1E (see Photo No. 39).

The bridge railing at the outside of the safety walks and the railings at the various access catwalks and stairs are in generally good condition. At the catwalks that cross the open median, one or two of four total handrails are missing at several locations (see Photo No. 38). The safety walk railing is detached from the post at few locations. A weld is broken at the base of a handrail post at the north safety walk staircase near the west abutment (see Photo No. 34).

Chain link security fencing is generally in good condition. A severely corroded bottom fence rail with broken connections at the east and west fence posts remains along the north side of the westbound roadway in Span 10 (see Photo No. 46).

Numerous deficiencies were found at the debris netting spanning the open median including holes in the netting (see Photo No. 47), detached or missing connection clips, partially detached U-bolts and broken welds at the aluminum support rails.

Utilities

The conduits extending along the backside of the north and south bridge railing in Spans 1 through 3 exhibit several broken or missing support brackets. However, due to the numerous supports for these conduits, this condition is not significant. Water main hangers and conduit hangers are deteriorated below the south safety walk near the west abutment causing the conduits to sag and the conduit joints to open (see Photo Nos. 33 and 35). A conduit support bracket is severely corroded at floorbeam 3W (see Photo No. 36). There are numerous electrical boxes attached to the rear side of the roadway barrier along the north and south safety walks that are missing and there is a broken conduit along the south safety walk at the New Jersey Tower (see Photo Nos. 40 and 45). These areas are considered accessible to the public / stranded motorists.

D. TRAVELERS

There are four travelers suspended beneath the lower level that are used for access to the underside of lower level roadway for inspection and maintenance / repair purposes. Each traveler is suspended from two traveler beams (similar to crane rails) that are connected to the floorbeams. The travelers are propelled along the traveler beams by wheels powered by electric motors (See Traveler Details on Drawing T2).

At the time of the inspection three of the four travelers were operational. The New York Main Span traveler remains removed from service (See Photo No. 28). An inspection of each traveler was performed prior to use and an inspection of each traveler was completed to verify the status of all previously recommended repairs. The other three travelers were used to complete the condition survey of the lower level inspections.

The traveler beams, located below stringers S4 and S15, are in good condition. No deficiencies were observed at the welds that join the flanges to the webs of these beams and no significant deficiencies were noted for the traveler rail splices.

The top flange of the traveler beams exhibit light to moderate corrosion with localized areas of severe corrosion with deliminations. The traveler beams are suspended from each floorbeam with four hanger rods which were wrapped in plastic tape after their installation. In Span 1, the tape was previously removed by sandblasting during bridge painting. Moisture trapped by the tape has continued to the deterioration of the hanger rods in Spans 2 and 3 resulting in measured losses of up to 30%. Moderate corrosion was also observed at the nuts and washers of the hanger rod connections. Testing performed in 2009 on the most seriously deteriorated rods indicated the rods, in their current deteriorated condition, have a sufficient factor of safety to support the travelers.

The hanger rods are connected to the floorbeams with an inverted tee section attached to stiffener plates on the web of the beam. The flange of the hanger tee support was roughly cut and coped to allow the tee stem to be connected to the stiffener. At several locations, an inspection of the coped area revealed as-built cuts that extend vertically from the cope into the web of the tee resulting from the coping process, however these cut areas are not structurally significant. However, at floorbeams 23E, 40W and 42W the stems of the hanger tee supports exhibit approximately 50% section loss which is a significant concern and is recommended for Priority repair (see Photo Nos. 26, 29 and 30). The lateral cross bracing angles between the main support truss chords typically exhibit moderate to severe corrosion with large holes noted at six locations (see Photo No. 31).

The vertical movement dampening springs and bolts are improperly aligned at numerous locations throughout Spans 1 through 3. The bolts were considered to be misaligned when the tapered center of the bolt was off the edge of the bearing plate attached to the top flange of the traveler beam.

The New Jersey Back Span, New Jersey Main Span and New York Main Span travelers exhibit moderate to severe corrosion with section loss at several main truss members (see Photo Nos. 27 and 32). These deteriorated areas are generally located near the center of the traveler directly below the lower level median opening. The chain link safety netting support angles and/or edge beams exhibit severe corrosion with localized holes at all four travelers (see Photo No. 52). Broken welds exist at the chain link fence posts and rails of the travelers, and various hinges or connection screws for hinges were missing at the access door grates (see Photo Nos. 49 and 50). Loose strap bolts and missing bolts that connect the chain link safety netting to the traveler framing were noted at 169 total locations at all four travelers (see Photo No. 54). The New York Main Span traveler has 9 holes of various sizes in the chain link safety netting, and the panels are brittle and prone to fracture due to their advanced age (see Photo No. 51). There is a missing horizontal rail angle at the truss platform below the floor access hatch at the New York Back Span traveler (see Photo No. 53).

III. Inspection Findings, Conclusions and Recommendations

E. RECOMMENDATIONS

Immediate: None.

Priority: The following priority repairs are recommended:

No.	Description	Dwg. No.
Underside of Deck		
*1	Repair spalled concrete pedestal at the east end of span 11 in the New York Anchorage. *(Photo 6)* (1 Location)	SDU-7
*2	Repair 1/2″ diameter hole in the bottom of web of stringer S4 at panel point 38E. *(Photo 7)* (1 Location)	SDU-5
*3	Repair spalled and cracked concrete pedestal causing minor undermining of the bearing under stringer S10 at the east end of span 10. Anchor bolts are partially exposed. *(Photo 8)* (1 Location)	SDU-7
*4	Repair twelve (12) up to 6" x 2" holes in the top plate of the south bottom truss chord between panel points 3E* and 3E. *(Photo 9)* (1 Location) Temporary repair performed by filling holes with caulk and repainting.	SDU-7
*5	Repair severe corroded stringer webs with holes above the bearings at stringers S6 and S14 above panel point 1E. *(Photo 10)* (2 Locations)	SDU-7
*6	Repair spalled and cracked concrete pedestal causing minor undermining of the bearing under stringer S16 at the west end of Span 10 and under stringer S14 at the east end of Span 11. *(Photos 11 & 12)* (2 Locations)	SDU-7
*7	Repair the severely corroded stringer S1, between panel points 7E* and 8E, with 50% section loss on top flange near the quarter point. *(Photo 13)* (1 Location)	SDU-7
*8	Repair severely corroded top flange and web with holes in the web at the bearings of stringers S2, S3, S4, S6, S7, S10 and S11, located at the east side of floorbeam 1E. *(Photo 14)* (7 Locations)	SDU-7
*9	Repair severely corroded webs with holes near the bearing of stringers S1, S5, and S8 located at the west end of span 7, and at stringers S11, S12 and S13, including an adjacent corrosion crack at stringer S12, located at the east end of span 9 *(Photos 15 & 16)* (6 Locations)	SDU-7
*10	Repair the severely corroded stringers S1 and S18 with web holes and 50% section loss of bottom flange near the 1/3 span between panel points 1E* and 1E. *(Photo 17)* (2 Locations)	SDU-7

III. Inspection Findings, Conclusions and Recommendations

*11	Repair severe corroded stringer web, with holes around the bearing stiffening angles, of stringer S1 at the east side of panel point 26W*. *(Photo 18)* (1 Location)	SDU-4
*12	Repair cracked and spalled concrete pedestals causing undermining of the bearing under stringer S13, S15 and S16 at the west end of Span 10 and under stringer S4, S7, S8, S10, S15 and S18 at the east end of span 11. *(Photos 19 & 20)* (9 Locations)	SDU-7
*13	Repair the 2 of 4 broken anchor bolts at the bearing of stringer S16 located at the east end of span 11. *(Photo 21)* (1 Location)	SDU-7
14	Repair spalled and cracked concrete pedestals, with or without exposed anchor bolts and/or rebar, causing minor undermining of the bearing under stringer S9 and S15 of span 10, under stringer S9 at the east end of span 11, and at 3 locations under stringer S12 in span 11. *(Photos 22 & 23)* (6 Locations).	SDU-7
Top of Deck		
*15	Repair/Replace missing expansion joint filler material at span 9. *(Photo 24)* (1 Location)	TD-6
*16	Repair the jammed finger joint plates at panel point 1E. *(Photo 25)* (1 Location).	TD-6
Travelers		
*17	New Jersey and New York Main Span Travelers - repair greater than 50% section loss in vertical stem of connection tee for south traveler hanger at panel point 40W that supports the track for the Main Span Travelers. *(Photo 26)* (1 Location)	SDU-5
*18	New Jersey Main Span Traveler – repair moderate to severe section loss at main support truss members. One new location added. *(Photo 27)* (13 Locations)	T-3
*19	New York Main Span Traveler – repair moderate to severe section loss at main support truss members. Additional 5 new locations added. *(Photo 28)* (95 Locations)	T-4
*20	New Jersey and New York Main Span Travelers - repair 50% section loss in vertical stem of connection tee that supports the south track at panel point 23E and the north track at panel point 42W for the Main Span Travelers. *(Photos 29 and 30)* (2 Locations)	SDU-5 and SDU-6
*21	New Jersey Main Span Traveler – repair moderate to severe section loss at cross bracings between the main support truss top chords. *(Photo 31)* (6 Locations)	T-3
22	New Jersey Back Span Traveler – repair moderate to severe section loss at main support truss members. *(Photo 32)* (5 Locations)	T-2
* Previously recommended as a “Priority Repair” in the 2009 inspection report.		

III. Inspection Findings, Conclusions and Recommendations

Safety: The following safety repairs are recommended:

No.	Description	Dwg. No.
Underside of Deck		
1	Replace two detached hangers and repair open joints of the 4-inch diameter electrical conduits with exposed electrical wires near the New Jersey abutment. *(Photo 33)* (1 Location)	SDU-3
2	Repair the broken weld at the base of the west handrail of the north safety walk staircase and broken base at the east handrail of the south safety walk stairs at the New Jersey abutment. *(Photo 34)* (2 Locations)	SDU-3
3	Remove section of abandoned 8" diameter water main with deteriorated clevis hanger. *(Photo 35)* (1 Location)	SDU-3
4	Replace the severely deteriorated steel knee brace support bracket for two 3-inch diameter electrical conduits at Stringer S2, west of floorbeam 3W at span 1. *(Photo 36)* (1 Location)	SDU-3
Top of Deck		
5	Remove partially detached curb plate. *(Photo 37)* (3 Locations)	TD-5 & 6
6	Replace the missing or partially missing railings at the walkways over the open median areas. *(Photo 38)* (8 Locations)	TD-2, TD-3 and TD-5
7	Repair the detached connections of the safety walk railing or bridge railing. *(Photo 39)* (5 Locations)	TD-2, TD-5 and TD-6
8	Repair or replace the missing or loose cover to the electrical panel box with exposed wires attached to the back of the barrier (accessible to the public / stranded motorists) along the north and south safety walks. *(Photo 40)* (29 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
9	Repair or replace the diamond plate safety walk uplifted 1.5 inches creating a tripping hazard at the New York tower. *(Photo 41)* (1 Location)	TD-5
10	Repair the severely deteriorated and collapsed section of steel curb at the south side of the eastbound roadway. *(Photo 42)* (1 Location)	TD-2
11	Remove the cable looped through the safety walk grate from below that creates a tripping hazard at the New York tower. *(Photo 43)* (1 Location)	TD-5
12	Replace the missing stair grate connection clip at the median catwalk at the New Jersey tower *(Photo 44)* (1 Location)	TD-2

13	Repair the broken conduit at the south safety walk at the New Jersey tower (Accessible to the public / stranded motorists). *(Photo 45)* (1 Location)	TD-2
14	Replace the broken bottom rail of the chain link fence panel at the west end of Span 10 along the westbound roadway and east end of Span 11 along the eastbound roadway. *(Photo 46)* (2 Locations)	TD-6
15	Repair or replace the safety netting with large holes at median (6 locations). *(Photo 47)* (6 Locations)	TD-2, TD-4, TD-5 and TD-6
16	Repair the 2' x 2' opening in the north safety walk due to removed conduits and 2' long x 4" wide section of removed safety walk grating at the New Jersey Tower. *(Photo 48)* (1 Location)	TD-2
Travelers		
17	Repair the broken aluminum fence posts and rails and repair welds between the fence fabric connection plates and the posts. *(Photo 49)* (11 Locations)	T-2, T-3, T-4 and T-5
18	Replace missing or broken hinges or hinge screws at access doors in grate floor of the travelers. *(Photo 50)* (5 Locations)	T-2, T-3 and T-4
19	Repair or replace the safety netting with large holes at the New York main span traveler. *(Photo 51)* (9 Locations)	T-4
20	Repair the moderate to severe section loss at W8's and 3" x 3" L's that support the safety netting for the travelers. *(Photo 52)* (35 Locations)	T-2, T-3, T-4 and T-5
21	Replace the missing horizontal rail angle at the New York Back Span Traveler truss platform below the floor access hatch. *(Photo 53)* (1 Location)	T-5
22	Tighten or replace the loose or missing bolts for safety netting straps and replace the missing safety netting straps and bolts. *(Photo 54)* (169 Locations)	T-2, T-3, T-4 and T-5

Routine: The following routine repairs are recommended:

No.	Description	Dwg. No.
Underside of Deck		
1	Replace the missing rivets or bolts at the top and/or bottom flange of the floorbeams, top and/or bottom of the bottom truss chord, or the bottom truss chord gusset plate. (# indicates the number of missing bolts or rivets). (7 Locations)	SDU-3
2	Repair the cracks and holes in the fascia stringer webs, S1 and S18, below the stringer support angle, diaphragms or vertical floorbeam stiffeners. (64 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7

III. Inspection Findings, Conclusions and Recommendations

3	Repair the vertical misalignment of damper bolt when the bolt is off the damper bolt base plate. Also repair or replace broken or bent damper bolts, loose nuts on damper bolts, damper bolts not in contact with damper bolt base plate and broken damper bolt springs. (186 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
4	Replace the sheared, fractured or missing bolts at the bottom truss chord. # indicates the number of sheared, fractured or missing bolts (3 Locations)	SDU-3 and SDU-6
5	Tighten the loose bolts and replace missing nuts and bolts at stringer web connections to the floorbeams (5 bolts per connection except 4 bolts per connection where the stringer tie-down has been modified). # indicates the number of loose bolts. (5 Locations)	SDU-3, SDU-5 and SDU-6
6	Remove the roadway debris accumulation that is partially covering the heavily rusted bearings at the New Jersey bridge seat and repair the top of the severely rusted bottom flange and web, with up to 1/8" pitting, of the stringer at the New Jersey back span. (11 Locations)	SDU-3
7	Repair the less than 1 square inch hole in the insulating plastic cover of the power supply line for the traveler near panel point 36E. (1 Location)	SDU-5
8	Reconnect the bearing strap plate at the south bearing of floorbeam 1E. (1 Location)	SDU-7
9	Clean the light to medium rust from the top of the top flange of both traveler beams and paint the top of the beam. Remove protective plastic tape where appropriate, clean the light to heavy rust and paint the hanger rod assemblies. (General condition, location not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
10	Repair or replace the heavily rusted horizontal stiffener plates with more than 50% areas of section loss adjacent to the traveler hanger tee. (71 Locations)	SDU-3, SDU-4, SDU-5, and SDU-6
11	Repair the cracked welds between a finger and a finger bar or a cracked finger bar at the tower deck joints. (7 Locations)	SDU-3 and SDU-6
12	Tighten the loose bolts at the top or bottom flange of the floorbeams. # indicates the number of loose bolts. (2 Locations)	SDU-3 and SDU-5
13	Repair deteriorated trapeze hanger supporting three electrical conduits. (1 Location)	SDU-3
14	Remove the abandoned electrical conduits with detached or missing flange attachment clips or provide proper support west of floorbeams 15W and 29W. (2 Locations).	SDU-3 and SDU-4

15	Replace rivets and/or bolts with greater than 50% loss of section of the rivet head or bolt head/nut at the top flange of the floorbeams. # indicates the number of deteriorated rivets or bolts. (297 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
16	Repair the heavy corrosion with random holes in channel supports of abandoned platforms attached to the bottom of the floorbeams. Alternately remove the platforms. (5 Locations)	SDU-3, SDU-6 and SDU-7
17	Repair the heavy rust with small holes in the lateral bracing between floorbeams. (2 Locations)	SDU-5 and SDU-6
18	Repair the 3 inch x 1 inch hole in the top plate of the stiffening truss bottom chord between panel points 14E and 15E. (1 Location)	SDU-6
19	Repair detached flange clips, replace missing flange clips and repair detached 1-1/2" channel support for electrical conduits. (10 Locations)	SDU-3, SDU-4, SDU-6 and SDU-7
20	Repair the deteriorated stone masonry at the south end of the New Jersey abutment. (1 Location)	SDU-3
21	Remove the accumulation of sand blasting medium and debris on top of the floorbeams beneath the median openings and at the outer curb lines. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
22	Repair the spalled concrete in underside of concrete filled steel deck grating visible through the deteriorated steel stay-in-place forms. (8 Locations)	SDU-6 and SDU-7
23	Clean and paint the moderate pitting and rusting of steel angles of diagonal, longitudinal bracing members between floorbeams or bracing at gusset plate connection to floorbeams particularly below safety walks and open median. Also disassemble built-up bracing members and connections with pack rust between components, clean and paint steel contact surfaces and reassemble with new bolted connections. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
24	Clean and paint the moderate to severe rusting and pitting with minor section loss, paint failure at stringers, stringer web connection plates, diaphragms, pin supports at cap beams (New York anchorage) beneath the median openings and at the outer curb lines (General condition, locations not shown on drawings).	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
25	Repair the cracked and/or spalled concrete pedestals with less than 10% undermining at the base plates in Spans 10 & 11 at the New York anchorage. (18 Locations)	SDU-7
26	Clean the debris from the south drainage screen and replace the north drainage screen at the north and south sides of Cap Beam 6 of Span 8 at the New York anchorage. (2 Locations)	SDU-7

27	Clean debris and clean and paint the moderately to severely rusted bearings at the north and south ends of Cap Beam 1E at the New York anchorage. (2 Locations)	SDU-7
28	Clean and paint the heavily rusted bearings in Spans 10 & 11 at the New York anchorage. (1 Location)	SDU-7
29	Repair the 2.5 ft wide x 1.0 ft long x 1.0 ft deep spalls at the south pedestal and north pedestal under Cap Beam 1E at the New York anchorage (no undermining of the bearing was noted). (2 Locations)	SDU-7
30	Clean and paint the moderately rusted bearings with up to 1/2" uplift of the stringer (1/2" maximum measured uplift of stringers 5 at the 14E bearing) due to pack rust at the towers. (56 Locations)	SDU-3 and SDU-6
31	Replace the missing drainpipe at drain hole in top flange of bottom chord of stiffening truss. (99 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
32	Clean and paint the top and bottom plates of the bottom chord of the stiffening truss and gusset plates at connections. Also replace missing caulk at the joint between the top and bottom plates and the web plates of the same members. In addition, install methods to prevent ponding on top of the top chord. (197 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
33	Repair the severely corroded diaphragm (with or without holes and up to 1/8" loss) that support the safety walk or median. # indicates the number diaphragms between the stringers. (7 Locations)	SDU-3 and SDU-4
34	Replace rivets with greater than 50% loss of section of the rivet heads along bottom chord of the stiffening truss or gusset plates at connections. (# indicates the number of deteriorated rivet heads). (68 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
35	Repair the deteriorated web area with up to 1/16" loss at the bottom of the stringer at the floorbeam connection. (17 Locations)	SDU-3, SDU-4, SDU-5, and SDU-6
36	Repair the deteriorated web area and small holes in the stringer over Floorbeam 1E. (7 Locations)	SDU-7
37	Divert flow from three abandoned water pipe sleeves at the north end of the New Jersey abutment backwall to prevent water from being discharged onto the bridge seat. (1 Location)	SDU-3
38	Clean and paint the light to severe rust with minor section loss at stringers S1 and S18 and all safety walk support beams. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7

39	Remove debris, clean and paint all floorbeams. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
40	Repair the 1 inch diameter hole in the top of the bottom chord of the stiffening truss between panel points 8E* and 9E. (1 Location)	SDU-7
41	Remove and replace the cracked and bulging neoprene pads at the stringer end web connection over the floorbeam or at the anchor bolt between the stringer and floorbeam. (114 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
42	Repair the severely corroded diaphragm with hole for the crosswalk. (2 Locations).	SDU-4
43	Remove the accumulated debris and clean and paint the light localized rust on the interior surfaces of the bottom truss chords. In addition, install methods to prevent ponding inside the bottom chord. (8 Locations)	SDU-3, SDU-4, SDU-5 and SDU-7
44	Remove the warped/bulging connection plates, due to pack rust, between stringer webs over floorbeams. Clean and paint steel surfaces and reassemble the connections with new bolts. # indicates the number of missing bolts. (27 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
45	Direct the scupper drain tube flows away from contact with structural steel members. (1 Location)	SDU-3
46	Replace the deteriorated deck joint material hanging from the underside of the joint. (7 Locations)	SDU-3, SDU-6 and SDU-7
47	Remove the heavy accumulation of debris on tower catwalks below the deck joints. (4 Locations)	SDU-3 and SDU-6
48	Repair the detached section of lower hand rail of two rail system at west New York tower catwalk (1 Location)	SDU-6
49	Remove the accumulated debris and clean and paint the light localized rust on the interior surfaces at the gusset plate connection of the bottom truss chord to the truss verticals or diagonals. In addition install methods to prevent ponding inside the connection area. (39 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
50	Clean localized pack rust, up to 3/4" thick, between the cover plates of the top flange of the floorbeam. (327 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
51	Clean and paint all the bearings at panel points 11W and 14W (General condition). (1 Location)	SDU-3

52	Repair the cracked weld between the bottom flange of stringers S4 to S6 and the bearing plate at panel point 11E. (3 Locations)	SDU-6
53	Replace rivets or bolts with greater than 50% loss of section of the rivet heads and/or bolt heads/nuts at the bottom flanges of the floorbeams. # indicates the number of deteriorated rivet or bolts. (137 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
54	Clean the medium to heavy rust without significant section loss from the web of the hanger tee or hanger rods. (30 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
55	Repair the deteriorated gusset plate at the connection of the bottom chord to the diagonals of the stiffening truss. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
56	Repair the random loose or deteriorated bolts at the gusset plates at the north stiffening truss at panel point 4E*. (1 Locations)	SDU-7
57	Remove the debris accumulated around the bearing pedestals in Spans 10 and 11. (1 Location)	SDU-7
58	Repair one of four broken anchor bolts at the bearing of stringers S2 and S3 at the west end of Span 10. (2 Locations)	SDU-7
59	Clean pack rust causing bulging between the bottom cover plate and bottom flange angles of the bottom chord of the stiffening truss and paint. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
60	Seal the holes at the anchor bolts connecting the Jersey Barrier to the deck in Spans 10 and 11 to prevent water intrusion into the deck. (1 Location)	SDU-7
61	Repair or remove the disconnected, abandoned or deteriorated electrical conduits or junction box supports. (3 Locations)	SDU-3, SDU-6 and SDU-7
62	Replace the sheared tie down bolts for the deck finger joint. (1 Location)	SDU-6
63	Repair the areas of mutual wear between the stringer lower flange and bearing plate over the floorbeam with up to 1/8" gap and minor vertical movement of the stringer under live load. (16 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
64	Remove the debris on the windlock and clean and paint the moderately to severely corroded windlock members. (2 Locations)	SDU-3 and SDU-7
65	Repair the areas of arrested metal loss with up to 1/4" diameter holes in the base of the web of floorbeam 4 at spans 6 and 7 between stringers S4 to S6. (1 Location)	SDU-7

III. Inspection Findings, Conclusions and Recommendations

Top of Deck		
66	Repair holes at top of railing/guiderail support. (43 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
67	Repair or replace missing and broken support straps for traffic signs. # indicates ratio of broken missing support strap to total number of required support straps. (1 Location)	TD-5
68	Repair corrosion holes in sliding cover plate over westbound roadway finger joint at panel point 2W. (1 location)	TD-2
69	Replace the broken or detached clips and/or screws attaching the safety walk grating to the steel framing below. (13 locations)	TD-2, TD-3, TD-4 and TD-5
70	Install panel point identification plates at vertical truss members. (73 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
71	Replace missing or deteriorated joint filler. # indicates the total linear feet of joint material to be replaced. (97 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
72	Repair water main tie down connections with loose or missing nuts and/or bolts at south safety walk. (127 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
73	Repair loose bolt at bottom of traffic sign connection to curb. (2 Locations)	TD-4
74	Repair broken weld or coupling at corner connection of debris net fence support rails. (2 Locations)	TD-2 and TD-5
75	Replace missing curb plate. (5 Locations)	TD-2 and TD-5
76	Repair spalls with or without exposed rusted steel reinforcement at tunnel walls, concrete curbs or pavement. (8 Locations)	TD-2 and TD-6
77	Replace severely corroded steel diamond plate with holes at south safety walk. (1 Locations)	TD-5
78	Clean debris from safety walk and debris netting in median, repair holes or damaged debris netting; repair debris net clips detached, missing, missing nuts; repair broken debris net rail u-bolts supports or u-bolts with missing or backed off nuts; repair detached debris net connections to tower columns. (General condition).	TD-2, TD-3, TD-4, TD-5 and TD-6

79	Repair, remove or replace missing condulette covers, open junction box covers, open or loose outlet covers, open blue light fixtures, open light fixtures, detached conduit couplings or detached conduit connections to electrical junction box with exposed wires in inaccessible areas. (4 Locations).	TD-2
80	Provide support for unsupported bridge railing. (1 Location)	TD-6
81	Repair the broken conduit coupling without exposed wires, broken conduit ground strap or broken conduit support clips at conduits attached to the back of the bridge rail. (182 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
82	Repair cracks and scaling at south of median in Spans 5 & 7. (1 Locations).	TD-6
83	Repair cracks in concrete curb at median. (2 Locations)	TD-6
84	Repair impact damage to steel median barrier. (1 Location)	TD-6
85	Replace missing sign. (1 Location)	TD-6
86	Replace 3 missing bolts at bottom plate connection of downspout tube at panel point 18W. (1 Location)	TD-2
87	Repair impact damage to south bridge rail post near panel point 22W. (1 Location)	TD-2
88	Repair holes in the curbs and vertical traffic barriers, repair the pitting of steel railings, curbs and vertical traffic barriers. (183 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
89	Replace missing downspout anchor bolt at south safety walk at panel points 17E and 18W. (2 Locations)	TD-2 and TD-5
90	Clean and paint medium rust at access stairs to span 9 at the south safety walk. (1 Location)	TD-6
91	Repair the potholes or severe raveling in the asphalt wearing surface. (108 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6
92	Repair or replace the damaged safety walk grating over areas measuring less than 3 square feet. (23 Locations)	TD-2, TD-3, TD-4 and TD-5
93	Repair broken hinge to access ladder hatch at median between panel points 14W-15W. (1 Location)	TD-2
94	Replace 1 of 2 light fixture connections missing at truss member at panel point 3W. (1 Location)	TD-2

III. Inspection Findings, Conclusions and Recommendations

95	Replace the missing screws/bolts at to cover of electrical panel box attached to the back of the north roadway barrier at panel points 10W and 26W*. (# indicates the total number of missing bolts). (2 Locations)	TD-2 and TD-3
Travelers		
96	Repair detached flange clips supporting electrical conduits. Properly support electrical conduit suspended with rope hanger and conduit cantilevered 8 feet without support. (4 Locations)	T-2
97	Replace approximately 10 SF of damaged floor grate at center of the New Jersey main span traveler at the east side. (1 Location)	T-3
98	Repair disconnected electrical conduit or junction box cover with exposed wires (no pedestrian access). (8 Locations)	T-2, T-3, T4 and T-5

Findings with no Recommendations:

No.	Description	Dwg. No.
Underside of Deck		
1	Exposed underside of steel grid deck due to deteriorated stay-in-place forms exhibits deck voids but without concrete deterioration. (33 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
2	Miscellaneous underside of deck deficiencies: - Exposed underside of deck at the cantilevers of the deck beyond the stringers, due to deteriorated stay-in-place forms, exhibit deck voids but without concrete deterioration. Embedded steel grid deck members, exposed at random locations, exhibit light to moderate rust. - As-built stay-in-place form blow outs (failures). - Exposed underside of deck due to deteriorated stay-in-place forms without voids or notable concrete deterioration. (General conditions, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
3	Loose hanger rods. (94 Locations)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
4	Pack rust at the connection of the hanger tee to the floorbeam at south connection at west side of floorbeam 27W. (1 Location)	SDU-4
5	Broken welds at square washers of hanger rod connections. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7

6	Misaligned "non-vertical" traveller hanger damper bolts that remain contacting the base plate. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
7	As-Built cut at cope in stems of hanger tees. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
8	Heavy rust of the short leg of the angle support for the steel curb with up to 100% loss of section at the deck elevation. (General condition, locations not shown on drawings)	TD-2, TD-3, TD-4, TD-5 and TD-6
9	Extra lengths of joint filler extend beyond edge of deck. (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
10	Steel straps welded to the underside of the steel plate median cover along the bridge centerline are missing or partially detached between floorbeams 2E and 1E elevation. (2 Locations)	SDU-7
11	Heavy pack rust at stringer web connection plates and built-up safety walk grate supports (General condition, locations not shown on drawings)	SDU-3, SDU-4, SDU-5, SDU-6 and SDU-7
12	Pin connection was previously loose and tightened without nut welded to pin and north end of pin hammered to restrict movement of north washer. (9 Locations)	SDU-7
13	Welded cover plates at east end of stringers S4 to S11 in span 9 with cracked welds due to pack rust and the cover plate at stringer S12 remains fallen off. (9 Locations)	SDU-7
Top of Deck		
14	Small electrical box detached from vertical of stiffening truss but supported by conduit. (10 Locations)	TD-2, TD-3, TD-4, TD-5 and TD-6

IV. Deficiency and Photo Location Plans

V. Photographs

George Washington Bridge Lower Level

Photo No.: 1. **Location:** North elevation. **Description:** General view.	
Photo No.: 2. **Location:** Span 1, underside of deck, superstructure and New Jersey Back Span Traveler. **Description:** General view.	

George Washington Bridge Lower Level

Photo No.: 3.

Location: Top of deck in Spans 1 and 2, westbound roadway.

Description: General view from Panel Point 9W.

Photo No.: 4.

Location: Top of deck in Spans 9 , 10 and 11.

Description: General view from Span 11.

George Washington Bridge Lower Level

Photo No.: 5.

Location: Span 2, south stiffening truss at Floorbeam 15W*.

Description: General view of bolted gusset plate along the bottom chord of the stiffening truss.

Photo No.: 6.

Location: Span 11, the concrete pedestal at the east end of Stringer 11.

Description: The pedestal exhibits a large spall with exposed and corroded rebar at the west end with minor undermining of the bearing.

(Priority Repair 1)

George Washington Bridge Lower Level

Photo No.: 7.

Location: Span 2, Stringer S4 at west side of Panel Point 38E.

Description: The bottom of web exhibits severe corrosion with a 1/2" diameter hole at Floorbeam 38E.

(Priority Repair 2)

Photo No.: 8.

Location: Span 10, concrete pedestal at the east end of Stringer S10.

Description: The concrete pedestal is spalled and cracked undermining the bearing. The remaining concrete exhibits severe scaling. Anchor bolts are partially exposed but in good condition.

(Priority Repair 3)

George Washington Bridge Lower Level

Photo No.: 9.

Location: Span 3, top of bottom chord between Panel Points 3E* and 3E of the south stiffening truss.

Description: The top plate is severely pitted with twelve (12) holes up to 6" long x 2" wide and water ponding throughout. Note the temporary repair performed by filling holes with caulk and repainting.

(Priority Repair 4)

Photo No.: 10.

Location: Span 3, east end of Stringer S14 at Floorbeam 1E.

Description: The web at the end of stringer exhibits severe corrosion with holes, including a 3" x 1" hole near the top of the web.

(Priority Repair 5)

George Washington Bridge Lower Level

Photo No.: 11.

Location: Span 10, concrete pedestal at the west end of Stringer S16.

Description: The pedestal is severely spalled with exposed anchor bolts causing undermining of the bearing plate under the stringer. The remaining concrete exhibits severe scaling.

(Priority Repair 6)

Photo No.: 12.

Location: Span 11, concrete pedestal at the east end of Stringer S14.

Description: The pedestal exhibits spalled concrete with exposed rusted rebar causing minor undermining of the bearing plate under the stringer.

(Priority Repair 6)

George Washington Bridge Lower Level

Photo No.: 13.

Location: Span 3, Stringer S1 between Panel Points 8E and 7E*

Description: The top flange exhibits severe corrosion with a 2" x 10" hole near the quarter point from Floorbeam 7E*.

(Priority Repair 7)

Photo No.: 14.

Location: Span 4, end of Stringer S10 over Floorbeam 1E.

Description: The web and top flange are severely corroded with large holes including a 1" high x 6" wide hole in the top of the web.

(Priority Repair 8)

George Washington Bridge Lower Level

Photo No.: 15.

Location: Span 7, Stringer S8 at Capbeam 4.

Description: The end of stringer exhibits severe corrosion with a 4" x 11" hole (arrow) in the web above the bearing.

(Priority Repair 9)

Photo No.: 16.

Location: Span 9, east end of Stringer S12.

Description: The bottom of the web exhibits severe corrosion with a 1.5" x 4" hole and an adjacent 5" long corrosion crack above the bearing.

(Priority Repair 9)

George Washington Bridge Lower Level

Photo No.: 17.

Location: Span 3, Stringer S18 between Panel Points 1E* and 1E.

Description: Fascia stringer S18, which does not support traffic loads, exhibits 50% section loss of both flanges along with large holes at the bottom of the web near mid-span.

(Priority Repair 10)

Photo No.: 18.

Location: Span 2, fascia Stringer S1 at the east side of Floorbeam 26W*.

Description: The stringer web exhibits severe corrosion with section loss and holes along the bearing stiffening angle at the floorbeam connection. Two 3/4" crack arrestor holes were drilled at this location.

(Priority Repair 11)

George Washington Bridge Lower Level

Photo No.: 19.

Location: Span 10, concrete pedestal at the west end of Stringer S16.

Description: The pedestal exhibits spalled concrete with voids, causing minor undermining of the bearing plate under the stringer.

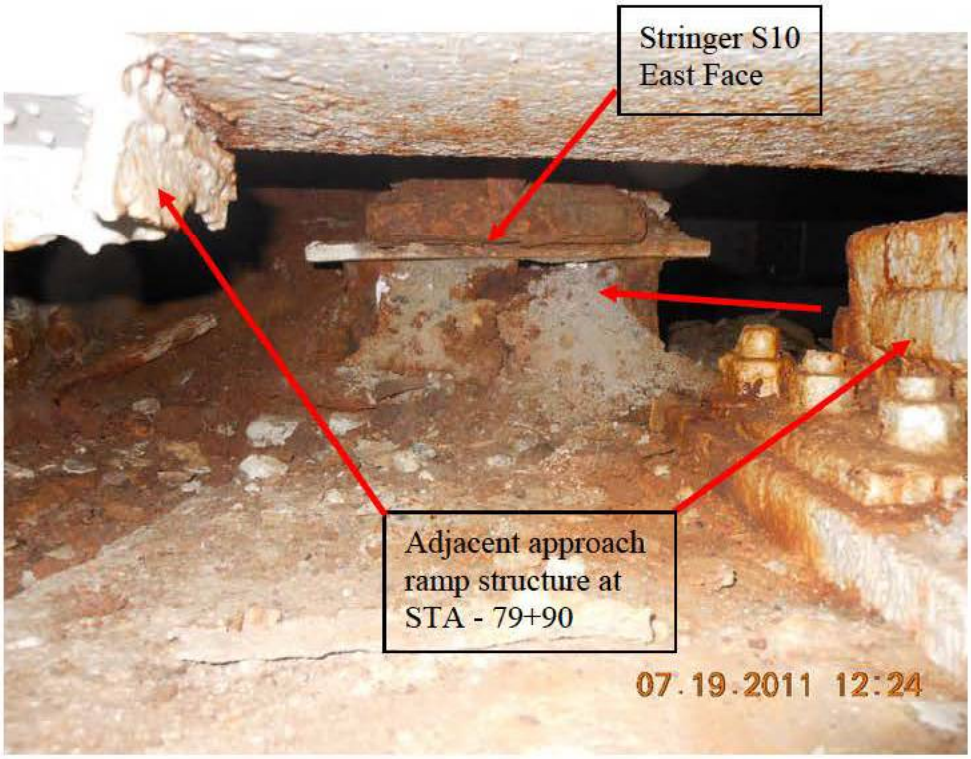
(Priority Repair 12)

Photo No.: 20.

Location: Span 11, concrete pedestal at the east end of Stringer S10.

Description: The pedestal exhibits spalled and cracked concrete causing minor undermining of the bearing plate under the stringer.

(Priority Repair 12)



George Washington Bridge Lower Level

Photo No.: 21.

Location: Span 11, concrete pedestal at the east end of Stringer S16.

Description: One out of two anchor bolts is sheared off on the south side of stringer. Also, one out of two anchor bolts is sheared off on the north side (not shown).

(Priority Repair 13)

Photo No.: 22.

Location: Span 10, concrete pedestal for Stringer 9 bearing at Pedestal 3 from west.

Description: Spalled concrete pedestal below stringer bearing with exposed rusted rebar.

(Priority Repair 14)

George Washington Bridge Lower Level

Photo No.: 23.

Location: Span 10, concrete pedestal for Stringer S15 bearing at Pedestal 3 from west.

Description: Spalled concrete pedestal below stringer bearing with exposed rusted rebar.

(Priority Repair 14)

Photo No.: 24.

Location: Span 9, expansion joint below westbound roadway at the east end of the span between Stringers S13 and S14.

Description: The joint filler material is missing for nearly the entire width of both roadways.

(Priority Repair 15)

George Washington Bridge Lower Level

Photo No.: 25.

Location: Span 3, underside of steel finger joint below the eastbound roadway at Panel Point 1E.

Description: The finger joint plates are shifted and jammed against each other (arrow), restricting movement.

(Priority Repair 16)

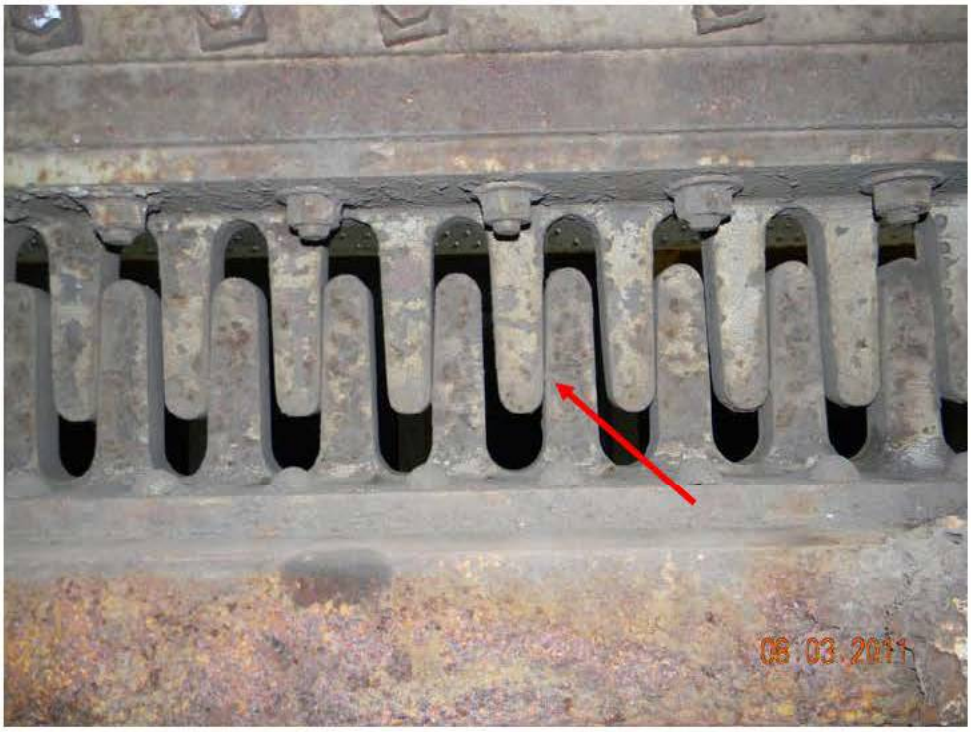


Photo No.: 26.

Location: Span 2, south traveler hanger at the east side of Floorbeam 40W.

Description: The stem of tee shape hanger support exhibits greater than 50% section loss due to active severe corrosion.

(Priority Repair 17)

George Washington Bridge Lower Level

Photo No.: 27.

Location: New Jersey Main Span Traveler.

Description: Severe corrosion to the west bottom member of the traveler support truss.

(Priority Repair 18)

Photo No.: 28.

Location: New York Main Span Traveler.

Description: General View. The traveler is not operational and is enclosed by netting to prevent falling debris. The traveler exhibits moderate to severe corrosion to main support truss members.

(Priority Repair 19)

George Washington Bridge Lower Level

Photo No.: 29.

Location: Span 2, south traveler hanger at the east side of Floorbeam 23E.

Description: The stem of the hanger tee support for the traveler exhibits greater than 50% section loss due to active severe corrosion.

(Priority Repair 20)

Photo No.: 30.

Location: Span 2, north traveler hanger at the west side of Floorbeam 42W.

Description: The stem of the hanger tee support for the traveler exhibits greater than 50% section loss due to active severe corrosion.

(Priority Repair 20)

George Washington Bridge Lower Level

Photo No.: 31.

Location: New Jersey Main Span Traveler.

Description: The bracing angle for the top chord of the traveler truss is severely corroded with large holes.

(Priority Repair 21)

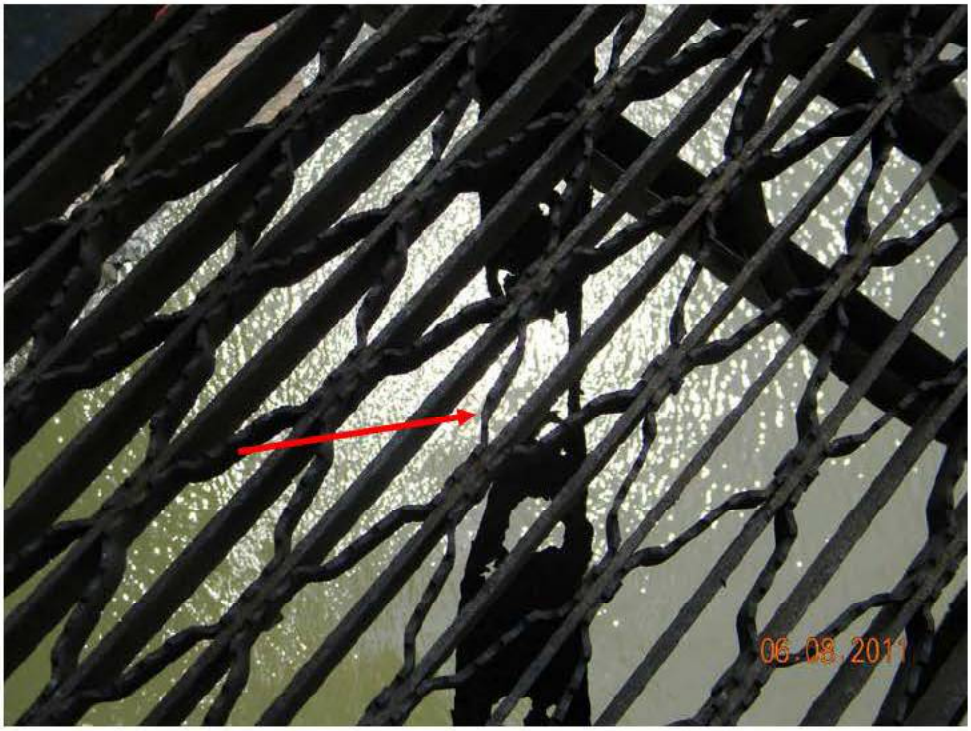


Photo No.: 32.

Location: New Jersey Back Span Traveler.

Description: Moderate to severe section loss at main support truss members.

(Priority Repair 22)

George Washington Bridge Lower Level

Photo No.: 33.

Location: Span 1, electrical conduits at the underside of south safety walk between Panel Points 2W and 2W*.

Description: The trapeze hanger for conduits has detached and causes the conduits to sag.

(Safety Repair 1)

Photo No.: 34.

Location: Span 1, bottom of north safety walk staircase near New Jersey abutment.

Description: The rail post is disconnected at the bottom due to broken weld around the full length of the post base.

(Safety Repair 2)

George Washington Bridge Lower Level

Photo No.: 35.

Location: Span 1, abandoned 8" diameter water main under the south safety walk at Panel Point 2W.

Description: The clevis hanger for the water main is severely deteriorated and the adjacent strap is broken.

(Safety Repair 3)

Photo No.: 36.

Location: Span 1, west face of Floorbeam 3W under Stringer S2.

Description: The conduit knee brace support exhibits severe corrosion with up to 90% section loss to the horizontal support member and one of the conduits is severely corroded.

(Safety Repair 4)

George Washington Bridge Lower Level

Photo No.: 37.

Location: Span 3, north median curb, along west bound roadway between Panel Points 7E and 6E*.

Description: Section of steel curb plate has detached from the steel curb along the median barrier.

(Safety Repair 5)

Photo No.: 38.

Location: Span 2, crossover walkway at Panel Point 27W.

Description: The southwest handrail (one of four) is missing at the stairs from the median barrier to the access catwalk.

(Safety Repair 6)

George Washington Bridge Lower Level

Photo No.: 39.

Location: Span 3, bridge railing of south safety walk at Panel Point 1E.

Description: The rail is detached from the post connection along the top of the roadway barrier.

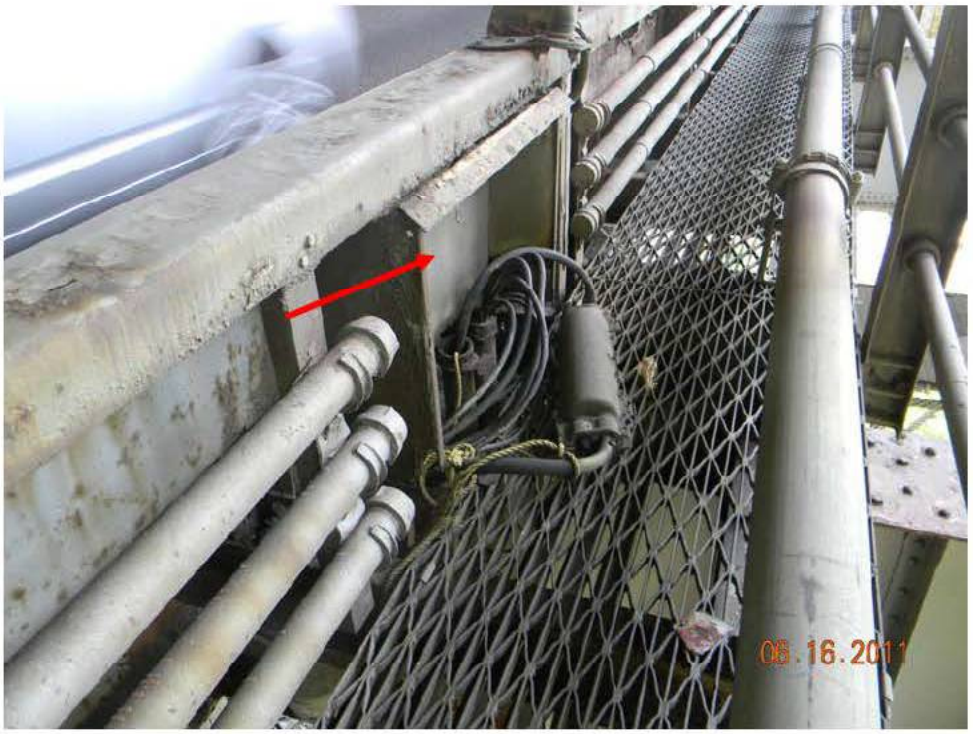
(Safety Repair 7)

Photo No.: 40.

Location: Span 1, south safety walk at Panel Point 3W.

Description: Missing electrical box cover with exposed wires attached to the back of roadway barrier along safety walk (Accessible to public/stranded motorists).

(Safety Repair 8)



George Washington Bridge Lower Level

Photo No.: 41.

Location: Span 2, north safety walk at New York Tower.

Description: The west edge of the safety walk diamond plate is uplifted 1.5" causing a tripping hazard.

(Safety Repair 9)

Photo No.: 42.

Location: Span 2, south curb of eastbound roadway at NJ tower (Panel Point 14W) finger joint.

Description: A four feet long section of steel curb remains collapsed and is severely corroded with numerous holes.

(Safety Repair 10)

George Washington Bridge Lower Level

Photo No.: 43.

Location: Span 2, north safety walk at New York Tower.

Description: There is a cable looped through safety walk grating from below that creates a tripping hazard.

(Safety Repair 11)

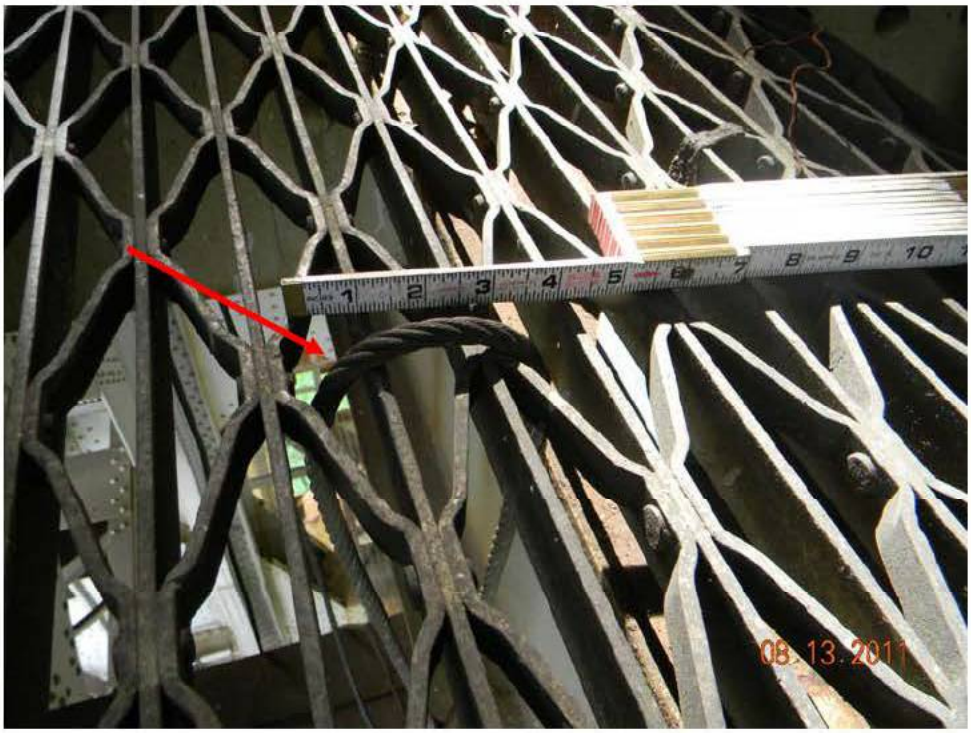


Photo No.: 44.

Location: Span 2, median catwalk step at New Jersey Tower.

Description: One of three steps is loose due to missing connection clips at the south side of the step.

(Safety Repair 12)

George Washington Bridge Lower Level

Photo No.: 45.

Location: South safety walk at the New Jersey Tower.

Description: Broken conduit coupling connection with exposed wires along the safety walk (Accessible to public / stranded motorists).

(Safety Repair 13)

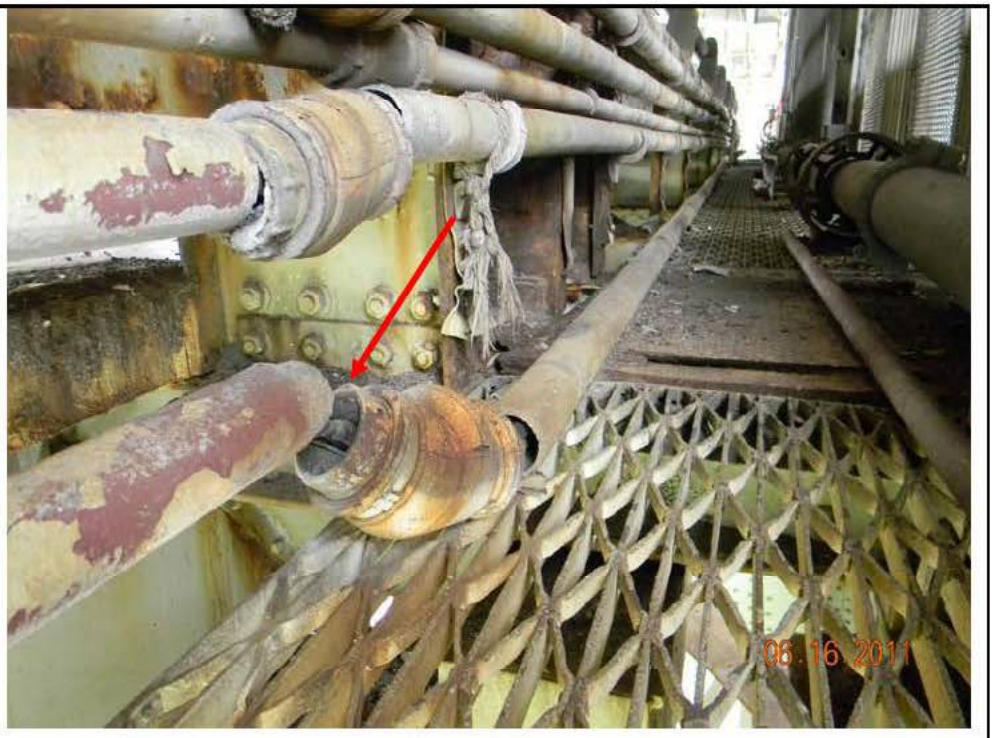


Photo No.: 46.

Location: Span 10, chain link fence at the north side of westbound roadway.

Description: The bottom rail of the fence panel is severely corroded and broken at both ends at the post connections.

(Safety Repair 14)

George Washington Bridge Lower Level

Photo No.: 47.

Location: Span 1, median safety netting between Panel Points 9W and 9W*.

Description: The netting exhibits a 18" long x 12" wide hole and a 6" diameter hole.

(Safety Repair 15)

Photo No.: 48.

Location: New Jersey Tower north safety walk.

Description: 2' x 2' opening in the safety walk, and 2' long x 4" wide cut out area of safety walk grating for conduits.

(Safety Repair 16)

George Washington Bridge Lower Level

Photo No.: 49.

Location: New Jersey Back Span Traveler.

Description: The weld between the fence fabric connection plate and the aluminum post is broken at the southwest corner of the traveler (arrow).

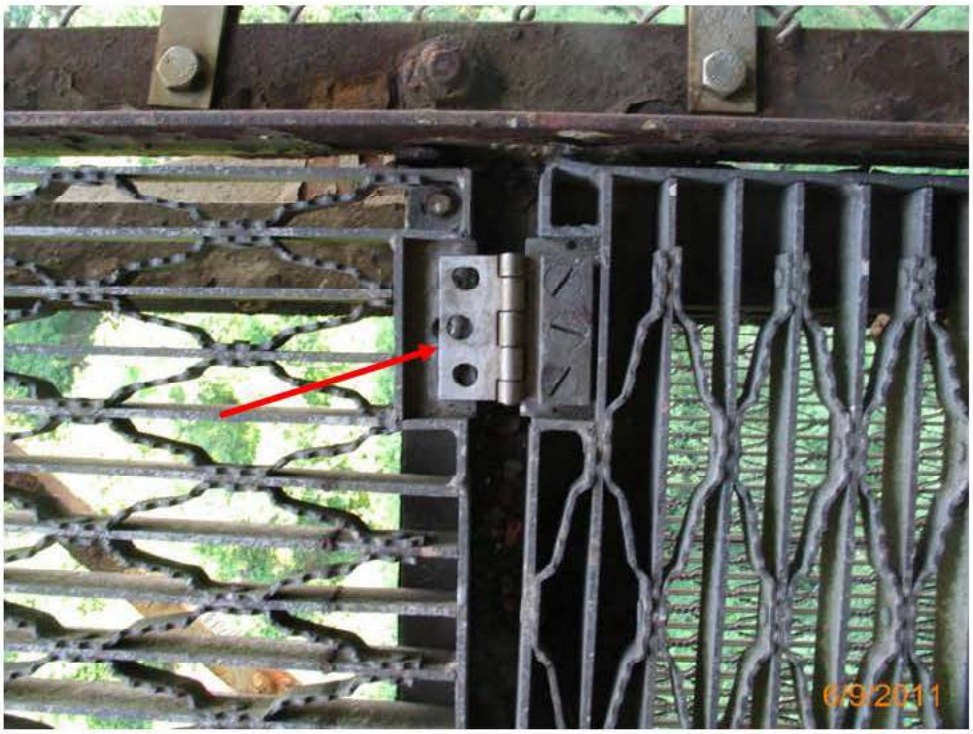
(Safety Repair 17)

Photo No.: 50.

Location: East side of New Jersey Back Span Traveler.

Description: The connection screws for the access door hinge are missing at the north side of the floor grating.

(Safety Repair 18)



George Washington Bridge Lower Level

Photo No.: 51.

Location: New York Main Span Traveler.

Description: Large hole in the safety netting with inadequate wire mesh (arrow) provided as temporary repair.

(Safety Repair 19)

Photo No.: 52.

Location: New Jersey Back Span Traveler.

Description: The 3" x 3" angle supporting the safety netting is severely corroded with holes in horizontal and vertical legs (arrow).

(Safety Repair 20)

George Washington Bridge Lower Level

Photo No.: 53.

Location: New York Back Span Traveler.

Description: Missing horizontal rail angle for platform below traveler floor access hatch.

(Safety Repair 21)

Photo No.: 54.

Location: New Jersey Back Span Traveler.

Description: Missing strap attachment (arrow) connecting traveler floor to safety netting fence fabric.

(Safety Repair 22)

VI. Appendix A
Table of Horizontal Cracks

APPENDIX A

TABLE OF HORIZONTAL CRACKS

FLOORBEAM	STRINGER (E/W)	CRACK LENGTH 2009	CRACK LENGTH 2011
5W	S17(W)	1-3/8″	1-3/8″
5W* (See Note 2)	S5(W)	2″	2″
24E	S2(W)	1-1/2″	1-1/2″
17W(See Note 3)	S17(W)	1/2”	1/2"
5E	S2(E)	2″	2″
5E	S17(E)	1″	1″

(E/W) denotes: Stringer on east or west side of floorbeam.

Notes:

1. The crack length development at the stringer webs along the top flange has not changed since the previous inspection in 2009. Therefore, no repair is required.

2. This crack was previously drilled with an arrestor hole.

3. This crack was previously noted and extends beyond a 2” x ½” corrosion hole at the end of the stringer web.

VII. Appendix B
Bridge Data Summary

BRIDGE DATA SUMMARY

BIN NO.	NAME	SPANS	LENGTH	YEAR	STRUCTURE TYPE	FCM	LAST INSPECTION	CONTRACT DWGS
5522507	Main Span	11	5062′	1962	Steel Suspension	Y (spans 1 to 9)	October 2009	HRB-5 HRB-5A HRB-5B GWB-190.008 GWB-190.040 GWB-244.056 GWB-244.114 CJ4375

VIII. Appendix C
Table of Drilled Holes

APPENDIX C - GWB LL - TABLE OF DRILLED HOLES

LOCATIONS OF ARRESTOR HOLES DRILLED IN FASCIA STRINGER WEBS TO PREVENT CRACK PROPOGATION

Span No.	Stringer No.	Panel Point	East / West Side	Size of Web Deterioration
2	S18**	24W	East Side	1/2" Diameter Horizontal Hole
	S1	25W*	East Side	3/8" x 2-1/2" Horizontal Hole
	S1	26W	East Side	1/2" x 5" Horizontal Hole
	S1	26W*	East Side	3/8" x 5" Horizontal Hole & 1/8" x 1" Vertical Hole
	S1	27W*	East Side	1/2" x 2" Horizontal Hole
	S1	28W	East Side	3/8" x 2-3/4" Horizontal Hole
	S1	29W	East Side	5/8" x 6" Horizontal Hole
	S1	30W	East Side	1/2" x 3-1/2" Horizontal Hole
	S1	31W	East Side	3/8" x 4-1/2" Horizontal Hole
	S1	32W	East Side	3/8" x 4" Horizontal Hole
	S1	36W	East Side	3/8" x 4" Horizontal Hole
	S18	36W	East Side	3/4" x 4" Horizontal Hole
	S1	39W*	East Side	Crack propagated to the other side of existing drilled hole
	S1	22E*	West Side	1/4" x 1" Horizontal Hole
	S1**	5E	West Side	1/2" Diameter Horizontal Hole

** New location of drilled arrestor holes noted in this report.