BRIDGE INSPECTION REPORT
BRIDGE NO. CUY-06-14.56
VETERAN'S MEMORIAL BRIDGE
OVER CUYAHOGA RIVER VALLEY
CUYAHOGA COUNTY, OHIO

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Prepared for

Ohio Department of Transportation
District 12

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I. INTRODUCTION

This report was prepared for District 12 of the Ohio Department of Transportation to convey the findings of a visual inspection of Bridge No. CUY-6-14.56 Veteran's Memorial Bridge over the Cuyahoga River Valley in Cuyahoga County, Ohio. The report consists of a narrative with photographs to describe the condition of the various bridge and roadway elements. A location map, plan and elevation views of the structure, member identification schematics, typical section views, and east and west station and subway tunnel plan views are provided as Exhibits 1 through 8. A summary of recommendations for repair or maintenance is provided in Appendix D. A copy of the completed BR-86 form is provided in Appendix A. Measurements taken at the expansion joints are provided in Appendix B. Tables listing the size and location of all areas of spalled and delaminated concrete on the concrete superstructure and substructure elements as detected by sounding are presented in Appendix E. Similar tables listing the size and location of all areas of spalled and delaminated concrete observed on the jack arches and columns of the East Subway Tunnel are also presented in Appendix E.

ms consultants, inc.'s commercial dive team performed an underwater investigation of Pier 3 and Pier 4 on July 15, 2003. A report summarizing the procedure used and findings of this investigation is provided in Appendix C.

As shown on the BR-86 form transmitted with our letter dated September 30, 2003, the General Appraisal Rating for the bridge is 6 – Satisfactory Condition. Note that the condition of the structural elements comprising the West Station and the subway tunnels beneath West 25th Street, Detroit Avenue, and Superior Avenue was not considered in determining the ratings coded on the BR-86 form. With the exception of the approach items, the ratings shown on the BR-86 form pertain only to the portion of the bridge that begins at Tower A and extends 2,656 feet east to the end of the East Station area.

II. PROCEDURE

A hands-on visual inspection of the bridge and routine inspection of the West Station and subway tunnel areas were performed by personnel of **ms consultants, inc**. between May 12, 2003 and August 7, 2003. Inspection personnel included Don Main and Paul Martin, E.I.T. Access to portions of the bridge was obtained by climbing, with the use of JLG 40-foot and 80-foot reach man-lift vehicles, and with the Ohio Department of Transportation's 50-foot and 60-foot Reach-All Inspection Units. The exposed surfaces of all main components of the bridge were visually inspected within arm's reach except at those locations where access was limited by electrical lines.

The inspection was conducted in accordance with guidelines set for in the Ohio Department of Transportation's Bridge Inspection Manual, dated 2001; the Federal Highway Administration's Bridge Inspector's Training Manual 90; and the American Association of State Highway and Transportation Official's Manual for Condition Evaluation of Bridges, dated 1994, including the latest interim revisions through 2000.

III. DESCRIPTION OF BRIDGE

The Veteran's Memorial Bridge located in downtown Cleveland carries US Route 6 over the Cuyahoga River Valley and connects West 25th Street and Detroit Avenue at the west end with Superior Avenue, West 9th Street and Huron Road at the east end (Photo 1). The structure, which was constructed in 1917, is comprised of two deck levels and was originally designed to carry vehicular traffic on the upper deck and six lines of electric railway traffic on the lower deck. Two major rehabilitation projects performed on the bridge were completed in 1970 and 1997. The railway tracks have been removed from the lower deck, which is now utilized only by utility and maintenance vehicles. The upper deck was modified to carry six lanes of vehicular traffic and carries an average of 21,300 (1994) vehicles per day.

The main span of the bridge is a three-hinged steel arch truss that spans 591 feet over the Cuyahoga River with a low steel elevation of 96 feet above mean low water. To the east, the main span is joined by a series of eight concrete open spandrel arch spans and one concrete-encased-steel open spandrel arch span with span lengths that vary from 75 feet 1½ inches to 178 feet. Beginning at the East Abutment, the East Station area extends over the east cellular abutment and beyond for a distance of 170 feet and is comprised of a roof and floor slab, walls, and a series of concrete floor beams, jack arches and columns. At the west end of the main span, three concrete open spandrel arch spans extend to West Abutment with span lengths that vary from 209 feet 1½ inches to 125 feet 3 inches. Two additional concrete spans extend for a total distance of 220 feet above the cells of West Abutment to West Station (Tower A) and are constructed in a manner similar to that of East Station. The total length of the structure from the west end of cellular West Abutment (Tower A) to the east end of the East Station area is 2,656 feet. A plan and elevation view of the structure is provided as Exhibit 2.

The lower roadway extends to the east through a subway tunnel comprised of a roof slab, walls, and series of concrete jack arch beams and columns for a distance of approximately 185 feet. Similarly, the lower roadway extends west of Tower A for a distance of approximately 350 feet through the West Station area to a point where it divides into two subway tunnels. From this location, one tunnel continues to the west under Detroit Avenue for a distance of approximately 659 feet and the other extends to the south under West 25th Street for a distance of approximately 479 feet. West Station and the subway tunnels are constructed of the same elements as East Subway Tunnel. All three tunnels end at closure walls that were constructed in 1955. Plan view schematics of West Station and the tunnels and East Station and tunnel are provided as Exhibits 7and 8, respectively.

Photo 1. South elevation view looking west. DCP_2599.JPG

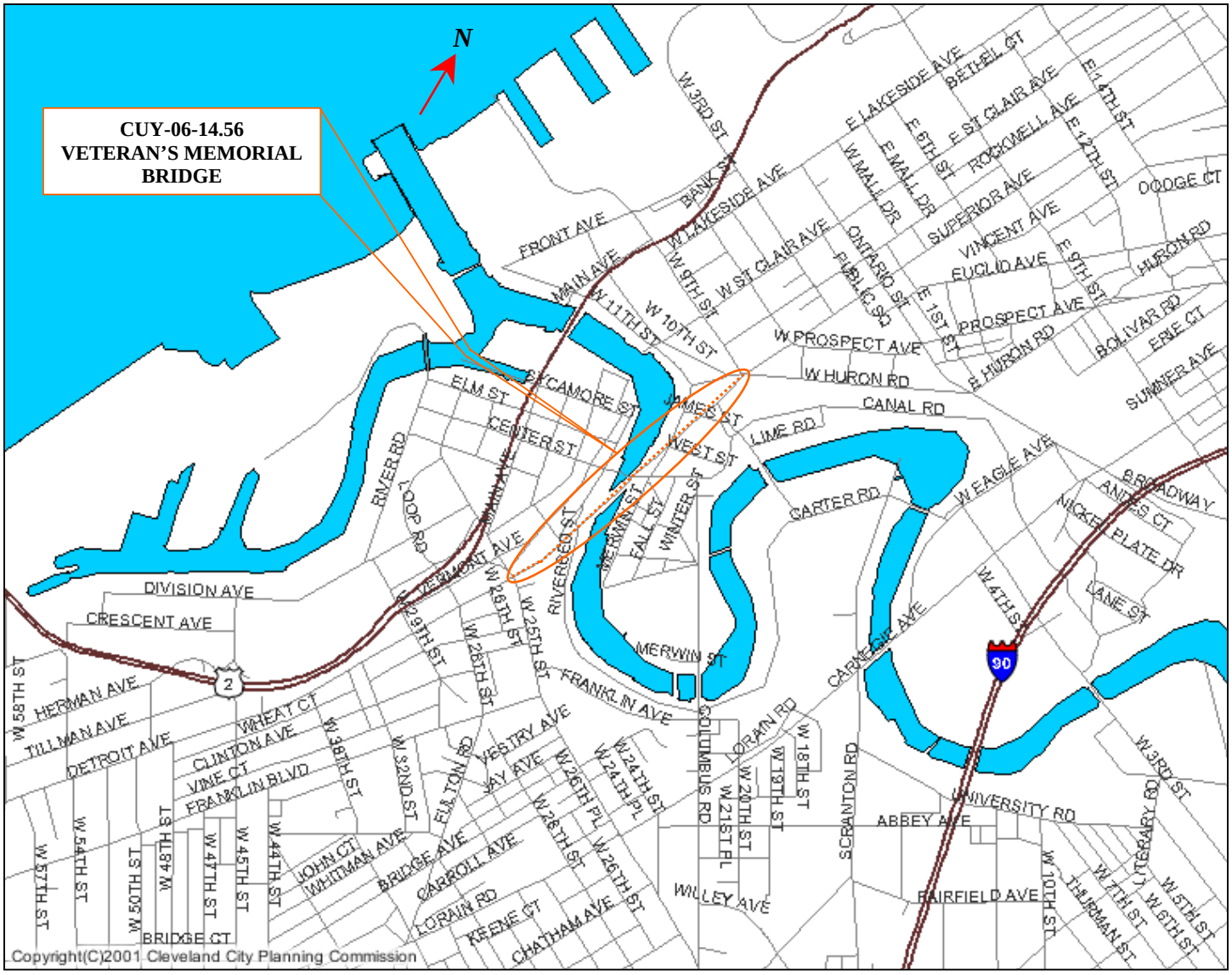
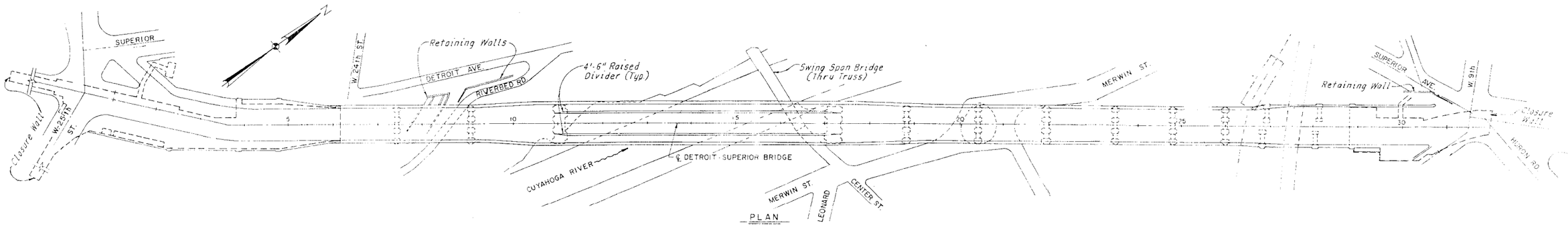
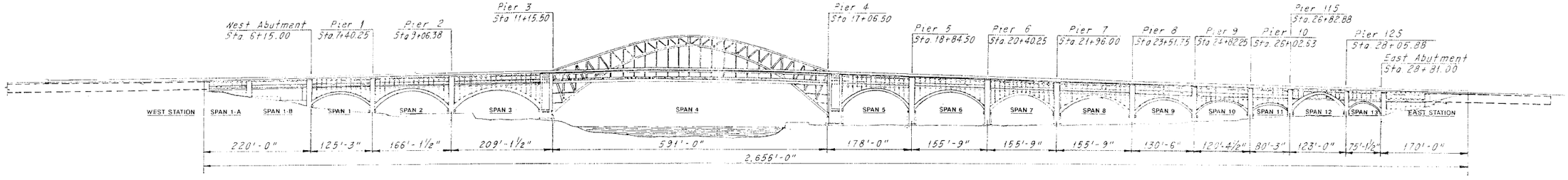


EXHIBIT 1
LOCATION MAP

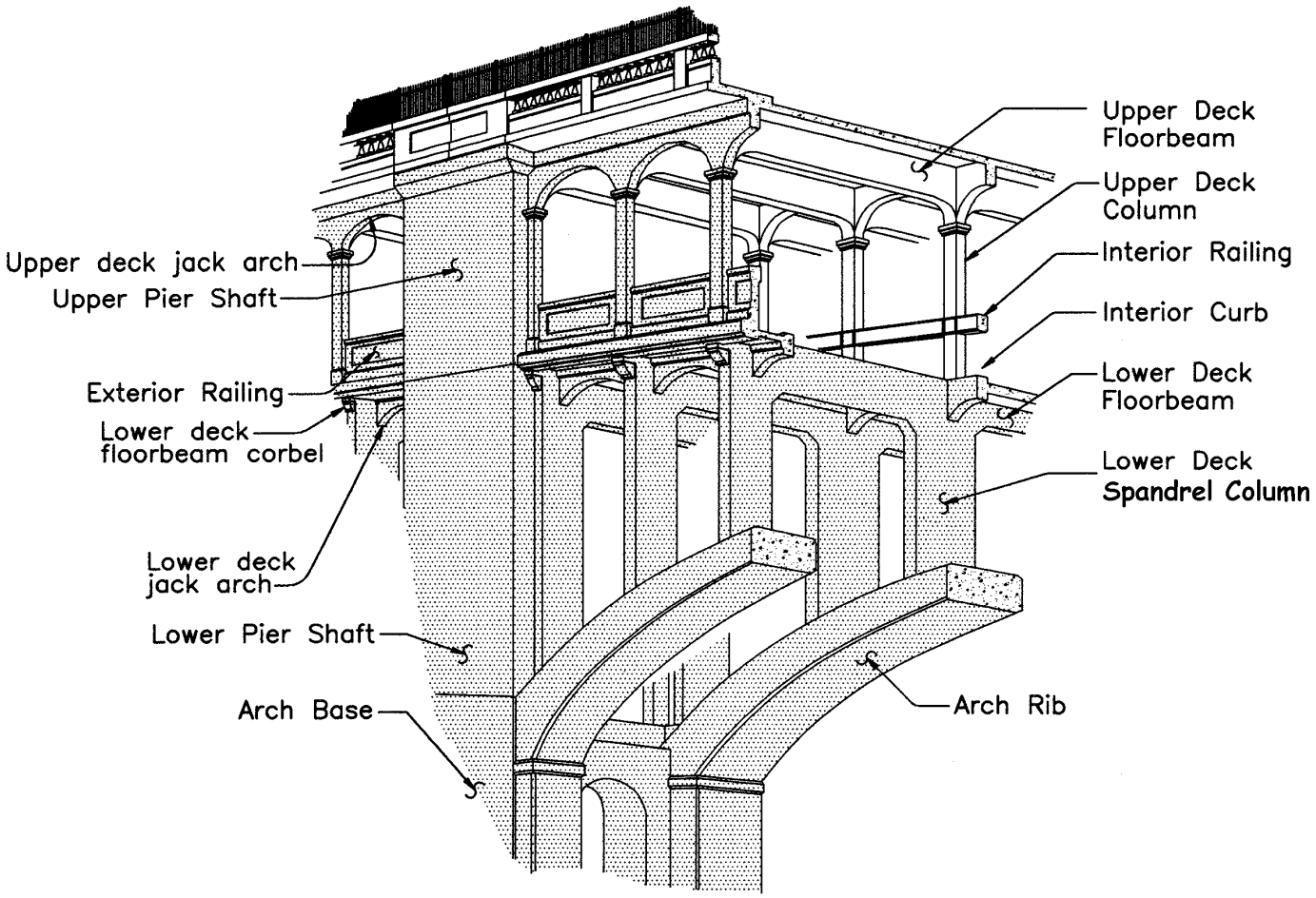


PLAN



ELEVATION

EXHIBIT 2
PLAN AND ELEVATION

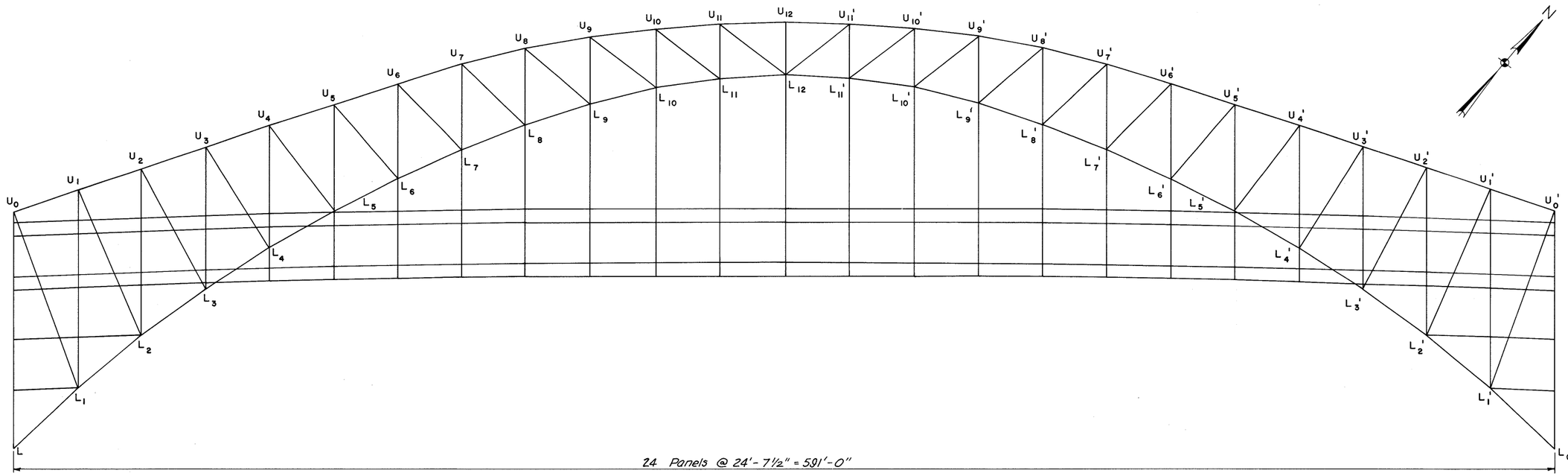


TYPICAL APPROACH SPAN

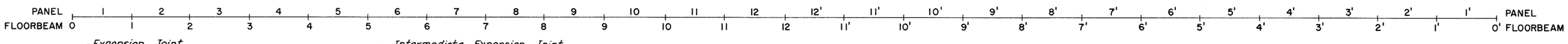
MEMBER IDENTIFICATION SCHEMATIC

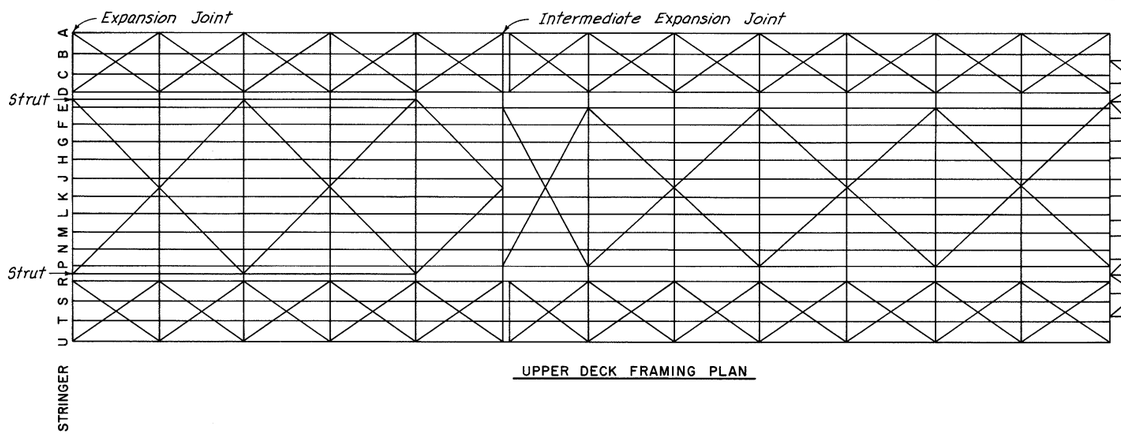
EXHIBIT 3

MEMBER IDENTIFICATION SCHEMATIC
APPROACH SPANS

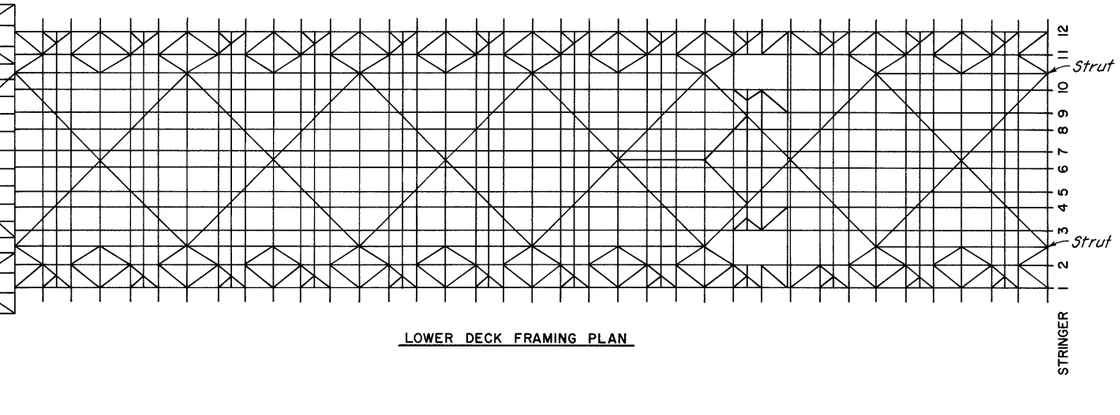


ELEVATION

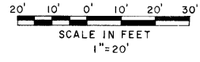




UPPER DECK FRAMING PLAN



LOWER DECK FRAMING PLAN



Note:
All framing plans are symmetrical about floorbeam 12.

EXHIBIT 4
MEMBER IDENTIFICATION SCHEMATIC
MAIN SPAN

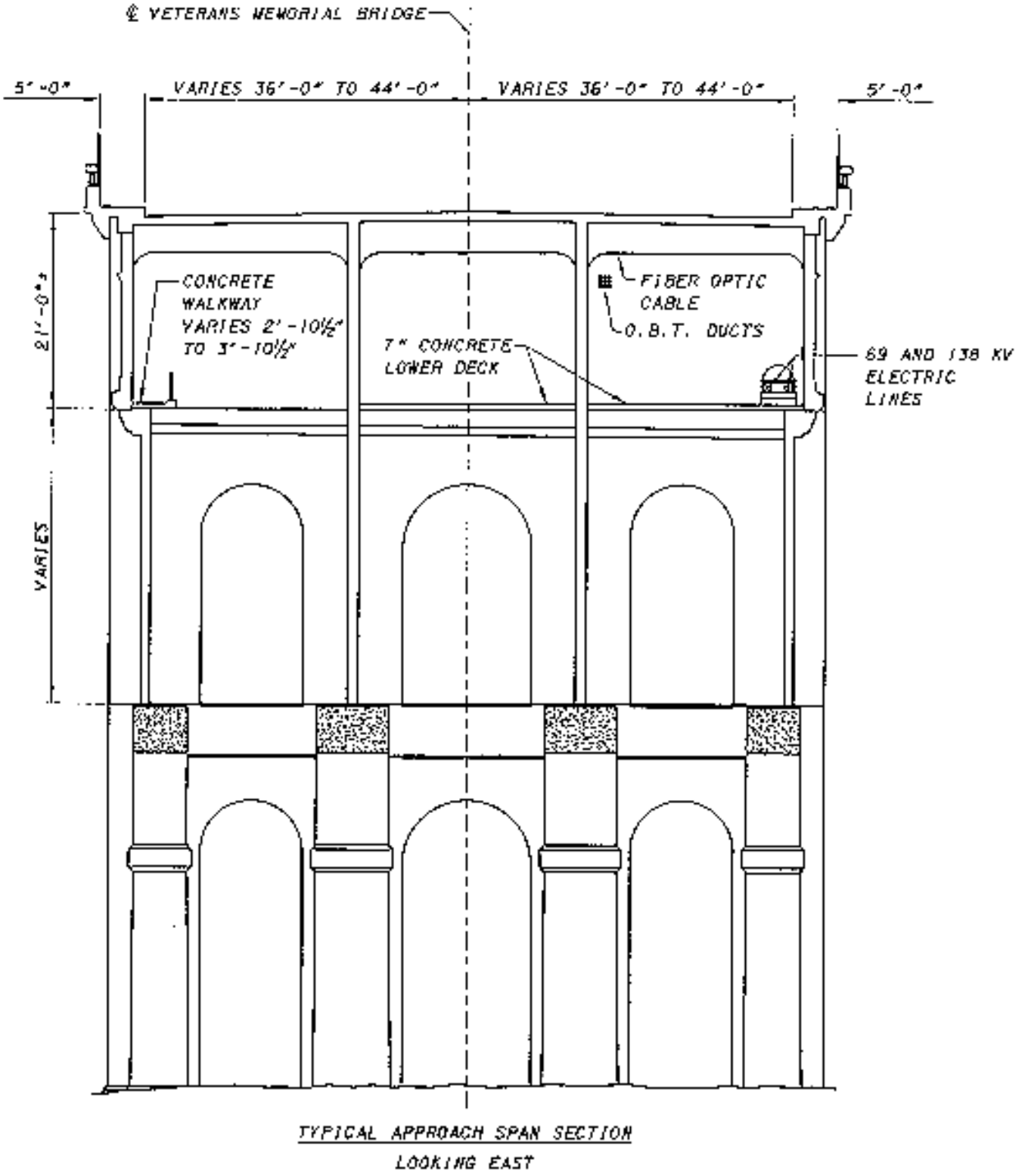
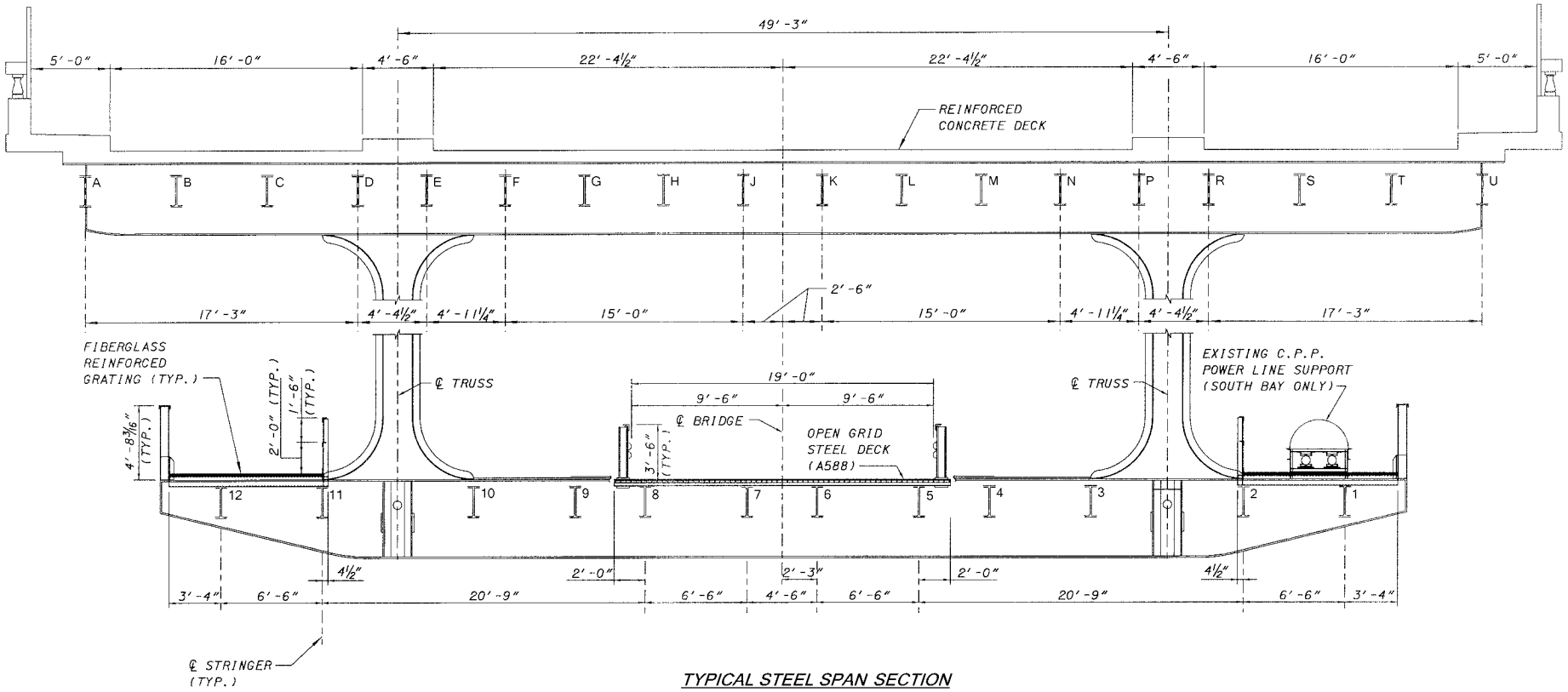


EXHIBIT 5
TYPICAL CROSS SECTION
APPROACH SPAN



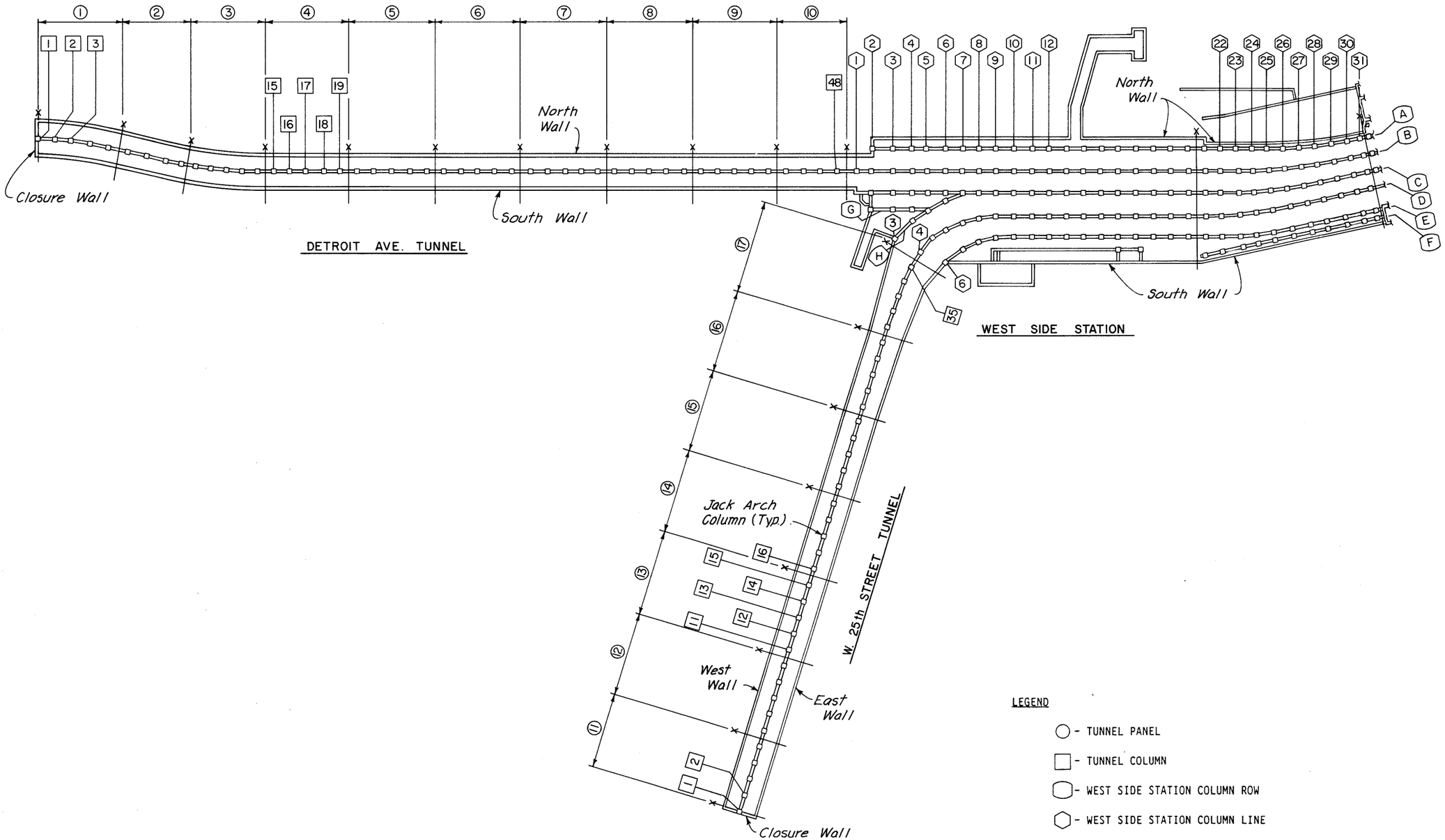
TYPICAL STEEL SPAN SECTION

(LOOKING EAST)

EXHIBIT 6

TYPICAL CROSS SECTION

MAIN SPAN



PLAN

50 0 50 100 150 200

SCALE IN FEET

EXHIBIT 7
PLAN VIEW
WEST STATION AND SUBWAY TUNNELS

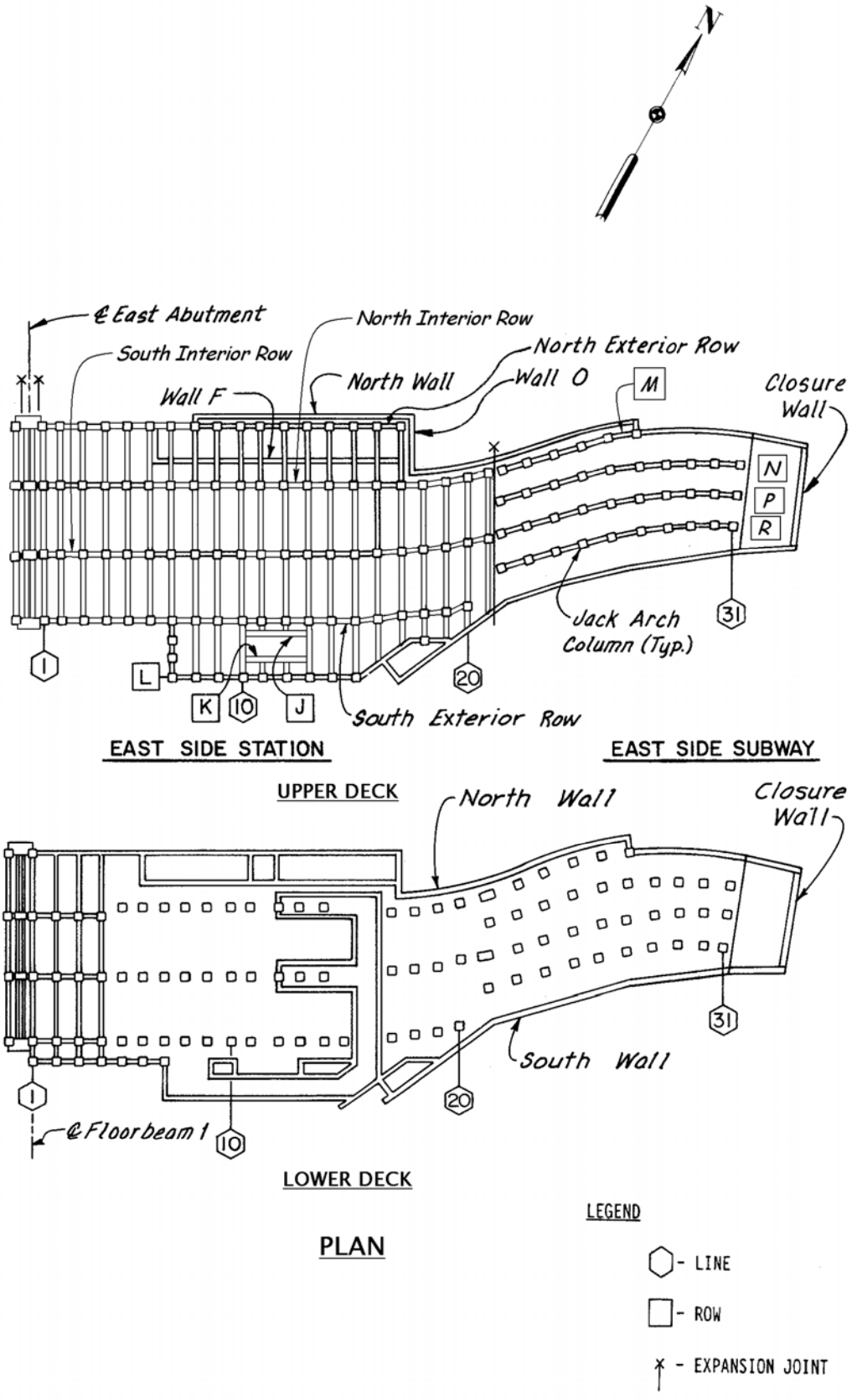


EXHIBIT 8
PLAN VIEW
EAST STATION AND SUBWAY TUNNEL

IV. DECK ITEMS

The upper level deck is a reinforced concrete slab with a thickness of 8¾ inches in the approach spans and a minimum thickness of 8 inches in the main span. In the approach spans, the upper deck is supported by transverse floor beams and longitudinal jack arches. Support for the upper deck in the main span is provided by a stringer and floor beam system. The deck has 8-inch high concrete sidewalks along both edges with steel plate curbs. The sidewalk railings consist of a 2-foot-3-inch high concrete parapet with a 2-foot-3-inch high decorative railing on top. The decorative railing is made up of 1-foot-6-inch high precast-nylon fiber-reinforced concrete balusters capped with a 9-inch high concrete rail. Also, a 5-foot-9-inch high aluminum picket fence is fastened to the top of the parapet in front of the decorative railing.

In the main span, the deck has traffic dividers to channel the traffic to each side of the through arches. The dividers are comprised of a 12-inch high concrete island with steel plate curbs. The island is centered on and slightly wider than the arch members and has steel posts fastened to the top along both sides that support a continuous deep beam guardrail that extends to the ends of the arches. The dividers extend past the ends of the arches (Panel Points 0 and 0') to the adjacent deck joint at the pier. Each island has a raised tapered concrete barrier in front of the blunt end of the arch, and at the arch ends facing oncoming traffic, the deep beam guardrail extends past the concrete barriers and connects to Low Maintenance Attenuators.

Twenty (20) elastomeric strip seal joints accommodate thermal movement in the upper deck. In the approach spans, the joints are located at the ends of the spans. The main span has a joint at each end and at Panel Points 5 and 5'.

The drainage system on the upper deck consists of scuppers located along each gutter at the downgrade ends of all approach spans except Spans 11 and 12 and at the east end of East Station. The main span has scuppers at both ends of the gutter along the sidewalks and the traffic dividers. The scuppers are connected to closed downspouts that discharge into catch basins at the ground level, except the scuppers at the ends of the main span that empty into downspouts, which discharge into the river.

The lower deck in Span 1A is separated into five bays (south, south interior, center, north interior, and north) and is supported by the walls and vaults inside the west abutment. In Span 1B and the portion of East Station above East Abutment, the lower deck is separated into three bays (south, center, and north) and is supported by transverse floor beams and walls inside the abutments. The deck in these spans consists of a 12-inch thick reinforced concrete slab that appears to be of original construction. Asphalt wearing surface several inches thick has been added in the south interior and north interior bays in Span 1A and in the center and north bays of Span 1B. The lower deck in the remaining approach spans is separated into three bays (south, center, and north) and supported in the same way as the upper deck. In these spans, the deck in the south and center bays is comprised of a 7-inch thick reinforced concrete slab. No deck is in place in the north bay except for a 3-foot-10½-inch wide walkway along the north railing. In the main span, the deck in the center bay is only 19 feet wide and is constructed of 5-inch open grid steel with steel deep beam guardrail mounted on steel posts. The deck is supported by a stringer and floor beam system. In the north and south bays, a 9-foot 4-inch wide walkway is constructed along the exterior railing. The walkways are comprised of fiberglass grating panels supported on steel framing members.

A. Upper Level Concrete Deck

Floor

The deck floor is in good condition. Random sounding indicated no areas of delamination. Transverse cracks with efflorescence were noted on the bottom side of the deck at scattered locations throughout the main span (Photo 2.)

Photo 2. View showing a 0.002 to 0.003-inch wide transverse crack in the bottom side of the upper deck of Span 4 at a location between Panel Points 1' and 2' and Stringers H and J.

DCP_2472.JPG

Also, a few diagonal cracks with efflorescence were detected on the bottom side of the deck above East Station, between Floor Beams 7 and 8, and 18 and 21 on the south side of the north interior column row, and between Floor Beams 17 and 19 on the north side of the south interior column row.

Wearing Surface

The 1-inch thick monolithic wearing surface is in good condition. One spalled and delaminated area was noted in the north eastbound lane near the end of the deck above East Station (Photo 3.) Areas of minor scaling and spalling are common on the concrete wearing surface within several inches of the expansion joint armor at nearly all the deck joints (Photo 4.) Also, longitudinal and a few transverse and diagonal cracks were noted at random locations in most spans, particularly Spans 4 and 7 (Photo 5).

Photo 3. View showing a 20- by 30-inch spalled and delaminated area on the wearing surface in the north eastbound lane of the upper deck above East Station, at a location approximately 75 feet west of the end of the concrete wearing surface at the east end of the station.
DCP_2279.JPG

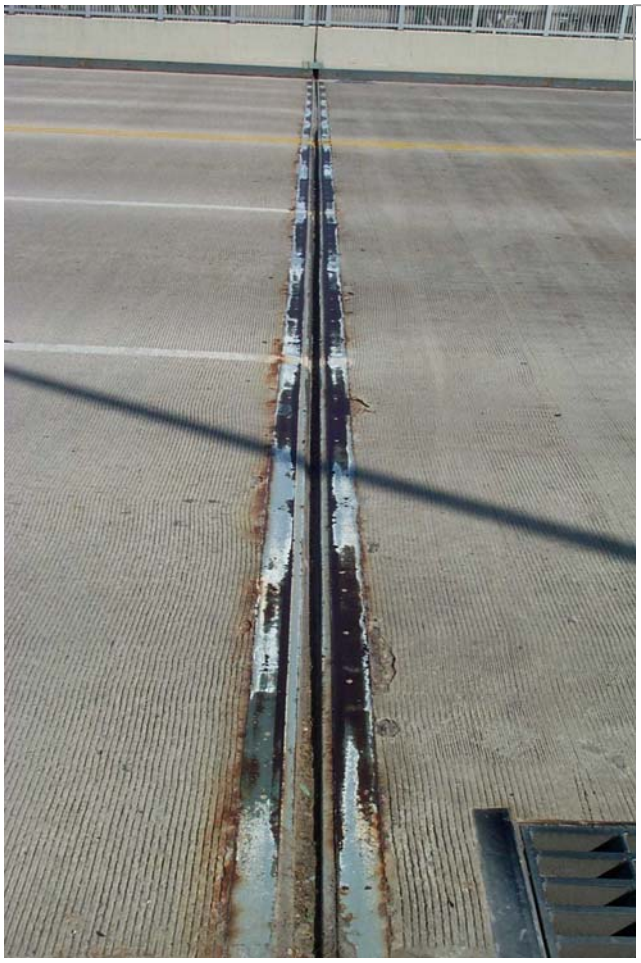


Photo 4. View looking south over the joint in the upper deck at Pier 7 showing scaled/spalled areas along the joint armor. DCP_2277.JPG

Photo 5. Close-up view showing a typical longitudinal crack in the wearing surface of the upper deck in the south westbound lane in Span 7. The crack measures between 0.003 and 0.005 inch in width. DCP_2343.JPG

Sidewalks and Curbs

The sidewalks and curbs are in good condition overall. The paint on the steel plate curbs is in poor to fair condition with areas of rust developing along the top and bottom edge and rust stains on the face (Photo 7). Several small delaminated and spalled areas were noted on the sidewalks along the curbs. These include a 6- x 24-inch area on the north walk adjacent to Panel Point (PP) 2 in Span 4, a 10- x 20-inch area on the south walk adjacent to PP10' in Span 4, an 8- x 23-inch area on the north walk in Span 8, and a 6- x 28-inch area on the north walk in Span 13 (Photo 6). Also, a 22- x 31-inch patch area on the north walk adjacent to PP3 in Span 4 is cracked and delaminated.

Photo 6. View showing a 28-inch long by up to 6-inch wide delaminated and spalled area on the north sidewalk along the curb plate in Span 13.

DCP_2278.JPG

Traffic Dividers

The traffic dividers that channel the traffic around the arch trusses in Span 4 are in fairly good condition. Numerous spalled and delaminated areas were noted on the top surface of the concrete dividers along the curb plates. The areas typically ranged in size from 1 to 3 feet in length and 8 to 10 inches in width (Photo 7). Approximately 18 areas were observed at the north divider and 12 at the south. In general, the Low Maintenance Attenuator (LMA) devices showed no signs of damage, however, the LMA device at the east end of the north arch truss is missing a cotter pin in the clevis bolt that secures the cable to the deck. The devices have a short length of heavy gage link-chain bolted to the deck adjacent to each leg, that slips onto a horizontal pin that projects through the leg. None of the chains are secured to the pins and approximately half of the chains are disconnected from the pin and lying on the deck (Photo 8).

Photo 7. View showing 9½-inch wide by 30-inch long and 4-inch wide by 10½-inch long spalled and delaminated areas along the north curb plate of the north arch-truss island between PP7 and PP8. Also in view are areas of rust along the top and bottom of the curb plate. DCP_2282.JPG

Photo 8. View from the south side of the LMA device located at the west end of the south arch truss. The ovals show locations where the anchor chain is disconnected from the horizontal pin on the leg of the LMA device. DCP_2642.JPG

Railing

Overall, the upper deck railing is in fair condition. The concrete parapets have been resealed and are in good condition. In Span 4, the north parapet has a 9- x 22-inch patched area adjacent to PP0' that is spalled and delaminated. The baulisters are in good condition, however, most of the sealer has lifted off. The top rail is in fairly good condition. Tight vertical cracks spaced at approximately 2 feet were noted throughout and most of the sealer is missing. The aluminum picket fence is in good condition except for one location on the south fence at the east end of Span 4 where 9 spindles are severed along the lower horizontal rail. The damaged area was covered with a section of wooden snow fence.

Drainage

The drainage system is in fair condition with a number of deficiencies noted including cracked, broken and misaligned pipes and silting at several catch basins. The scuppers in the deck and the downspouts are all clear except the scupper in the north gutter at the east end of East Station where an automobile hub cap is lodged at the inlet of the downspout causing partial restriction of flow.

At Pier 1 South, the end of the downspout is slightly angled and is not centered over the catch basin lid. This allows some water to bypass the catch basin which is beginning to erode the adjacent embankment to the east and south of the catch basin (Photo 9). At the downspout at Pier 2 South, the first PVC union collar above the elbow at the bottom of the spout is cracked. A strip of rubber clamped over the broken collar as a repair, is partially unfastened which is allowing water to spill-out onto the ground. Also, the end of the downspout is not centered over the catch basin and a short length of corrugated plastic pipe sleeved onto the end of the downspout to function as an extension is not secured (Photo 10). At the downspout at Pier 4 North, the first PVC connection collar above the steel elbow at the bottom of the spout is cracked. At the downspout at Pier 10 North, the elbow just below the lower level deck has a 1¾- x 3½-inch hole broken through the bottom portion, which is allowing water to splash onto the pier. At the deck scupper along the south curb at the east end of East Station, the vertical spout that exits the scupper has a smaller diameter than the elbow of the PVC pipe that it discharges into, directly below the deck. The opening at this junction allows water to spill out. Also, water is leaking out of holes drilled through the bottom of the deck adjacent to the downspout. The leaking water has caused the brick veneer to lift off and spalling of the concrete on the wall in the adjacent area and may be the source of the water that is pooled inside the east subway tunnel (Photo 11).

Photo 9. View looking south showing the end of the downspout and the lid of the catch basin at Pier 1 South. Note that the lid could be moved up to 5 inches to the north, which would better align the spout with the grate.

DCP_2325.JPG

Photo 10. View looking southeastward showing the broken connection collar and rubber repair strip (oval) and the CPP extension at the bottom of the downspout at Pier 2 South. Note the water pooled alongside the pier that leaked out of the collar. DCP_2350.JPG

Photo 11. View looking southeastward showing the PVC downspout below the deck scupper in the south gutter at the east end of East Station. The horizontal arrow points to the junction where water escapes through the gap between the vertical spout and the elbow. The oval highlights the area where water is leaking through holes drilled into the deck floor. Also note the water leaking through the adjacent deck joint (vertical arrow). DCP_2372.JPG

Several of the catch basins located at ground level beneath the bridge overflow during heavy rainfall and several have silt build-up or pooled water inside the outlet pipe. At the catch basin located on the floor of the West Station area between Column Rows C and D and Column Lines 20 and 21, the basin and outlet pipe inlet are clean. However, storm water temporarily backs up onto the surrounding floor after heavy rainfall indicating insufficient capacity or restrictions inside the outlet pipe. Water is pooled inside the catch basin at Pier 5 South leaving only 3 inches of free board in the 12-inch diameter outlet pipe. The catch basin at Pier 7 South has heavy silt in the bottom and inside the outlet pipe with only 3 inches of free board remaining inside the pipe. At Pier 9, both catch basins have silt deposited at the bottom and up to 5 inches deep inside the 12-inch diameter outlet pipes. Water was observed outflowing under the lids of both of these basins during a period of heavy rainfall (Photo 12).

Photo 12. View looking down at the downspout and catch basin at Pier 9 South showing water leaking under the lid of the basin (arrows) and flowing into the adjacent parking lot. DCP_2375.JPG

Photo 13. View looking south showing gouges in the joint armor along the west side of the deck joint at Tower B. Also note the absence of paint and light rust on the armor. DCP_2276.JPG

Expansion Joints

Overall, the upper deck expansion joints are in good condition with minor wear and areas of missing paint and light rust on the joint armor. Exceptions include the joints at Tower B and Pier 3 East. At Tower B, the west joint armor has numerous gouges along the strip seal within the center area of the westbound lanes (Photo 13). The east joint at Pier 3 has a 2-inch long tear in the joint armor on the east side near the center of the south eastbound lane and is leaking (Photo 14). Also, the elastomeric strip seal gland does not extend completely to the end of the joint armor at the following locations: both ends of the joint at Piers 6, 7, 8, 9, 11, 12 and at East Abutment; and at the north end of the joint at Pier 5 (Photo 15). Water that passes through the opening between the armor falls onto the top horizontal face of the pier shaft and seeps down between the adjacent vertical faces of the pier shaft and the upper deck and spandrel columns. It then seeps out onto the side (east and west) faces of the pier shaft. Repeated exposure to this water is likely the cause of the spalls and delaminations that are typical on the east and west faces of the pier shafts adjacent to the columns (Photos 31, 70, 71, 72 and 73). At the east end of East Station there is a sealed joint that separates the deck above East Station from the deck above East Tunnel. Water was observed leaking through this joint over its entire length (Photo11).

At Piers 11 and 12, expansion of the deck is accomodated at the floor beams directly below the deck joint. The floor bears on rectangular steel plates supported by a series of short concrete pedestals cast on top of the floor beams. At Pier 11, one plate in the center bay has slid out and is no longer in place (Photo 16) and one plate is loose in the north and south bays. At Pier 12, one plate in the south bay and three in the north are partially displaced from their original position.

Photo 14. View showing a 2-inch long tear in the joint armor on the east side of the east joint at Pier 3, near the center of the south eastbound lane.

DCP_2280.JPG

Photo 15. View looking north beneath the sidewalk overhang at the south end of the deck joint at Pier 7. Note that the end of the elastomeric gland (arrow) stops 2 inches short of the south face of the pier shaft and 13 inches short of the end of the joint armor.

DCP_2333.JPG

Photo 16. View showing an 11- x 9- x 3/8-inch plate that has slid from its original position between the deck floor and the pedestal on the floor beam in the center bay below the deck joint at Pier 11. The red arrow points to the front edge of the adjacent plate that is in its intended position.

DCP_2439.JPG

B. Lower Level Concrete and Steel Grid Deck

Floor

The concrete floor at Spans 1A and 1B (above the cellular West Abutment) and at the East Station area (above the cellular East Abutment) is in fair condition. In Span 1A, the floor above the first 3 cells from the west end within the south bay has a few diagonal cracks on the bottom side with efflorescence. A few short longitudinal cracks were noted on the floor of the eighth cell from the west, and a narrow band of similar cracks was observed at the south end of the ninth cell. Except where obscured by form planks, the bottom side of the floor above the remaining cells looks good. The bottom side of the floor above the cell in the north bay at Tower B has numerous cracks with efflorescence and some spalling at the north end. In Span 1B, the 4th and 8th cells from the west in the south and center bays have a transverse band of cracks on the bottom side of the floor at the center with rust stains and efflorescence. The floor above the 7th cell in the south bay has a spalled area approximately 6 square feet on the bottom side. A few diagonal cracks with rust stains or efflorescence were noted on the bottom side of the floor above several other cells but otherwise the floor above the remaining cells looks good. At East Station a few longitudinal cracks with efflorescence were noted on the bottom side of the floor above the cellular East Abutment. Additionally, three pedestrian stairwells extend below the street car level in the East Station area to a common tunnel that passes from north to south beneath the rails. Up to as much as 5 feet of water is pooled inside the tunnel and backed up into the stairwells. A large pool of water is also collected on the floor of East Station and extends into East Subway Tunnel. The pool of water, which is up to 12 inches deep, begins at Column Line 19 in East Station and extends eastward to Column Line 26 in East Subway Tunnel (Photo 79). As previously stated, one source for the pooled water is the water that leaks below the deck scupper located in the south gutter at the east end of East Station. A sloped pedestrian access tunnel extends upgrade to the north from the street car level in East Station to a closure wall near the street level. The roof slab in the access tunnel has a few small spalls but otherwise is in fairly good condition. Water seepage was observed around a 2½-inch diameter pipe that extends down through the roof slab of the access tunnel.

The concrete floor in Spans 1-3 and 5-13 is in very good condition. Metal stay-in-place forms were used in all spans except in two beam bays in Span 12 and are in good condition. No deficiencies were noted on the bottom side of the deck where it is exposed in Span 12. The steel grid deck in Span 4 is in good condition with no noted deficiencies.

Wearing Surface

As previously noted, an asphalt wearing surface exists in several bays of Spans 1A and 1B and is in good condition. However, in the remaining bays within these two spans, no wearing course is present and the top surface of the deck is gouged and uneven, with the ends of reinforcement bars exposed and protruding in several areas and concrete fragments and dust lying about (Photo 17). Similar conditions exist at the top surface of the deck in the East Station area, but not as pronounced.

Photo 17. View looking west through the south bay of Span 1B showing the poor condition of the surface of the original lower level concrete deck.

DCP_2482.JPG

The top surface of the deck in Spans 1-13 is in good condition with no noted deficiencies. The top flange of the floor beams in Span 4 protrudes slightly above the surface of the steel grid panels, causing a slight bump for vehicles.

Sidewalks and Curbs

The concrete walkway along the north side of the north bay in Spans 1-3 and 5-13 is in very good condition with no deficiencies. The walkways in the north and south bays of Span 4 are comprised of three 3-foot wide fiberglass grating panels supported on steel framing members. The walkways are in good condition, but several minor deficiencies were noted. At the north walkway, all three panels are raised at two transverse support members near PP4, and one panel is raised at two transverse support members near PP3'. The raised panels displace vertically when stepped upon. Also, one transverse rib between two longitudinal grating bars is damaged at one panel near PP0'. At the south walkway, one panel is missing a clip bolt at PP6'.

The concrete curbs in Spans 1-3 and 5-13 are in fairly good condition with minor cracks and scrapes. No curbs exist in Span 4.

Railing

The lower deck railing is in fair to good condition. In Spans 1-3 and 5-13, the concrete rails at the north and south exterior column rows are in good condition with a few minor spalls and delaminations noted. No deficiencies were noted for the steel hand railing along the walkway in the north bay. The concrete railing at the north and south interior column rows is in fairly good condition with cracks and small spalled and delaminated areas noted at random locations throughout (Photo 18).

Photo 18. View of a crack through the south face of the railing adjacent to Column 1 in the south interior column row in Span 12. Note that the railing has a keyed joint at this location that coincides with the expansion joint in the deck. Insufficient opening in the key may have caused the concrete to crack from pressure encountered during movement.

DCP_2481.JPG

In Span 4, the exterior hand railing along the walkway in the north and south bays is in fair condition with areas of pack rust, section loss and corrosion holes. Corrosion on the exposed surfaces of the sidewalk railing members was removed in the last cleaning and painting operation, however, heavy pack rust remains between the channels at most of the vertical back-to-back channel posts that support the railing at the floor beams. Pack rust was also noted at several post connections and at back-to-back angle support brackets. Deep groove pitting is fairly typical on the webs of the channel posts adjacent to the connection of the center and bottom horizontal channel rails, and perforations through the inside flanges of the channels were observed at a few posts. A few vertical pipe railing spindles have holes from corrosion at the interface with the center or bottom horizontal channel rail. The steel interior hand railing along the walkways is in very good condition with no deficiencies. The Type 4 steel railing along the deck in the center bay is also in very good condition with no deficiencies.

Expansion Joints

The compression joints are in good condition with no noted deficiencies.

V. SUPERSTRUCTURE

The approach spans are made up of a combination of three reinforced concrete beam and column spans, eleven reinforced concrete arch spans and one concrete-encased steel arch span. The reinforced concrete beam and column spans (Spans 1A, 1B and the East Station area) are comprised of a roof and floor slab, walls and a series of floor beams, jack arches and columns. The reinforced concrete arch spans (Spans 1–3, 5–11, and 13) consist of upper and lower decks supported by a system of floor beams, jack arches, columns and spandrel columns on four rows of arch ribs. The concrete-encased steel arch span (Span 12) is constructed in a similar manner except the span is of part-through design with respect to the lower deck that is supported by hangers in the center portion of the span.

The main span is a single trussed three-hinged thru arch that spans 591 feet between end bearings. The structure consists of two rows of arch ribs that form the lower curve; each braced with truss webbing connected to a top chord that defines the upper curve. The arch ribs and the top chord are box sections made up of plates and angles riveted together with lacing channels or bars. The truss web members are also box sections made up of similar elements. Sway bracing is provided in a plane perpendicular to the trusses. Lateral bracing is provided in the plane of the top chords and the arch ribs and also in the plane of the lower flange of the upper and lower deck floor beams. Horizontal struts brace the two end truss panels and the lower deck between floor beams. Both roadway decks are supported by a floor system of longitudinal stringers framed into transverse floor beams. The stringers are rolled shapes and the floor beams are built-up members comprised of riveted and bolted plates and angles. At Panel Points 5-5', the upper and lower deck floor beams are rigidly connected with built-up vertical hangers. The floor beam frames are in turn supported by pins connected to pairs of eye bar hangers suspended from the lower chord. At Panel Points 4 and 4', the floor beams are supported by the truss web members and are connected by a pair of eye bar hangers. The truss web members support the floor beams at the four remaining end bay panel points.

Typical cross sections of the approach spans and main span superstructure are provided as Exhibits 5 and 6.

A. Concrete Approach Spans

General

The concrete approach spans are in satisfactory condition. Areas of delaminated concrete were observed on the arch ribs particularly in Span 10. Areas of delaminated and/or spalled concrete were noted on the spandrel columns, columns, and the floor beams and jack arches at upper and lower deck levels. Tables listing the size and location of all areas of delaminated and/or spalled concrete observed on the concrete superstructure are listed in Appendix E.

Upper Deck Floor Beams

The floor beams supporting the upper deck fall into one of three categories. These include floor beams from the original 1917 construction, floor beams replaced during the 1967 rehabilitation and floor beams replaced during the 1995 rehabilitation. All floor beams not replaced during the 1967 rehabilitation were strengthened. The majority of deficiencies recorded were for the original floor beams with a few minor deficiencies noted for the beams dating to 1967. The floor beams replaced during the 1995 rehabilitation were found to be in very good condition.

Overall, the floor beams are in fair to good condition. A total of 79 floor beams were found to have 10 square feet or less of delaminated and/or spalled concrete each, while 34 were found to have more than 10 square feet. Total areas ranged from 3.2 square feet in Span 6 to 227 square feet in Span 12. Delaminations accounted for most of the areas recorded (Photo 19), however, spalled areas with exposed reinforcement were observed primarily in the south bay of Spans 1A, 2, 12 and 13 and the north bay of Spans 12 and 13 (Photo 20). Also, delaminations on the bottom face at the base of the haunch and small voids or spalls on the bottom face along the haunch interface with the corbel detail of the columns were noted at random locations, primarily in Spans 1A, 1B, 2 and 3 (Photo 28). Minor flexural cracks were noted at a few locations but were not significant. Epoxy-injected cracks showed no sign of progression.

Photo 19. View of the east face of Floor Beam 15 in the south bay of Span 3. The black lines outline an area of delaminated concrete located within the north half of the beam. DCP_2457.JPG

Photo 20. View of the lower portion of the west face and the bottom of Floor Beam 6 in the south bay of Span 13 showing a spall with exposed reinforcement. The widened section at the bottom of the beam encapsulates extra reinforcement added at the end portions of the original beams during the 1967 rehabilitation as a strengthening measure. The red lines outline delaminated concrete that was part of the strengthening repair. Areas of delamination are fairly typical at the strengthened beam ends.

DCP_2441.JPG

Lower Deck Floor Beams

In general, the lower deck floor beams are in fairly good condition. Sporadic areas of cracked, delaminated and spalled concrete were observed in all spans (Photos 21 through 24). The most extensive spalled areas are located on the bottom face of beams 1 and 2 in all three bays inside the east cellular abutment (Photo 25). With the exception of these areas, nearly all of the remaining spalls noted are relatively small and shallow with little or no surrounding delamination. Although these areas have been sealed, rust is reactivating on the reinforcement exposed at some of the spalls (Photo 26). Note that the shallow spalls of this type were observed mostly in Span 10 and were noted but not measured. A total of 72 floor beams were found to have 10 square feet or less of delaminated and/or spalled concrete per span, per bay, while 30 were found to have more than 10 square feet. Total areas ranged from 4.5 square feet in Span 11 to 232.8 square feet in Span 12. Although most of the delaminated concrete is still partially bonded, it can be expected to further separate as time goes on. Because pedestrians and motorists travel beneath nearly all of the concrete spans on a daily basis, areas of delaminated concrete should be closely monitored to identify and remove any concrete that becomes loose.

Photo 21. View looking upward showing longitudinal cracks on the bottom face and within the lower 4 inches of the west face of Floor Beam 6 in the south bay of Span 3. A similar crack is present within the lower 4 inches of the east face also. The concrete below the cracks in the vertical faces and on the entire bottom face is delaminated.

DCP_2317.JPG

Photo 22. View of the bottom and west faces of Floor Beam 2 in the south bay of Span 5. The blue dashed lines show the edges of an area of delaminated concrete that extends to the right of the spalls above the spandrel column. Note that the concrete on the bottom face of the floor beam below the marked area is also delaminated.

DCP_2319.JPG

Photo 23. View showing a horizontal crack in the north end face of Floor Beam 5 in Span 12, approximately 5 inches above the bottom of the beam. The crack separates an area of delaminated concrete that extends 9 inches inward (south) along both vertical faces of the floor beam and 19 inches on the bottom face. A similar crack and area of delamination was noted at the ends of several other beams in Span 12.

DCP_2367.JPG

Photo 24. View showing a delaminated and spalled area on the bottom face of the longitudinal beam adjacent to the north exterior arch ring that connects the ends of Floor Beams 10, 11, and 12 in Span 12. Note that this area lies directly above a parking lot and that the concrete is separated and loose.

DCP_2363.JPG

Photo 25. View looking north beneath Floor Beams 1 and 2 in the north bay inside the cellular East Abutment showing heavy spalls and corroded reinforcement along the bottom of the floor beams. The lower layer of longitudinal bars is exposed over the full length of Floor Beam 1 and the north two-thirds of Floor Beam 2 in this bay. Similar spalls expose large areas of reinforcement on these two beams in the center and south bays also.
DCP_2487.JPG

Photo 26. View looking east showing shallow spalls on the west face of Floor Beams 10 and 11 in the north bay of Span 10. Note that this condition is typical of many floor beams in Span 10 but is most pronounced at Floor Beam 10.
DCP_2371.JPG

Upper Deck Jack Arches

The upper deck jack arches are in fairly good condition. Noted deficiencies include sporadic cracks and areas of delamination with occasional spalls (Photo 27), and areas of cracks and delamination on the bottom face at the base of the haunch with small voids or spalls along the haunch interface with the corbel detail at the top of the columns (Photos 28 and 29). Deficiencies were noted in all spans but were most prevalent in Spans 1A, 2 and 3. A total of 76 jack arches were found to have 5 square feet or less of delaminated and/or spalled concrete each, while 26 were found to have more than 5 square feet. Total areas ranged from 0.9 square feet in Span 7 to 122.9 square feet in Span 1A.

Photo 27. View looking north showing the jack arch between Columns 9 and 10 in the south exterior column row of Span 5. The dashed blue lines highlight the edges of an area of delaminated concrete on the south and bottom faces.
DCP_2320.JPG

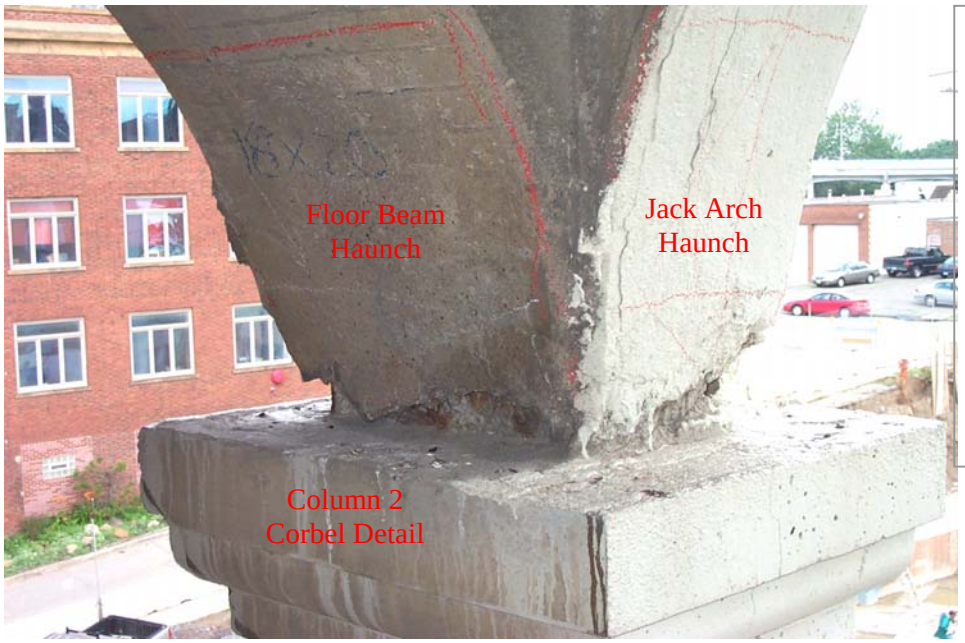


Photo 28. View of the corbel detail at the top of Column 2 in the north exterior column row in Span 2. The red lines outline areas of delaminated concrete on the bottom face at the base of the floor beam haunch and the jack arch haunch. Also in view are spalled or void areas along the haunch interface with the top of the corbel detail.
DCP_2443.JPG

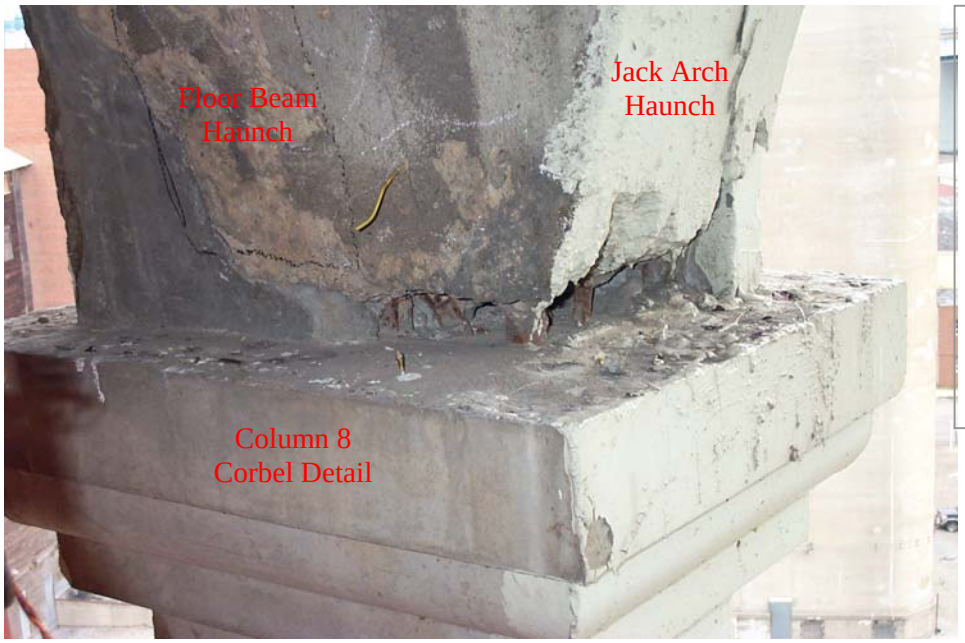


Photo 29. View at the corbel detail on top of Column 8 in the south exterior column row in Span 3 showing reinforcement exposed in the spalled/void areas along the interface of the floor beam and jack arch haunch with the corbel detail.

DCP_2456. JPG

Lower Deck Jack Arches

The jack arches at the lower deck level are in very good condition with very few cracks and delaminated areas observed. Delaminated areas were recorded for a total of 5 jack arches in as many spans, only one of which had greater than 5 square feet of delaminated concrete.

Upper Deck Columns

The upper deck columns are in fair to good condition. Delaminations and spalls were noted on the columns throughout the concrete spans and typically are located at or directly below the corbel detail at the top of the column (Photos 30 and 31) or within 30 inches of the bottom. The areas of deteriorated concrete were observed at scattered locations in all the concrete spans but were more numerous in Spans 1A and 1B. A total of 102 upper deck columns were found to have 10 square feet or less of delaminated concrete each, while 21 were found to have more than 10 square feet. Total areas ranged from 0.8 square feet in Span 6 to 232.3 square feet in Span 1A.

Photo 30. View showing a spalled area on the south face at the top of Column 6 in the north central column row in Span 1A. Note that the south protrusion of the corbel detail has fallen away and the spalled area extends the full width of the column and up to 48 inches down from the top.

DCP_2444. JPG

Photo 31. View showing a spalled area on the west and north faces at the top of Column 12 in the north exterior column row in Span 12. Note that portions of the corbel detail and the jack arch are cracked and delaminated in this area. The epoxy coating on the exposed reinforcement bar indicates that the column was replaced in the 1995 rehabilitation and thus the concrete deterioration developed in a short period of time. Also in view is a spall on the west face of the pier shaft. The east sidewalk along Robert Lockwood, Jr. Blvd. passes directly below this location.

DCP_2286. JPG

Lower Deck Spandrel Columns

The lower deck spandrel columns are in fairly good condition. Longitudinal cracks near the corners and areas of delamination were noted at sporadic locations in all the concrete arch spans, except Spans 12 and 13, and were most common in the north exterior and south exterior column rows (Photo 32). A spalled area with exposed reinforcement was observed on Column 1 in the south interior row in Span 6 (Photo 33). A total of 76 upper deck spandrel columns were found to have 10 square feet or less of delaminated concrete each, while 34 were found to have more than 10 square feet. Total areas ranged from 31.4 square feet in Span 11 to 202.4 square feet in Span 2.

Photo 32. View showing areas of delamination outlined by blue lines on the south and east faces and a longitudinal crack along the west edge of the south face of Column 1 in the south interior row in Span 8. A total of 31.9 square feet of delaminated concrete was recorded for this column.

DCP 2335.JPG

Photo 33. View showing 36- x 42-inch and 36- x 36-inch spalls on the west face and a 6- x 8-inch spall on the south face of Column 1 in the south interior row in Span 6.

DCP 2324.JPG

Arch Ribs

The concrete arch ribs are in fair to good condition. Typical deficiencies include sporadic cracks and delaminated areas mostly on the bottom face and on the side faces near the edges. Delaminations were noted to areas of patch concrete (Photo 34) as well as concrete from the original construction (Photo 35). Map cracks in the side faces and concentric cracks several feet in length along the edges of the bottom and side faces were noted at a few random locations, however, sounding indicated no delamination in most of these areas (Photo 36). Small amounts of debris consisting of aggregate and concrete rubble were observed lying on the top surface of the arch ribs primarily near the crown. An area of 4.6 square feet with exposed reinforcement was observed on the top surface of the north interior arch rib in Span 13, adjacent to East Abutment (Photo 37).

Areas of delaminated concrete were noted in all spans and, excluding Span 10, totals ranged from 32 square feet in Span 13 to 252.9 square feet in Span 8. In Span 10, a total of 818.7 square feet of delaminated concrete was recorded, with 739.8 square feet being located on the bottom face of the arch ribs. This represents 22% of the total area of the bottom faces in Span 10 (Photo 38). As noted in the 2000 Physical Condition Report prepared by HNTB Ohio, Inc., the presence of a greater amount of delaminated concrete in Span 10 may be related to this span being the first to be patched and the possibility that proper procedures may not have been developed.

Photo 34. View showing a concentric crack located approximately 12 to 16 inches below the top of the south face of the south exterior arch rib, that extends from the 3rd to the 6th spandrel column bay in Span 1. Note that the concrete within the area above the crack is patch concrete and is delaminated. Also, a similar size area of delaminated patch concrete is present along the adjacent edge of the top face of the rib.

DCP_2312.JPG

Photo 35. View showing a 13 to 20-inch wide delaminated area of original concrete along the south edge of the bottom face of the south interior arch rib below the 6th spandrel column bay in Span 7. This band of delaminated concrete extends below the next two, spandrel column bays to the west and is positioned above West Avenue.

DCP_2377.JPG

Photo 36. View showing map cracks on the south face of the south arch rib near the 14th spandrel column in Span 5. No delaminations were detected by sounding in this area.

DCP_2321.JPG

Photo 37. View showing reinforcement exposed in a 22- x 36-inch area on the top surface of the north interior arch rib in Span 13, adjacent to East Abutment. This area appears to be what remains of a larger area that was prepared for patching, which was not completed.

DCP_2360.JPG

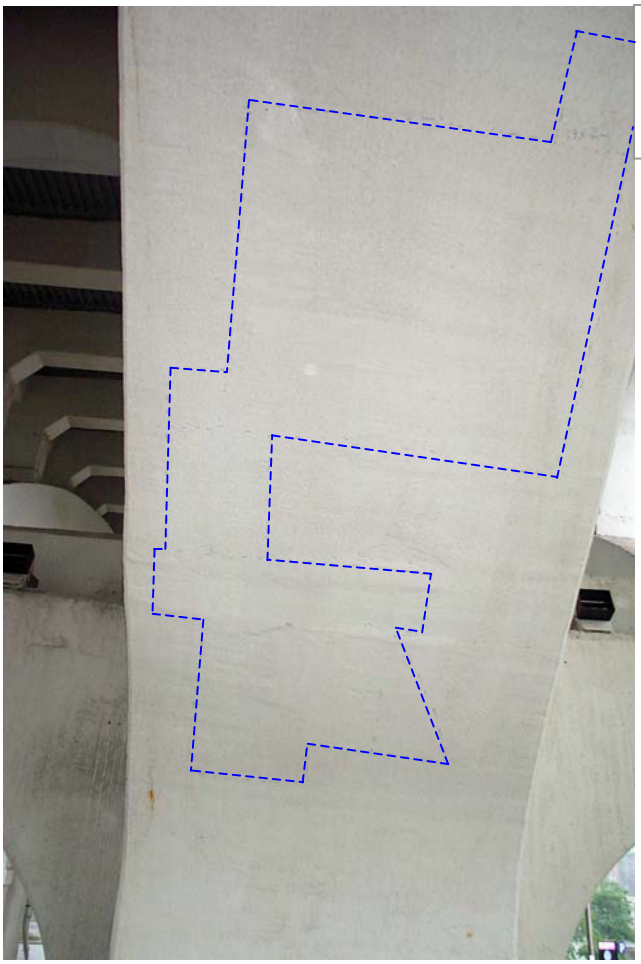


Photo 38. View looking west at typical delaminated areas outlined by the blue dashed lines, on the bottom face of the north interior arch rib in Span 10.

DCP_2374.JPG

B. Steel Arch Main Span

General

Overall, the steel members comprising the main span are in fair to good condition. Members above the upper deck level are generally in good condition with minor section loss and few deficiencies. Except for those members replaced in the 1995 rehabilitation, the majority of the members below the upper deck level have localized areas of section loss sustained prior to the last painting operation, ranging in severity from moderate depth pits to full depth corrosion holes. Areas of pack rust are also present primarily on the vertical posts, in between the gusset plates at the horizontal strut to lower deck floor beam connections (Photo 66), and on the exterior railing posts and connections. While the cleaning and painting performed during the last rehabilitation arrested the corrosion overall, rusting was observed in sporadic areas of paint failure and in areas that were inadequately prepared or missed due to limited access (Photos 46, 47, 50, 51, 53, 54, 55, 56, 59, 64, 65, and 67).

One feature that has promoted corrosion in areas below the upper level deck is the opening in the deck at the truss lower chords, web members and eyebar hangers. The openings allow water and de-icing chemicals to come in contact not only with these members, but also those areas of the floor beams and lower chord located below or downgrade of these members. (Photos 39, 40, 41, and 58).

Photo 39. View of the opening through the deck around the west eyebar hanger for the upper deck floor beam at Panel Point 8 of the north truss. Note the active corrosion on the web and top flange of the floor beam. The corrosion on the opposite face of the hanger is hidden from view.

DCP_2473.JPG

Photo 40. View from the west side of the upper deck floor beam at Panel Point 7' of the south truss. Note the corrosion that has developed on the top and bottom flange and portions of the web of the floor beam as a result of exposure to water and roadway chemicals that passed through the opening in the deck around the hanger.

DCP_2463.JPG

Photo 41. View looking west through the horizontal strut at the connection to the lower deck floor beam at Panel Point 4 of the north truss showing corrosion on the web of the floor beam and water collected inside the strut. The water, which originates from above the upper deck, flows down the vertical and accumulates in the connection area.
DCP_2347.JPG

Truss Main Members

The top chord members are in good overall condition. Areas of groove pitting are common inside the top chord, on the web of the top and bottom lacing channels at the interface with the chord web plates. At Top Chord U11-U12 of both trusses and U12-U11' of the south truss, a few areas of active corrosion and initial pack rust were observed between the top edge of the web plates and the vertical leg of the top angles. Also, areas of pitting with active corrosion were noted on the web of the lower lacing channels at the interface with the web plates. The lack of slope of these members has attributed to the development of corrosion in these areas (Photo 42).

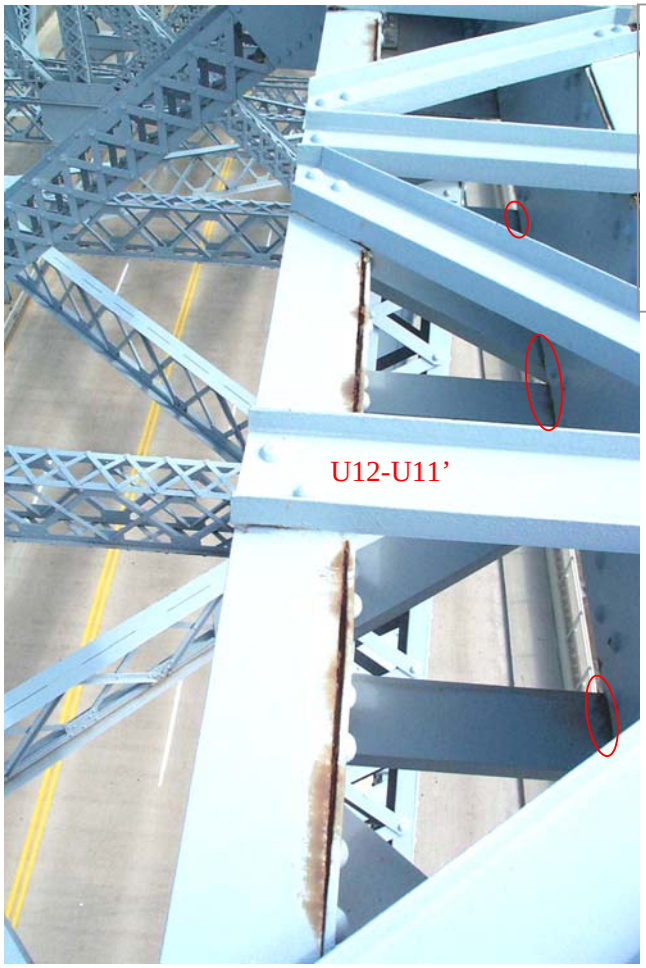


Photo 42. View looking east along Top Chord U12-U11' of the south truss showing areas of initial pack rust and active corrosion between the top edge of the north web plate and the vertical leg of the angle. The ovals highlight areas where the corrosion has reactivated on the web of the lower lacing channels.
DCP_2512.JPG

The vertical leg of the lower outside (south) angle of Top Chord U12-U11' of the south truss is corroded through in the area behind the vertical plate that covers the truss joint at Panel Point U12. Also, the horizontal leg of this angle has deep pitting in this area with a hole at the end. At Panel Point U12 of the north truss, pack rust was observed between the top batten plate and the horizontal leg of the top angles of Top Chord U11-U12 and U12-U11'. Pack rust was also noted at this location between the horizontal cover plate at the truss joint and the top batten plate at the end of Top Chord U12-U11'. One missing rivet was observed on Top Chord U8-U9 of the north truss at Panel Point U8 and on Top Chord U6'-U5' of the north truss near mid-length.

The bottom chord members that comprise the arch ribs are in fairly good condition. At Panel Point L12 of the south truss, pack rust was noted between the south web plate of the chord and the vertical cover plate at the joint. At the north truss, a similar formation of pack rust was also observed between the cover plate and the web plate on the south side of the lower chord. The expansion caused by the rust growth may be exerting undue pressure on the cast iron washer bolted to the end of the hinge pin (Photo 43). Areas of groove-type pitting are common on the lacing channels (Photo 44). Below the level of the upper deck, the effects of corrosion are more pronounced. In this area, thinning and perforations through the lower lacing channels are typical (Photo 45). Sporadic areas of pitting were noted on the horizontal leg of the top angles of the lower chord in the connection areas. Also, at the first web diaphragm inside the lower chord, closest to Panel Points L0 to L4 and L4' to L0', a band of heavy scale was observed on the inside face of one or both web plates of the chord, along the interface with the diaphragm. Where the scale was removed, loss of section ranging from 1/4 to 1/2 inch was common (Photo 46). At Panel Points L0 and L0' of both trusses, moderate section loss of up to 1/4 inch and areas of active corrosion were observed on the vertical leg of the lower interior angle of the lower chord, extending several feet from the end of the chord (Photo 47).

Photo 43. View looking east along the south side of the lower chord at Panel Point L12 of the south truss showing a gap between the web of the chord and the edge of the cover plate caused by the expansion of pack rust behind the plate.

DCP_2520.JPG

Photo 44. View looking east at areas of pitting and active corrosion on the top lacing channels of Lower Chord L5-L6 in the south truss.

DCP 2519.JPG

Photo 45. View of corrosion holes through the flanges of the lower lacing channels and active corrosion on the web diaphragm of the lower chord of the north truss, below Panel Point L2.

DCP_2348.JPG

Photo 46. View inside Lower Chord L2-L3 of the south truss at the first diaphragm east of Panel Point L2. The white paint highlights an area of scale on the inside face of the north inside web plate, along the web diaphragm. The measurements show the depth of section loss where the scale was removed. Note that the scale was not removed from the entire area.

DCP_2298.JPG

Photo 47. View showing section loss and active corrosion on the vertical leg of the lower interior angle of Lower Chord L0-L1 of the north truss adjacent to the lateral brace connection plate at Panel Point L0.

DCP_2306.JPG

The truss web members (vertical posts and diagonals) above the upper deck are in good condition. Three missing rivets were noted at Vertical L6'-U6' within the connection at Panel Point U6' of the north truss. Below the upper deck, however, a number of deficiencies were observed. As noted earlier, the cleaning and painting performed in the last rehabilitation stopped most of the corrosion. However, scattered pitting remains on these members below the upper deck as well as perforations through lacing bars and stay plates. Also, pack rust between angles is fairly typical at the verticals in the area extending several feet below the upper deck floor

beams, particularly at expansion joint locations (Photo 48). Diagonal L1'-U0' of the north truss has corrosion holes through both south flange legs adjacent to the horizontal strut at the upper level deck. Vertical Post L0'-U0' of both trusses has corrosion holes and perforations through the stiffener plates and attached curved angles on the east side, below the upper deck floor beam. At the north truss, L0'-U0' also has 4 consecutive lacing bars corroded through at the connection to the east web plate, below the upper deck floor beam. At Vertical Post L3'-U3' of the south truss, the north and south batten plates are corroded through below the upper deck floor beam. Vertical Post L0-U0 of the south truss has 3 missing flange bolts and 3 lacing bars severed at the connection to the west web plate, below the upper deck floor beam (Photo 48).

At Panel Points 4 and 4', connection brackets extend below the lower chord and fasten to the top flange of the lower deck floor beam. The bracket at Panel Point L4 of the north truss has pitted areas in the vertical plate along the top flange of the floor beam, and a 3- x 6-inch area of holes behind the eyebar hangers (Photo 49).

Photo 48. View of Vertical Post L0-U0 of the south truss, looking southwestward. The oval highlights 2 of 3 bolts missing from the north flange and the arrow points to 1 of 3 lacing bars corroded through along the west web. Also note the pack rust between the flange angles and the rust stains. Not in view are corrosion holes through the west stiffener plate on the north side of the member and through both west curved stiffener angles.

DCP_2458.JPG

Photo 49. View from the east side of the connection bracket above the lower deck floor beam at Panel Point L4 of the north truss showing pitted areas and holes in the vertical plate of the bracket. Also note the deep pits and holes corroded through the web stiffener plate of the floor beam, adjacent to the pin.
DCP_2477.JPG

Areas of paint are beginning to deteriorate on the truss web members below the upper deck with minor corrosion and rust staining. Numerous areas of paint lift-off and rust were observed on the vertical posts at Panel Points 2' and 3' of the south truss and on the adjacent Diagonal L2'-U1'. Also, areas of heavy flake rust remain at a few locations where surfaces were not adequately cleaned prior to painting or were not cleaned or painted due to access constraints (Photos 50 and 51).

Photo 50. View looking west inside Lower Chord L3'-L2' of the south truss, into the opening at the bottom of the east web plate of Vertical Post L3'-U3'. Note the rust showing through the areas of scale that were painted over on the inside web plates of the lower chord. Also note the large chunks of flake rust lying on top of the lower chord. The chunks separated and fell from the surfaces inside the vertical post that were not cleaned during the painting operation.
DCP_2358.JPG

Photo 51. View looking east between Stringers P and R towards the intersection of the horizontal strut with Diagonal L1'-U0' of the south truss, showing accumulations of blasting material and areas of rust that were either painted over or missed. Not visible in the photo are the rust and scale that remain on the surfaces inside and on the north side of (arrow) the diagonal, extending from the horizontal strut up to the connection to Vertical Post L0'-U0'.

DCP 2471.JPG

The vertical gusset plates at Panel Points L1 to L4 and L4' to L1' of both trusses typically have a 1- to 3-inch wide band of pitting in one or both faces along the interface with the top plate of the lower chord or attached lateral brace gusset plates. The depth of pitting typically ranges from 1/8 to 1/4 inch but localized section loss of up to 7/16 inch was observed at a few locations. Where pitting is present on both faces of the plate, total section loss is estimated at 30% to 50%. Also, corrosion is beginning to reappear in these areas at locations where not all of the rust scale was removed prior to painting (Photos 52 through 54).

Photo 52. View of the outside face of the south gusset plate at Panel Point L3 of the south truss showing a typical band of pitting along the top plate of the lower chord.

DCP_2351.JPG

Photo 53. View of a band of pitting on the inside face of the north gusset plate on the east side of Vertical Post L2-U2 at Panel Point L2 of the south truss. Note that some active scale was removed prior to application of the white paint. A similar band of pitting is present at this location on the opposite (outside) face. Also note the pitting and section loss to the rivet heads and top plate of the lower chord.

DCP_2299.JPG

Photo 54. View of a band of pitting and active scale on the outside face of the north gusset plate, on the west side of the connection at Panel Point L2 of the south truss. Similar pitting also exists at the opposite (inside) face.

DCP_2301JPG

Eyebar Hangers, Pins and Vertical Hangers

The eyebar hangers suspended from the arch ribs (lower chord) at Panel Points L5 through L5' are in good condition. Active light corrosion was observed on the interior face of several hangers below openings in the deck (Photo 39).

The eyebar hangers at Panel Points L4 and L4' pass through the lower chord and the vertical post and connect to pins at the upper and lower deck floor beams. Unlike the hangers at Panel Points L5 through L5', these hangers

were not replaced in the most recent rehabilitation and are in fair condition. Because a limited amount of cleaning and painting was performed inside the vertical posts, the hangers typically have rust scale and initial section loss on the inside face in the area adjacent to the lower flange of the upper deck floor beam. At Panel Point L4 of the north truss, a transverse band of pitting with approximately 3/16 inch of section loss was noted on the west hanger in this area (Photo 55). Also, areas of groove pitting were observed on one or both faces of several hangers at the pins in the lower deck floor beams. The pitted areas typically encircle the pins and have active scale on the inside (hidden) face of the hanger. The most significant section loss was noted on both faces of the east hanger at Panel Points 4 and 4' of the south truss, on the outside face of the east hanger at Panel Point 4 of the north truss, and on both faces of the west hanger at Panel Point 4' of the north truss. The pitted areas range from 1 to 2 inches in width and 1/8 to 7/32 inches in depth and generally have overlapping portions (Photos 49 and 56). The west hanger at Panel Point 4'of the north truss also has a 5/32-inch deep transverse band of pitting on the inside face, adjacent to the top flange of the floor beam (Photo 57).

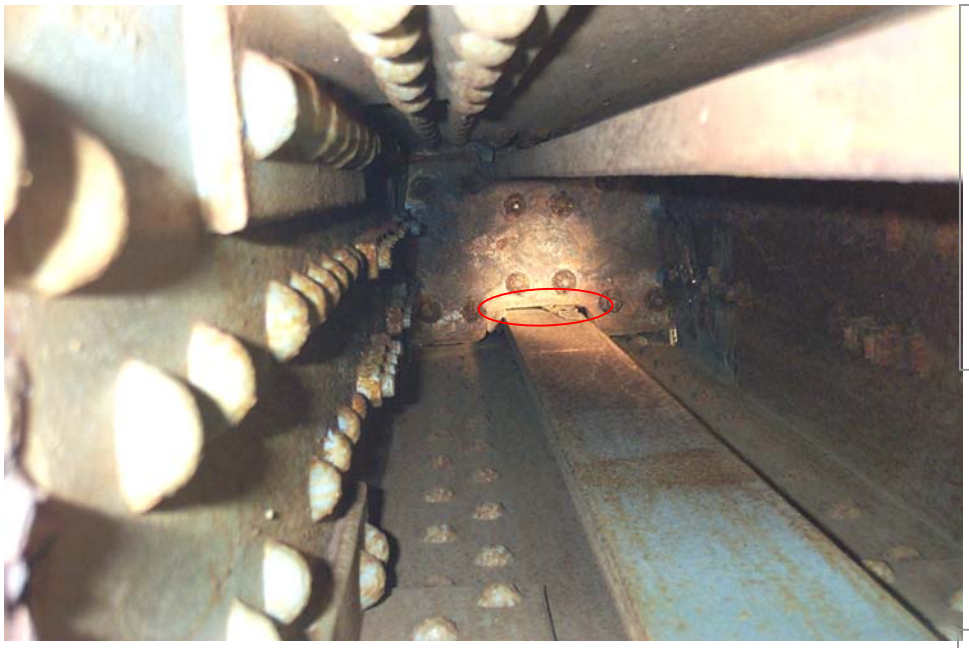


Photo 55. View looking up inside Vertical Post L4-U4 of the north truss showing the absence of paint and the band of pitting on the inside face of the west hanger (oval), adjacent to the lower flange of the upper deck floor beam.

DCP_2479.JPG

Photo 56. View of a circular band of pitting on the outside face of the east hanger, at the connection to the lower floor beam at Panel Point 4 of the south truss. The pitted area is approx. 1 1/2 to 2 inches wide and extends between the positions of 7 and 11 o'clock (moving clockwise). A similar area of pitting is present on the opposite (inside) face of the hanger and extends between the positions of 3 and 2 o'clock (moving clockwise). The measurements show the depth of pitting and remaining bar thickness at the location measured. Also note the pieces of heavy rust scale lying on the beam flange that were removed from the inside face of the hanger to determine the depth of section loss.

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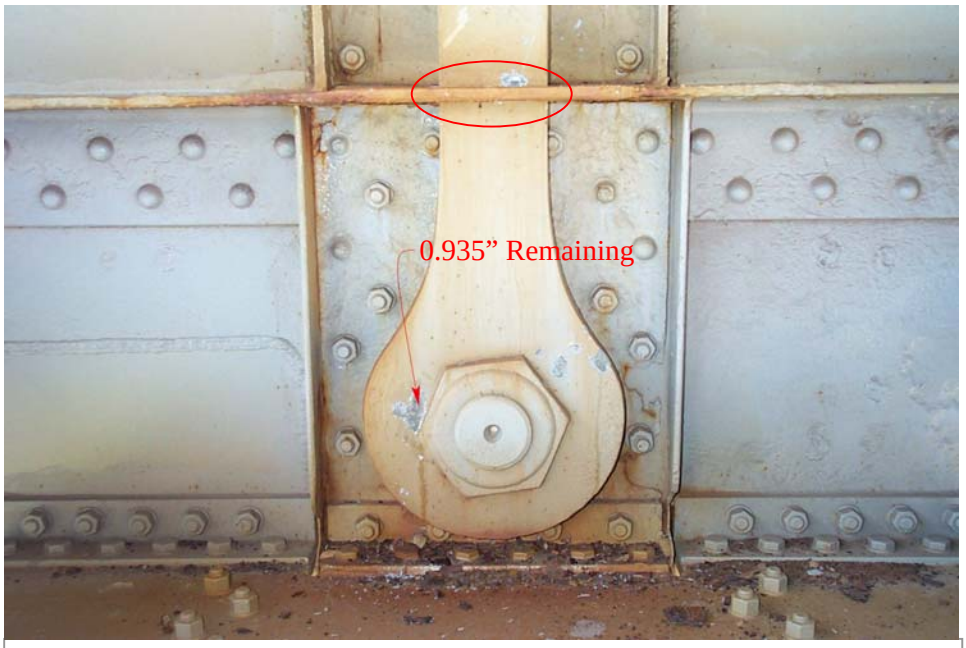

Photo 57. View showing a circular band of pitting on the outside face of the west hanger at the connection to the lower floor beam at Panel Point 4’ of the north truss. The pitted area is up to 2 inches wide and extends between the positions of 8 and 10:30 o’clock (moving clockwise). A similar area of pitting on the opposite face extends between the positions of 8 and 4 o’clock (moving clockwise). The measurement shows the remaining bar thickness at the location measured. Again, note the rust scale lying on the beam flange that was removed from the inside face of the hanger. The oval shows the location of a transverse band of pitting on the inside face of the bar where the metal thickness measures 1.061 inches, which represents a net section loss of approximately 13%.

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The eyebar hanger pins at Panel Points 5 through 5’ are in good condition. The following deficiencies were noted at the connections to the lower chord: the pins at Panel Points 6, 7, 8, 9’, 8’, 7’, and 6’ of the south truss and 9’, 8’, 7’ and 6’ of the north truss show no signs of grease seepage around the hangers indicating that the pins have been lubricated; the pin at Panel Point 6’ of the north truss has a grease fitting at one end only; there is no paint at one end on the pin and nut at Panel Points 6 and 11’ of the south truss and at 11’ and 6’ of the north truss. Similarly, the following deficiencies were observed on the pins at the eyebar connections to the upper deck floor beams: the pins at Panel Points 5, 9, 10, 11, 10’, 9’, 7’, 6’ and 5’ of the south truss and 6, 9, 11’, 10’, 9’, 8’, 7’, and 6’ of the north truss show no signs of grease seepage around the hangers; the pin at Panel Point 10 of the south truss has no grease fittings; and the pins at Panel Points 5, 11’, 10’ and 9’ of the north truss are missing a grease fitting at one end.

The eyebar hanger pins through the upper and lower deck floor beams at Panel Points 4 and 4’ of both trusses appear to be in satisfactory condition. It is not known whether or not the orifice at the ends of the pins is a grease port, but none of the orifices show signs of accepting grease and none of the pins exhibit any bleed-out of lubrication. Also, rust between the pin nut and the eyebar hanger is typical at the pins through the upper deck floor beams.

The built-up vertical hangers rigidly connected to the upper and lower deck floor beams at Panel Points 5 through 5’ are in fairly good condition. Areas of pitting sustained prior to the last painting are typical, particularly near the upper deck floor beams.

Floor Beams

The upper deck floor beams are in fair to good condition. Pitting and areas of section loss sustained prior to the most recent painting operation are most pronounced on the web of several floor beams adjacent to the seat angle at the connections of the stringers in Line E. Corrosion holes were noted in the web of the floor beams at Panel Points 10, 12, 11', 10', 8' and 6', on both sides of the seat angle at the stringer connections in Line E (Photo 58). The floor beams at Panel Points 0 and 0' have holes and perforations through the bottom portion of many web stiffener plates on the side of the web facing the pier. The floor beam at Panel Point 0' also has a 1-inch diameter hole in the lower web between Stringers N and P. As previously stated, areas of rust are beginning to develop on the floor beams in the vicinity of the eyebar hanger openings in the deck (Photos 40 and 58). Additionally, at Panel Point 3' of the south truss, an area of heavy corrosion and an 8-inch wide hole was observed in a portion of the web of the floor beam enclosed within Vertical Post L3'-U3'. The area was viewed through a 7-inch wide opening that was flame cut through both web plates of the vertical post (Photo 59). Heavy rust scale was also noted on the web of the floor beam within both vertical posts at Panel Point 0 and within the south vertical post at Panel Point 1'. Note that the floor beam web could not be viewed at the remaining locations where the floor beam is enclosed within the vertical post (Panel Points 0, 0', 1, 1', 2, 2', 3, and 3') because similar flame-cut openings were closed with welded plates.

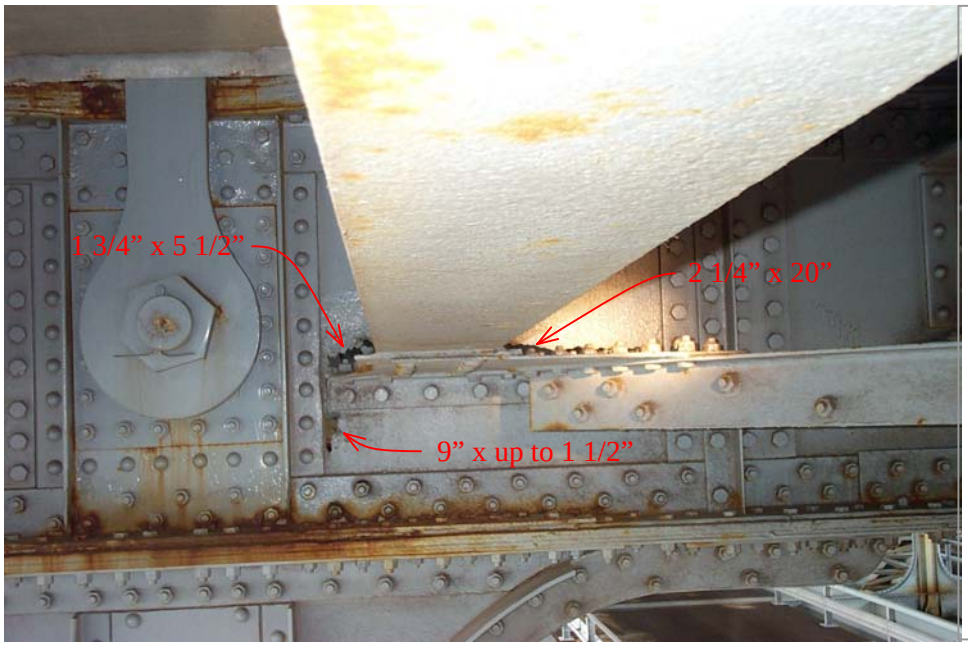

Photo 58. View from the west side of the upper deck floor beam at Panel Point 8' showing corrosion holes in the beam web adjacent to the seat angle for Stringer E. The holes at this location were the largest observed on the upper deck floor beams. Also, note the rust on the top and bottom flange of the floor beam.

DCP_2462.JPG

L3'-U3' WEST
WEB PLATE

Photo 59. View looking through a 7-inch wide hole cut in the west web plate of Vertical Post L3'-U3' of the south truss, showing a portion of the web of the upper deck floor beam enclosed within the vertical post. The arrows point to the vertical edges of an 8-inch wide hole corroded through the web plate of the floor beam (between vertical stiffener angles). The hole extends vertically through the top half of the web, and the lower half is heavily scaled and thin in this area.

DCP_2470.JPG

The lower deck floor beams are in fair condition. Areas of deep pitting and occasional corrosion holes and perforations sustained prior to the most recent painting operation are typical mainly in the area adjacent to Stringers 1 through 3 at the south end of the beams, and Stringers 10 and 11 at the north end.

The floor beams at Panel Points 0 and 0' have perforations and holes through the horizontal leg of the lower flange angles at both cantilevered ends. Also, holes through the lower portion of the web plates were noted at these locations (Photo 60), except at the south cantilevered end of the beam at Panel Point 0'. A 5 5/8-inch long crack was observed in the west web plate at the north cantilevered end of the floor beam at Panel Point 0. The crack originates from the opening coped in the plate to accommodate the lower flange of Stringer 12 (Photo 61).

Corrosion holes through the floor beam web above the north half of the seat angle at the stringer connections in Stringer Line 1 were noted at Panel Point 4, and Panel Points 7 through 6' (Photo 62).

Holes ranging in size from perforations to 2 inches in diameter were also observed on the floor beam web on each side of the horizontal strut between Stringer Lines 2 and 3 at Panel Points 9', 7', 6' and 2'; and on each side of the horizontal strut between Stringer Lines 10 and 11 at Panel Points 9' and 8' (Photo 63). Additionally, the lower flange of many of the floor beams has been coped or has perforations in the immediate area on each side of the horizontal strut (Photo 63).

A few areas of rust are beginning to redevelop on the floor beams at Panel Points 0 and 0' and in the areas adjacent to the connections at the horizontal struts.

Photo 60. View showing corrosion holes in the web plates and lower flange angles at the north cantilevered end of the lower deck floor beam at Panel Point 0'.

DCP_2344.JPG

Photo 61. View showing a 5 5/8-inch long crack in the west web plate of the lower deck floor beam at Panel Point 0, adjacent to the north edge of the lower flange of Stringer 12. Not in view are large corrosion holes in the floor beam web below the stringer.

DCP_2349.JPG

Photo 62. View from the east side of the lower deck floor beam at Panel Point 11' showing a typical corrosion hole through the web, above the north half of the seat angle at Stringer 1. Also in view are perforations through the connection plate, and groove pitting and a 1-inch diameter hole in the lower web of the stringer.

DCP_2355.JPG

Photo 63. View from the west side of the lower deck floor beam at Panel Point 9', on the north side of the connection to the strut located between Stringer Lines 2 and 3. Note the band of deep pitting and perforations in the floor beam web along the lower flange angle, the section loss to the angle, and the portion of the lower flange that has been coped. Also note the coped hole in the web of the strut and the reactivated corrosion.

DCP_2356.JPG

Stringers

The upper deck stringers are in good condition except for stringers in lines D, E, P and R in the end four stringer bays. Here, areas of rust and heavy scale are common, primarily at the lower web and bottom flange on the adjacent sides of the stringers. These areas were either missed or were painted over during the most recent rehabilitation, possibly because of limited access permitted by the horizontal strut member present in these bays. Moderate section loss was observed in several of these areas with perforations noted at a few locations (Photos 64 and 65).

Photo 64. View from the south side of Stringer P showing a 3-foot-6-inch long area on the lower web and bottom flange where the scale was removed and white paint applied to highlight the section loss. The arrows point to a 1 x 2 1/2-inch and a 1/4-inch diameter hole in the bottom flange. The depth of pitting in the web is up to 3/8-inch. Note the close proximity of the strut member.

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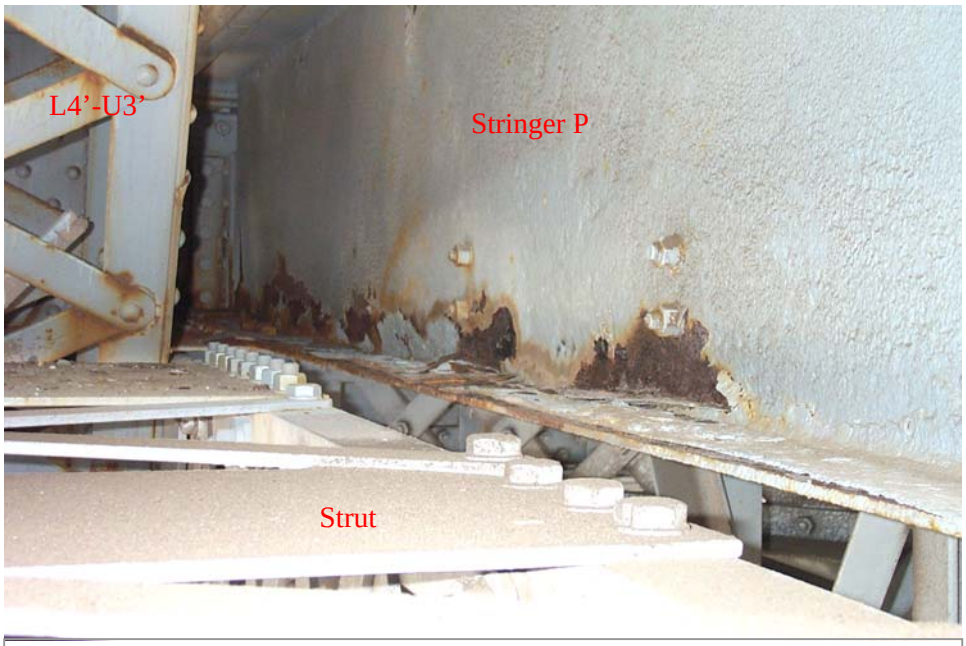

Photo 65. View looking west along the south side of Stringer P, between Panel Points 3' and 4', showing heavy scale on the lower web and bottom flange. Note that the web has a few perforations in this area and the flange is thinned to 3/16-inch at a few locations.

DCP_2467.JPG

Stringer F is missing 2 of 4 bolts on the south web connection angle at Panel Point 6'. Also at this location, 1 of 2 bolts securing the stringer seat angle on the east side of the floor beam is loose. Additionally, Stringer U has a minor dent in the lower flange between Panel Points 4' and 3'.

At the lower deck, the stringers within Lines 4 through 9 are generally in good condition with no significant section loss. The stringers in Lines 1 through 3 and 10 through 12, however, are in fair condition and typically have widespread pitting. Corrosion holes in the lower web at the end of the stringers were noted at a few locations, but primarily at the expansion bearings at Panel Points 3 and 3'. Specifically, holes through the lower web were observed at the following locations: Stringer 1 at the end on the east side of the floor beam at Panel Points 1, 2, 11' and 3' (Photo 62); at the ends of Stringers 1, 2 and 11 at the expansion bearings at Panel Point 3; and at the ends of Stringers 1, 2, 3, 10, 11, and 12 at the expansion bearings at Panel Point 3'. Additionally, a 12-inch long area of perforations was noted in the lower web of Stringer 3, approximately 20 inches from the connection on the east side of the floor beam at Panel Point 6. The corrosion damage to the stringers was sustained prior to the most recent painting operation, although some active rust was observed at a few corrosion-hole locations.

Additionally, Stringer 1 between Panel Points 3 and 4 has 4 bolts loose at the connection of both lateral bracing members to the lower flange.

Corrosion holes were also observed in the U-shaped stringer expansion bearing seats at Stringers 3, 10 and 11 at Panel Point 3 and at Stringers 1, 2, 3, 10 and 12 at Panel Point 3'.

Bracing

The bracing members are in good overall condition. Bracing members located below the upper deck typically sustained more damage from corrosion, which occurred prior to the last painting operation, than those located above the deck. Scattered pitting is typical with occasional perforations through angle legs and lacing bars. At the connection of the horizontal strut members to the lower deck floor beams, pack rust between the edges of the

lower horizontal gusset plate and the strut is typical (Photo 66). Also, flake rust was observed at a few locations inside the horizontal strut members, in the area adjacent to the connection to the lower deck floor beams (Photo 67).

Photo 66. View from the east side of the lower deck floor beam at Panel Point 10 showing the connection to the horizontal strut located between Stringers 2 and 3. Note the pack rust between the edges of the gusset plate, fill plate, and the lower flange angles of the strut and the floor beam. Also in view is a hole coped in the web of the strut and section loss to the rivets and vertical leg of the lower flange angle of the floor beam.

DCP_2354.JPG

Photo 67. View inside the horizontal strut between Stringers 10 and 11, looking towards the connection on the east side of the lower deck floor beam at Panel Point 8, showing areas of flake rust that were painted over at the time of the last rehabilitation.

DCP_2346.JPG

Above the upper deck, the only significant section loss observed on the bracing members was at the portal braces at Panel Points 2 and 2'. Typical section loss on these braces includes perforations through the lower batten plates, pitting to the lower angles on the horizontal leg and pitting with some active rust in the member connection areas. At Panel Point U5' of the south truss, the upper horizontal gusset plate for the sway brace has a 1 1/4-inch long tear at the west edge, likely incurred during construction.

Bearings

The arch span bearings are comprised of a steel pin supported by a cast steel shoe with a cast steel retaining washer bolted to each end of the pin. The bearings, which are located at both ends of the lower arch ribs (Panel Points 0 and 0') at Piers 3 and 4, are in fair condition with a few deficiencies noted.

Radial cracks in the face and/or transverse cracks at the edge were observed at several of the 18-inch diameter retaining washers. The cracks appear to have been caused by pressure exerted from pack rust behind the washer, and coincide with cupping in the exterior face of the washer. The most prominent cracks were observed at the south washer for the bearing at the west end of the south arch rib. Here, radial and transverse edge cracks were noted at the 12:30 and 3:30 o'clock positions and transverse edge cracks at the 7:00 and 9:00 o'clock positions (Photo 68). The north washer at this bearing has a short radial and a transverse edge crack at the 4 o'clock position and a transverse edge crack at the 9:30 o'clock position. Also, the south washer for the bearing at the east end of the south arch rib has a radial crack at the 1:00 o'clock position. The north washer for the bearing at the east end of the north arch rib has a short radial crack at the 12:30 o'clock position, and the north washer for the bearing at the west end of the north truss has a transverse edge crack at the 7:30 o'clock position.

The cast steel shoes typically have slight groove pitting in the face of the flanges surrounding the retaining washers and heavy scale on the surfaces inside the web cavities that were not cleaned or painted in the last rehabilitation. Water and debris is also collected inside the cavities at a few locations.

Photo 68. View showing radial and edge cracks (ovals) in the face of the retaining washer on the south side of the bearing at the west end of the south arch rib. The straight edge shows cupping in the face of the washer at the upper crack. The arrows point to the locations of transverse cracks at the edge of the washer. Note the active rust that shows at the interface of the washer and the flange of the shoe.

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VI. SUBSTRUCTURE

The substructure consists of twelve reinforced concrete piers and reinforced concrete abutments. The plans show the foundations at Piers 1 through 4 to be supported on spread footings. The abutment foundations at the ends of the arch rings and the foundations at Piers 5 through 12 are supported on piles. Both abutments extend beyond the arch ring foundations and are of cellular construction with a roof slab supported by a combination of floor beams, columns, and walls on spread footings.

A. Abutments

Overall, the abutments are in fair to good condition with a number of deficiencies observed inside the cellular construction. The condition of the roof slab and the floor beams was previously discussed in the lower deck floor and floor beam sections, respectively.

The cellular construction of West Abutment extends westward beneath Spans 1A and 1B for a distance of 220 feet. Access to this area was gained by ladder through an opening inside Tower 1B North.

Span 1A is comprised of a row of nine cells along the north and south exterior walls and is filled in the center area. In the north row, the transverse walls between the cells typically have one or two vertical cracks that extend down through the arched opening in the wall. Also, the first four cells from the west end each have a few diagonal cracks in the north wall with efflorescence. In the south row, the 1st cell from the west has several diagonal cracks in the west wall with efflorescence. The 3rd, 4th, 5th, 6th and 7th cells all have 1 or 2 prominent cracks near the north end of the transverse walls between the cells. The cracks typically extend vertically down from the top of the walls then move diagonally towards the north until they reach the lower portion of the north wall of the cell. Additionally, the diagonal cracks in the transverse walls of the 3rd, 4th and 5th cells join a crack in the north wall that extends horizontally across the wall and meets with the opposite crack. The east transverse wall in the 4th, 5th and 6th cells also has a short diagonal crack in the lower south half of the wall, that extends to the arched opening. The 8th cell has vertical rust stains on both sides of the east transverse wall and a short diagonal crack on the north wall. At the 9th cell, a 2 to 4-foot wide vertical strip of delamination was observed along the full height of the south wall and a short Y-shaped crack was noted at the top of the north wall.

Span 1B is made up of a row of transverse cells or column walls along the north and south exterior walls that support transverse floor beams in the center portion. The column walls and floor beams have a few sporadic shallow spalls but are otherwise in generally good condition. A spalled and delaminated area measuring approximately 50 square feet was observed on the south wall inside the 1st cell in the south row.

The cellular East Abutment extends a short distance beneath the East Station area and is comprised of a south, center, and north bay with walls, columns, and transverse floor beams. The area was accessed through a small opening secured with a steel gate on the south wall. Except for the heavy spalls previously noted on the bottom face of the first two floor beams, no other deficiencies were observed on the remaining floor beams or the exposed portions of the columns and walls. Standing water up to approximately 8 feet deep is pooled inside the abutment, within the cells on both sides of the south, center and north column walls. Water was observed to be leaking from a 12- x 18-inch concrete conduit (Photo 69) that passes through the abutment and may be the source for the pooled water. Water was also observed flowing out of two small drain pipes that exit through the breast wall of the abutment, near the center, and discharge into a catch basin located along the breast wall.

Photo 69. View inside the cellular East Abutment showing a 12- x 18-inch concrete conduit above a cell opening on the north side of the north column wall. The arrow points to the location where water is leaking from the bottom of the conduit. The type of pipe or utility that is encapsulated within the concrete is undetermined. Also in view is approximately 6 feet of water inside the cell.

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B. Piers

The piers are in fair to good condition. One common deficiency observed on the external pier shafts is the presence of cracks, spalls and/or delaminations on the east and/or west faces along the interface with the upper deck and spandrel columns (Photos 31, 70, 71, 72 and 73). As noted earlier, this deterioration is likely due to repeated exposure to water that seeps onto these faces after passing through the ends of the deck joints, where a portion of the elastomeric gland is missing. Areas of deficient concrete were recorded at 26 of the 32 external pier shafts, with the largest amount being at the south exterior pier shaft at Pier 5, totaling 136.4 square feet (see Appendix E). At many of these locations, some of the concrete is totally separated and could fall at any time. As previously stated, all loose concrete should be removed, and delaminated areas closely monitored to reduce the potential hazard to pedestrians, motorists and vehicles that are present beneath nearly all spans of the bridge.

Photo 70. View of a 10- x 50-inch spall/delamination on the east face of the north exterior pier shaft at Pier 1, just below the sidewalk at the upper level deck.

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Photo 71. View of three delaminated areas on the west face of the north exterior pier shaft at Pier 8, along the interface with the upper deck column.

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Photo 72. View of a delaminated area on the east face of the north exterior pier shaft at Pier 6, adjacent to the corbel detail at the top of the spandrel column.

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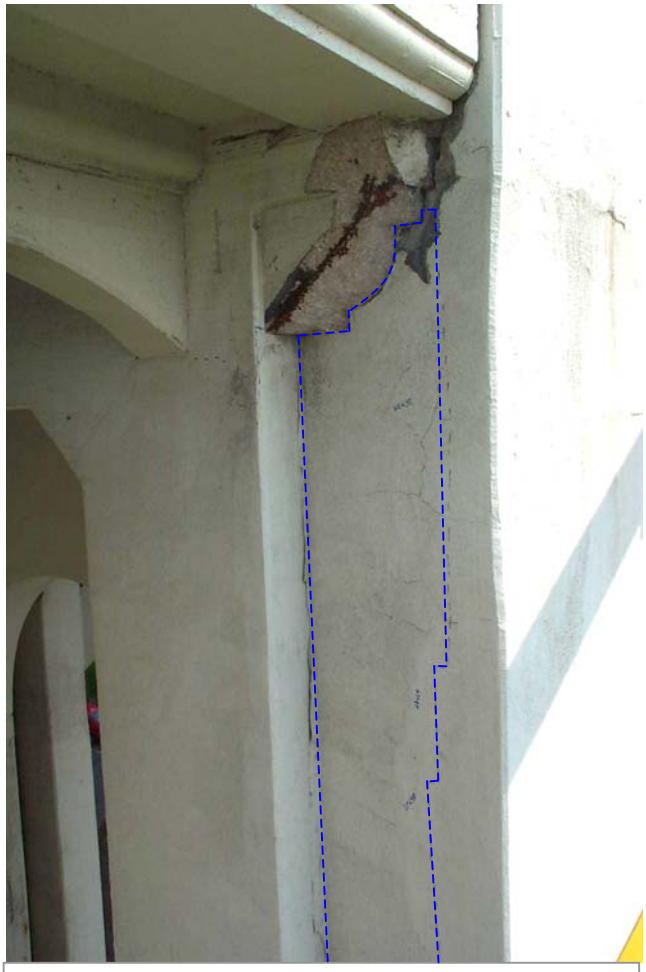

Photo 73. View of the west face of the south exterior pier shaft at Pier 8 showing areas of delaminated concrete outlined by the blue dashed lines. Also in view is a large portion of the corbel detail at the top of the spandrel column that recently separated and fell to the ground.

DCP_2337.JPG

Inside the towers at Piers 3 and 4, cracks, spalls and delaminations were noted primarily within the north and center bays on the jack-arch beam, on the edges and portions of the faces of the north and south columns, and on the north and south walls (Photo 74).

Photo 74. View inside the north bay of the tower at Pier 4 showing cracks, delaminations and spalls on the bottom and west faces of the jack-arch beam.

DCP_2381.JPG

Vertical rust stains were observed at sporadic locations on the lower exterior pier shafts, on the pier bases, and on the pedestal for the south truss at Pier 4 (Photo 75). No deterioration of the concrete surrounding the areas marked by the stains was detected by sounding.

Small areas of delamination were noted at random locations on the arch bases and on the jack arch beams between the arch bases. The pedestal for the south truss at Pier 4 has rust stains and map cracks on the west face; however, no deterioration was detected by sounding (Photo 75).

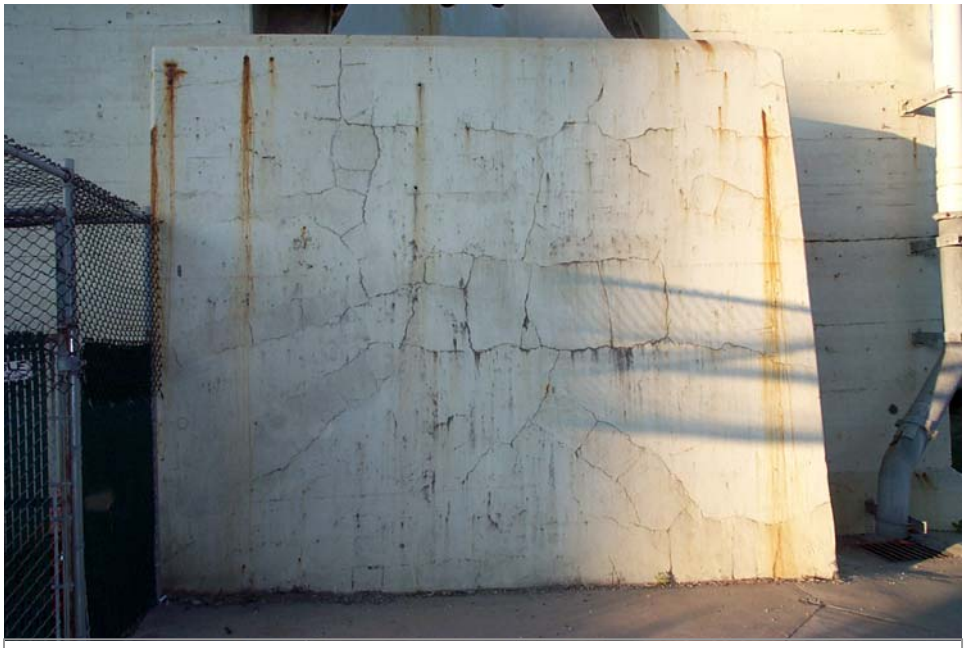

Photo 75. View of the west face of the pedestal for the south truss at Pier 4 showing map cracks and rust stains.

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Pier 3 has minor section loss at the splash zone and below the water line in the area surrounding the southwest corner, which is in contact with the river. At Pier 4, the concrete cap on the protection wall has a spalled area adjacent to the northwest corner of the pier. The deterioration in these areas is detailed in the report included in Appendix C for the underwater investigation performed by **ms consultant's inc.** Commercial Dive Team.

The underwater investigation revealed no scour of the channel bottom surrounding the portion of Piers 3 and 4 in contact with the river. However, gaps were detected between the edge of the steel sheet piling and the upstream and downstream face of Pier 4, as well as a void in the embankment adjacent to the downstream pier face. These deficiencies are detailed in the underwater investigation report provided in Appendix C.

VII. CHANNEL

The Cuyahoga River flows north under the main steel span at a skew angle of approximately 65 degrees. The underwater investigation performed by **ms consultant's inc.** Commercial Dive Team found the river channel bottom in the vicinity of Piers 3 and 4 to be in good condition with no significant scour or obstructions. No obstructions were observed at the surface of the river for several hundred feet upstream and downstream of the bridge.

The steel sheet piling along the east bank of the river typically has scale at the water line. As previously noted, the concrete cap on the protection wall along Pier 4 has a spalled area adjacent to the northwest corner of the pier. Also, there are gaps between the edge of the sheet piling and the upstream and downstream face of the pier below the cap at this location. At Pier 3, some steel sheet piling is in place out in front of the downstream (east) face of the pier, but is very irregular.

The embankment west of Pier 3 is sliding towards the river channel. Cracks have formed in the slope in the area where the embankment has separated. The cracks generally follow the curve of the river bank and have openings up to approximately 2 feet in width and several feet deep (Photo 76). Previous inspection reports prepared by HNTB, Ohio Inc. indicated that fill material had been graded off in this area within the past few years and that neither Cuyahoga County nor the State of Ohio owns this property.

Photo 76. View looking south showing the area of slope failure in the embankment west of Pier 3. The arrows point to the cracks formed where the embankment has separated. Note that the cracks are partially obscured by the grass.

DCP_2307.JPG

VIII. APPROACHES

The east and west approaches are in fairly good condition with a few deficiencies noted in the asphalt approach pavement.

At the east approach, the asphalt pavement is patched in the north and center westbound lanes, and has wheel line grooves and a few patched areas in the center and south eastbound lanes. A wide transverse crack extends across all lanes at approximately 8 feet 5 inches east of the joint at the end of the concrete wearing surface (Photo 77). Also, longitudinal cracks along the lane lines and a few transverse cracks in the lanes were noted.

Photo 77. View looking northeastward from the end of the concrete wearing surface, showing the condition of the asphalt pavement in the eastbound lanes of the east approach. Note the wheel line grooves in the south and center lanes and the wide transverse crack (arrow) that extends across the entire roadway.

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At the west approach, the asphalt pavement has longitudinal cracks along the lane lines and transverse cracks spaced at approximately 20 feet. Most of the transverse cracks are continuous and extend through the south sidewalk (Photo 78). A few cracks also extend through the north sidewalk. The pavement is also grooved in the wheel lines of the north westbound (to southbound) turning lane, near the intersection.

Photo 78. View looking southwestward from the west end of Span 1A showing typical transverse and longitudinal cracks in the west approach pavement.

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IX. GENERAL

Land Use

In addition to watercraft that travels the Cuyahoga River under Span 4, pedestrians, motorists, and the RTA rail system also utilize the land beneath the structure. Riverbed Road passes beneath Span 2. There is a recently constructed parking lot under Span 3. Center Street passes under Span 4. On the east side of the river, there are

parking lots beneath Spans 5, 6, 8, and 9, and a newly constructed parking lot beneath Span 13 and a portion of Span 12. Merwin Street passes under Span 6, West Avenue under Span 7, and Robert Lockwood Jr. Blvd. under Span 12. There are pedestrian walkways under Spans 4, 7, 8, 10, 11 and 12 and two sets of RTA rail lines pass beneath Span 11.

Navigation Lighting

The six green and red navigation lights mounted on the river span are operating properly.

Warning Signs

The warning signs and flashing yellow lights that alert motorists of the divided lane at the west end of the south truss and the east end of the north truss are in good condition. There are also two white lights positioned above each divided lane sign to illuminate the sign. One light is missing at the southwest location and one is not working at both locations.

Sign Supports

The sign supports are in good condition except for the overhead sign above the north westbound lane, which is fastened to the north truss at the east end. An over-height vehicle apparently damaged this support sometime in the past. Although several welded bracing members were added when it was repaired, the sign support remains bent slightly towards the west.

Utilities

Several deficiencies were noted for the light poles mounted along the sides of the upper deck, including inadequately tightened mounting nuts, missing service access covers, and loose or missing bolts that secure the service access covers.

All 4 top mounting nuts at Light Pole 3VM3 and 3 of 4 top nuts at Light Pole 1VM6 have only 60% and 75% of their threads engaged by the mounting studs, respectively. At Light Pole 2VM9, 1 of 4 top mounting nuts is not tight. The oval service access cover is missing at Light Pole 1VM10 and at the pole supporting the 4-light lamp located in the plaza area at the east end of the south sidewalk. The access cover is missing 1 of 2 bolts at Light Poles 3VM3, 3VM2, 4VM2, 4VM8, 3VM11 and 3VM8, and has both bolts loose at Light Pole 1VM1. Also, Light Pole 4VM10 has a 28-inch long dent near the base on the west side.

A nighttime inspection was not performed to check the operation of the deck and architectural lighting.

Several deficiencies were noted for the utilities that pass through conduits fastened to the underside of the upper level deck in the south bay. Water was observed leaking from the corrugated metal utility sheds suspended from the bottom of the upper deck, in the south bay of Spans 3, 6 and 13. The water enters through the man access covers in the deck above the sheds. One plastic conduit is hanging down and lying on the lower level deck in Spans 3, 5, 6 and 7. Also, this conduit has a substandard connection to one floor beam in the upper deck at the east end of Span 7, where it leaves the bridge and drapes to a utility pole south of the bridge, along West Avenue.

X. STATIONS AND TUNNELS

A. East Subway Tunnel

As discussed earlier, the East Station area which supports the roadway deck, extends over the cellular East Abutment and beyond for a total distance of 170 feet. This portion of the structure falls within the structure limits defined by the 2,656-foot deck length. Accordingly, the condition of the deck items and superstructure elements of East Station was covered earlier in the report.

East Subway Tunnel extends eastward from East Station for a distance of approximately 185 feet under Superior Avenue and terminates at a full-height closure wall. The tunnel is comprised of a roof slab, a north and south wall, and four longitudinal rows of concrete columns that support concrete jack-arch beams. The utility conduits suspended beneath the upper deck in the bridge spans extend eastward through the south bay of East Station and East Subway Tunnel. A plan view of East Station and East Subway Tunnel is provided as Exhibit 8.

The roof slab is in good condition with no noted deficiencies.

The jack-arch beams are generally in good condition but have a few sporadic cracks, spalls and delaminations. Only one jack arch was found to have greater than 5 square feet of delaminated and/or spalled concrete and the total area observed on the jack arches was 13 square feet.

The columns are in fairly good condition. Spalls and delaminations were observed at 11 out of a total of 36 columns, and are typically located at the corners at the top or bottom of the columns (Photo 79). Only 2 columns were found to have greater than 10 square feet of delaminated and/or spalled concrete and the total area observed on the columns was 45.1 square feet. Tables listing the size and location of the areas of deteriorated concrete on the jack-arch beams and columns are provided in Appendix E.

Photo 79. View showing a spalled and delaminated area at the corner of the south and west faces at the bottom of Column 22 in Column Row N in East Subway Tunnel. The spalled area extends to the floor of the tunnel that was covered by a pool of water 8 inches deep at this location at the time of the inspection.

DCP_2359.JPG

The north and south walls are in fair condition with scattered spalled areas and exposed reinforcement. Two full-height spalls up to 2 feet wide were observed on the north wall, one on the south wall. Additionally, scattered spalls up to 3 feet high were noted along the bottom of the south wall over most of its length.

As noted earlier, water up to 12 inches deep covers most of the floor of East Subway Tunnel. The pool extends from Column Line 19 in East Station to Column Line 26 in East Subway Tunnel and appears to have accumulated from water that leaked below the deck scupper located in the south gutter, at the east end of East Station (Photo 11).

B. West Station and Tunnels

As previously stated, the structure supporting the roadway west of the bridge is known as West Station, and extends approximately 350 feet west of Tower A, to a location where it divides into two subway tunnels. One tunnel extends to the west beneath Detroit Avenue for a distance of approximately 659 feet, and the other extends to the south under West 25th Street for a distance of approximately 479 feet. The utility conduits suspended below the upper deck in the bridge spans extend through West Station between Column Rows C and D, then along the south wall of Detroit Avenue Tunnel. A plan view of West Station and the subway tunnels is provided as Exhibit 7.

Water that entered through a manhole in the roadway was observed leaking down through a corrugated utility shed located between Columns C12 and D12. Within the West Station area there are three open stairwells near the west end that lead to a common pedestrian tunnel that passes from the north to the south beneath the subway level. Approximately 1 foot of standing water was noted inside the pedestrian tunnel. A ramped pedestrian tunnel along the south wall that formerly led to the West 25th Street intersection is closed off at the street level. Also, a stairwell that ascends to the street level inside a building on the corner of Detroit Avenue and West 25th Street is barricaded at the subway level. A ramped pedestrian tunnel at the north wall that leads to a locked entrance adjacent to the County Engineer's Garage is in good condition and is still utilized by guided tours. Also located in West Station along the south wall are restrooms and various storage rooms that are no longer in service.

Similar to East Subway Tunnel, West Station is comprised of a roof slab, a north and south wall, and six longitudinal rows of concrete columns that support concrete jack-arch beams.

During the 1995 rehabilitation project, transverse sections of the roof slab several feet in width were replaced at the expansion joints and at a few intermediate locations. The expansion joints and the concrete are in good condition at these locations. At the expansion joint between Column Lines 20 and 21, water seepage near Column Row A and efflorescence between Column Rows C and D was noted. The remainder of the roof slab in West Station is in fair condition. Approximately 14 transverse cracks were noted which extend through one or two column bays, primarily within the south half of the station area. A full-width transverse crack was observed between Column Lines 7 and 8, and 13 and 14 (Photo 80). The cracks are typically marked with heavy efflorescence and stalactites, with rust stains and small spalls on the deck floor adjacent to many of the cracks. Shallow spalls exposing transverse reinforcement were noted at sporadic locations on the roof slab throughout West Station (Photo 81). Efflorescence and stalactites were also observed at approximately four transverse construction joints within the south half of the station area and over most of the length of the construction joint between Column Lines 4 and 5.

Photo 80. View looking southeastward showing a transverse crack with efflorescence and stalactites on the roof slab of West Station, between Column Rows C and D and Column Lines 7 and 8. The crack extends from the north wall to Column Row E.

DCP_2496.JPG

Photo 81. View looking west showing spalls and transverse cracks with efflorescence on the roof slab of West Station, between Column Rows C and D and Column Lines 29 through 31.

DCP_2498.JPG

The jack-arch beams throughout West Station are in fair condition. Varying degrees of deterioration in the form of cracks, delaminations and spalls with exposed reinforcement were observed. Out of a total of 161 jack-arch beams located in West Station, noted deterioration was slight or minor at approximately 40, moderate at 16, and advanced at 3 to the extent that repairs should be made (Photo 82).

The majority of West Station columns are in fair condition, however, several are in poor condition. Similar to the jack-arch beams, varying degrees of deterioration were also observed at the columns. Out of a total of 165 columns, the deterioration was slight or minor at approximately 29, moderate at 18, and advanced at 12 to the extent that repairs should be made (Photos 82 and 83).

Photo 82. View looking southeastward showing deep spalls with exposed and disbonded reinforcement on the north and west faces of Column C13 in West Station. Similar spalls are present on half of the south face and portions of the east face of the column. Also in view are spalls with exposed reinforcement and surrounding delaminations on the north and bottom faces of the adjacent jack-arch beam.

DCP_2497.JPG

The north and south walls in the area of West Station located between the expansion joints adjacent to Column Lines 1 and 20, have a glazed brick facing and are in good condition. The north wall within the remaining area of the station extending eastward to the joint at Tower A, however, is in fair to poor condition. Full-height spalls with exposed reinforcement and surrounding delamination were observed adjacent to Columns A21 and A27 (Photo 83), and a full-height crack was noted in the area between Columns A28 and A29. Also, numerous spalls and delaminations were observed within a 3 to 5-foot wide strip along the top of the wall, in the area adjacent to Columns A21 to A31. Occasional spalls and delaminations were also observed within a strip up to 3 feet wide along the bottom of the wall in this same area. The south wall in the remaining area of the station located between the expansion joints adjacent to Column Line 20 and at Tower A is in fairly good condition. Noted deficiencies include 2 full-height cracks in the area between Columns F24 and F26 with a few surrounding spalls and delaminations, and an area of pattern cracks with seepage at the top of the wall adjacent to Column F23.

Photo 83. View looking west showing deep spalls with exposed reinforcement on the east face of Column A21 in West Station. Similar deterioration was noted on the west face and a portion of the north face of the column. Also in view is a spalled area several feet wide that extends over the full height of the north wall.

DCP_2500.JPG

Detroit Avenue Subway Tunnel is comprised of a roof slab, a north and south wall and a central row of concrete columns that support concrete jack-arch beams.

Similar to West Station, transverse sections of the roof slab were replaced at the expansion joints during the 1995 rehabilitation. A new slab was also placed over the original roof slab. The expansion joints and the new concrete are in good condition at these locations. Several small cracks with efflorescence were observed in the replacement concrete at the expansion joint between Tunnel Panels 4 and 5 (Joint 4/5), in the south bay (Photo 84). The remainder of the original roof slab in the tunnel is in fair condition. Cracks with efflorescence and rust stains were noted in the original slab along one or both sides of the replacement concrete at joints 0, 1/2, 2/3, 4/5, 5/6, 6/7, 7/8, 8/9, 9/10 (Photo 84). Also, scattered spalls, delaminations and transverse cracks with efflorescence and rust stains were observed on the roof slab in all tunnel panels except Panels 4 and 6, where only a few transverse cracks were noted.

Photo 84. View looking west at the expansion joint in the roof slab between Panels 4 and 5 in the south bay of Detroit Avenue Subway Tunnel. Note the short cracks with efflorescence in the replacement concrete and the cracks, efflorescence and rust stains in the original concrete along the interface with the replacement concrete.

DCP_2495.JPG

The jack-arch beams in Detroit Avenue Subway Tunnel are in fair condition. Varying degrees of deterioration in the form of cracks, delaminations and spalls with exposed reinforcement were observed on a number of the beams. Out of a total of 48 jack-arch beams located in Detroit Avenue Tunnel, approximately 8 exhibited slight or minor deterioration, 1 showed moderate deterioration and 2 were deteriorated to the extent that repairs should be made (Photo 85).

Photo 85. View looking south showing spalls with exposed reinforcement on the north and bottom faces of the jack-arch beam located between Columns 7 and 8 in Detroit Avenue Subway Tunnel. Also in view is a typical transverse crack with efflorescence on the roof slab in the south bay.

DCP_2494.JPG

The columns in Detroit Avenue Tunnel are in fair condition. Similar to the jack-arch beams, varying degrees of deterioration were observed on many of the columns. Out of a total of 48 columns, noted deterioration was slight or minor at approximately 16, moderate at 6, and progressed at 6 to the extent that repairs should be made (Photo 86).

Photo 86. View looking west showing a large spall with exposed reinforcement on the east face within the upper half of Column 44 in Detroit Avenue Subway Tunnel. County maintenance workers performing repairs to the north wall erected the blue tarp along the column line.
DCP_2493..JPG

The north and south walls in Detroit Avenue Tunnel are in poor to fair condition. Full-height spalls several feet wide with exposed and disbonded reinforcement were noted at 14 locations along the north wall and at 16 locations along the south wall (Photos 87 and 88). At the time of the inspection, repairs were being made at 3 of the 14 locations on the north wall. Also, a band of spalls ranging from 1 to 3 feet high with exposed reinforcement was observed along the base of both walls in all tunnel panels, but is more prevalent on the south wall. Additionally, isolated delaminations and spalls were noted at 5 locations on the north wall and at 9 locations on the south wall. Water was observed leaking from a corrugated utility shed positioned below the conduits located in the south bay.

Photo 87. View of the north wall of Detroit Avenue Subway Tunnel in an area adjacent to Columns 1, 2 and 3 showing large full-height spalls with exposed and disbonded reinforcement. The tunnel closure wall is visible at the left of the photo.

DCP_2490.JPG

Photo 88. View of a full-height spall approximately 8 feet wide, with exposed and disbonded reinforcement. The area is located on the south wall of Detroit Avenue Subway Tunnel, below the roof slab expansion joint at the east end of the tunnel. This condition is typical at many of the expansion joints.

DCP_2492.JPG

Similar to Detroit Avenue Subway Tunnel, West 25th Street Subway Tunnel is comprised of a roof slab, an east and west wall, and a central row of concrete columns that support concrete jack-arch beams. A water line is fastened to the upper portion of the east wall.

The roof slab is in fairly good condition. Scattered spalls and transverse cracks with efflorescence were observed in Tunnel Panels 11, 12, 13 and 16 and a few small shallow spalls were noted in Panels 14 and 15.

The jack-arch beams are also in fairly good condition. A few minor cracks, delaminations and spalls were noted at 3 of a total of 35 jack-arch beams located in West 25th Street Tunnel.

The columns are in fair condition with varying degrees of deterioration in the form of cracks, delaminations and spalls with exposed reinforcement. Out of a total of 35 columns located in West 25th Street Tunnel, noted deterioration was slight or minor at approximately 7, moderate at 7, and progressed at 1 to the extent that repairs should be made.

The east and west walls in West 25th Street Tunnel are in fair condition with deterioration similar to that found on the walls of Detroit Avenue Tunnel, but not as widespread. Full-height spalls a few feet wide with exposed reinforcement were observed at 3 locations along both walls. Scattered spalls along the vertical joints in the walls were also noted at 4 of a total of 8 joints in each wall. A full-height vertical crack with efflorescence was noted in both walls at Column 9. This crack joins a partial-width transverse crack in the roof slab. Similar vertical wall cracks were also noted at the following locations: on the west wall at Column 13, between Columns 16 and 17 and 28 and 29, and at Columns 32 and 34; on the east wall at Column 23 and between Columns 32 and 33. Additionally, a band of spalls within a strip up to 2 feet high with exposed reinforcement was observed along the base of both walls in all tunnel panels except on the west wall of Panel 17. The spalls within this strip are more prevalent on the east wall. Also, a delaminated and spalled area was noted on both walls near the joint at the north end of the tunnel and on the closure wall at the south end of the tunnel.

APENDIX A

BRIDGE INSPECTION REPORT (FORM BR-86)

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

1/8

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
1A	SOUTH	2	8X27E, 16X27E, 6X6E 6X6E, 12X27E	12X19E, 10X19E		10.2
1A	SOUTH	3	8X27E, 8X27E, 18X27E 12X14E, 12X14E	36X19E	8X36E, 20X16E, 8X14E	18.4
1A	SOUTH	4	8X14E	60X19E	8X27E	10.2
1A	SOUTH	5	8X27E, 12X14E, 8X14E	10X19E, 6X6E		5.0
1A	SOUTH	6	8X27E, 8X12E, 6X6E			2.4
1A	SOUTH	7	60X27E, 8X27E, 8X14E, 8X14E	96X19E	8X14E	27.8
1A	SOUTH	8	6X10E, 8X14E	12X28E	8X14E, 12X8E, 14X6E	5.4
1A	SOUTH INTERIOR (3RD FROM SOUTH)	7		4X14		0.4
					TOTAL SPAN 1A →	79.8
1B	NORTH	3	9X18, 8X19, 14X15 8X10	7X13, 11X17, 15X20, 6X10 10X14Δ, 16X20, 10X12Δ	12X18, 14X18, 7X22Δ, 12X22 11X27, 9X13, 14X20, 9X27	23.9
1B	NORTH	5		12X14, 20X20, 20X20 8X8Δ		6.9
1B	NORTH	6		28X20Δ		1.9
1B	CENTER	9		20X29, 4X6	7X33Δ	5.0
					TOTAL SPAN 1B →	37.7
1	NORTH	4	12X6	20X20, 7X14	4X11, 13X14Δ, 9X11 12X14, 12X14, 12X28	10.2
1	NORTH	6	10X16Δ, 7X7, 9X16Δ		9X12, 8X14, 11X14, 12X34, 14X46, 13X13, 16X16Δ, 10X34Δ	14.5
1	NORTH	7	18X24, 14X16, 12X14	12X30	10X14, 12X14, 27X64, 9X19, 24X36, 15X18, 10X18	32.7

*ALL MEASUREMENTS IN INCHES

E - DENOTES ESTIMATED SIZE

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

2/8

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
1	NORTH	8	16x30, 12x16, 9x22, 14x10 7x16	13x16, 24x24	29x40, 15x30, 22x22, 18x27, 19x19Δ, 10x12, 11x16	34.5
					TOTAL SPAN 1 →	91.9
2	SOUTH	7	12x30			2.5
2	SOUTH	8	12x26	30x38, 10x8	15x56, 12x16, 21x35 (P116)	22.9
2	SOUTH	9	13x19		16x37, 20x27	9.6
2	SOUTH	15	12x24, 14x20	48x20, 13x17, 11x11, 10x11 5x27, 14x20, (P117, 118)	16x20Δ, 9x16, 25x45	26.6
2	CENTER	11		10x18Δ		0.6
2	CENTER	15		9x18Δ		0.6
2	NORTH	2		18x20 (P113, 114)		2.5
2	NORTH	3		12x16		1.3
2	NORTH	4		15x18Δ, 7x13Δ, 6x20		2.1
					TOTAL SPAN 2 →	68.7
3	SOUTH	8	16x28	7x36, 8x13	20x36, 12x30	13.1
3	SOUTH	9	21x60, 10x14		10x36, 11x24	14.0
3	SOUTH	10			13x18, 8x9, 22x54	10.4
3	SOUTH	11		38x5	28x38, 11x21	10.3
3	SOUTH	13	6x20, 6x32, 6x12Δ 24x75, 12x20Δ	13x26Δ		16.9

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

3/8

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
3	SOUTH	14			12x20, 30x70, 18x20Δ	17.5
3	SOUTH	15	28x28		13x17, 18x24, 22x23Δ, 20x20Δ 23x70, 6x18, 14x19, (P12D)	26.9
3	SOUTH	16	17x28		8x14, 14x25, 7x18	7.4
3	SOUTH	17	6x27Δ	7x20, 13x20, 20x66	5x36, 16x16, 11x16 12x13	17.8
3	CENTER	3		12x20		1.7
3	CENTER	7		17x20		2.4
3	CENTER	13	10x22	20x20, 6x13Δ, 19x20		7.2
3	CENTER	15	11x20			1.5
3	CENTER	16	10x18			1.2
3	CENTER	17		20x44	6x36	7.6
3	NORTH	3		8x20		1.1
					TOTAL SPAN 3 →	157.0
5	SOUTH	6	10x14	7x10Δ	10x12	2.0
5	SOUTH	9	12x12			1.0
5	SOUTH	11		5x24	11x15, 9x11Δ	2.3
5	CENTER	6			21x21	3.1
5	CENTER	11	20x40	20x21, 5x6	19x22	11.6

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

4/8

SPAN	BRIDGE BAY	FLOOR BEAM **	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
					TOTAL SPAN 5 →	20.0
6	SOUTH	14	11 x 14	8 x 8	8 x 12	2.2
6	CENTER	5		7 x 24 Δ		0.6
6	CENTER	7		5 x 12		0.4
					TOTAL SPAN 6 →	3.2
7	SOUTH	3	5 x 36	5 x 36		2.5
7	SOUTH	6			10 x 16	1.1
7	SOUTH	11	5 x 38, 8 x 38, 13 x 36	5 x 38		8.0
7	SOUTH	12	11 x 14, 14 x 26	6 x 6, 6 x 7 Δ		4.0
7	NORTH	6		4 x 14 Δ		0.2
					TOTAL SPAN 7 →	15.8
8	SOUTH	7	8 x 13	21 x 34		5.7
8	SOUTH	8	11 x 14	10 x 16		2.2
8	SOUTH	9	12 x 24, 11 x 14	9 x 20		4.3
8	SOUTH	10	10 x 15			1.0
8	SOUTH	11		10 x 13		0.9
8	SOUTH	12		16 x 21		2.3

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

5/8

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
8	SOUTH	13	12x20	9x22, 20x36, 5x18Δ		8.4
8	SOUTH	14	11x16			1.2
8	CENTER	6			19x23	3.0
					TOTAL SPAN 8 →	29.0
9	SOUTH	3		9x13, 16x16		2.6
9	SOUTH	4	9x20			1.2
9	SOUTH	5		12x18, 8x33		3.3
9	SOUTH	7		16x20	9x10, 8x9, 13x20	5.2
9	SOUTH	8	9x18, 9x12, 5x20	7x16, 11x21		5.0
9	SOUTH	12		18x24		3.0
9	NORTH	2	10x64, 10x30			6.5
9	NORTH	3	7x7, 11x18, 9x15	10x15		3.7
9	NORTH	4	12x18, 11x16			2.7
9	NORTH	5			6x14	0.6
					TOTAL SPAN 9 →	33.8
10	SOUTH	4			7x24, 7x29, 13x15	3.9
10	SOUTH	7			13x13	1.2

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

6/8

SPAN	BRIDGE BAY	FLOOR BEAM **	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
10	SOUTH	8	12x28, 13x20		13x28	6.7
10	CENTER	9			18x21	2.6
					TOTAL SPAN 10 →	14.4
11	SOUTH	2		14x20Δ	7x11	2.5
11	SOUTH	3			6x15, 10x10, 11x16	2.5
11	SOUTH	4		8x12, 12x26		2.8
11	SOUTH	5	11x14, 8x14Δ, 8x18, 10x11Δ, 12x18	10x12		5.2
11	SOUTH	6	15x14			1.4
11	SOUTH	7	16x26Δ		14x18, 12x24, 10x15	6.2
11	SOUTH	8		20x24	14x27, 8x24, 18x23Δ, 6x32, 6x28, 12x20, 12x17	14.3
11	NORTH	3	15x12Δ, 11x12, 15x31, 8x8	6x18, 12x12, 8x26, 21x45, 20x22, 16x23, 22x25	6x7, 7x22, 19x27, 8x16 6x9, 9x10, 11x13, 12x22Δ	37.5
				8x18, 6x18, 17x22		
11	NORTH	4	7x12			0.6
11	NORTH	7	8x12E, 15x15Δ, 10x11	5x20, 12x21	5x20, 20x24, 10x11 4x20	10.0
					TOTAL SPAN 11 →	83.0
12	SOUTH	2	11x16, 15x18, 11x14, 7x18Δ 6x24, 6x24, 9x9	7x24, 24x29, 10x24Δ		14.0
12	SOUTH	3		13x13, 30x48, 14x18	6x34	14.3

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

7/8

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
12	SOUTH	4		6x21, 7x7, 7x17Δ		1.6
12	SOUTH	5	13x20, 10x14, 8x15 5x9, 15x18	18x20, 18x26		11.5
12	SOUTH	6		24x24, 13x16, 14x14, 7x16, 11x32, 20x32, 18x28		18.0
12	SOUTH	7	10x14	10x18, 15x15, 10x20		5.2
12	SOUTH	9	14x25, 7x24	24x60		13.6
12	SOUTH	10		24x32		5.3
12	SOUTH	11		22x36	13x26, 6x24	8.8
12	SOUTH	12	6x42, 26x48, 9x14, 3x9, 6x24	22x28, 10x22, 30x48	10x12, 12x14Δ, 13x27, 8x6	32.5
12	NORTH	3	6x10	17x27, 10x12, 7x20	13x14, 15x25	9.3
12	NORTH	4	8x10E	20x24, 20x29, 15x20, 11x11	16x32, 11x12, 9x26 9x7Δ	17.2
12	NORTH	5	12x14, 14x16ΔE, 10x14ΔE	10x14		3.4
12	NORTH	6	10x14ΔE, 16x16, 28x40, 16x22, 8x10Δ, 10x12, 12x13Δ, 9x14, 14x22	12x19	15x26, 6x26E	22.5
12	NORTH	7	8x12, 10x13	9x18Δ	9x18	3.2
12	NORTH	9	10x16, 15x33, 18x48	20x27	6x12, 7x12, 10x12	16.2
12	NORTH	10	27x30, 7x21, 13x13, 14x15Δ, 4x12E 4x12E, 4x12E, 12x20ΔE	13x20, 5x22, 16x22 (P109)	16x24, 10x12, 8x22, 7x12 7x24, 9x12	22.6
12	NORTH	11	13x20, 11x12	11x13, 12x12	11x12	5.6

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

E - DENOTES ESTIMATED SIZE

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK FLOOR BEAMS

8/8

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
12	NORTH	12	8x13, 11x20			2.2
					TOTAL SPAN 12 →	227.0
13	SOUTH	5	7x37	15x15, 8x13, 5x37		5.4
13	SOUTH	6	14x82	30x68, 5x22, 17x28 9x13	14x36, 6x28	31.7
13	NORTH	1			7x14Δ	0.3
13	NORTH	4	12x17	17x18, 7x16, 7x10Δ 5x16Δ, 15x16, 13x16	10x15	9.0
13	NORTH	5	9x24, 4x6, 17x32, 9x27, 8x10Δ	14x18, 9x9, 15x16, 8x10	7x9	12.4
13	NORTH	6	7x12, 7x9Δ			0.8
13	NORTH	7	8x10, 4x13, 4x11, 6x10, 6x21 8x8Δ, 7x10Δ (P108)			3.0
					TOTAL SPAN 13 →	62.6

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK FLOOR BEAMS

1/7

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
2	SOUTH	14			12x36	3.0
2	NORTH	10		12x48	5x48	5.7
					TOTAL SPAN 2 →	8.7
3	SOUTH	6	4x158	24x158, (P44)	4x158	35.1
3	CENTER	17		6x60E		2.5
3	NORTH	2	17x20	24x41		9.2
3	NORTH	15	12x13, 12x14			2.2
					TOTAL SPAN 3 →	49.0
5	SOUTH	2	16x34, 28x30, 15x24, 8x18, 10x16 (P46)	24x48, 12x12		23.2
5	CENTER	2			6x96E	4.0
					TOTAL SPAN 5 →	27.2
6	SOUTH	14		24x158 → LIGHT DELAM W/LONGITUDINAL CRACKS		26.3
6	NORTH	15			17x38	4.5
					TOTAL SPAN 6 →	30.8
7	SOUTH	10		4x8, 12x12, 12x23Δ	13x15Δ, 13x21Δ, 12x13	4.9
7	NORTH	1	17x22Δ	7x12		1.9
7	NORTH	4		24x64, 9x11Δ, 9x34 (P102)		13.1

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK FLOOR BEAMS

2/7

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
7	NORTH	8	7x32	20x32, 11x23, 12x22		9.6
7	NORTH	15	18x29, 12x16, 16x18Δ			6.0
					TOTAL SPAN 7 →	35.5
8	SOUTH	5	34x73, 10x17			18.4
8	NORTH	8	13x26			2.3
8	NORTH	9	36x44			11.0
8	NORTH	15			15x18, 16x34, 15x16Δ, 15x18	8.4
					TOTAL SPAN 8 →	40.1
9	SOUTH	5	15x19			2.0
9	SOUTH	13	26x35, 12x27, 10x22, 7x18			11.0
9	CENTER	1	13x34, 38x69	15x24, 8x14Δ		24.2
9	CENTER	4	13x14Δ, 14x14Δ, 14x24, 15x54, 12x14		14x48	15.1
9	CENTER	11			13x16	1.4
9	NORTH	1			18x24	3.0
9	NORTH	2	9x6, 11x11	12x16	6x15, 5x6	3.4
9	NORTH	3	11x17Δ, 7x10		10x13, 16x21, 10x15	5.4
9	NORTH	4	23x40, 7x19, 10x19		10x14Δ, 9x20Δ, 8x6	10.1

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK FLOOR BEAMS

3/7

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
9	NORTH	5	17x21, 14x26			5.0
9	NORTH	6			9x12	0.8
9	NORTH	11	24x45, 14x20, 28x28 5x10, 5x9Δ	15x24		17.9
9	NORTH	13	5x7Δ, 46x100, 21x36 15x21Δ	8x51	28x36	48.2
					TOTAL SPAN 9 →	147.5
10	SOUTH	1		24x47, 32x6	6x47, 13x31	13.9
10	SOUTH	2		FEW SHALLOW SPALLS (FSS)	18x14Δ	0.9
10	SOUTH	3	FSS		FSS	NR
10	SOUTH	4	24x34, FSS		FSS	5.7
10	SOUTH	5	FSS		FSS	NR
10	SOUTH	6			FSS	NR
10	SOUTH	7	FSS			NR
10	SOUTH	8	FSS		FSS	NR
10	SOUTH	9	FSS		FSS	NR
10	SOUTH	10	17x24, 10x36, 19x19Δ FSS			6.6
10	SOUTH	11	10x21, FSS		FSS	1.4
10	SOUTH	12	10x20, FSS	20x20		4.2

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

FSS = FEW SHALLOW SPALLED AREAS WHICH ARE RELATIVELY SMALL IN SIZE, HAVE NO LOOSE CONCRETE AND HAVE BEEN COVERED WITH SEALER

NR = NOT RECORDED

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK FLOOR BEAMS

4/7

SPAN	BRIDGE BAY	FLOOR BEAM **	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
10	CENTER	1	FSS		FSS	NR
10	CENTER	2	FSS		FSS	NR
10	CENTER	9			FSS	NR
10	CENTER	10	FSS		FSS	NR
10	CENTER	11			9x30, 10x18Δ	2.5
10	NORTH	1	FSS		10x16, 8x8, 10x13Δ, 6x13Δ	2.3
10	NORTH	2	FSS			NR
10	NORTH	3	23x23, FSS		FSS	3.7
10	NORTH	4	FSS			NR
10	NORTH	5			ONE SHALLOW SPALL	NR
10	NORTH	6	SEVERAL SHALLOW SPALLS	18x30, 16x24	36x50	18.9
10	NORTH	8			FSS	NR
10	NORTH	9			FSS	NR
10	NORTH	10	FSS (P97)			NR
10	NORTH	11	FSS		FSS	NR
10	NORTH	12	ONE SHALLOW SPALL			NR
					TOTAL SPAN 10 →	60.1

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

FSS = FEW SHALLOW SPALLED AREAS WHICH ARE RELATIVELY SMALL IN SIZE, HAVE NO LOOSE CONCRETE AND HAVE BEEN COVERED WITH SEALER

NR = NOT RECORDED

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK FLOOR BEAMS

5/7

SPAN	BRIDGE BAY	FLOOR BEAM **	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
11	SOUTH	4	18x36			4.5
					TOTAL SPAN 11 →	4.5
12	SOUTH	LONGITUDINAL BEAM EXTENDING FROM BEAMS 2-4 AT SOUTH END OF BAY		15x7		0.7
12	SOUTH	4	16x42, 16x28Δ		15x22, 8x16, 7x44	11.5
12	SOUTH	6	22x22	17x21	6x32, 18x18	9.4
12	SOUTH	8			10x16	1.1
12	SOUTH	9	12x56		12x18, 18x20Δ	7.4
12	SOUTH	10	28x36, 8x32			8.8
12	SOUTH	LONGITUDINAL BEAM EXTENDING FROM BEAMS 10-12	NORTH FACE: 29x36	14x36	SOUTH FACE: 36, 11, 58	14.3
12	SOUTH	12		20x84 (LOOSE)	21x48	18.7
12	CENTER	2	12x36	17x48	5x48	10.3
12	CENTER	3			9x9	0.6
12	CENTER	LONGITUDINAL BEAM EXTENDING FROM BEAMS 2-4 AT SOUTH END OF BAY			SOUTH FACE: 18x39	4.9
12	CENTER	4			12x28, 10x17	3.5
12	CENTER	5			6x32, 8x27, 12x18	4.3
12	CENTER	6			13x15	1.4
12	CENTER	7	16x25, 27x27			7.8

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK FLOOR BEAMS

6/7

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
12	UNDER 2ND ARCH RIB FROM SOUTH	8	16 x 34			3.8
12	CENTER	8	12 x 14			1.2
12	CENTER	9			12 x 18, 14/24 13	3.2
12	CENTER	10	12 x 15			1.2
12	UNDER 3RD ARCH RIB FROM SOUTH	10	24 x 36			6.0
12	CENTER	11	10 x 18			1.2
12	NORTH	2	13 x 23, 14 x 23			4.3
12	NORTH	LONGITUDINAL BEAM EXTENDING FROM BEAMS 2-4 AT NORTH END OF BAY	NORTH FACE: 5 x 48	8 x 82	SOUTH FACE : 5 x 82	9.1
12	NORTH	4			14 x 15, 10 x 18, 5 x 37	4.0
12	NORTH	5	9 x 5, 24 x 30, 13 x 30, 7 x 32	19 x 19, 5 x 19 NORTH END (P93)	9 x 5	13.1
12	NORTH	6	12 x 23, 12 x 19, 79 x UP TO 9 (P94)		18 x 20, 9 x 9	11.5
12	NORTH	7			9 x 10, 12 x 20 Δ, 20 x 36	6.4
12	NORTH	8	7 x 18		32 x 32	8.0
12	NORTH	10	17 x 22		34 x 44, 18 x 24	16.0
12	NORTH	LONGITUDINAL BEAM EXTENDING FROM BEAMS 10-12		8 x 68, 18 x 84, (P89)		14.3
12	NORTH	12		18 x 31	7 x 41, 44 x 62 (P90)	24.8
					TOTAL SPAN 12 →	232.8

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK FLOOR BEAMS

7/7

SPAN	BRIDGE BAY	FLOOR BEAM**	WEST FACE	BOTTOM FACE	EAST FACE	TOTAL (SQ. FT.)
13	SOUTH	2		31 X 117 (P87)	5 x 72, 6 x 18	28.4
13	SOUTH	6	6x6			0.2
13	CENTER	2		6 X 12,	7 X 18	1.4
13	CENTER	3		15 X 19		2.0
					TOTAL SPAN 13 →	32.0

*ALL MEASUREMENTS IN INCHES

** LINE NUMBER FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK JACK ARCHES

1/7

SPAN	COLUMN ROW	COLUMN BAY **	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
1A	SC	1	10x48, 12x24Δ			4.3
1A	SC	2	12x30		13x48	6.8
1A	SC	3	12x38			3.0
1A	SC	6	16x20			2.2
1A	SC	7	10x36			2.5
1A	SC	8	12x36Δ			1.5
1A	SI	4		16x18, 16x16	14x26Δ	5.0
1A	SI	7		16x24, 10x16		3.8
1A	SI	9		16x60	36x44Δ, 12x22Δ	13.1
1A	NI	4		12x16		1.3
1A	NI	5		9x16Δ, 16x28	6x48	5.6
1A	NI	6		11x11, 11x18Δ	7x22	2.6
1A	NI	7		12x17, 7x22, 16x30	5x12, 20x40	11.8
1A	NI	8		16x24		2.7
1A	NC	3	8x25		10x64, 8x22Δ	6.4
1A	NC	4			12x67, 38x42Δ	11.1
1A	NC	5	5x20, 10x29, 4x29Δ 24x24Δ		12x75, 38x42Δ	16.9
1A	NC	6	10x21, 10x23, 12x23Δ		9x39, 28x32Δ	9.6
1A	NC	7			12x60, 16x36Δ	7.0

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
** FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK JACK ARCHES

2/7

SPAN	COLUMN ROW	COLUMN BAY **	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
1A	NC	8	10x24, 24x24			5.7
					TOTAL SPAN 1A →	122.9
1B	SI	3		16x30		3.3
1B	SI	5	12x17Δ	16x28		3.8
1B	SI	6	10x13, 5x12Δ, 8x32	16x24Δ, 16x37		8.3
1B	NI	2		16x26		2.9
1B	NI	3	8x16		19x19	3.4
1B	NI	5			7x25	1.2
1B	NI	6		16x24	5x20Δ	3.0
					TOTAL SPAN 1B →	25.9
1	NI	4		12x20Δ		0.8
1	NI	6	5x34	16x34		5.0
1	NE	3		14x16, 10x16Δ 16x18		4.1
1	NE	8	3x3Δ	16x36		4.0
					TOTAL SPAN 1 →	13.9
2	SE	8			13x32	2.9
2	SI	2		15x16, 16x17		3.6
2	SI	7	7x50	16x26, 16x48, 3x4	7x20	11.7
2	SI	8		7x24		1.2

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
** FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK JACK ARCHES

3/7

SPAN	COLUMN ROW	COLUMN BAY **	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
2	SI	11	10x17Δ, 10x27 16x17	6x27, 10x21, 8x16	9x20, 10x12	9.9
2	NI	2		16x20, 16x17		4.1
2	NI	3		16x22Δ		1.2
2	NI	4		16x16, 12x16		3.1
2	NI	6	6x30Δ	16x25, 16x30		6.7
2	NI	8	28x28Δ	16x27, 16x32	14x22Δ	10.3
2	NI	9		16x21, 16x22, 16x30		8.1
2	NI	10		15x24	4x32, 8x14	4.2
2	NI	11		13x16		1.4
2	NI	14		12x16		1.3
2	NE	2		16x28 (P113,114)		3.1
2	NE	4	12x20			1.7
2	NE	10	9x25, 7x16Δ			2.0
					TOTAL SPAN 2 →	76.5
3	SE	7		2x12 (P119)		0.2
3	SI	7		7x16		0.8
3	SI	10		16x24, 16x24		5.3
3	SI	12	20x28Δ, 6x8 14x20, 7x16, 16x15Δ	15x46, 5x14Δ	12x12Δ, 18x32, 13x25Δ, 6x12 10x14Δ	17.5
3	SI	16	8x36, 5x5	6x16, 15x24	6x20	6.2

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
** FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK JACK ARCHES

4/7

SPAN	COLUMN ROW	COLUMN BAY **	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
3	NI	2	7x28Δ	8x12, 16x18Δ		2.3
3	NI	3		16x16, 13x16		3.2
3	NI	4		14x16, 5x7		1.8
3	NI	7		10x15, 5x5Δ		1.1
3	NI	8		16x50, 28x36Δ		9.0
3	NI	10	7x14	16x42		5.3
3	NI	12	15x30Δ, 9x30	6x54, 6x9Δ, 16x48, 16x30		14.5
3	NI	16		15x18		1.9
3	NE	2		16x16		1.8
					TOTAL SPAN 3 →	70.9
5	SE	8			15x16	1.7
5	SE	9	6x24	16x24		3.7
5	SE	10		12x12		1.0
					TOTAL SPAN 5 →	6.4
6	SE	4		16x36	6x36	5.5
6	SI	4		8x7		0.4
6	SI	10			12x13	1.1
6	NI	4		7x18		0.9
6	NI	7	18x24, 10x24Δ			3.8

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
** FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK JACK ARCHES

5/7

SPAN	COLUMN ROW	COLUMN BAY **	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
6	NI	11	12x18Δ	16x40		5.2
					TOTAL SPAN 6 →	16.9
7	NI	6		8x16		
					TOTAL SPAN 7	0.9
8	SI	4		14x24		2.3
8	SI	8		6x20		0.8
8	SI	12		12x14, 8x22, 6x16	5x19	3.7
8	SI	13		14x36	6x30Δ	4.1
8	NI	4	3x12	8x12, 6x18		1.7
8	NI	5		15x15		1.6
8	NI	11		11x27		2.1
					TOTAL SPAN 8 →	16.3
9	SI	6		8x29Δ		0.8
9	NI	3	16x27Δ			1.5
9	NI	8		10x16		1.1
9	NE	11	14x38, 10x14Δ 9x31Δ			5.1
					TOTAL SPAN 9 →	8.5
10	SE	4	8x20	7x20		2.1
10	SE	10		12x15		1.2

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
** FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK JACK ARCHES

6/7

SPAN	COLUMN ROW	COLUMN BAY **	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
10	NI	3		6 x 17		0.7
					TOTAL SPAN 10 →	4.0
11	SE	1	6x12 Δ			0.2
11	SE	8		5x20		0.7
11	SI	7	10x20		12x19, 10x14	3.9
					TOTAL SPAN 11 →	4.8
12	SI	8	6x15 Δ	6x16	15x26	3.7
12	NI	3	8x9		10x19	1.8
12	NI	4	9x9 Δ, 6x9, 7x10			1.1
12	NI	12	4x56	16x45	3x45	7.5
					TOTAL SPAN 12 →	14.1
13	SI	2		14x15		1.4
13	NI	5			8x20, 4x25	1.8
					TOTAL SPAN 13 →	3.2
EAST STATION	SI	6	8x30			1.7
EAST STATION	SI	9	14x24			2.3
EAST STATION	SI	11	12x24			2.0
EAST STATION	SI	14	12x24			2.0
EAST STATION	NI	5	12x24			2.0

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
** FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK JACK ARCHES

7/7

SPAN	COLUMN ROW	COLUMN BAY	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
EAST STATION	NI	6	18x36			4.5
EAST STATION	NI	15	12x36	4x48	12x48	8.3
					TOTAL EAST STATION →	22.8

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
** FROM JOINT AT WEST END OF SPAN

SPALLED AND/OR DELAMINATED AREAS*

LOWER DECK JACK ARCHES

1/1

SPAN	SPANDREL COLUMN ROW	SPANDREL COLUMN BAY**	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
2	SE	15			6, 18, 34	2.7
3	SE	6	4x48	15 x 48		6.3
9	NI	6		15 x 28	5 x 47	4.5
10	NE	8		15 x 36		3.8
11	SE	4	6 x 24	3 x 24		1.5

*ALL MEASUREMENTS IN INCHES

** FROM JOINT AT WEST END OF SPAN

NE - NORTH EXTERIOR ROW

NI - NORTH INTERIOR ROW

SI - SOUTH INTERIOR ROW

SE - SOUTH EXTERIOR ROW

TOTAL ⟶ 18.8

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

1/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
1A	SE	3	20x22, 10x12			6x18	4.6
1A	SE	4			20x51		7.1
1A	SE	5	20x24		20x36, 8x42, 6x10		11.1
1A	SE	6	20x31		11x27		6.4
1A	SE	7	20x40, 10x47, 6x10		10x48		12.6
1A	SE	8	20x48				6.7
1A	SC	1			12x44Δ		1.8
1A	SC	3	8x22, 20x78		11x20		13.6
1A	SC	4			20x24		3.3
1A	SC	5			20x20		2.8
1A	SC	6			20x26		3.6
1A	SC	7			20x27		3.8
1A	SC	8			20x25		3.5
1A	SI	2	16x20	6x25	6x16, 18x20		6.4
1A	SI	3	10x15	6x21, 6x12		6x38	4.0
1A	SI	5	18x20, 8x9Δ	15x36	20x20, 10x18Δ	15x22	12.2
1A	SI	6	14x20		7x12, 9x32Δ	7x32Δ	4.3

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

2/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
1A	SI	7	10x24	15x26	9x32, 7x20	7x29	8.8
1A	SI	8	20x32	15x37	20x37	15x37	17.3
1A	SI	9	20x30, 6x20		15x30Δ, 10x12, 5x6	15x36	11.4
1A	SI	4		5x24	11x24		2.7
1A	NI	1	8x24	12x15	12x16Δ		3.2
1A	NI	2				8x17	0.9
1A	NI	6		3x24	6x6Δ		0.6
1A	NI	7	11x14 @ CAP		10x20Δ, 10x20Δ 11x14@ CAP	11x14 @ CAP	4.6
1A	NI	8	20x22			15x28	6.0
1A	NI	9	20x28	12x15, 9x18Δ		15x29	8.7
1A	NC	1	14x28Δ, 11x25 @ CAP, 24x25Δ			10x13Δ	5.8
1A	NC	2	4x25 @ CAP				0.7
1A	NC	3	21x20Δ	5x14	20x24, 11x25 @ CAP		7.2
1A	NC	4	11x25 @ CAP, 18x18		20x20, 11x25 @ CAP		8.8
1A	NC	5	16x18	5x150, 5x20	12x20, 11x25 @ CAP		11.5
1A	NC	6	7x20, 11x25 @ CAP 18x26		20x33, 11x25 @ CAP, 20x37 (P115)		17.8
1A	NC	7			20x30		4.2

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

3/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
1A	NC	8	15x20		5x12Δ, 6x12Δ		2.5
1A	NE	3			10x34Δ		1.2
1A	NE	5			4x20		0.6
						TOTAL SPAN 1A →	232.3
1B	SE	6	8x24, 20x25				4.8
1B	SE	7	7x22, 20x33				5.6
1B	NI	2	8x35, 16x20			8x35Δ, 6x10Δ 6x16	6.0
1B	NI	3		6x24	7x11, 16x20, 19x20	7x25	7.6
1B	NI	4	10x10, 14x14	7x13	14x19, 20x26	6x8	8.5
1B	NI	5	20x23, 20x20		19x20, 10x18		9.9
1B	NI	6	11x11, 16x20, 20x24, 8x14		20x27, 14x20	5x18, 6x18, 10x15	15.3
1B	NI	7			20x32	15x22, 6x15, 10x12	8.2
1B	NI	8	20x37, 20x26		13x20, 8x12	15x18, 5x13Δ, 10x17	14.5
1B	NI	9	20x28, 11x37, 11x18 @ CAP	8x12, 11x25 @ CAP	20x35	15x16, 16x16, 6x48	21.0
1B	NI	10	8x20, 10x13		20x23Δ, 16x20	6x18	6.6
1B	NI	11	16x20,	15x15, 5x14	20x25, 7x18, 11x15	7x15	10.5
1B	NE	2			15x44		4.6

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

4/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
1B	NE	4			16x20, 20x20, 20x22, 8x24	7x9, 7x15	10.6
1B	NE	5			12x20, 20x48, 20x26		11.9
1B	NE	6			8x8		0.4
1B	NE	11	20x32	9x19, 9x11	10x10, 20x20		9.8
						TOTAL SPAN 1B →	155.8
1	SE	?	13x16Δ, 10x15Δ			5x12	1.6
1	SE	8		8x15	12x15		2.1
1	SI	2	16x22, 11x25@CAP	11x25@CAP	11x25@CAP	11x25@CAP	10.1
1	SI	4	5x18@CAP, 11x12@CAP			11x13@CAP	2.5
1	SI	7			12x21, 11x25@CAP	6x14	4.2
1	NI	4	8x20, 10x16, 11x25@CAP	11x25@CAP, 16x16	6x20, 9x12 11x25@CAP	11x25@CAP, 8x15	14.0
1	NI	5				7x16	0.8
1	NI	11	19x20	10x10	12x22		5.2
1	NE	4			7x13, 8x27		2.1
1	NE	7			8x14		0.8
1	NE	10			7x21, 18x20		3.5
						TOTAL SPAN 1 →	46.9

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

5/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
2	SI	11	11x15 @ CAP			9x11 @ CAP	1.8
2	SI	14	14x21	5x10	14x19		4.2
2	SI	15	11x20, 11x11 @ CAP	10x15, 7x15Δ 11x11@ CAP			4.6
2	NI	14			13x30		2.7
2	NI	15	11x25 @ CAP, 10x30		16x18, 11x14@CAP	11x25 @ CAP, 10x17	10.2
2	NE	4			6x20		0.8
2	NE	10		3x14, 11x25@CAP			2.2
2	NE	?	10x10 @ CAP 10x10 @ CAP			6x10 @ CAP 6x10 @ CAP	2.2
						TOTAL SPAN 2 →	28.7
3	SE	11			FULL WIDTH DIAGONAL CRACK		
3	SI	10			8x9		0.5
3	SI	13	9x11 @ CAP		9x15, 9x11@ CAP	5x25 @ CAP	3.2
3	NI	13				11x46, 9x51	6.7
3	NI	15	6x16Δ	14x16Δ			1.1
						TOTAL SPAN 3 →	11.5
5	SE	1			9x15		0.9
5	SE	2			7x21	6x21	1.9

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

6/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
5	NI	12	14x24				2.3
						TOTAL SPAN 5 →	5.1
6	NI	5				8x14	0.8
						TOTAL SPAN 6 →	0.8
7	NI	3				15x40, 10x16Δ	4.7
7	NI	6		5x11 @ CAP, 6x8	9x11 @ CAP		1.4
						TOTAL SPAN 7 →	6.1
8	SE	11	15x29				3.0
8	SE	15			12x19, 5x12Δ	7x12	2.4
8	SI	2			8x25		1.4
8	NI	6			5x30		1.0
8	NI	9		3x24 @ CAP		4x19 @ CAP 6x19 @ CAP	1.8
8	NI	10	9x11 @ CAP	6x24 @ CAP		11x24 @ CAP	3.5
8	NI	12	6x24 @ CAP			6x24 @ CAP	2.0
						TOTAL SPAN 8 →	15.1
9	NI	5	7x11 @ CAP		11x15 @ CAP, 5x7	11x22 @ CAP	3.6
9	NI	6	8x15, 9x15Δ, 10x12Δ 6x26				2.8

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

7/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
9	NI	7				8x16	0.9
9	NI	9		7x16Δ	9x9, 12x13 11x28 @ CAP	11x18 @ CAP	5.5
9	NI	11	13x15, 20x24, 9x19	3x36			6.6
						TOTAL SPAN 9 →	19.4
10	SE	6				2x20 @ CAP	0.3
10	SE	8			14x32		3.1
10	SI	11				7x15	0.7
10	NI	10				8x40, 7x28	3.6
						TOTAL SPAN 10 →	7.7
11	SI	2			19x20		2.6
11	SI	3			19x20		2.6
						TOTAL SPAN 11 →	5.3
12	SI***	9	20x36		20x56, 9x20Δ		13.4
12	NI***	5	16x20		20x24		5.6
12	NI***	6	20x59		20x50		15.1
12	NI***	7	20x44				6.1
12	NI***	8			20x39		5.4

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
*** HANGER BELOW ARCH RIB

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

8/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
12	NI ***	10	20x57, 9x20Δ		20x57, 9x20Δ		17.1
12	NE	11		7x24			1.2
						TOTAL SPAN 12 →	63.9
13	SE	3			6x9		0.4
13	SE	4	11x11, 15x15, 13x37			3x15, 3x11	6.3
13	NE	1	12x15			15x27	4.1
						TOTAL SPAN 13 →	10.8
EAST STATION	L	18	14x84, 12x20	12x18, 18x60		12x18	20.3
EAST STATION	SE	5	20x28, 8x26			8x28	6.9
EAST STATION	SE	7	7x20	3x20			1.4
EAST STATION	SE	8			5x24	15x24	3.3
EAST STATION	SE	9				5x22Δ	0.4
EAST STATION	SE	15			20x28		3.9
EAST STATION	SE	17	4x30Δ	4x20, 6x30Δ	4x20		2.2
EAST STATION	SE	18	3x24			8x24	1.8
EAST STATION	SI	4		6x8	6x8		0.7
EAST STATION	SI	15		8x20			1.1

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW
*** HANGER BELOW ARCH RIB

SPALLED AND/OR DELAMINATED AREAS*

UPPER DECK COLUMNS

9/9

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
EAST STATION	SI	21		15 x 36			3.8
EAST STATION	NI	16				11 x 25	1.9
						TOTAL EAST STATION →	47.7

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR ROW
NC - NORTH CENTRAL ROW
NI - NORTH INTERIOR ROW
SI - SOUTH INTERIOR ROW
SC - SOUTH CENTRAL ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*
SPANDREL COLUMNS

1/7

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
1	SE	3		5x32, 12x36 @ CORB.	3x32, 8x36 @ CORB.		6.8
1	SE	10	12x34		6x36 @ CORB.	12x36 @ CORB. 18x32Δ	9.3
1	SI	2		10x100	24x124 ENTIRE FACE (P38)	5x88	30.7
1	NE	6		12x13 @ CORB.			1.1
1	NE	10	24x24				4.0
1	NE	11	24x24				4.0
1	NE	12	16x24, 8x8			34x40	12.6
						TOTAL SPAN 1 →	68.5
2	SE	3	5x44	6x44, 9x28, 11x12			6.0
2	SE	4		12x36 @ CORB.	24x36 @ CORB.	12x36 @ CORB., 12x18, 28x53, 6x18, 12x28Δ	25.7
2	SE	10				12x24 @ CORB., 24x27Δ @ CORB.	4.2
2	SE	12	7x60	54x62	6x40, 8x36		29.8
2	SE	13	24x48, 12x12, 8x12	10x36, 8x24	8x68Δ	18x50, 52x54, 24x36, 12x32	49.8
2	SE	16				27x34	6.4
2	SI	1			6x96 E, 6x16ΔE, 6x36		5.8
2	NI	1	4x60, 7x70	10x68		9x70	14.2
2	NE	3			10x30, 8x24	42x52	18.6
2	NE	4	8x60	6x60	21x90	5x90, 12x12	23.1

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE- NORTH EXTERIOR ROW
NI- NORTH INTERIOR ROW
SI- SOUTH INTERIOR ROW
SE - SOUTH EXTERIOR ROW
E - ESTIMATED SIZE

SPALLED AND/OR DELAMINATED AREAS*
SPANDREL COLUMNS

2/7

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
2	NE	10		22x28			4.3
2	NE	11		16x18			2.0
2	NE	12	14x44	23x26		10x15	9.5
2	NE	14		12x36			3.0
						TOTAL SPAN 2 →	202.4
3	SE	3	20x30			16x18	6.2
3	SE	4				22x30	4.6
3	SE	5		7x45	4x45		3.4
3	SE	12		8x42 @ CORB.		12x12Δ	2.8
3	SE	13				10x42 @ CORBL., 13x22	4.9
3	SI	15				14x70	6.8
3	NI	1	4x25			19x25	4.0
3	NI	4		10x27			1.9
3	NI	5		15x23Δ, 12x16			2.5
3	NI	15		11x22, 12x15 14x15Δ			3.6
3	NE	2	4x20	11x30	18x39, 10x40, 25x36 11x15, 8x20, 24x150	5x52, 18x44, 8x52, 14x16 8x10, 8x8Δ, 9x96, 4x48	63.9
3	NE	3	9x46	4x20, 9x24, 5x46	24x48	12x36	17.5
3	NE	9	16x36 @ CORB.			12x36 @ CORB.	7.0

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE- NORTH EXTERIOR ROW
NI- NORTH INTERIOR ROW
SI- SOUTH INTERIOR ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*
SPANDREL COLUMNS

3/7

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
3	NE	12	6x6 @ CORB.	6 x 12			0.8
3	NE	13		12x12			1.0
3	NE	16				6x6	0.2
3	NE	18			12x39, 8x24	12x20, 6x13, 11x46 5x19, 6x19a	11.4
						TOTAL SPAN 3 →	142.5
5	SE	12		6x36 @ CORB, 17x20 @ BOTTOM CORB			3.9
5	SE	13			9x28, 10x11	8x23	3.8
5	SE	15			15x44	16x17, 13x14, 6x13	8.3
5	SI	1			9x17, 5x13		1.5
5	NI	1		9x12, 17x30	6x25, 9x52, 8x127 9x60		19.4
5	NI	2	4x49			20x54, 10x27, 12x12	11.7
5	NE	1	4x12, 4x48				1.7
5	NE	15				2½ x 120	2.1
						TOTAL SPAN 5 →	52.4
6	SE	1		9x36, P50	12x36		5.2
6	SE	3		10x48, 10x19, @ CORB. → 24 | 28 12 | 28		10x21, @ CORB. → 24 | 36 24 | 8	12.1
6	SE	10				10x12	0.8
6	SE	12		13x20 @ BOTTOM CORB.		24 | 28 12 | 28 ← @ CORB.	5.1

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE- NORTH EXTERIOR ROW
NI- NORTH INTERIOR ROW
SI- SOUTH INTERIOR ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*
SPANDREL COLUMNS

4/7

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
6	SE	13				7 x 25	1.2
6	SE	14	14x16Δ, 8x27, 13x33				5.2
6	SE	15	4x24			4x24	1.3
6	SI	1			6x8	36x42, 36x36 (PSI)	19.8
6	NE	12			16x42	30x66	18.4
6	NE	13		TIGHT DIAGONAL CRACK AT BASE OF JACK ARCH			—
6	NE	15				13x21	1.9
						TOTAL SPAN 6 →	71.0
7	SE	1		8x24 @ CORB			1.3
7	SE	2		9x24, 13x20 BOTTOM OF CORB.	20x23	10x30, 24 / 28 / 12 / 28 @ CORB	11.9
7	SE	6			24x42	24 / 28 / 12 / 28 @ CORB, 3x13, 18x18Δ, 54x36, 19x40	30.5
7	SE	14	13x25, 9x17 9x11, 11x17, 9x13Δ		12x20		7.4
7	SE	15	14x40Δ				1.9
7	SI	15			12x41Δ, 6x36 E	30x46, 13x18, 20x25, 10x11, 11x11Δ, 17x20	21.4
7	NI	14		13x21Δ, 12x21			2.7
7	NI	15		9x11, 16x36, 13x14		18x41Δ, 41x44, 11x11	21.9
7	NE	12		8x60		12x12 BOTTOM OF CORB.	4.3
7	NE	13				8x12Δ	0.3

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE- NORTH EXTERIOR ROW
NI- NORTH INTERIOR ROW
SI- SOUTH INTERIOR ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*
SPANDREL COLUMNS

5/7

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
7	NE	15		7x37, 15x37		12x44, 18x44 } @ CORB. (REMOVED)	14.8
7	SE	11				16x16Δ @ CORB.	0.9
						TOTAL SPAN 7 →	119.3
8	SE	2				12x16	1.3
8	SE	3				9x16	1.0
8	SE	12		10x17			1.2
8	SE	13			9x14, 16x16	10x42, 20x34	10.3
8	SE	15	15x18, 5x24, 7x16			33x33Δ @ CORB., 18x36, 8x10	12.3
8	SI	1		6x46, 6x84	14x46, 7x28, 24x72, (P62)	18x18, 9x102	31.9
8	SI	15		28x74, 15x15, 10x58	9x38, 7x16		23.1
8	NI	13				7x14	0.7
8	NI	14		13x24, 6x6			2.4
8	NE	1		12x36 @ CORB. 12x18			4.5
8	NE	2				18x26, 8x16	4.1
8	NE	11		24x27, 8x13Δ			4.9
8	NE	12				9x14, 8x9Δ, 9x14, 15x15, 39x40	14.4
8	NE	13	5x24	12x24, 4x24 9x36 @ CORB.			5.8
8	NE	14			6x16	9x36 @ CORB. 16x30	6.2

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE- NORTH EXTERIOR ROW
NI- NORTH INTERIOR ROW
SI- SOUTH INTERIOR ROW
SE- SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*
SPANDREL COLUMNS

6/7

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
8	NE	15			9x31		1.9
						TOTAL SPAN 8 →	126.0
9	SE	1	12x18, 12x12Δ, 10x60, 7x62, 7x18Δ	24 28 12 28 @ CORB., 12x98 14x30Δ, 18x10	6x15, 13x72, 6x48	11x24, 16x21, 23x82, 10x18Δ	50.8
9	SE	2				6x13	0.5
9	SE	6				11x19	1.4
9	SE	11				2x28, 7x18	1.3
9	SE	13			10x12, 6x10	24 28 12 28 @ CORB 10x35 9 20 27	9.7
9	SI	1	7x30, 13x28Δ			14x24, 30x38	13.0
9	NI	1			16x25Δ, 16x16	16x27, 24x30 29x49, 18x30	24.8
9	NE	1			12x15Δ, 12x30Δ, 6x20, 7x12		3.3
9	NE	10		9x12, 11x15, 7x7			2.2
9	NE	11				13x26, 19x20, 10x14, 8x21Δ, 12x35, 11x17	10.8
						TOTAL SPAN 9 →	117.8
10	SE	1	5x46, 13x29 5x45, 7x24	10x64	6x64	7x45	16.2
10	SE	5		8x22		6x15, 7x8	2.2
10	SE	10				19x37	4.9
10	SI	1			5x12		0.4
10	SI	12				12x16	1.3

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE- NORTH EXTERIOR ROW
NI- NORTH INTERIOR ROW
SI- SOUTH INTERIOR ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*
SPANDREL COLUMNS

7/7

SPAN	COLUMN ROW	COLUMN NUMBER**	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
10	NI	10		12x14, 14x36	20x49		11.5
10	NI	12	8x44, 24x38, 10x13, 12x25, 10x12	15x54, 12x15Δ			18.8
10	NE	1			10x19, 18x26Δ, 9x18	7x19, 5x20	5.7
10	NE	2			11x20, 7x14, 3x6		2.3
10	NE	5		24x24 @ CORB.			4.0
10	NE	11				7x15	0.7
						TOTAL SPAN 10 →	68.0
11	SE	1			5x52	10x52	5.4
11	SE	2		9x15			0.9
11	SE	3			12x14	28x28, 27x36	13.4
11	SE	4			24x36	4x7	6.2
11	SE	6		16x18, 22x23			5.5
						TOTAL SPAN 11 →	31.4

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE- NORTH EXTERIOR ROW

NI- NORTH INTERIOR ROW
SI- SOUTH INTERIOR ROW
SE - SOUTH EXTERIOR ROW

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

1/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
1	SE	CENTER OF BAY 3 TO CENTER OF BAY 6 (P39)	14 X 336	14 X 336			65.3
1	SE	9			13 X 61	8 X 61	8.9
1	NE	5			16 X 38	10 X 32	6.4
1	NE	7		13 X 94	16 X 28 Δ, 6 X 40, 16 X 40, 6 X 22		17.1
1	NE	8			11 X 48 Δ, 16 X 26		4.7
						TOTAL SPAN 1 →	102.4
2	SE	1	17 X 30	28 X 43, 17 X 34, 17 X 15 Δ, 14 X 40 Δ	18 X 31, 18 X 22		25.4
2	SE	2		20 X 28, 13 X 32			6.8
2	SE	10			14 X 42 OVER ROAD	12 X 42 OVER ROAD	7.6
2	SE	12 & 13			26 X 108		19.5
2	SE	13			20 X 20, 23 X 28, 17 X 17		9.2
2	SE	14			32 X 66, 12 X 12, 17 X 30, 5 X 7, 24 X 25, 22 X 50	8 X 96	36.6
2	SE	15			10 X 12, 8 X 16, 12 X 28		4.0
2	SI	2			22 X 50, 14 X 21		9.7
2	SI	3			14 X 16, 16 X 30		4.9
2	SI	4			12 X 28		2.3
2	SI	13			24 X 32, 26 X 44, 15 X 18, 16 X 64, 12 X 15	9 X 60	27.3
2	SI	14			12 X 22, 10 X 30		3.9

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

2/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
2	SI	15			10x26, 14x28 26x43, 12x63		17.5
2	NI	12			16x36 E		4.0
2	NI	13			14x22		2.1
2	NI	14			22x27		4.1
2	NE				15x20		2.1
2	NE	10	32x44, 24x44			10x76	22.4
						TOTAL SPAN 2 →	209.4
3	SE	2			18x40		5.0
3	SE	5			9x30	12x30 ADJOINS	4.4
3	SI	4			12x38		3.2
3	SI	10			16x20		2.2
3	SI	12		7x24			1.2
3	SI	14	20x20				2.8
3	SI	17			25x39		6.8
3	NI	13			9x32		2.0
3	NE	2			5x37, 9x26		2.9
3	NE	4				9x56	3.5
3	NE	11			13x28		2.5

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

3/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
3	NE	16				30x34, 12x25, 16x16, 8x30	12.6
						TOTAL SPAN 3 →	49.1
5	SE	13		13x32, 6x20Δ			3.3
5	SI	1			9x12		0.8
5	SI	2			11x18		1.4
5	SI	3	16x77, 8x30		15x16, 9x16Δ	16x48Δ, 14x21Δ, 14x64	22.3
5	SI	14		4x11Δ, 11x11, 4x11Δ			1.1
5	NI	1		12x24	8x40		4.2
5	NI	2			10x28, 8x28		3.5
5	NI	3			9x24		1.5
5	NI	14			6x18		0.8
5	NE	1			16x27	13x32	5.9
5	NE	14			14x17		1.6
						TOTAL SPAN 5 →	46.4
6	SE	2			10x18		1.2
6	SE	3			9x10, 13x18Δ, 20x38	12x43	10.3
6	SE	14			8x10		0.6
6	SI	4			15x36, 9x14, 4x14Δ		4.8

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

4/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
6	SI	9		12x43, 12x15Δ	6x52		6.4
6	SI	10	15x52, 15x24Δ	5x54			8.5
6	SI	12	16x56, 8x18	13x78			14.3
6	SI	13	8x27	5x32, 8x30, 13x27	15x45		11.4
6	SI	14	13x54	11x70	11x18, 16x45, 17x18 13x19, 6x8		20.8
6	NI	1			24x29, 14x16		6.4
6	NI	2			10x14, 9x24		2.5
6	NI	13			13x32		2.9
6	NI	14			22x25, 6x10		4.2
6	NE	1		5x24			0.8
						TOTAL SPAN 6 →	95.1
7	SE	2			14x18	8x89	6.7
7	SE	4	20x36		28x52, 6x45	6x45	18.9
7	SE	5	15x56			9x28, 12x32	10.2
7	SE	6	72x100 (ENTIRE SURFACE BETW. COLS.)	6x100			54.2
7	SE	7	6x40				1.7
7	SE	13	13x58	20x20, 7x29 14x23, 17x67		6x50	21.6
7	SE	14			24x26		4.3

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

5/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
7	SI	1				14x37	3.6
7	SI	2			12x16, 6x8Δ, 7x11		2.0
7	SI	3			16x36 E		4.0
7	SI	4		6x60 E	10x100, 16x48 E		14.8
7	SI	5			16x100 E		11.1
7	SI	6			13x100E, 7x48E (P103)		11.4
7	SI	8			19x14, 9x24, 6x56 10x16Δ, 15x20 11x31, 12x24	13x56, 10x52	21.4
7	SI	9			11x14, 6x37	10x56	6.5
7	SI	13			7x42		2.0
7	SI	14		5x29, 10x31	8x62		6.6
7	NI	2			12x44		3.7
7	NE	2			12x23		1.9
7	NE	4			7x27, 15x15, 9x12		3.6
7	NE	6		10x37	6x37, 7x62	10x62	11.4
7	NE	8				13x43, 10x44	6.9
						TOTAL SPAN 7 →	228.5
8	SE	1			10x20, 6x12		1.9

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR
E - ESTIMATED SIZE AREA NOT ACCESSIBLE DUE TO ELECTRIC LINES, SLOPING GROUND, ETC.

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

6/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
8	SE	2			14x16, 14x23, 10x17		5.0
8	SE	4			24x28		4.7
8	SE	5	12x78	11x78, 18x30	21x27		20.1
8	SE	13			16x34, 10x20, 8x20Δ		5.7
8	SI	1			16x30, 11x30Δ, 5x12, 14x35	7x32	9.8
8	SI	2	14x20Δ, 20x40		15x84, 14x35	11x56	23.0
8	SI	3			14x14		1.4
8	SI	6			16x18		2.0
8	SI	8	42x60, 12x24	10x67, 12x48E	20x25		31.6
8	SI	9			16x48, 28x66, 20x40, 16x30, 9x99	8x72	37.2
8	SI	10			8x32, 10x15, 15x18		4.7
8	SI	13			8x20		1.1
8	SI	14	34x42, 9x11	8x37	16x56, 6x34 10x40		23.1
8	NI	1	16x45		13x16, 4x9	10x37	9.3
8	NI	2			13x17, 10x46, 10x38		7.4
8	NI	3			12x19Δ, 12x22, 8x22, 14x90		12.6
8	NI	5		9x15, 11x50			4.8
8	NI	7			18x22Δ, 16x50		6.9

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR
E -

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

7/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
8	NI	8			16x17, 11x13		2.9
8	NI	9			19x21, 14x18		4.5
8	NI	12			20x24		3.3
8	NI	13			10x12, 12x19 15x18, 7x17, 4x13Δ		5.3
8	NE	1			9x27, 9x28, 3x6		3.6
8	NE	3			18x18		2.2
8	NE	5			11x26, 7x28, 9x10		4.0
8	NE	6			23x25, 14x17, 7x10		6.1
8	NE	9			8x14, 16x38, 7x8 11x18Δ, 12x18, 7x23		8.7
						TOTAL SPAN 8 →	252.9
9	SI	1			7x14Δ, 30x78		16.6
9	SI	2	12x33, 17x50		15x24, 12x60, 7x9 27x34, 10x16	6x83	27.5
9	SI	3		14x36	17x36, 9x24Δ 12x46		12.3
9	SI	11			10x10		0.7
9	NI	1	7x30, 8x11, 8x8, 16x18		10x18, 7x7 10x12Δ		6.5
9	NI	2			10x24		1.7
9	NI	3	17x48		12x20		7.3
9	NI	4			8x23, 12x20, 20x28		6.8

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

8/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
9	NI	5	12x86, 9x10		9x11Δ, 12x19, 12x30Δ	5x67	13.3
9	NI	6				5x5	0.2
9	NI	7	18x52, 10x30			5x25	9.4
9	NI	8			9x16Δ POP OUT (REMOVED)		0.5
9	NI	10	13x24, 4x14			11x31	4.9
9	NI	11	4x32, 4x11		12x12	10x32, 11x21	6.0
9	NI	12	7x18		10x32	6x18	3.8
9	NE	2	23x62	5x62	18x26, 42x48, 12x12, 14x14Δ, 14x70, 9x10		38.4
9	NE	10			12x41		3.4
9	NE	11			15x74, 5x34Δ, 24x50, 12x18Δ		17.4
9	NE	12			22x22, 4x11		3.7
						TOTAL SPAN 9 →	180.4
10	SE	2			24x60, 13x42, 29x40, 20x43, 24x44		35.2
10	SE	10				12x34	2.8
10	SE	11			27x85		15.9
10	SI	3			12x42		3.5
10	SI	4			14x46		4.5
10	SI	5		21x73	9x15, 9x56		15.1

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

9/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
10	SI	7			64x92, 12x40, 9x58		47.8
10	SI	8			36x36, 44x52		24.9
10	SI	9			12x32, 28x31 15x14, 20x52		17.4
10	SI	10			20x39, 15x25, 16x46Δ, 7x29, 18x26, 10x12		16.1
10	SI	11			36x54, 8x12, 18x36, 12x23		20.6
10	NI	1			66x59, 12x12, 20x28, 16x54, 42x32, 12x28, 18x32Δ		52.0
10	NI	2			48x85, 7x36, 11x32, 13x22		34.5
10	NI	3	17x35, 28x99	16x12, 5x32	28x30, 10x28Δ, 12x15, 9x28, 24x52, 12x32, 8x32	4x99	51.5
10	NI	4		12x107	21x21, 7x9, 37x46, 28x29, 30x53, 8x8		41.4
10	NI	5		5x40	42x83, 15x25		28.2
10	NI	6		8x35	22x29Δ, 22x42, 41x88, 20x72, 42x42	19x10	59.2
10	NI	7			30 45 42 30x42, 20x30, 32x61Δ, 19x42		36.5
10	NI	8			17x52, 13x45Δ, 18x58, 22x25		19.2
10	NI	9			14x39, 27x37, 7x16, 24x28, 11x30, 7x10, 11x32, 9x9, 13x26		24.3

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

10/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
10	NI	10			10x65		4.5
10	NE	1			40x42, 26x42		19.2
10	NE	2			20x24, 14x42	16x19, 16x22Δ	10.8
10	NE	3			15x34, 20x68		13.0
10	NE	4			22x22, 22x32, 10x27, 12x42		13.6
10	NE	5			24x24Δ, 20x23, 24x47, 9x44, 19x68		24.8
10	NE	6			34x60, 50x56, 8x24 22x36		40.4
10	NE	7	42x78Δ		9x36, 13x16, 51x36, 72x60		57.8
10	NE	8	6x60Δ	9x59, 12x20, 16x18	60x88		45.3
10	NE	9			9x18, 14x30, 28x59, 24x51, 18x21		26.6
10	NE	10			9x21, 9x32, 7x8		3.7
10	NE	11			24x35, 14x27		8.4
						TOTAL SPAN 10 →	818.7
11	SI	8		9x32			2.0
11	NI	8				19→ 24 8x16, 9x20	5.0
11	NE	7	24x52Δ		22x70		15.0
11	NE	8		14x48	15x30, 48x48		23.8
						TOTAL SPAN 11 →	45.8

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
ARCH RIBS

11/11

SPAN	ARCH RIB	SPANDREL COLUMN BAY**	TOP FACE	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
12	SE	10				54 x 56Δ	10.5
12	SE	11	12x16	15x18Δ, 15x33			5.7
12	SI	2				16x60	6.7
12	SI	10		9x16, 11x12Δ			1.4
12	NI	9	15x26, 15x15, 32x109				28.5
12	NE	1		24x24			4.0
12	NE	11			26x58, 18x96		22.5
						TOTAL SPAN 12 →	79.3
13	SE	1	14x17				1.6
13	SE	5			7x18		0.9
13	SI	7	19x32	6x32			5.6
13	NI	4			18x34		4.2
13	NI	5		5x66	40x44, 8x22Δ		15.1
13	NI	ADJACENT TO ABUTMENT	22x30 (P86)				4.6
						TOTAL SPAN 13 →	32.0

*ALL MEASUREMENTS IN INCHES
** FROM JOINT AT WEST END OF SPAN
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
PIER SHAFTS

PIER	ARCH RIB	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
TOWER B	SE				2.5 STRIPS @ 18"x120" (ESTIMATED)	37.5
					TOTAL TOWER B →	37.5
WEST ABUTMENT	SE		8x14, 12x21 @ TOP CORBEL 14x22 @ LOWER DECK	22x46, 15x28 8x16, 15x18		17.4
					TOTAL WEST ABUT. →	17.4
1	SE		28x30, 12x16 (P41)		9x30 @ LOWER DECK 5x30 @ CORBEL (P40)	10.1
1	NE		5x14, 14x20 @ LOWER DK. 10x50 @ CORBEL (P37)			5.9
					TOTAL PIER 1 →	16.0
2	SE		34 [18/26] @ CORBEL (P43)		6x14 @ CORBEL	5.8
					TOTAL PIER 2 →	5.8
3	SE				18x18 @ CORBEL	2.2
3	NE	12x12				1.0
					TOTAL PIER 3 →	3.2
4	SE		17x24Δ @ BOTTOM COLUMN			1.4
4	WALL BETWEEN SE AND SI		16x18, 27x37, 5x34			10.1
4	NE	16x16, 5x60	4x8		5x60	6.2
					TOTAL PIER 4 →	17.7
5	SE	5x29, 5x41	4x31, 15x48, 30x48, 24x25, 30x52, 12x16, 16x30, 16x34, 42x100,	22x36, 9x19, 15x31,	22x28, 9x18, 21x51, 12x18, 14x23, 9x38, 8x24	136.4
			4x45, (P50)	46x50, 23x38Δ, 30x72		

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
PIER SHAFTS

PIER	ARCH RIB	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
5	SI		8x32Δ	8x32, 6x72 (P51)		5.7
5	NI	6x18, 12x30	8x53			6.2
5	NE			6x60 E		2.5
					TOTAL PIER 5 →	150.8
6	SE		31x40Δ, 23x60, 9x23 (P55, 56)	12x12, 12x16Δ, 20x72, 12x40, 8x40		32.5
6	NE		3x42, 40x78Δ, 12x42		15x15	16.8
					TOTAL PIER 6 →	49.3
7	SE		4x24, 6x14, 2x46 8x28Δ	8x24	4x28, 12x20, 16x24 4x4, (P61)	9.2
7	NI	10x13Δ, 10x30, 6x38				4.1
7	NE	12x14Δ, 10x10Δ, 14x28	5x56		25x27Δ, 2x24, 3x10, 12x30, 6x32, 5x16	12.9
					TOTAL PIER 7 →	26.2
8	SE		18x24, 28x122	23x32	27x48, 24x28, 32x62, 20x27Δ, (P64)	61.2
8	NE		8x13, 18x30, 10x18 @ CORBEL		10x26, 5x22, 11x24, 16x38	14.3
					TOTAL PIER 8 →	127.9
9	SE		30x39, 7x18, 13x18	9x24Δ, 18x48	15x20, 32x42, 12x20Δ (P65)	29.6
9	NE		16x18 @ CORBEL (LOOSE)			2.0
					TOTAL PIER 9 →	31.6
10	SE	14x61, 9x20Δ, 5x20, 5x16	9x22, 10x15, 17x24 (P66)	11x22, 7x16Δ	13x30, 17x18, 20x42, 21x30, 8x13, 5x97	34.2

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
PIER SHAFTS

3/3

PIER	ARCH RIB	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
10	NE				12x26, 7x30Δ, 8x30, 9x12	5.3
					TOTAL PIER 10 →	39.5
11	SE		4x7	13x24		2.4
11	NE		6x30@ BOTTOM RAIL, 18x32 @ BOTTOM JACK ARCH			5.2
					TOTAL PIER 11 →	7.6
12	SE	6x66, 4x19	12x19Δ		24x30Δ, 26x36Δ, 26x34 (PBT), 10x30@ UP. DK EDGE	18.0
12	NE				18x36 @ BOTTOM JACK ARCH	4.5
					TOTAL PIER 12 →	22.5
EAST ABUTMENT	NE		12x36 @ TOP			3.0
					TOTAL EAST ABUT. →	3.0

*ALL MEASUREMENTS IN INCHES
NE - NORTH EXTERIOR
NI - NORTH INTERIOR
SI - SOUTH INTERIOR
SE - SOUTH EXTERIOR

SPALLED AND/OR DELAMINATED AREAS*
JACK ARCH AT ARCH BASE

1/2

PIER	BRIDGE BAY	TOP FACE	EAST FACE	BOTTOM FACE	WEST FACE	TOTAL (SQ.FT.)
1	CENTER				30x68	14.2
1	NORTH				11x48Δ, 12x36, 12x16	6.2
					TOTAL PIER 1 →	20.4
2	CENTER		20x15			2.1
					TOTAL PIER 2 →	2.1
5	SOUTH		9x24Δ, 11x11Δ, 11x24, 19x21, 13x17			7.3
5	CENTER			5x48, 20x24		5.0
					TOTAL PIER 5 →	12.3
7	CENTER			15x28, 9x14 11x16Δ		4.4
7	NORTH			12x32		2.7
					TOTAL PIER 7 →	7.1
8	SOUTH			9x12		0.8
8	CENTER			16x17, 20x20 9x20Δ, 11x13Δ, 14x16		7.3
					TOTAL PIER 8 →	8.1
9	SOUTH			8x32, 9x32Δ, 8x8		3.2
					TOTAL PIER 9 →	3.2
10	CENTER		12x40			3.3
					TOTAL PIER 10 →	3.3

*ALL MEASUREMENTS IN INCHES

SPALLED AND/OR DELAMINATED AREAS*
JACK ARCH AT ARCH BASE

2/2

PIER	BRIDGE BAY	TOP FACE	EAST FACE	BOTTOM FACE	WEST FACE	TOTAL (SQ.FT.)
12	SOUTH			26X36, 16X24, 22X24 22X26, 8X14 (OVER LOT)	20x UP TO 9 (SPALL REMOVED BY US) (P91)	18.8
12	NORTH		8 X 28 (OVER LOT)			1.6
					TOTAL PIER 12 →	20.4

*ALL MEASUREMENTS IN INCHES

SPALLED AND/OR DELAMINATED AREAS*
ARCH BASE

1/1

PIER	ARCH RIB	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
4	NORTH INTERIOR		20 x 22			3.0
					TOTAL PIER 4 →	3.0
5	SOUTH EXTERIOR	10x24, 15x26, 10x40 15x17, 26x30	9x26, 8x15, 8x22, 14x15Δ 10x13, 10x18, 18x42Δ		9x72	28.0
5	SOUTH INTERIOR	9x13				0.8
5	NORTH INTERIOR	13x19, 12x16	9x12, 21x21, 12x97 14x15, 5x5, 12x24	14x68, 11x28 (P104)		27.3
5	NORTH EXTERIOR		18x22, 16x25	17x156, 7x20, 14x16, 11x11 19x72, 9x10, 23x38, 11x18, 12x16, 12x20 7x18 (P106)	11x138, 16x16, 9x26	62.4
					TOTAL PIER 5 →	118.5
6	SOUTH EXTERIOR	8x43, 17x34, 7x19 13x22	18x20		15x32, 25x67, 17x27, 13x14	31.2
6	SOUTH INTERIOR			6x28	7x25	2.4
6	NORTH EXTERIOR		9x30	23x41, 14x49, 12x13, 22x24 10x12, 24x24, 12x24Δ, 17x28 26x38, 16x20, 48x88 22x81, 16x36		81.9
					TOTAL PIER 6 →	115.5
7	SOUTH EXTERIOR	12x31, 10x49, 15x56 19x43, 46x52, 13x24			14x38, 9x26Δ, 10x12 12x20, 15x32	46.6
7	SOUTH INTERIOR		27x27, 7x31, 4x11	5x48	28x37	15.7
7	NORTH INTERIOR				18x56	7.0
					TOTAL PIER 7 →	69.3
8	SOUTH EXTERIOR	12x22, 9x20, 15x30, 42x79, 12x13	7x38		28x34	38.8
8	NORTH EXTERIOR				65x67	30.2
					TOTAL PIER 8 →	69.0
9	NORTH INTERIOR		11x43, 5x12	6x38		5.3
					TOTAL PIER 9 →	5.3

*ALL MEASUREMENTS IN INCHES

SPALLED AND/OR DELAMINATED AREAS*

EAST TUNNEL JACK ARCHES

1/1

COLUMN ROW	COLUMN BAY FROM EAST ABUTMENT	SOUTH FACE	BOTTOM FACE	NORTH FACE	TOTAL (SQ. FT.)
R	25			6x8, 12x12, 6x16	2.0
R	27			12x18	1.5
P	23		6x8		0.3
P	27	18x30	18x30	8x12, 12x12	9.2
				TOTAL EAST TUNNEL →	13.0

*ALL MEASUREMENTS IN INCHES

SPALLED AND/OR DELAMINATED AREAS*

EAST TUNNEL
COLUMNS

1/1

COLUMN ROW	COLUMN NUMBER FROM EAST ABUTMENT	NORTH FACE	EAST FACE	SOUTH FACE	WEST FACE	TOTAL (SQ. FT.)
R	22	18x36, 24x36			18x36, 12x36Δ	16.5
R	24			12x24		2.0
R	25	8x25				1.4
P	22	8x40Δ			5x40Δ	1.8
P	23	5x18, 7x28Δ	8x18		5x28Δ	2.8
P	24	3x10Δ	3x10Δ			0.2
P	26		4x30	4x30		1.7
N	22 (P85)	24x36, 8x36		8x24	8x24, 24x36	16.7
N	27				4x48 EDGE	1.3
M	22	2x6		2x4	2x6	0.2
M	27			2x18	2x18	0.5
					TOTAL EAST TUNNEL →	45.1

*ALL MEASUREMENTS IN INCHES

APPENDIX B

EXPANSION JOINT MEASUREMENTS

EXPANSION JOINT MEASUREMENTS

Location	Strip Seal Gland Size	Design Opening @60°	2000 (11/7) Opening Measured at South Lane Line	2003 Opening Measured at Centerline South Lane	2000 (11/7) Opening Measured at North Lane Line	2003 Opening Measured at Centerline North Lane
Tower A	3	2	2 1/8 @50°	1 9/16 @65°	2 1/8 @50°	2 1/16 @ 50°
Tower B	3	2	2 3/8 @50°	2 1/8 @65°	2 1/8 @50°	2 3/16 @ 50°
West Abutment	3	2	2 5/8 @50°	2 3/16 @65°	2 1/2 @50°	2 1/16@ 50°
Pier 1	3	2	2 1/2 @50°	2 1/16 @65°	2 3/8 @50°	2 1/16 @ 50°
Pier 2	3	2	2 3/8 @50°	1 15/16 @65°	2 1/4 @50°	1 15/16 @ 60°
Pier 3	3	2	2 1/2 @50°	2 3/16 @65°	2 1/2 @50°	1 15/16 @ 60°
Panel Point 0	4	2	1 3/4 @50°	1 5/8 @65°	1 3/4 @50°	1 9/16 @ 60°
Panel Point 5	3	2	2 1/8 @50°	1 13/16 @65°	1 7/8 @50°	1 11/16 @ 60°
Panel Point 5’	3	2	2 3/8 @50°	2 1/16 @65°	2 1/2 @50°	2 3/16 @ 60°
Panel Point 0’	4	2	2 @50°	1 3/4 @65°	1 7/8 @50°	2 @ 52°
Pier 4	3	2	2 3/8 @50°	2 1/8 @65°	2 3/8 @50°	2 3/16 @ 52°
Pier 5	3	2	2 @50°	1 7/8 @65°	2 @50°	1 13/16 @ 52°
Pier 6	3	2	2 3/8 @50°	2@ 55°	2 3/8 @50°	2 @ 70°
Pier 7	3	2	2 3/8 @50°	2 1/8 @55°	2 1/2 @50°	2 5/16 @ 52°
Pier 8	3	2	2 1/2 @50°	2 1/4 @55°	2 1/2 @50°	2 1/16 @ 60°
Pier 9	3	2	2 1/4 @50°	2 1/8 @55°	2 3/8 @50°	2 1/4 @ 60°
Pier 10	3	2	2 1/2 @ 50°	2 3/16 @55°	2 1/4 @50°	2 1/16 @ 70°
Pier 11	3	2	2 1/4 @50°	1 15/16 @55°	2 1/4 @50°	2 1/16 @ 70°
Pier 12	3	2	2 1/4 @50°	2 @55°	2 1/4 @50°	2 @ 70°
East Abutment	3	2	2 1/8 @50°	1 15/16 @55°	2 1/8 @50°	1 3/4 @ 70°

NOTE: Temperature shown in degrees Fahrenheit.
All measurements in inches.

APPENDIX C

UNDERWATER INSPECTION REPORT

I. PURPOSE AND SCOPE

This report presents the findings of an underwater investigation of Pier 3 and Pier 4 of the Veterans Memorial Bridge Number CUY-06-14.56 (S.R. 6) over the Cuyahoga River Valley. This underwater investigation was performed by **ms consultant's inc.** certified Commercial Dive Team and augments the 2003 In Depth Bridge Inspection performed by **ms consultants, inc.**

II. METHOD OF INVESTIGATION

On July 15, 2003 an underwater inspection was performed on Pier No. 3 at the West bank and Pier No. 4 at the East Bank of the Cuyahoga River to determine the physical condition of the piers. The underwater inspection involved a visual and tactile examination from the water line to the mud line of the piers and the protection wall that adjoins Pier No. 4 at the East bank. Documentation includes photographs and sketches with field notes of noteworthy conditions.

A Certified Commercial Dive Team conducted the underwater inspection. The team consisted of the following members:

Senior Structural Inspector:	Don Main
Engineer/Diver:	James Henry
Dive Team Supervisor:	Kevin Hogan
Standby Diver/Tender:	Mark Maguire

The dive team worked from the East bank at Pier No.4 and from a boat at Pier No. 3. Surface supplied air diving equipment (Hard Hat) was utilized during the inspection. The diving conditions were as follows:

Depth:	2 to 31 feet.
Current:	Mild
Visibility:	Very turbid with light penetrating no more than 3-feet, resulting in zero visibility as the diver descended.
Water Temp:	Approx. 70º

The inspection was performed through the divers visual and tactile senses. The diver used a masonry-chipping hammer to sound the concrete pier surfaces at the water line and below the water line. A blunt probe was also used to examine the piers and piling members for voids, cracks, and misalignments. Each face of the piers and protection wall was examined at approximate 5-foot wide vertical sections from the water line to the mud line. Soundings were taken of the channel bottom adjacent to and around the pier at locations similar to those used for the previous underwater inspection.

III. EXISTING CONDITIONS

PIER No.3 INSPECTION
(Below Water Line)

Bridge No: CUY-06-14.56 **Inspection Date:** 15 July 2003

Pier Location/No: West Bank Pier #3

Type of Construction/Description: Reinforced concrete on spread footing.

Bottom Material: Concrete rubble/debris with jagged rebar surrounds the water side of the pier and extends toward the channel.

Debris Around Pier: Concrete rubble and jagged rebar.

Scour: None detected.

Exposed Footer: None detected.

Footer Undermining: None detected.

Exposed Piling: N/A.

Piling Condition: N/A.

PIER No.3 INSPECTION (Cont.)
(Below Water Line)

Cracks and Spalls: Two large spalled or dished-out areas located at both outside corners A and B were detected below the water line (see Pier No. 3 Sketch, Page 9 and Pier No. 3 Detail A and B, Page 10). Also, the corners are rounded in the area extending from the water line down to the mud line with up to approximately 9 inches of concrete loss.

Above the water line within a 36 to 48-inch high splash zone, rounding at the corners is more pronounced with concrete loss extending approximately 24 inches into the pier face at corner A and 16 inches at corner B. Also, areas of section loss up to 6" deep are common within the splash zone along the water's edge (see Photos 1 and 2).

Based on the description of these deficiencies provided in the previous underwater inspection report dated October 20, 2000, the deterioration does not appear to have progressed significantly.

Fender Condition: N/A.

Impact Damage: Dished-out areas at outside corners below the water line may be a result of impact damage.

Unusual Conditions: Prior concrete repairs to what appears to be the full height of the pier begin approximately 36 to 48 inches above the water line. The existing concrete below this point and extending below the water line has minor spalling/loss of section.

Overall Condition Rating: Good with no major deficiencies.

Inspection/Dive Team Members:

- Senior Structural Inspector: Don Main
- Engineer/Diver: Jim Henry
- Dive Supervisor: Kevin Hogan
- Standby Diver/Tender: Mark Maguire

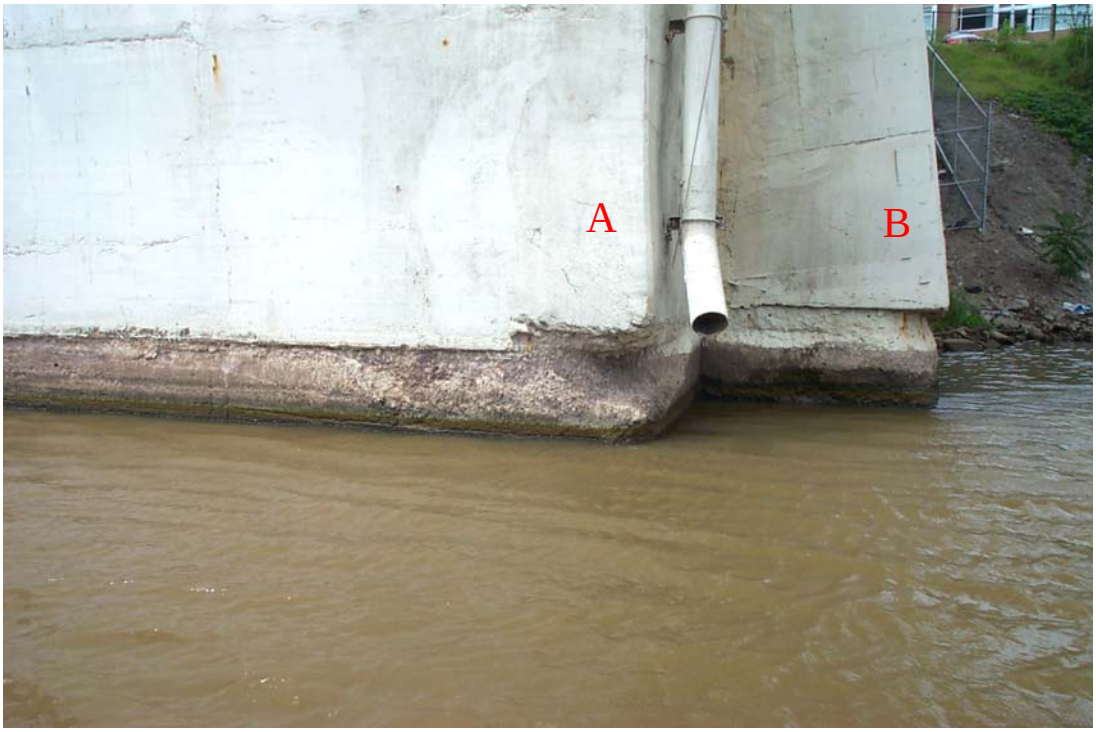

Photo 1. View looking northwestward showing deterioration of the concrete of Pier 3 in the splash zone between the water line and a horizontal construction joint or lower limit line of former concrete repair. Note the rounding at the corners marked “A” and “B” where the concrete loss ranges from 16 to 24 inches in depth. Loss of section in other areas within the splash zone varies up to 6 inches in depth. Not visible in the photo are spalled or dished-out areas at corners A and B below the water line with concrete loss extending 3 to 6 inches into the pier, and rounding at the corners with concrete loss of up to 9 inches (see Pier No. 3 Plan View, Page 9 and Pier No. 3 Detail A and B, Page 10).

Photo 2. Additional view looking west showing the spalled and missing concrete within the splash zone at corners A and B of Pier 3. This condition does not appear to have changed significantly from what was reported in the previous inspection.

PIER No.4 INSPECTION
(Below Water Line)

Bridge No: CUY-06-14.56 **Inspection Date:** 15 July 2003

Pier Location/No: East Bank Pier #4

Type of Construction/Description: Reinforced concrete on spread footing. Pier number 4 has a protection wall at the water edge that is comprised of a concrete cap supported by a configuration of steel piling. The cap measures 69 feet long by 30 inches wide by 7 feet high. The piling consists of six, circular or caisson type piles with steel sheets between each circular section, unlike the Z-shape sheet piling which adjoins the protection wall at both ends (see Pier No. 4 Plan View, Page 11).

Bottom Material: Primarily soft silt with some concrete rubble/debris.

Debris Around Pier: Some concrete rubble/debris.

Scour: None detected.

Exposed Footer: None detected.

Footer Undermining: None detected.

Exposed Piling: N/A.

Piling Condition: N/A.

PIER No.4 INSPECTION (Cont.)
(Below Water Line)

Cracks and Spalls: The concrete cap has minor spalling or concrete disintegration over the Lower half, beneath the water line.

Above the water line the cap has a large area of spalled and deteriorated concrete located approximately 21 feet from the upstream end of the cap where the cap intersects the corner of the bridge pier. This area lies directly below the bridge scupper downspout and measures approximately 12 feet in width at the top of the cap and tapers to 2 to 3 feet in width below the water line (see Photos 4 and 5). At the interface between the cap and the downstream pier face, a gap exists that varies in width from a fraction of an inch at the top surface of the cap to between 3 and 6 inches in width below the water line.

Fender Condition: N/A.

Impact Damage: None detected.

Unusual Conditions: A large hole was detected in the embankment between the protection wall cap and the downstream face of Pier No. 4. The trapezoidal-shaped hole measures 5 feet long by approximately 4 feet wide and is up to 5 feet deep (see Photo3). Water visible at the bottom of the hole was noted to be at the same elevation as the water surface of the river. Underwater investigation at this location revealed that the hole coincides with a vertical gap between the edge of the steel sheet piling below the cap and the face of the pier that projects past the line of the piling. A similar gap is present between the edge of the steel sheet piling and the upstream face of the pier (see Pier No. 4 Plan View, Sheet 11).

Overall Condition Rating: Because the portion of the pier that abuts the channel is obscured by the protection wall, its condition could not be evaluated.

The protection wall appears to be in good condition except for the large spalled area on the concrete cap and the void that exists at the interface between the pier faces and the steel sheet piling below the cap.

Inspection/Dive Team Members:

- Senior Structural Inspector: Don Main
- Structural Inspector/Diver: Jim Henry
- Dive Supervisor: Kevin Hogan
- Standby Diver/Tender: Mark Maguire

Photo 3. View looking southeastward showing the hole eroded in the embankment between the concrete cap of the protection wall and the downstream face of Pier 4. The embankment is moving in the direction shown by the arrow through a vertical gap that exists between the sheet piling supporting the cap and the face of the pier (see Pier No. 4 Plan View, Sheet 11).

Photo 4. View looking northeastward showing the large spalled area on the concrete cap of the protection wall along Pier 4. The area is approximately 12 feet wide at the top of the cap and tapers to a width of approximately 2 to 3 feet below the water surface and exposes a total of 8 horizontal reinforcement bars (see Pier No. 4 Plan View, Sheet 11).

Photo 5. Additional view looking downstream along the concrete cap of the protection wall showing the spalled area on the cap adjacent to the corner of Pier 4.

Pier No.3

Shore Line

Steep Bank– Large Concrete Fragments (Rubble) and Scattered Reinforcing Steel.

15.9'

12.0'

Areas with up to 6" deep Loss of Section within the 48" high splash zone that extends from the water line up to the bottom of the area where the concrete was repaired. This condition is typical around the perimeter of the pier at the river edge.

Detail–A

25.5'

14.0'

Photo 1.

Bridge Scupper Downspout

Outside corners are rounded with an average loss of section up to approximately 9"deep from water line to mud line in addition to the localized deterioration shown in Details A and B.

Detail–B

N

17'–0"

Steep Bank– Exposed Soil/Concrete Fragments

Upstream

Photo 2.

10.6'

8'–0"

27'–6"

2.0'

8'–9"

Shore Line

Old steel sheet piling

Minor zebra mussel coverage on concrete surfaces below water line.

26.6'

Old steel sheet piling

Downstream

● Denotes location and depth of water at soundings taken adjacent to the pier and approximately 25–feet. into the channel.

22.5'

Pier No. 3 Plan View

NOT TO SCALE

Veterans Memorial Bridge CUY–06–14.56

Cuyahoga County Engineer

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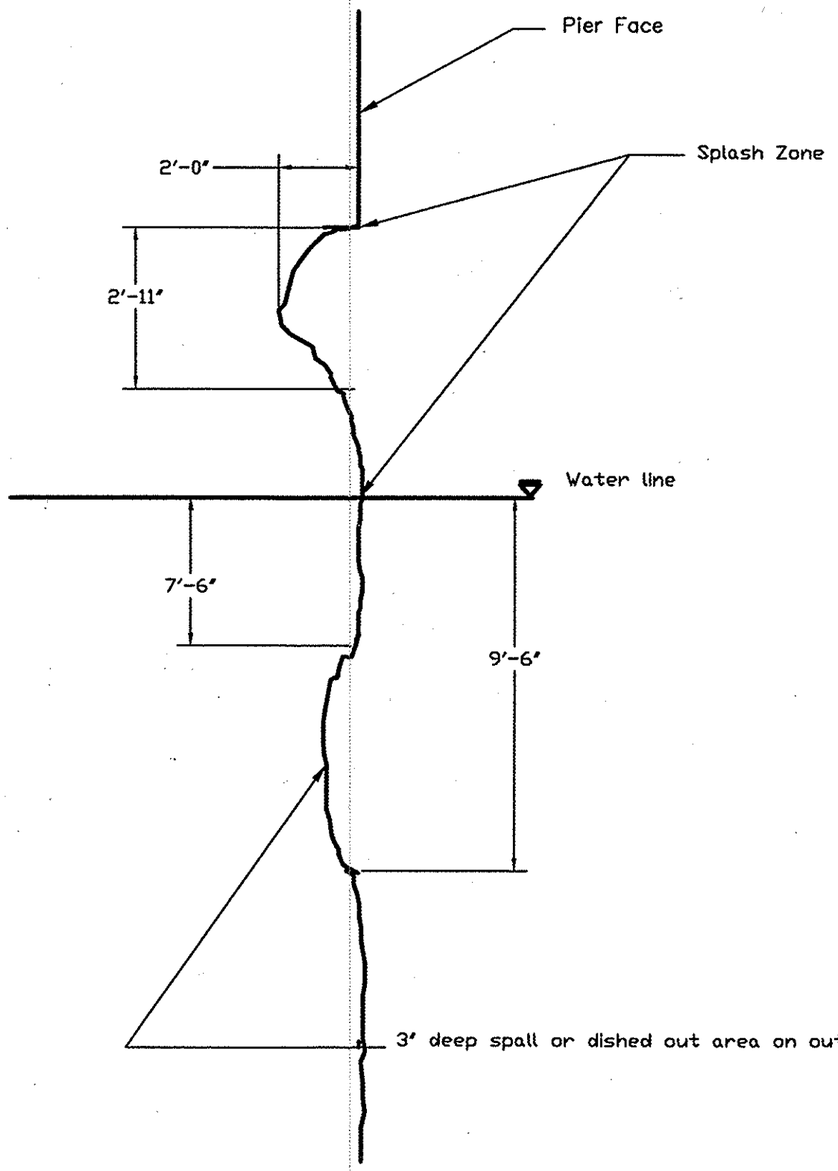
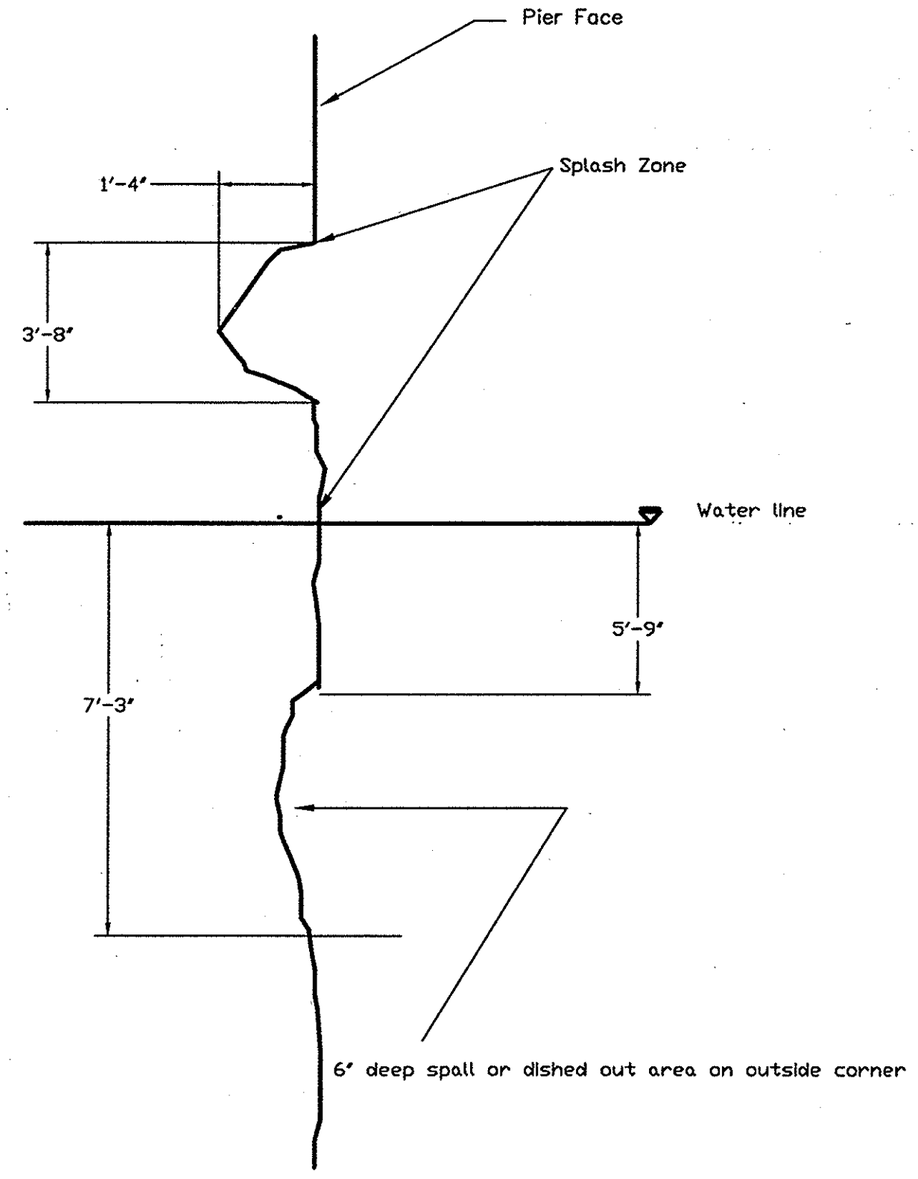


Detail -A.



Detail -B.

Pier No. 3 Detail A & B

NOT TO SCALE

Veterans Memorial Bridge CUY-06-14.56

Cuyahoga County Engineer

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N

(1) A large hole has developed in the embankment behind the concrete cap between the pier and the cap. The hole is 5–ft. long measured parallel with the cap by 4–ft. wide measured perpendicular to the cap, and approximately 5–ft. deep. Water is visible at the deepest point and was noted to be at the same elevation as the water surface in the river. The eroded material appears to be migrating towards a void between the sheet piling and the pier. (see Note 2.)

(2) Underwater investigation at this location revealed that the hole described in Note 1. is in correlation with a 4" to 8" wide gap between the steel plate and the downstream pier face that extends vertically from the bottom of the cap to the mud line. At the upstream face a similar gap exists between the steel plate and the pier face. The gap varies from 3" to 6" in width and extends vertically from the bottom of the cap to the mud line. A horizontal void adjoins the gap and extends up to 2–ft. into the embankment.

6 circular or caisson type piles.

Steel sheet plate

"Z"shape steel sheet piling.

Pier No.4

Direction of erosion

Photo 3.

Bridge scupper downspout

20" Dia. Metal Pipe.

Photo 5.

Photo 4.

30'

16'

69'+

16.0' 20.0' 16.0' 12.9' 13.5' 15.3'

25.0' 24.9' 23.0' 22.0' 27.3' 31.0'

Minor spalling or concrete disintegration along the lower half of the cap below the water line.

Soft silt with some minor scattered concrete rubble.

A large area of spalled and deteriorated concrete exists at this location with 8 exposed rebar. The area measures approximately 12–ft. in width at the top of the cap and tapers to approximately 2–ft. to 3–ft. in width at an elevation just below the water line. The spalled area is located approximately 21–ft. from the upstream end of the cap and lies directly below the bridge scupper downspout at the corner of the pier.

o Denotes location and depth of water at soundings taken adjacent to the pier and approximately 25 feet into the channel.

Downstream

Upstream

Pier No. 4 Plan View

NOT TO SCALE

Veterans Memorial Bridge CUY–06–14.56

Cuyahoga County Engineer

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APPENDIX D

RECOMMENDATIONS

RECOMMENDATIONS

DECK ITEMS

Number	Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Patch spalled area on upper deck wearing surface above East Station.	✓										
2	Patch scaled/spalled areas along joint armors.						✓					
3	Seal upper deck wearing surface.	✓										
4	Clean and paint steel curb plates.	✓					✓					✓
5	Patch spalls on sidewalks.	✓										
6	Patch spalls on traffic divider island.	✓										
7	Install cotter pin in clevis bolt that secures cable to deck for LMA device at east end of north arch truss.	✓										
8	Have manufacturer perform inspection of LMA devices (installed in 1993) to evaluate their present condition, determine remaining service life and compliance with current federal and state standards.	✓										
9	Seal parapet concrete.					✓					✓	
10	Repair severed spindles of south aluminum picket fence in Span 4.	✓										
11	Repair the cracked, broken, leaking or mis-aligned downspouts at Pier 1 South, Pier 2 South, Pier 4 North, Pier 10 North and below the deck scupper in the south gutter at the east end of East Station.	✓										
12	Remove the hubcap lodged at the inlet of the downspout leading from the deck scupper in the north gutter at the east end of East Station.	✓										
13	Remove silt and flush catch basins and outlet pipes at ground level catch basins located in West Station between Column Rows C and D and Column Lines 20 and 21, also at Pier 5 South, Pier 7 South and Pier 9 North and South.	✓										
14	Clean clogged scuppers, downspouts, catch basins and outlet pipes.			✓		✓		✓		✓		✓
15	Repair tear in joint armor on east side of east joint in upper deck at Pier 3.	✓										
16	Seal opening between the upper deck joint armors where a portion of the elastomeric strip seal is missing at both ends of the joint at Piers 6, 7, 8, 9, 11, 12, and at East Abutment; and at the north end of the joint at Pier 5.	✓										
17	Reseal the joint in the deck at the east end of East Station.	✓					✓					✓

RECOMMENDATIONS

DECK ITEMS (CONTINUED)

Number	Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
18	Reposition loose steel bearing plates between the upper deck and the floor beam at the joints at Piers 11 and 12.	✓										
19	Replace the missing clip bolt securing the fiberglass grating panel in the south walkway near Panel Point 6' of Span 4.	✓										
20	Install water shield or seal at openings for eyebar hangers and truss members in upper deck of Span 4.	✓										
21	Install seal or water barrier at man openings in upper deck that lead to utility sheds suspended below.	✓										
	SUPERSTRUCTURE											
1	Remove areas of delaminated and loose concrete from the lower deck floor beams in Span 12 and the upper deck floor beams in the north bay of Spans 12 and 13 and patch.	✓										
2	Remove areas of delaminated and loose concrete from the upper and lower deck floor beams in Spans 1–3 and 5–13 and patch.						✓					
3	Remove areas of delaminated and loose concrete from the upper deck columns and jack-arches in the north and south exterior rows and patch.	✓										
4	Remove areas of delaminated and loose concrete from the upper deck columns and jack-arches and the lower deck spandrel columns and patch.						✓					
5	Remove debris lying on top surface of arch ribs.	✓										
6	Remove areas of delaminated and loose concrete from the arch ribs and patch.	✓										✓
7	Patch the area of exposed reinforcement on the top surface of the north interior arch rib in Span 13.	✓										
8	Remove the cast iron washer and cover plate at the hinge pin at Panel Point L12 of both trusses. Remove pack rust, paint exposed surfaces, externally lubricate pins with oil and reinstall washer and cover plate.	✓										
9	Spot clean and paint the structural steel in Span 4 with special attention to corrosion in those areas having limited accessibility.	✓										✓
10	Install missing grease fittings at the ends of the eyebar hanger pins.	✓										
11	Grease all eyebar hanger pins. Externally apply heavy lubricating oil to those pins that do not accept grease.	✓			✓			✓			✓	

RECOMMENDATIONS

SUPERSTRUCTURE (CONTINUED)

Number	Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
12	Disassemble Vertical Post L3'–U3' of the south truss at the location where it intersects the upper deck floor beam. Repair the corrosion damage to the floor beam web. Clean, paint and reassemble all affected steel components.	✓										
13	Cut hole in web of vertical post at upper deck floor beam locations at Panel Points 0, 0', 1, 1', 2, 2', 3, 3' and inspect condition of portion of floor beam enclosed within vertical post. Disassemble post, repair corrosion damage to floor beam, clean and paint affected components and reassemble as required.	✓										
14	Replace the 2 missing bolts on the south web connection angle for Stringer F at Panel Point 6'. Tighten 1 loose bolt on the east seat angle for this stringer at this location.	✓										
15	Tighten the 4 loose bolts at the connections of the lateral bracing members to the lower flange of Stringer 1, between Panel Points 3 and 4.	✓										
16	Remove cracked retaining washers at pins of truss main bearings. Clean and paint exposed area of pin and bearing shoe. Install new washers with rust inhibitor or sealer on mating surfaces to prevent rust recurrence.	✓										
17	Externally apply heavy lubricating oil to truss main bearing pins.	✓			✓			✓			✓	
SUBSTRUCTURE												
1	Remove water pooled inside cellular East Abutment and install drains.	✓										
2	Determine what type of conduit is leaking water inside cellular East Abutment and make repairs to stop the leak or prevent the water from entering the abutment.	✓										
3	Remove areas of delaminated and loose concrete from the external pier shafts and reseal the affected areas.	✓			✓			✓			✓	
4	Remove rust staining on piers and spot seal concrete.	✓										
CHANNEL												
1	Repair the void in the embankment adjacent to the downstream face of Pier 4.	✓										
2	Stabilize the area of slope failure on the embankment west of Pier 3.	✓										

RECOMMENDATIONS

APPROACHES

Number	Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Seal the cracks in the asphalt approach pavement and the west approach sidewalks.	✓										
2	Resurface the asphalt approach pavement.											✓

GENERAL

1	Replace the missing or inoperative light bulbs in the fixture above the divided lane warning sign at the west end of the south truss and the east end of the north truss.	✓										
2	Adjust and tighten the mounting nuts at Light Poles 3VM3, 1VM6, and 2VM9.	✓										
3	Replace the missing service access cover plate at Light Pole 1VM10 and at the pole for the 4-light lamp located in the plaza area at the east end of the south sidewalk.	✓										
4	Replace the missing bolts that secure the service access cover plate at Light Poles 3VM3, 3VM2, 4VM2, 4VM8, 3VM11 and 3VM8. Tighten the service access cover bolts at Light Pole 1VM1.	✓										
5	Refasten the plastic conduit lying on the lower level deck in Spans 3, 5, 6, and 7.	✓										
6	Utilizing a suitable connector, refasten the plastic conduit that enters the lower level deck at the east end of Span 7.	✓										

STATIONS AND TUNNELS

1	Remove areas of delaminated or unsound concrete from the jack-arch beams and columns in East Subway Tunnel and patch.				✓							
2	Remove delaminated or unsound concrete at the spalled areas on the north and south walls of East Subway Tunnel and patch.	✓										
3	Remove the water collected inside the pedestrian tunnel in the East Station area and pooled on the floor of East Station and East Subway Tunnel and install drains.	✓										
4	Remove the water collected inside the pedestrian tunnel in the West Station area and install drains.	✓										
5	Monitor cracked and spalled areas of roof slab in West Station for signs of advanced deterioration or distress.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	Remove areas of delaminated or unsound concrete from the jack-arch beams and columns in West Station and patch.	✓										

RECOMMENDATIONS

STATIONS AND TUNNELS (CONTINUED)

Number	Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
7	Remove areas of delaminated or unsound concrete on the north wall of West Station in the area located between the expansion joints adjacent to Column Lines 20 and 31 and patch.	✓										
8	Remove areas of delaminated or unsound concrete from the jack-arch beams and columns in Detroit Avenue Subway Tunnel and patch.				✓							
9	Remove delaminated or unsound concrete at the spalled areas on the north and south walls of Detroit Avenue Subway Tunnel and patch.	✓										
10	Remove areas of delaminated or unsound concrete from the columns in West 25th Street Subway Tunnel and patch.	✓										
11	Remove delaminated or unsound concrete at the spalled areas on the east and west walls of West 25th Street Subway Tunnel and patch.				✓							

APPENDIX E

TABULATION OF SPALLS AND DELAMINATIONS

STATE OF OHIO DEPARTMENT OF TRANSPORTATION
BRIDGE INSPECTION REPORT

2003

1800930 — STRUCTURE FILE NUMBER

CUY — CO; 00006 — ROUTE; 1456 — UNIT; BRIDGE NUMBER

CLEVELAND

YEAR BUILT 1917 / 1997

DIST. 12 | Steel / Arch / Thru — BRIDGE TYPE | 1 5 7 — TYPE SERVICE | OLD1499-CUYAHOGA RIV/RTA

DECK

1. Floor SCATTERED TRANSVERSE CRACKS W/EFFLORESCENCE SPACED 7 20' (TRUSS SPAN ONLY) Out/Out = 85.2 1 Conc	1	2. Wearing Surface Wearing Surface Date N/A SCATTERED LONGIT. & FEW TRANS. CRACKS THCK= 1.0 2 Conc Mono .003"-.005"	1
3. Curbs,Sidewalks & Walkways FEW ISOLATED 1 Conc SMALL DELAMS/SPALLS, SUPERFICIAL CRACKS, LIGHT RUST ON CURBS 1 Conc	1	4. Median	
5. Railing TIGHT VERT. 5 Rein Conc Post/Conc Panel CRACKS IN TOP RAIL @ 2' SPACING, DETERIORATED PATCH @ PP 0' NORTH	2	6. Drainage BROKEN 3 Scuppers and downspouts COLLAR @ PIER 2S & PIER 4N, HOLE IN DSPOUT @ PIER 10N, SEVERAL CB'S PART SILTED	2
7. Expansion Joint GOUGES IN ARMOR @ TOWER B, TEAR IN ARMOR AT PIER 3 EAST 8 Elastomeric Strip Seal LEAKS	2	8. Summary	7

SUPERSTRUCTURE

9. Alignment Max. Span = 591	1	10. Beams/Griders/Slab N N/A	
11. Diaphragms or Crossframes Total Lgth = 2,656		12. Joists/Stringers RUST & SCALE ON LOWER WEB & BOTTOM FLANGE OF STRINGERS D E P & R W/FEW PERFORATIONS	2
13. Floor Beams STEEL: PITTING & HOLES THRU WEB CONCRETE: NUMEROUS DELAMS & SPALLS W/EXPOSED REINF.	2	14. Floor Beam Connections PITTING & HOLES THRU WEB OF SEVERAL BUILT-UP HANGERS	2
15. Verticals PITTING & HOLES THRU LACING BARS, SCATTERED CREVICE CORROSION TO GUSSET PLATES @ PP'S L0-L4, L0'-L4'	2	16. Diagonals HOLES THRU 2 ANGLE LEGS OF L1'-L0' NORTH AT UPPER DECK	2
17. End Post 4 CONSECUTIVE LACING BARS CORRODED THRU ON L0'-U0' NORTH BELOW UPPER FLOOR BEAM	2	18. Top Chord	1
19. Lower Chord GROOVE PITTING TO BOTTOM LACING CHANNELS AND TO WEB PLATES AT DIAPHRAGMS BELOW LOWER DECK, PITTING TO LOWER INSIDE ANGLES @ TRUSS BEARINGS	2	20. Lower Lateral Bracing	1
21. Top Lateral Bracing	1	22. Sway Bracing SCATTERED AREAS OF PITTING	2
23. Portals PERF'S. THRU LOWER BATTEN PLATES, PITTING TO LOWER ANGLES AND AT MEMBER CONNECTIONS	2	24. Bearing Devices 8 Fixed Arch-Rib PACK RUST W/CRACKS IN PIN WASHERS AT TRUSS BRGS., LOOSE PLATES AT UPPER DECK JT'S. AT PIERS 11 & 12	2
25. Arch DELAMINATED AREAS AT EDGES AND BOTTOM FACE	2	26. Arch Columns or Hangers DELAMINATIONS AT SPANDREL COLUMNS, DELAMS. & SPALLS AT UPPER DECK COLUMNS	2
27. Spandrel Walls		28. Paint < 5% DETERIORATED BUT AREAS OF RUST & SCALE IN CRITICAL STRUCTURAL AREAS Type: ~~2~~ 5-OZEU Year = ~~1970~~ 1997	2
29. Pins/Hangers/Hinges PITTING TO HANGERS @ PPS 4 & 4' N & S, PACK RUST BETWEEN WEB PLATE & HINGE WASHER @ PP L12 N & S	2	30. Fatigue Prone Connections	1
31. Live Load Response	S	32. Summary	6

SUBSTRUCTURE

33. Abutments CRACKS THRU SEVERAL CELL WALLS, DELAM AND 3 Solid Wall SPALLED 2 Conc AREA ON SOUTH WALL BELOW 2 Conc SPAN 1A	2	34. Abutment Seats Abutment: Not on Piling	
35. Piers SPALLS & DELAMS AT N & S PIER SHAFTS, SCATTERED DELAMS AND RUST STAINS Spans = 13 AT BASE	2	36. Pier Seats Piers: Not on Piling	1
37. Backwalls Piers = 12		38. Wingwalls	
39. Fenders and Dolphins	1	40. Scour 3	2
41. Slope Protection N None		42. Summary Diving Dive Dt = ~~N/A~~ 2003	6

CULVERTS

43. General N Not A Culvert		44. Alignment	
45. Shape		46. Seams	
47. Headwalls or Endwalls		48. Scour	
		50. Summary	

CHANNEL

Culvert Length 0.00

51. Alignment FLOWS DIAGONALLY UNDER SPAN 4	2	52. Protection SCALE 3 Sheet Piling AT WATER LINE, INCOMPLETE AT WEST BANK	2
53. Waterway Adequacy Water Direction L	1	54. Summary WEST BANK SLIDING UNDER SPANS 3 AND 4	6

APPROACHES

55. Pavement GROOVED W/ FEW CRACKS, PATCHED AND SLIGHTLY SETTLED 1 Conc AREAS AT EAST, FEW GROOVES, CRACKS & SETTLED AREAS AT WEST	2	56. Approach Slabs	
57. Guardrail 0	1	58. Relief Joints	
59. Embankment BRDG.WIDTH= 72.00	1	60. Summary Pct. Legal = 135	6

GENERAL

61. Navigation Lights	1	62. Warning Signs MISSING OR BURNT OUT LIGHT BULBS Maint. Resp: 3 County ABOVE LANE DIVISION SIGNS AT ENDS OF STEEL ARCH SPAN	2
63. Sign Supports SLIGHT DAMAGE TO OVERHEAD SIGN MVC ON = 14 ABOVE NORTH WB LANE AT EAST END OF STEEL ARCH SPAN	2	64. Utilities PLASTIC CONDUIT HAS SUBSTANDARD CONNECTION AT SPAN 7 & IS LAYING ON LOWER DECK IN SPANS 3,5,6,7	2
65. Vertical Clearance	1	66. General Appraisal & Operational Status	6A

Inspected By:

Donald L. Main / Paul C. Martin — Signature

DONALD L. MAIN PAUL C. MARTIN

Inspection Date 08/07/03

Deck Area: 226,292

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Reviewed By: ms consultants, inc.

Raymond M. Repko — Signature

RAYMOND M. REPKO, P.E.

Reviewed Date 8/14/03