CUY-6-1456

PHYSICAL CONDITION REPORT
ROUTINE INSPECTION
VETERANS MEMORIAL/DETROIT-SUPERIOR BRIDGE OVER THE CUYAHOGA RIVER
SFN: 1800930

Inspection Date:
November 27-28, 2017

Submitted to:

Ohio Department of Transportation
District 12
5500 Transportation Boulevard
Garfield Heights, OH 44125
United States of America

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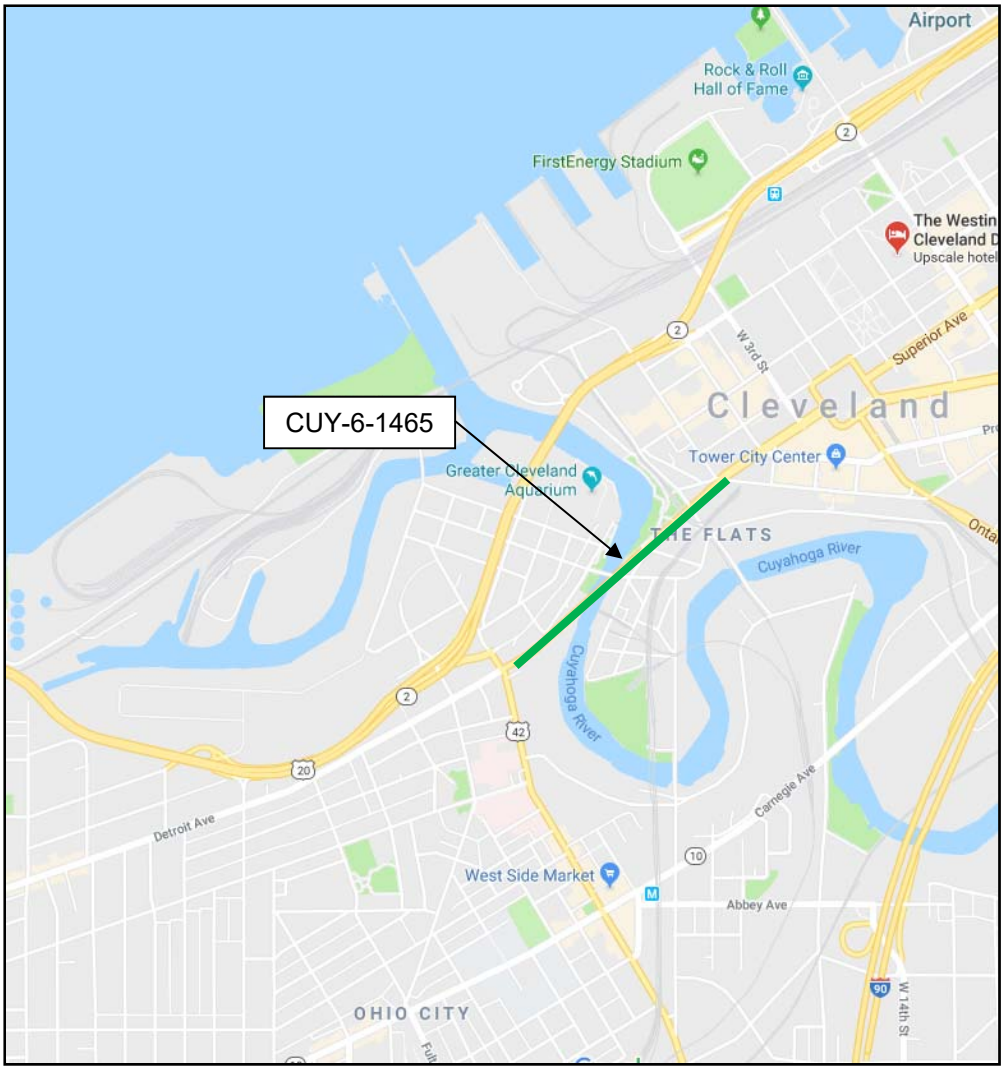
LOCATION MAP



Structure: CUY-6-1456
Veterans Memorial/Detroit-Superior over Cuyahoga River
Cleveland, Ohio

GENERAL DESCRIPTION

The Veterans Memorial/Detroit-Superior Bridge (CUY-6-1456, SFN 1800930) carries three lanes of traffic and one lane of bike traffic over the Cuyahoga River Valley, local streets, and RTA railroad tracks. The bridge is approximately 2,880 feet long, including 1,673 feet of subway tunnel that is linked by the lower deck. The bridge was constructed from 1914 to 1917.

The upper deck was opened to vehicular traffic in November 1917 and currently carries four lanes of traffic over the Cuyahoga River Valley. The lower deck was designed for four streetcar lines with room for an additional two lines that were active from January 1918 to 1953. On January 18, 1974 the bridge was added to the National Register of Historic Places. On Veterans Day November 11, 1989 the bridge was renamed the Veterans Memorial Bridge.

The bridge has undergone two major rehabilitation projects from 1967 to 1970 and 1995 to 1997. Work included replacing and widening the deck, updating safety features, improving the drainage system, installing new floor system members, and strengthening or replacing deteriorated sections.

The Detroit-Superior Bridge consists of three (3) units of varying structure types within each section.

Unit I - West Approach
Unit II - Main Unit Spans
Unit III - East Station

Plan views of the Veterans Memorial/Detroit-Superior Bridge with the units and sections identified are shown in Drawings 1 through 3.

Unit I – West Approach

The West Approach section consists of the West Station area spanning a total of 350 feet west of Tower A and two abandoned subway tunnels: the Detroit Avenue Tunnel (660 feet long) and the West 25th Street Tunnel (480 feet long). There are several utilities that pass through the west station and tunnels. The West Station has been open to the public for tours and festivals since the 1980s.

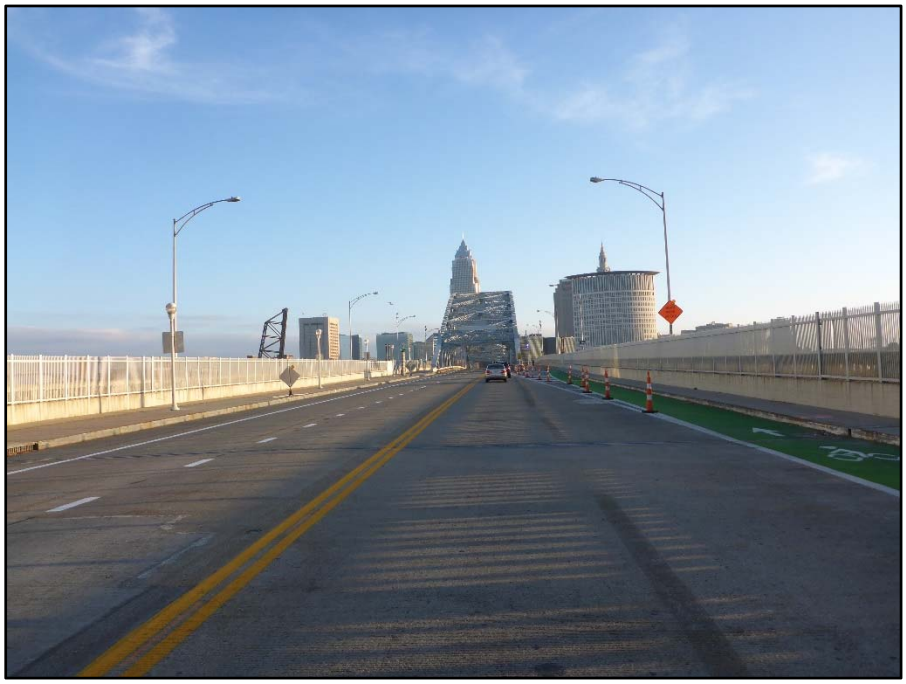
Unit II – Main Unit Spans

The Main Unit is comprised of Spans 1A, 1B, and Spans 1 through 13. Spans 1A and 1B are transition structures from the underground West Station to the approach and main spans. These two concrete cellular spans total 220 feet long and each has enclosed cellular construction below the lower deck. Spans 1 through 13 are the main spans of the bridge with a double deck design. Spans 1 through 3, 5 through 11, and 13 are concrete open spandrel arches. Span 12 is a concrete encased steel half through arch. Span 4 is a 591 foot, three-hinged steel half through arch truss in a Pratt configuration. The upper deck is used for vehicular and pedestrian traffic and the lower deck is used for utilities and maintenance access. Occasional tours and festivals take place on the lower deck.

Unit III – East Station

The East Station is a concrete cellular span that extends 165 feet past the East Abutment. A three panel long, cellular construction is present under the East Station lower deck immediately behind the East Abutment.

East end view looking West



West end view looking East

South elevation

North elevation

Construction and Maintenance History

The following is a summary of significant events in the history of the Detroit-Superior Bridge:

- 1914-1917: Construction of the Detroit Superior High Line Bridge
- November 1917: Bridge opened up to vehicular and pedestrian traffic.
- January 1918: Bridge opened up to streetcar traffic.
- 1953: Streetcar lines abandoned.
- 1967-70 Major Rehabilitation
    - Removal of the original upper deck consisting of four vehicular lanes and two 15-foot wide sidewalks.
    - Strengthening or replacement of all upper deck concrete floorbeams.
    - Span 4: Erection of new steel floorbeam cantilevers.
    - Construction of the new upper deck with six vehicular lanes and two five-foot wide sidewalks.
- January 18, 1974: Bridge was added to the National Register of Historic Places
- November 11, 1989: Bridge was renamed the Veterans Memorial Bridge.
- 1995-97 Major Rehabilitation
    - Replacement of the upper and lower deck floors.
    - Replacement of select upper and lower concrete floorbeams, columns, jack arches and pier shafts.
    - Application of epoxy-urethane or non-epoxy sealer to most exposed concrete surfaces.
    - Span 4: Replacement of all steel hangers, Panel Points 6 through 6'.
    - Span 4: Replacement of Upper Deck and Lower Deck floorbeams 5 through 5' and the corresponding stringers.
    - Painting of all steel superstructure components.
    - Installation of new drainage system.
    - Installation of architectural lighting.
- 2003 North Sidewalk Linear Park Conversion.
    - Conversion of vehicular traffic to two Westbound and one Eastbound lane between the steel trusses and on Eastbound lane on the Span 4 South cantilever.
    - Widening of the North sidewalk with longitudinal trench drainage.
    - Installation of public art and benches along the modified North sidewalk.
- 2014-Present
    - Span 1A through Span 13: Patching deficient upper deck wearing surface areas.
    - Patch deficient concrete super and substructure components in West Station, Detroit Avenue Tunnel, West 25th Street Tunnel and Spans 1-3 and 5-13. (Note: In Spans 1-3 and 5-13, the patching below the lower deck was later restricted to areas adjacent to and over public areas.)
    - Span 4: Zone painting of primary and secondary truss members between upper and lower decks.
    - Install hanger caps at hanger opening in upper deck, Panel Points 6 through 6'.
    - Repaired spalled wearing surface in Span 9.
    - Pipe cleanout for pedestrian tunnels in the West and East Station. (This task was performed but not successful.)
    - South vehicular Eastbound lane converted into bike lane.

INSPECTION PROCEDURE

Infrastructure Engineers, Inc. conducted a routine inspection on the structural elements of Units I, II, and III using a combination of equipment and modified industrial rope access techniques. The inspection was performed by a crew of four (4) members recording inspection notes and verifying any new or previously reported areas of deterioration or structural distress.

From the 1995-97 bridge rehabilitation up until the 2015 Routine inspection, a different bridge nomenclature system had been used. With the original construction and rehabilitation drawings included as a significant element of the bridge record, and past FHWA policy of recommending that original member identification system be followed, this inspection therefore followed the structure's original member identification. This practice ensures that this inspection will at a minimum, conforms with the original shop drawings and documentation for the prior bridge rehabilitation.

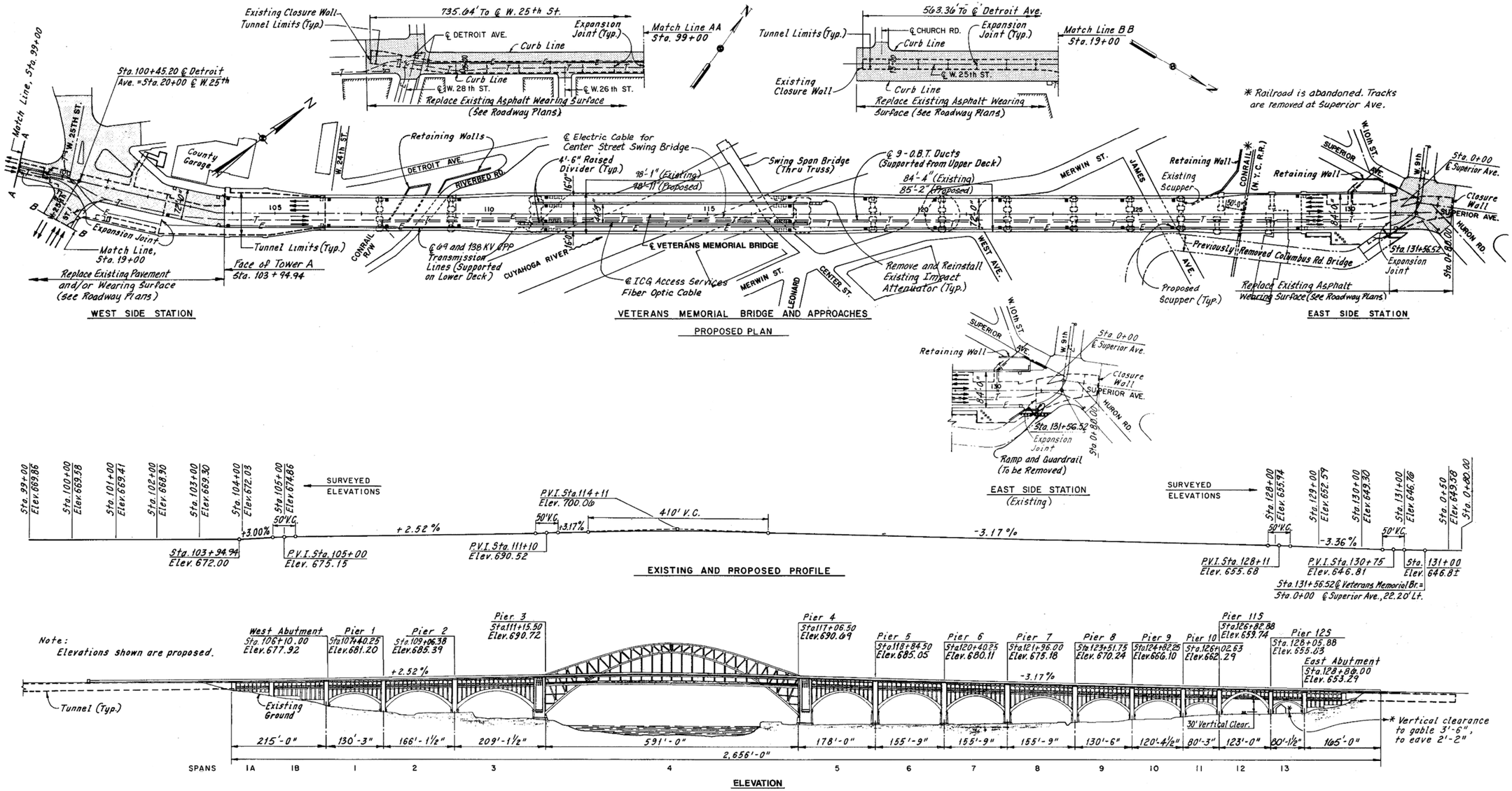
Condition and Element Rating Guidelines

The table below contains the bridge inspection rating matrix established by the Federal Highway Administration (FHWA), using a 0-Failure through 9-Excellent scale, and used by the Ohio Department of Transportation (ODOT). In this report, component conditions will generally be discussed based on the ODOT rating guidelines for individual components, 1-Good through 4-Critical.

The General Appraisal, the Deck, Superstructure, Substructure, Channel and Approach Summaries, and the Protective Coating System rating will follow the NBIS/ODOT 0 through 9 rating guidelines.

Individual Items (ODOT)	Summary Items (NBIS)	Condition	Defect
1 GOOD	9	Excellent	Excellent condition.
	8	Very Good	No problems noted.
	7	Good	Some minor problems
2 FAIR	6	Satisfactory	Structural elements show some minor deterioration.
	5	Fair	All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
3 POOR	4	Poor	Advanced section loss, deterioration, spalling, or scour.
	3	Serious	Loss of section, deterioration, spalling or scour has seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
4 CRITICAL	2	Critical	Advanced deterioration of primary structural elements, Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure report. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
	1	"Imminent Failure"	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic, but corrective action may be put it back in light service.
	0	Failed	Out of service – beyond corrective action.

Manual of Bridge inspection, Ohio Department of Transportation (ODOT), 2014
Bridge Inspector's Reference Manual, Federal Highway Administration (FHWA), 2015
Manual for Condition Evaluation of Bridges, 2nd Edition, AASHTO, 2010 (rev 2011)
National Bridge Inspection Standards, U.S. Department of Transportation, 2004
Inspection of Fracture Critical Bridge Members, U.S. Department of Transportation, 1986



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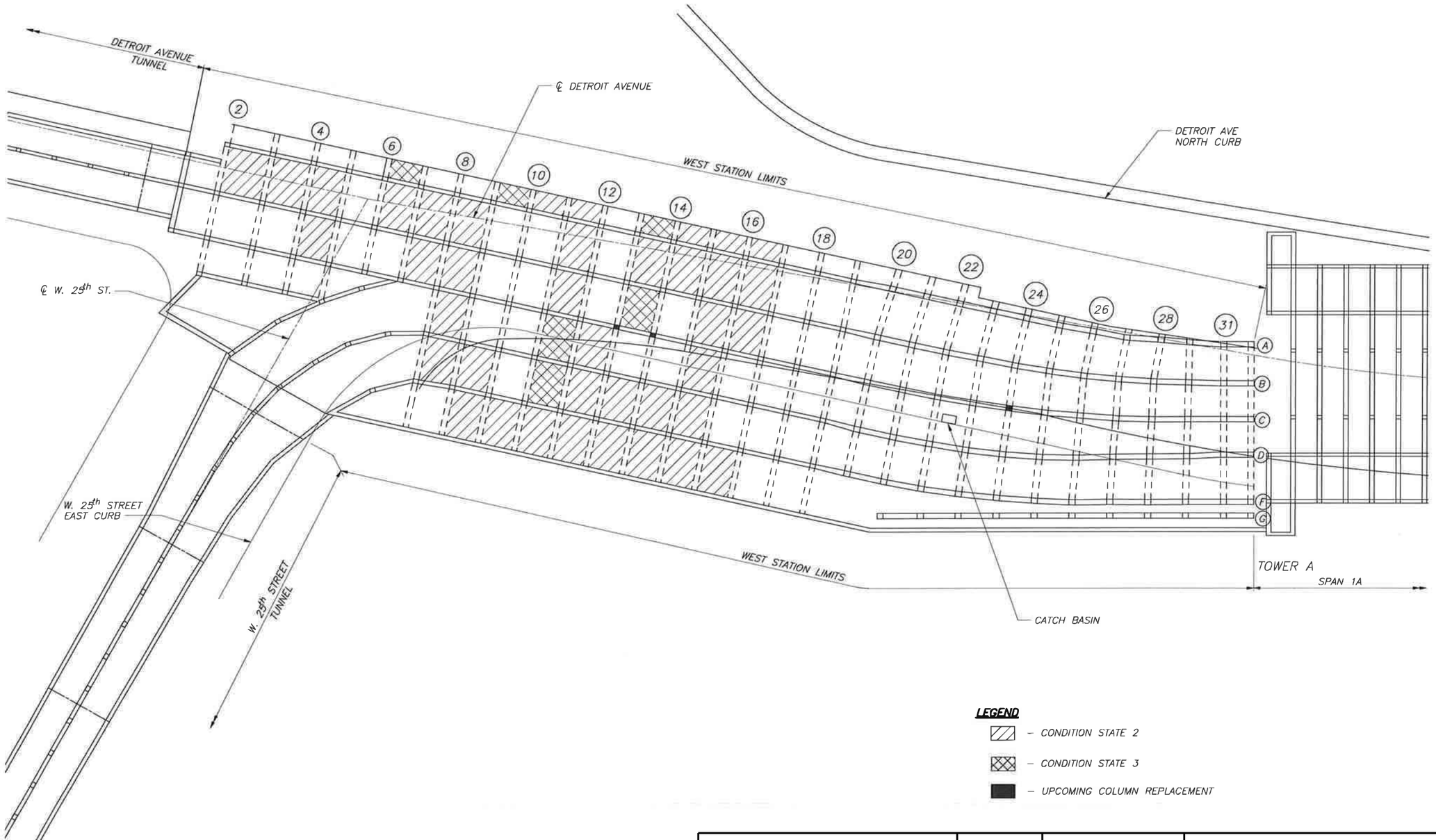
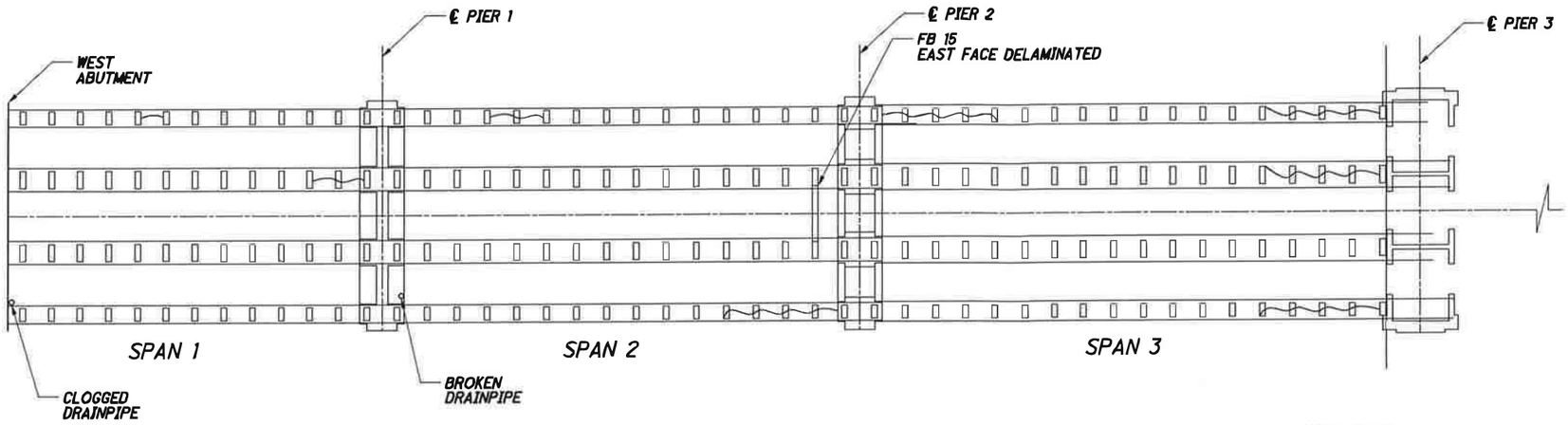
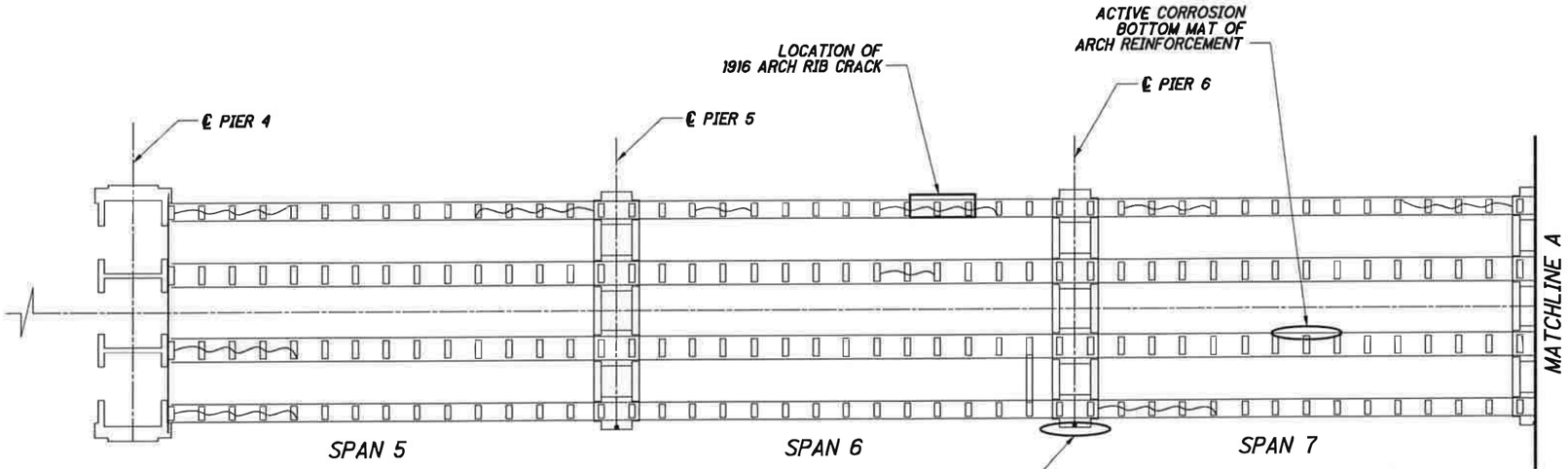
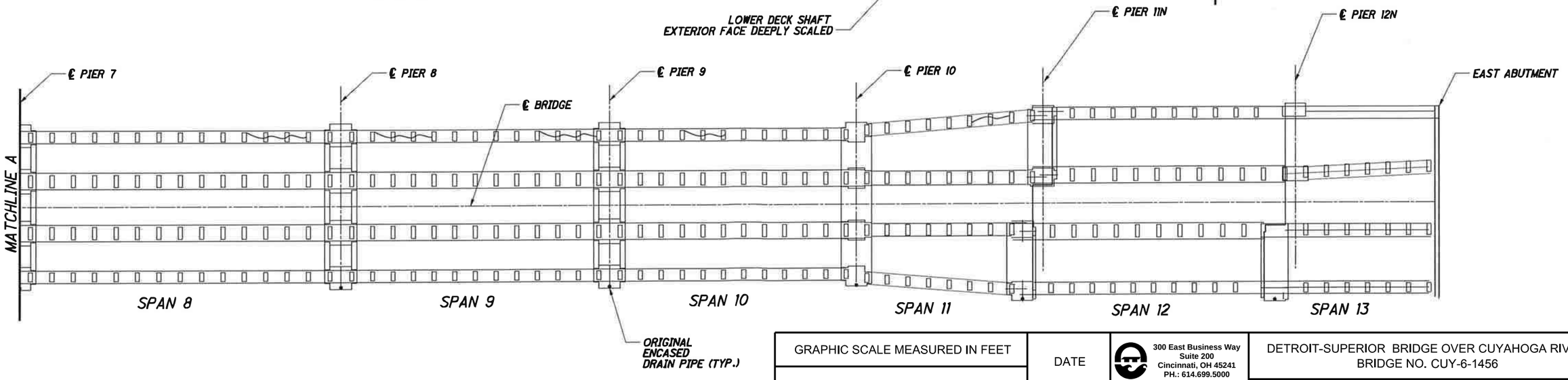


GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE NOV, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1456 WEST STATION PLAN PAGE D-2







LEGEND

VERTICAL ARCH CRACK

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE NOV, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1456 SUPERSTRUCTURE PLAN PAGE D-3

Inspection Findings:

Item N58 – Deck (6, Satisfactory Condition)

The deck is in overall ***Satisfactory*** condition, a rating of a 6 on the NBIS condition rating guidelines.

The deck findings and summary of deck conditions for individual deck items are as follows:

Item 7.1 – Floor - Upper Deck (5, Fair Condition)
The upper deck floor is in ***Fair*** condition.

Section	Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
Detroit Ave. Tunnel	17,950 SF	17,950 SF				
West 25th St. Tunnel	13,750 SF	13,650 SF	100 SF	100 SF		
West Station	37,800 SF	29,600 SF	7,350 SF	850 SF		
Spans 1A, 1B, 1-13	232,250 SF	232,250 SF				
East Station	31,150 SF	31,150 SF				
Total Structure	332,900 SF	324,500 SF	7,450 SF	950 SF		

Detroit Avenue Tunnel: The Detroit Avenue tunnel slab was retrofitted during the 1995-1997 rehabilitation; a new reinforced concrete slab was placed on top of the original slab. The new slab was designed for HS20 live load with the original slab offering no structural support. The top and bottom surfaces for the new slab is not visible and assumed to be in good condition despite the poor and critical conditions of the original tunnel slab beneath.

West 25th Street Tunnel: The West 25th Street tunnel floor is in good condition and exhibits isolated delaminated areas and shallow spalling.

West Station: The West Station Floor exhibits areas of spalling, cracking and efflorescence, active water infiltration, and exposed reinforcing steel. The most significant areas of deterioration are adjacent to the restored floor joints and in Bays A and B.

Spans 1A, 1B, and 1 through 13: The upper deck floor in the main spans is in good condition with isolated cracks with and without efflorescence.

East Station: The East Station floor is in good condition with no significant deficiencies.

Lower Deck: Not considered in this quantity was the lower deck floor. The lower deck is in good condition. The lower deck is reinforced concrete with stay in place (SIP) forms in Spans 1 through 3, and Spans 5 through 13. In Span 4 the lower deck is a combination of an interior vehicular steel grid deck and exterior pedestrian fiberglass grating. In the center bay of Panel 15 in Span 2 the SIP forms exhibit severe corrosion that is staining the west face of Pier 2. The South Bay in Span 1B has spalling up to 4-inches deep that exposed the top mat of reinforcing in the 12-inch thick slab.

Item 7.2 – Edge of Floor – Upper Deck (6, Satisfactory Condition)
The edge of floor is in ***Satisfactory*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
5,312 LF	5,312 LF				1.00

Item 8 – Wearing Surface (5, Fair Condition)
The concrete wearing surface is in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
191,232 SF		191,232 SF			

The asphalt wearing surface above the West Station exhibits heavy cracking and patching throughout. The deterioration above the West Station is more prominent in the eastbound lanes. The concrete wearing surface exhibits delaminations, large asphalt patches, and deteriorating asphalt patches. The bike lane along the south side of the bridge in Span 4 has multiple asphalt and concrete patches throughout with wide spread map cracking. Not considered in this quantity was the lower deck wearing surface.

Item 9 – Curb and Sidewalk (5, Fair Condition)
The concrete wearing surface is in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
5,312 LF		5,312 LF			

The curbs and sidewalks exhibit random cracking, isolated spalls, and delaminations.

Item 10 and Item 11 – Median and Railing (7, Good Condition)
The concrete median and railings are in ***Good*** condition.

Component	Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
Median	674 LF	635 LF	39 LF			
Railing	5,312 LF	5,310 LF	2 LF			

The median exhibits shallow spalls. The southwest impact attenuator in Span 3 exhibits minor impact damage. In Span 5 the south railing aluminum fence has a 2-foot long damaged section. The south railing at Tower A is misaligned 7/8-inch vertically. The south railing at Tower B is vertically misaligned 1/4-inch vertically.

Item 12 – Drainage (5, Fair Condition)
The deck drainage is in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
28 EA	22 EA	1 EA	1 EA	4 EA	

The West Abutment, south downspout is completely clogged at the base of the catch basin. At Pier 1 there is a 15-foot section of PVC pipe missing from the south drain on the east face of the pier. The north catch basin at Pier 1 is missing the catch basin grate. At Piers 8 and 9, the south catch basin is clogged. The Pier 9 south catch basin concrete frame has shifted to the west. The north sidewalk longitudinal trench drains are filled with debris and not functioning.

Item 13 – Expansion Joints (5, Fair Condition)
The expansion joints are in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
2579 LF		2538 LF	40 LF		

The Tower B expansion joint in the westbound lane exhibits broken fillet welds attaching the joint extrusion to the joint armor due to the formation of pack rust between the components. Snow plow damage is also present on the Tower B expansion joint in the westbound lane due to the west armor sitting 1/2-inch higher than the east armor. Joints are typically filled with debris and have edge spalls along the joint armor.

Deck deficiencies and specific locations are noted in the following table:

Deck Notes			
Unit	**Span**	**Note**	**Photo**
Railing	Tower A	South top railing; vertically misaligned 7/8" at railing joint.	Photo 7
Upper Deck	West tunnels	Heavy efflorescence, cracking, delaminations, and spalls with corroded reinforcing throughout the underside of the deck.	Photo 8
Wearing Surface	West Station	Heavy cracking and patching throughout asphalt wearing surface. This is more prominent in the eastbound lanes	Photo 9
Drainage	West Abut.	South downspout is completely clogged at the bottom.	
Lighting	1	The light pole base on the north sidewalk in Span 1 is broken	
Railing	1A	South parapet has an open electrical box.	
Lower Deck	1B	South Bay; exposed top mat of reinforcement	
Drainage	Pier 1	South drain pipe is missing a 15' long section of PVC.	Photo 10
Drainage	Pier 1	The North drain pipe catch basin grate is missing	
Lower Deck	2	Panel 15, Center Bay; SIP forms have severe corrosion that is staining the west face of Pier 2	Photo 11
Median	3	Southwest attenuator has minor impact damage.	Photo 12
Wearing Surface	4	East end of span 4; there is a 6' diameter asphalt patch that is beginning to deteriorate with an adjacent 2' Diameter x 1-1/2" D pothole.	Photo 13
Wearing Surface	5	Panel 2; Large delamination	
Railing	5	South railing fence has a 2' L damaged section.	
Upper Deck	7	Panel 4, Center Bay; local area of efflorescence	Photo 14
Wearing Surface	7	Two large asphalt/concrete patches in the westbound lanes.	
Wearing Surface	8	36' L deteriorating asphalt patch in Eastbound lanes and a 5' Diameter asphalt patch in Westbound lanes.	Photo 15
Drainage	Pier 8	The South drain pipe catch basin is clogged.	
Wearing Surface	9	Numerous concrete and asphalt patches in the Eastbound lane. The asphalt patches are beginning to deteriorate.	
Drainage	Pier 9	The South drain pipe catch basin is completely clogged and concrete frame is shifted to the west. North drain pipe catch basin is partially clogged.	
Wearing Surface	10	Numerous concrete and asphalt patches in the Eastbound lane. The asphalt patches are beginning to deteriorate.	

Deck Notes			
Unit	**Span**	**Note**	**Photo**
Lighting	11	The light pole base on the north sidewalk in Span 11 is broken	Photo 16
Upper Deck	18	South Bay; Panel 3; 2’ Diameter area of map cracking and efflorescence	
Expansion Joints	Tower B	Left Westbound lane; pack rust has broken fillet welds. Snow plow damage is present.	Photo 17
Railing	Tower B	South top railing; vertically misaligned 1/4" at railing joint.	

Item N59 – Superstructure (5, Fair Condition)

The superstructure is overall ***Fair*** condition, or 5 on the NBIS condition rating guidelines.

The superstructure findings and summary of conditions for individual items are as follows:

Item 14 – Alignment of Members (7, Good Condition)
The alignment of the primary superstructure members is ***Good***.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
40 EA	40 EA				

Concrete Superstructure

Item 27 – Concrete Arch (5, Fair Condition)
The concrete arches are in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
8,040 LF	6,540 LF	1,475 LF	25 LF		

The concrete arches typically exhibit cracking, spalls with and without exposed reinforcing, and delaminations throughout. Some of the previous spalling has been repaired particularly over public areas and parking lots. The repairs appear to be sound.

Item 27 – Concrete Arch Columns (6, Satisfactory Condition)
The concrete arch columns are in ***Satisfactory*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
747 EA	697 EA	50 EA			

The concrete arch columns exhibit up to full height corner cracking and up to full height shallow spalls with exposed reinforcing steel. Previously patched columns exhibit delaminated areas adjacent to the patched concrete. Concrete arches connecting the columns just below the upper deck exhibit spalls with exposed reinforcing steel, cracks, and delaminated areas.

Item 15.1 Beams - Concrete (4, Poor Condition)
The beams are in overall ***Poor*** condition. This element consists of the longitudinal beams in the Detroit Tunnel, West 25th Street Tunnel, and West Station.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
7,394 LF	3,698 LF	1,848 LF	1,848 LF		

The concrete beams in the West Station, Detroit Tunnel, and West 25th Street Tunnel are in poor condition due to extensive spalling with and without exposed reinforcing, delaminations, and efflorescence. The previous report mentioned these spalls were to be replaced at the conclusion of the current rehabilitation in Spring 2016, however these spalls still exist.

Item 18 – Floorbeams - Concrete (6, Satisfactory Condition)

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
33,543 LF	10,000 LF	16,543 LF	7,000 LF		

The concrete floorbeams in Spans 1A, 1B, 1 through 3, and Spans 5 through 13 are in ***Satisfactory*** condition. The floorbeams exhibit isolated spalls with exposed reinforcing, cracking, and delaminations.

The lower deck floorbeams in the East Station have the bottom mat of reinforcing steel exposed. This deterioration has changed little since the 1980's and with no live load carried by these floorbeams, no repairs are recommended.

The lower deck corbels appear to be architectural elements however they are actually cantilevered ends to the floor beams, directly supporting the exterior upper deck column loads above. Many of the corbels were patched or replaced in the 1995 and 2014 rehabilitations. Additional cracks, delaminations, and spalls where are present on multiple lower deck corbels due to the corrosion of the compressive diagonal reinforcing steel

in the corbel.

Concrete superstructure deficiencies and specific locations are noted in the following table:

Concrete Superstructure Notes			
Unit	**Span**	**Note**	**Photo**
Arch	3	North Interior arch rib, Panel 13, North face; Previously noted horizontal crack, 5/32" W, that was epoxy injected with new cracks propagating.could not be located.	
Arch	5	North Exterior arch rib, Panel 14 - longitudinal through crack that has propagated into the base of several spandrel columns	Photo 18
Arch	7	South Interior arch rib - Lower north corner near apex has an unrepaired spall with corroded reinforcing	Photo 19
Arch	8	North Exterior arch underside at east end is cracked and delaminated.	
Arch	11	North Exterior arch has a crack on the south face near the bottom extending from Pier 11 to approximately 1/4 the way up the arch.	Photo 20
Arch	12	North Exterior arch, south face is delaminated with widespread cracking near the bases.	
Arch Columns	2	North Exterior lower columns 3 and 4 south faces have up to full height spalling with exposed corroded reinforcing.	Photo 21
Arch Columns	3	North Exterior Column; Cracked and spalled lower deck column with exposed rebar.	
Arch Columns	3	North Exterior Column 1; Cracked and spalled lower deck column.	
Arch Columns	8	North Interior upper column 2 has a 4' H x 4" D corner spall on the northeast corner of the column with exposed rebar.	Photo 22
Arch columns	8	North Interior upper column 13 has up to 4" D corner spall on the northeast corner of the column with exposed rebar.	
Arch Columns	9	Columns 5, 7, and 9 exhibit edge spalling at top of column (bottom of upper deck).	
Arch Columns	9	North Interior upper columns 11 and 12 north faces have extensive delaminations and spalls for full height.	
Arch Columns	10	North Interior Column 7 south face has 1 SF spall at strut with exposed rebar.	
Arch Columns	12	North Exterior Arch Column 7 south face has 1/2" W crack with delaminated surface.	
Concrete Floorbeams	East Station	Lower deck floorbeams have bottom mat of reinforcement exposed.	
Concrete Floorbeams	2	North; Floorbeams 4, 6-8 all have additional width added to the bottom flange. Cracking with efflorescence is evident.	

Concrete Superstructure Notes			
Unit	**Span**	**Note**	**Photo**
Concrete Floorbeams	5	Upper deck Floorbeam 6 between the interior arches has a 1-1/2' Diameter x 2" D spall with exposed rebar on the east face.	
Concrete Floorbeams	5	Upper deck Floorbeam 11 between the interior arches has a Full Height x 3' W x 4" D spall with exposed rebar on the west face. East face has a 1-1/2' Diameter delamination.	Photo 23
Concrete Floorbeam	6	Upper deck Floorbeam 2 between the Interior arches has a Full Height x 1' W x 4" D spall with exposed rebar on the west face.	
Concrete Floorbeams	6	Floorbeam 14 south bay, upper deck; Previously noted spall in the floorbeam has been repaired.	
Concrete Floorbeam	8	Between South Exterior and South Interior Arches, Floorbeam 14 is spalled 3' H x 4' W x 4" D with exposed rebar on the west face.	
Concrete Floorbeams	10	Floorbeams typically have random spalls with exposed corroded reinforcing.	
Concrete Floorbeams	12	Lower deck floorbeams have numerous areas that have been chipped off and painted. Numerous areas are cracked and marked, but have not been chipped away.	Photo 24
Concrete Floorbeam	12	Lower deck floorbeam 6 appears to be delaminated almost full length, which can be a hazard to the road below	

Deteriorating Arches between Upper Deck Columns			
Between Columns	**Span**	**Deficiency**	**Photo**
3 & 4	2	North Exterior arch is cracked at the west end and travels down into Column 3.	
10 & 11	2	North Exterior arch is cracked and delaminated.	
5 & 6	3	North Exterior arch is cracked and spalled.	
10 &11	3	North Interior arch is cracked and delaminated with efflorescence.	Photo 25
12 & 13	3	North Interior arch is cracked and delaminated with efflorescence.	
11 & 12	6	North Interior, between columns 11-12, 2" D x 1-1/2' diameter spall.	
12 & 14	8	South Interior, between columns 13-14; 1' L x 2" H spall with exposed rebar.	
6 & 7	9	South Interior arch is cracked and spalled with exposed rebar.	
7 & 8	9	South Interior arch is cracked and spalled with exposed rebar.	
11 & 12	9	North Exterior South face has 3' L x up to 2' H delamination.	
4 & 5	10	Bottom face of South Exterior arch is cracked and delaminated.	
11 & 12	12	South Interior arch is delaminated.	

Steel Superstructure (Span 4)

The load bearing components (web plates and flange angles) of the primary truss members and gusset plates are composed of nickel steel, an early high strength steel also known for its corrosion resistant properties. The original hangers, composed of nickel steel, were replaced with 50 ksi steel. All lacing member components of the primary truss members, upper and lower deck floorbeams, lateral and longitudinal bracing and sway bracing are composed of 30 ksi carbon steel.

Item 17 – Stringers (7, Good Condition)
The stringers are in ***Good*** condition. All of the upper deck stringers have shear studs welded to the top flange providing composite action with the deck. The upper and lower deck stringers in Panels 4, 5, 5', and 4' were replaced in 1995.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
10,638 LF	10,638 LF				

The upper deck stringers are in good condition. The original curb stringers of Lines 5 and 14 exhibit light pitting on the bottom flanges. The stringers supporting the outer pedestrian fiber glass grid deck are also in good condition.

The lower deck stringers supporting the steel grid deck are in good condition. Lower deck stringers supporting only their own dead weight often exhibit advanced corrosion at the saddle bearings.

Item 18 – Floorbeams - Steel (7, Good Condition)
The steel floorbeams in Span 4 are in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
3,925 LF	3,921 LF	4 LF			

Upper Deck Floorbeams 4', 8', and 10' exhibit web perforations above the upper deck lateral bracing gusset plates. This section loss does not appear to have changed since 1997.

The lower deck floorbeams exhibit light active corrosion below the truss lines. Knife edging on lower deck Floorbeams 5 and 5' was removed during the 1995 rehabilitation.

Item 19 – Truss Verticals (7, Good Condition)
The truss verticals are in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
50 EA	50 EA				

Local perforations are present on diaphragm plates located between the upper and lower decks and minor corrosion of the lacing bars below the lower deck.

Item 20 – Truss Diagonals (5, Fair Condition)
The truss diagonals are in ***Fair*** condition with isolated areas of pack rust and pitting.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
268 EA	253 EA	4 EA	11 EA		

The truss diagonal stay plates below the lower deck exhibit minor pitting. Random lacing bars above the upper deck exhibit painted over corrosion holes.

Item 21 – Truss Upper Chord (7, Good Condition)
The truss upper chords are in ***Good*** condition with isolated areas of pack rust and pitting.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
48 EA	48 EA				

The truss upper chord members exhibit isolated rust staining with negligible section loss. North U12U11' exhibits pack rust between the hinge cover plate and the truss top flange resulting in a 1/8-inch Diameter corrosion hole in the cover plate.

Item 22 – Truss Lower Chord (6, Satisfactory Condition)
The truss lower chords are in ***Satisfactory*** condition with isolated areas of pack rust and pitting.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
48 EA	36 EA	12 EA			

Item 23 – Truss Gusset Plates (5, Fair Condition)
The truss gusset plates are in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
104 EA	75 EA	25 EA	4 EA		

The lower chord gusset plates exhibit minor corrosion above the top of the lower chord members. The south face of the south gusset plate at North L2 and both gusset plates at L3 exhibit pitting up to 1/4-inch deep with reactivating corrosion along the interior face of the gussets above the lower chord. The rest of the gusset plates below the lower deck exhibit areas of surface corrosion on the interior faces of the gusset plates.

Item 24 – Lateral Bracing (7, Good Condition)
The lateral bracing is in ***Good*** condition with isolated areas of minor surface corrosion present below the lower deck.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
36 EA	36 EA				

Item 25 – Sway Bracing (7, Good Condition)
The sway bracing is in ***Good*** condition with isolated areas of pack rust and pitting.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
28 EA	28 EA				

Isolated perforations were noted at the connections to the truss vertical members below the lower deck.

Item 26 – Bearing Devices (5, Fair Condition)
The bearings are in ***Fair*** condition with surface corrosion noted on the interior faces of all four bearing castings.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
4 EA		4 EA			

The non-structural bearing pin cover plates exhibit cracks up to 7-inches long at L0 and L0’ on both trusses. These cracks have not significantly propagated. Steel shot blasting material from the 1997 painting operation has piled within the casting chambers.

Item 30 – Protective Coating System (5, Fair Condition)
The protective coating system (PCS) is in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
14,469 LF	12,869 LF	1,200 LF	400 LF		

Areas of corrosion and failed paint were present on the main truss members below the lower deck. The structural steel between the upper and lower decks were repainted in 2014-2015 and is in very good condition. Blast material not contained during the 2014-2015 painting operation has accumulated on bracing and gusset connections. The top coat of the protective coating system above the upper deck has oxidized with minor rust staining.

Item 31 – Pins, Hangers and Hinges (7, Good Condition)
The pins, hangers and hinges are in ***Good*** condition with no significant deficiencies noted.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
30 EA	30 EA				

Item 32 – Fatigue Prone Details (7, Good Condition)
The fatigue prone details are in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
14,469 LF	14,469 LF				

Steel superstructure deficiencies and specific locations are noted in the following table:

Steel Superstructure Notes			
Unit	**Span**	**Note**	**Photo**
Steel Floorbeams	4	Floorbeam 10', Upper Deck; web perforation below the upper deck lateral bracing gusset plate on the North arch	Photo 28
Steel Floorbeams	4	Floorbeam 8', Upper Deck; web perforation below the upper deck lateral bracing gusset plate on the North arch.	Photo 29
Steel Floorbeams	4	Floorbeam 4', Upper Deck; web perforation below the upper deck lateral bracing gusset plate on the North arch.	
Upper Chord	4	North U12U11'; pack rust between hinge cover plate and truss top flange resulted in a 1/8" Diameter corrosion hole in the cover plate.	

Steel Superstructure Notes			
Unit	**Span**	**Note**	**Photo**
Lower Chord	4	L0-L5 and L0'-L5'; uphill transverse angles have water and debris causing pitting and perforations of the diaphragm plates and transverse angles.	
Lower Chord	4	North Truss, L0'-L5'; mid-member diaphragms have laminating corrosion and corrosion holes. Horizontal strut between trusses at L2', bottom uphill flange is holding debris which is causing thick laminating corrosion. North Truss, L1'L0' web at L1' has large corrosion holes that appear to be reactivating.	Photo 30
Lower Chord	4	South Truss, L0L1 upper transverse channel lacing near L0 with 5” H x 3/4” W & 1/2” Diameter corrosion holes. Four more corrosion holes in diaphragm for L0L1 South truss near L1.	
Lower Chord	4	South Truss, L0L1; fractured bolt on top lacing channel connection along the top flange.	Photo 31
Gusset Plate	4	North Truss, L3, south face of the south gusset plate with up to 1' H x 2" W x up to 3/16" D painted over pitting just west of the lower Floorbeam 3 connection angle. Active laminar corrosion and pitting up to 3/16" D x 8" H above L2L3 on the south face. 6' H x up to 6" L area of active laminar corrosion on north face of L3 gusset.	Photo 32
Gusset Plate	4	North Truss, L2 North Gusset plate exhibits 2' L x 3" H x up to 1/8" D pitting above L2L3 on the south face and 2' L x up to 3" H x up to 1/4" D pitting on the north face above L2L3 with reactivating laminar corrosion. The south gusset plate at L2 exhibits 30" L x up to 4" H x up to 3/8" D pitting on the south face with reactivating corrosion and 2' L x up to 3" H x up to 1/4" D pitting on the north face above L2L3, these section losses are at the same location on the plate. Original plate 3/4" T. Above L1L2 at L2 the south face of the south gusset exhibits reactivating pitting above the full length of the lower chord up to 4" H x up to 1/4" D.	Photo 33
Sway Bracing	4	General Note - Isolated perforations at the connections to the truss vertical members. North Truss L2 lower batten plate with 20" L x 8" W corrosion hole.	Photo 34
Bearings	4	General Note - Cracks up to 7" L on the non-structural bearing pin cover plates at L0 and L0' on both trusses.	Photo 35

Item N60 – Substructure (6, Satisfactory Condition)

The substructure is in overall **Satisfactory** condition, or 6 on the NBIS condition rating guidelines.

The substructure findings and summary of conditions for individual items are as follows:

Item 33 – Abutment Walls (6, Satisfactory Condition)
The abutment walls are in ***Satisfactory*** condition. The abutment walls consist of the West and East Abutments and the walls of the Detroit Avenue and West 25th Street Tunnels.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
3459 LF	1689 LF	1600 LF	170 LF		

The abutments exhibit map cracking throughout with minor moisture staining. Some staining appears to be superficial due to leaking deck joints above.

At the East end, the tunnel continues to the east and is flooded with water. The pedestrian stairwell along the south wall is visible, but holds water up to the second step from the top.

The West Abutment walls typically exhibit deep spalling and delaminations throughout.

Item 36 – Pier Walls (6, Satisfactory Condition)
The Pier walls at Piers 1, 3 and 4 are in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
200 LF	100 LF	100 LF			

The west face of Pier 1 is primarily covered by fill. The exposed portions of the pier walls exhibit map cracking with minor corrosion staining as well as graffiti.

The East face of Pier 3 is covered with painted murals which hides surface flaws. The areas around the murals exhibit map cracking with corrosion staining. The west face of Pier 3 also exhibits map cracking and corrosion staining throughout.

The West face of Pier 4 is on the edge of the Cuyahoga River with sloped fill along the North end. The bottom quarter of the pier exhibits map cracking. Near the water surface, the edge of the sealant was visible. An underwater inspection was not performed during this inspection. The West face of the pier wall is against higher fill while the exposed portion exhibits minor map cracking.

Item 38 – Pier Columns/Bents (5, Fair Condition)
The pier columns are in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
40 EA	24 EA	5 EA	10 EA		

The reinforced concrete pier columns exhibit map cracking with moisture staining throughout. Below leaking joints or faulty downspouts, superficial staining it common on the surfaces as well.

Deep spalling, up to 10” D with exposed reinforcement was noted throughout. Some of these instances exist over areas that are accessible to the public.

Item 39 – Backwalls (6, Satisfactory Condition)
The backwalls are in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
263 LF	263 LF				

The abutment backwalls do not exist at the West and East Abutments due to the continuation of the tunnels. At the East tunnel, the backwall acts as a closure panel.

Item 40 – Wingwalls (5, Fair Condition)
The wingwalls are in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
12 EA			12 EA		

The wingwalls along Spans 1A and 1B and the East Station exhibit cracking and spalling with exposed reinforcement throughout.

The South wall at Tower B continues to exhibit movement spanning over the past 10 years. The tower currently resides with an outward measurement of 4-3/4” at the lower deck level. On the interior, the top of the tower is spalled and cracked due to contact with the soffit of the upper level sidewalk.

Item 42 – Scour (7, Good Condition)
The scour is in ***Good*** condition. Sea walls are present along both river banks, providing protection for Pier 8 and 9. No underwater inspection is required for this structure.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
2 EA	2 EA				

Item 43 – Slope Protection (7, Good Condition)
The concrete slope protection is in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
2 EA	2 EA				

Substructure deficiencies and specific locations are noted in the following table:

Span	Deficiency	Photo
West Station	Numerous columns and arches into the west stationing tunnel are in need of repair, most of the heavily deteriorated sections are marked.	Photo 40
West Abutment	West Abutment below the South Exterior Arch; there is a 1/4" W vertical crack.	Photo 41
West Abutment	The Southeast corner of the abutment is delaminated and broken off.	
Span 3	Steeply graded banks below span 3 appear to be stable and vegetated.	
Pier 5	North Exterior column, Southwest corner; 10' H x 6" D corner spall with exposed rebar.	Photo 42
Pier 5	South Exterior Column, East Face; 6' H x 4' W x 8" D spall with exposed rebar under bottom deck overhang.	
Pier 6	South Exterior Column, South Face; widespread spalling and delaminations throughout middle 1/3.	
Pier 8	South Exterior Column, East Face; 6' H x 3' W delamination above parked cars.	Photo 43
Pier 8	South Exterior Column, West Face; 4' H x 4' W x 10" D spall under bottom deck overhang.	Photo 44
Pier 10	South Exterior Column, West Face; 4' H x 2' W x 4" D spall with exposed rebar under bottom deck overhang.	
Tower B	Continuous monitoring of Tower B, South side; still 4-3/4" at the lower deck level. The interior top section at Tower B South is fractured at the interface with the upper deck	Photo 45

Channel (8, Very Good Condition)

The channel is in ***Very Good*** condition, or an 8 on the NBIS condition rating guidelines.

The channel findings and summary of conditions for individual items are as follows:

Item 51 – Alignment (8, Very Good Condition)
The alignment is in ***Very Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
200 LF	200 LF				

Item 52 – Protection (6, Satisfactory Condition)
The channel protection is in ***Satisfactory*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
200 LF		200 LF			

Item 53 – Hydraulic Opening (8, Very Good Condition)
The hydraulic opening is in ***Very Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
1 EA	1 EA				

Item 54 – Navigation Lights (2, Critical Condition)
The navigation lights are in ***Critical*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
6 EA				6 EA	

Item 6 – Approaches Summary (6, Satisfactory Condition)

The approaches are in ***Satisfactory*** condition, or a 6 on the NBIS condition rating guidelines.

The approach findings and summary of conditions for individual items are as follows:

Item 1 – Approach Wearing Surface (5, Fair Condition)
The approach wearing surfaces are in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
2 EA		2 EA			

The east and west approaches exhibit moderate map cracking throughout and the west approach exhibits isolated spalls.

Item 4 – Embankment (7, Good Condition)
The approach embankments are in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
4 EA	3 EA		1 EA		

The embankment under Span 3 exhibits several slope depressions. This embankment was primarily loose soil placed over demolition debris. Beneath this fill is a concrete strut between piers 2 and 3 used as a means of structure stability during construction. This strut is preventing portions of the fill from sliding into the Cuyahoga River.

Item 5 –Guardrail (7, Good Condition)
The approach guardrail is in ***Good*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
4 EA	4 EA				

Utility Items

Item 56 – Utilities (5, Fair Condition)
The utilities are in ***Fair*** condition.

Total Quantity	CS 1	CS 2	CS 3	CS 4	Transition Rating
4,553 LF		4,553 LF			

The lower deck telephone junction chamber in Spans 2 and 13 are severely corroded and lacking security due to salt water infiltration through the manhole above. At the time of inspection, the telephone company was actively repairing the junction chambers.

The lighting on the bridge is in good condition. The upper deck architectural light pole bases on the north sidewalk in spans 1 and 11 have cracked and are broken. All of the exterior pier shaft light brackets exhibit paint failure and corrosion with minor section loss present.

Architectural lighting was installed throughout the bridge in 1996 for the City of Cleveland

Security Items

There are locations where the structure and structure right of way can be accessed by non-bridge personnel. Security fencing installed around Piers 2 and 3 can easily be surpassed by vagrants. The fence running from Tower A South to Pier 1 which encloses the land between Span 1 and along Spans 1A and 1B is accessible due to an unlocked gate on the southeast end of Pier 1. Due to the unlocked gate there are multiple homeless camps set up beneath the spans. Preventative access steel mesh installed outside Span 1A near Tower A to prevent access appears formidable however plastic steps located adjacent to this area indicate opportunities have been taken to gain access.

A chain link enclosure for the Center Street bridge operator's vehicle on the west side of Pier 4 allows vandals to climb the fencing cover to access the sway bracing. From here the vandals have vandalized Pier 4 and have access to the truss lower chord and lower deck.

Recommendations

The Veterans Memorial/Detroit-Superior Bridge over the Cuyahoga River is in overall Fair condition, or 5 on the NBIS rating guideline.

High:

- Pier 8 South exterior column; Remove loose concrete and repair spalled area

Immediate:

- Repair and clean areas of the deteriorated concrete deck
- Clean and Repair the drainage catch basins
- Replace and/or repair the concrete railings
- Repair areas of the deteriorated and leaking joints with dislodged joint materials
- Repair and clean areas of the deteriorated concrete arch superstructure
- Repair and clean areas of the deteriorated concrete stringer superstructure
- Repair and clean areas of the deteriorated concrete floor beam superstructure
- Repair and clean areas of the deteriorated steel superstructure
- Spot paint areas of the deteriorated steel components
- Repair and clean areas of the deteriorated substructure concrete
- Repair and/or replace the navigation lights
- Repair areas of the deteriorated approach wearing surfaces
- Repair the embankment in Span 3
- Secure all access points to the structure
- Drain water from the East Tunnels so a full inspection can be completed.

Deck Photos

Photo 1 – Typical lower deck soffit West Approach

Photo 2 – Typical upper deck soffit Span 2

Photo 3 – Typical upper deck soffit Span 4

Photo 4 – Typical upper deck wearing surface condition

Photo 5 – Typical bridge rail condition

Photo 6 – Typical expansion joint condition

Photo 7 – South top railing at Tower A; vertically misaligned 7/8” at railing joint

Photo 8 – West tunnels upper deck with heavy efflorescence, cracking, delaminations, and spalls with corroded reinforcing steel

Photo 9 – West Station wearing surface; heavy map cracking and patching throughout

Photo 10 – Pier 1 south downspout; missing 15’ section of PVC pipe

Photo 11 – Span 2, Panel 15 center bay; SIP forms exhibit severe corrosion that is staining the west face of Pier 2

Photo 12 – Span 3 south attenuator; minor impact damage

Photo 13 – East end of Span 4; deteriorating 6’ Diameter patch with adjacent 2’ Diameter x 1-1/2” D pothole

Photo 14 – Upper Deck, Span 7, Panel 4 center bay; local area of efflorescence

Photo 15 – Span 8 eastbound lane; 36’ L deteriorating asphalt patch

Photo 16 – Span 11, North sidewalk; broken light pole base

Photo 17 – Tower B expansion joint, left westbound lane; Pack rust has broken fillet welds. Snow plow damage is present.

Superstructure Photos

Photo 18 – Span 5 North Exterior Arch Rib, Panel 14; longitudinal through crack that has propagated into several spandrel columns

Photo 19 – Span 7 South Interior Arch Rib; lower north corner near apex has an unrepaired spall with exposed reinforcing

Photo 20 – Span 11 North Exterior Arch, south face; crack extending from Pier 11 up 1/4 length of the arch

Photo 21 – Span 2 North Exterior lower columns 3 and 4; south faces have up to full height spalling with corroded reinforcing

Photo 22 – Span 8 North Interior Upper Column 2; 4’ H x 4” D corner spall on the northeast corner of the column with exposed reinforcing

Photo 23 – Span 5 Upper Deck Floorbeam 11 west face between interior arches; Full height x 3’ W x 4” D spall with exposed rebar

Photo 24 – Span 12, lower deck floorbeams; multiple floorbeams have chipped off concrete with exposed, painted reinforcing

Photo 25 – Span 3 North Interior Arch between upper deck Columns 10 & 11; arch is cracked and delaminated with efflorescence

Photo 26 – Typical superstructure condition

Photo 27 – Typical truss condition

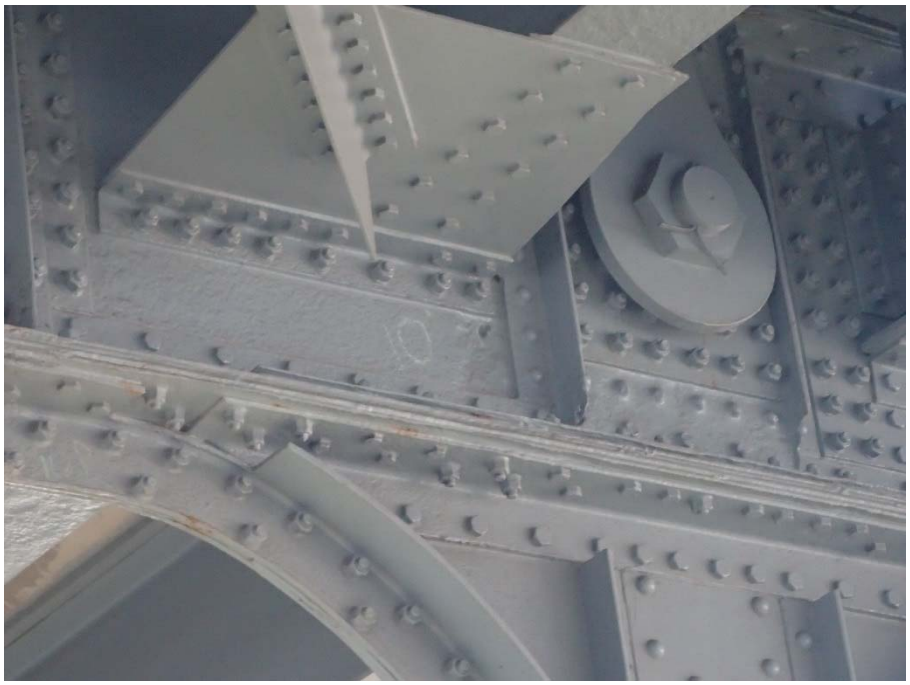


Photo 28 – Span 4 Upper Deck Floorbeam 10’; web perforation below the upper deck lateral bracing gusset plate on the north arch

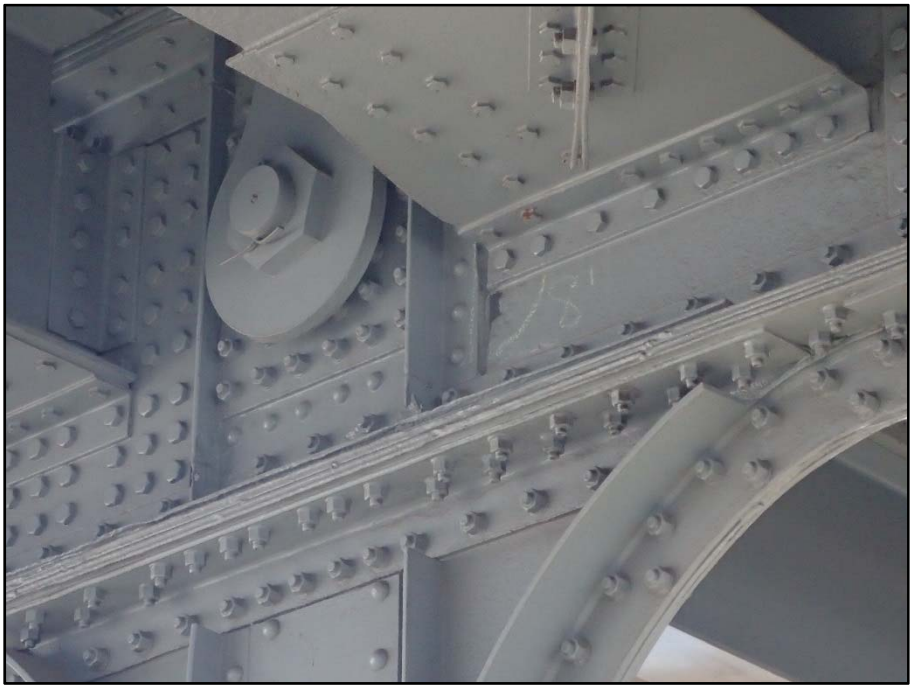


Photo 29 – Span 4 Upper Deck Floorbeam 8’; web perforation below the upper deck lateral bracing gusset plate on the north arch

Photo 30 – Span 4 North Truss L3'L2' diaphragm; corrosion hole

Photo 31 – Span 4 South Truss L0L1 near L0; fractured bolt on top lacing channel connection along top flange

Photo 32 – Span 4 North Truss L3 south gusset above L2L3; Active laminar corrosion and pitting up to 3/16” D

Photo 33 – Span 4 North Truss L2 South Gusset, North Face; 2’ L x up to 3” H x up to 1/4” D pitting with reactivating laminar corrosion

Photo 34 – Span 4 North Truss L2 lower batten plate; 20” L x 8” W corrosion hole

Photo 35 – Span 4 South Truss L0 Outboard Pin Cover Plate; non-structural plate with 7” L crack

Substructure Photos

Photo 36 – East Abutment typical condition

Photo 37 – Pier typical condition

Photo 38 – West Abutment typical condition

Photo 39 – Pier 2 North Face; architectural lighting brackets are corroding

Photo 40 – West Station Columns and Arches; heavily deteriorated with exposed reinforcing and efflorescence

Photo 41 – West Abutment Below South Exterior Arch; 1/4” W vertical crack

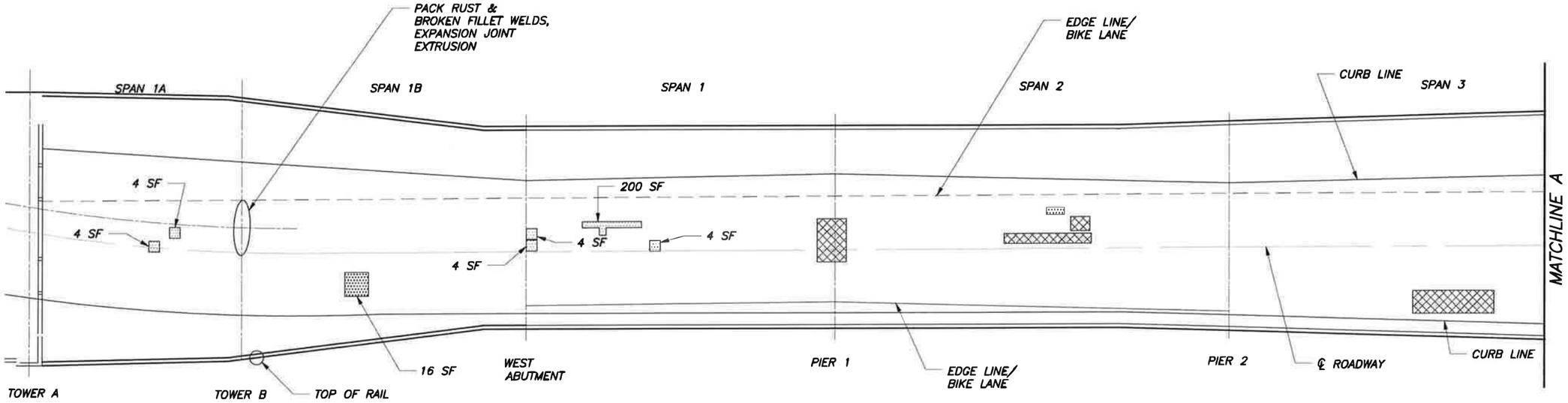
Photo 42 – Pier 5 North Exterior Column; 10’ H x 6” D corner spall with exposed reinforcing

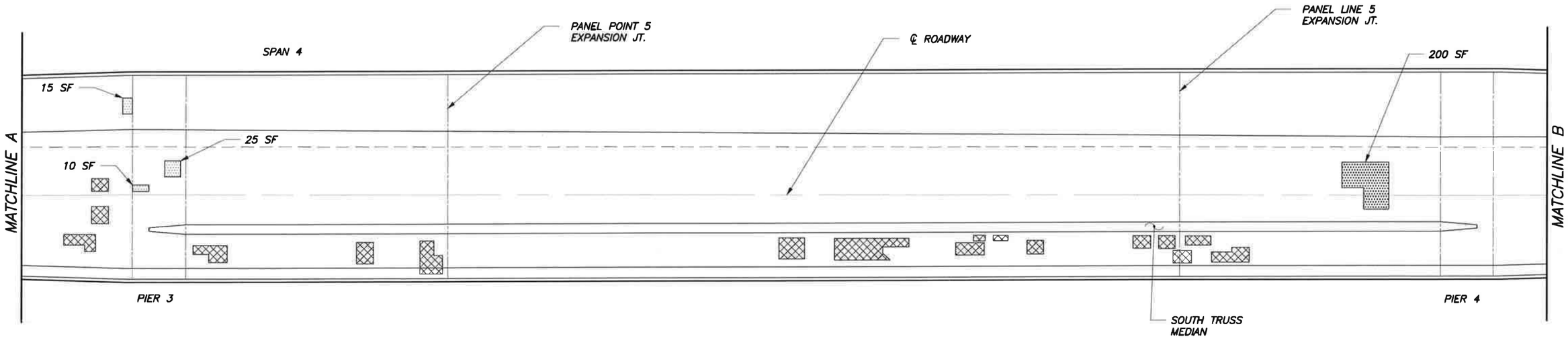
Photo 43 – Pier 8 South Exterior Column, East Face; 6’ H x 3’W delamination above parked cars

Photo 44 – Pier 8 South Exterior Column, West Face; 4’ H x 4’ W x 10” D spall

Photo 45 – Tower B South side; rotated outwards and fractured at the interface with the upper deck

OPEN SPANDREL ARCH AND TRUSS SPANS CADD DRAWINGS AND DEFICIENCIES





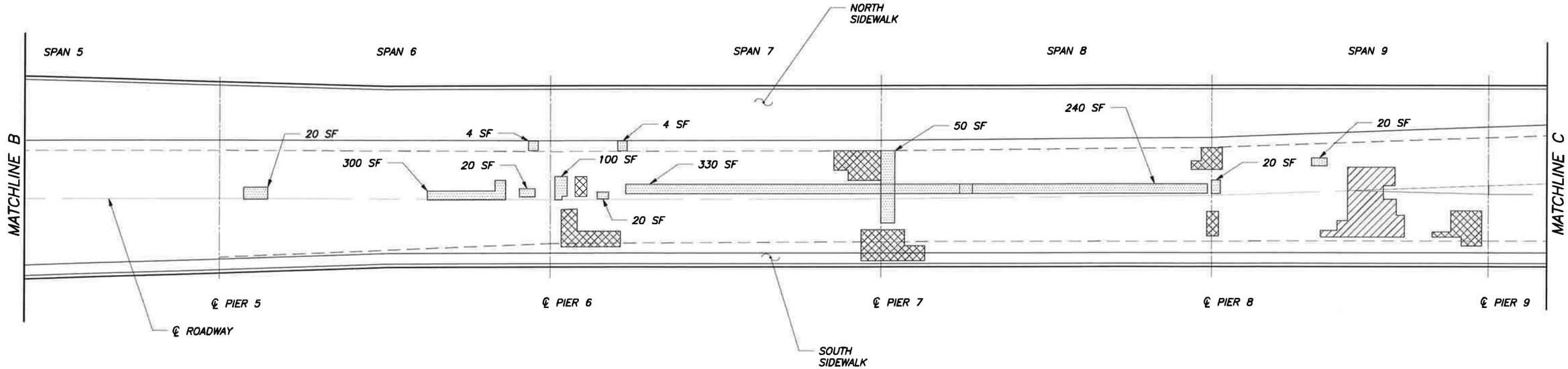
General Notes:

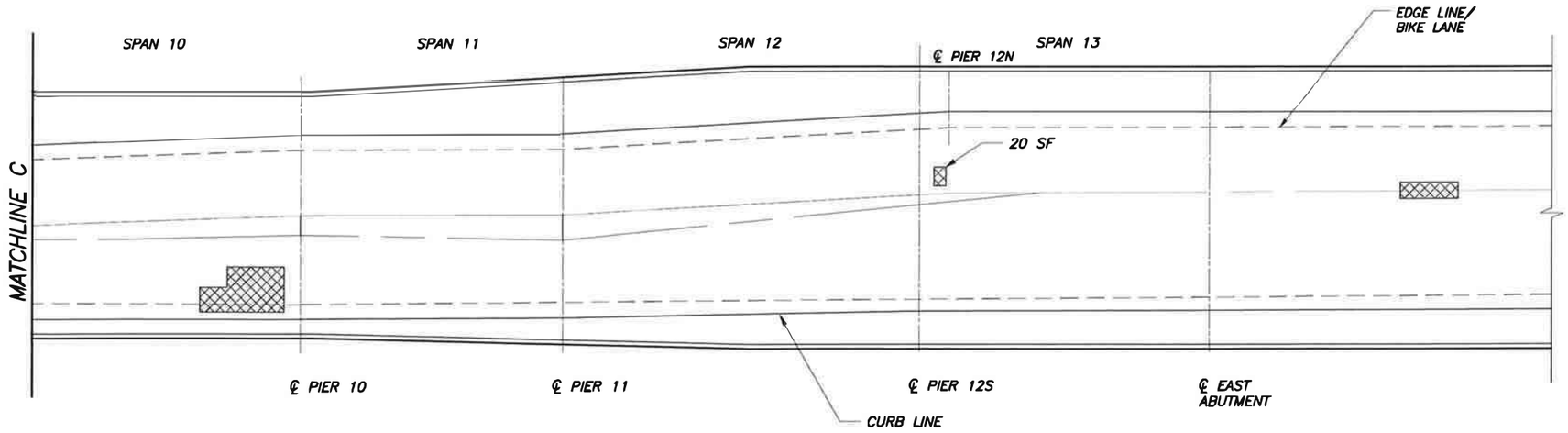
- Map cracking throughout wearing surface.
- Heavy cracking and patching throughout wearing surface. This is more prominent in the eastbound lanes.
- Joints are typically filled with debris and have edge spalls along the joint armor.
- Heavy efflorescence, cracking, delaminations, and spalls with corroded reinforcing throughout all members and underside of deck.

LEGEND

- DELAMINATED CONCRETE WEARING SURFACE WITH ESTIMATED AREA
- PATCHED WEARING SURFACE NOVEMBER 2015
- PREVIOUS WEARING SURFACE REPAIR

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1456
NOT TO SCALE	NOV, 2017	INFRASTRUCTURE ENGINEERS, INC.	DECK PLAN - SPAN 1A TO SPAN 5 / PAGE A-1





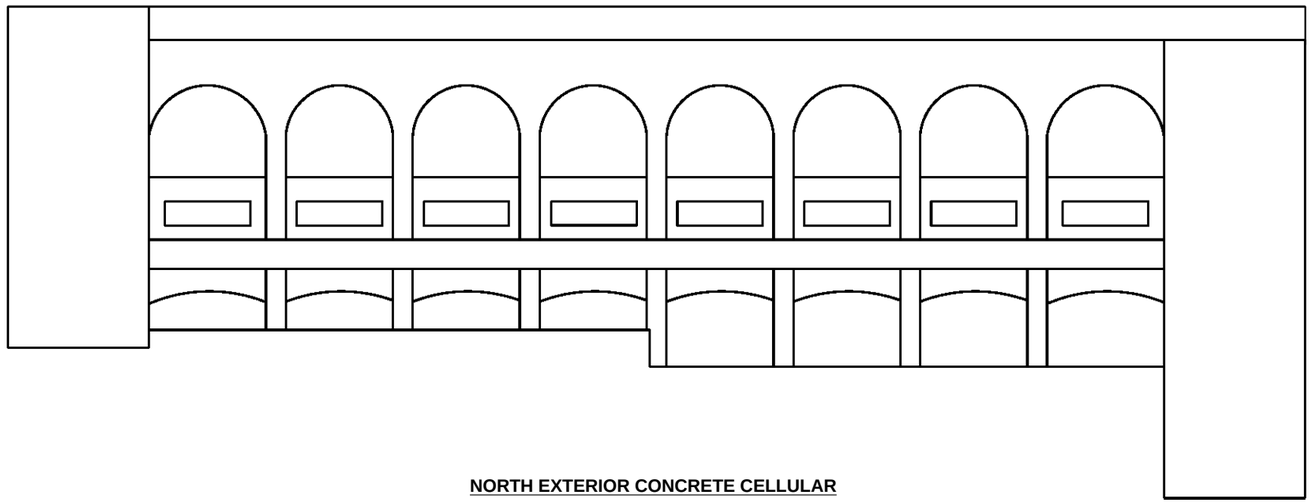
LEGEND

- DELAMINATED CONCRETE WEARING SURFACE
- WEARING SURFACE PATCH 2015
- PREVIOUSLY PATCH WORN

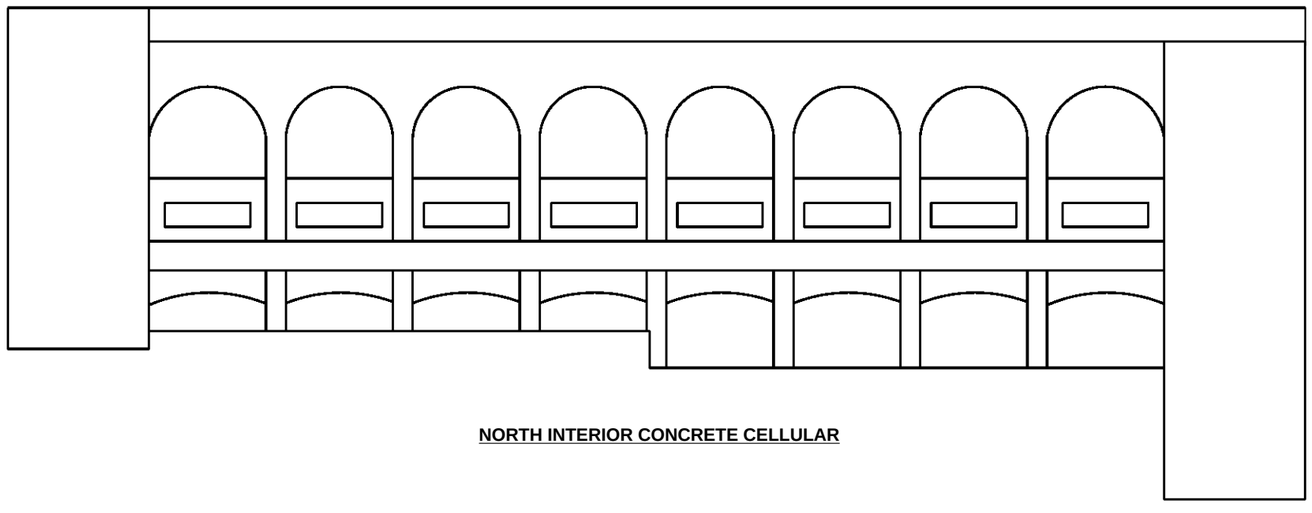
General Notes:

- Map cracking throughout wearing surface.
- Heavy cracking and patching throughout wearing surface. This is more prominent in the eastbound lanes.
- Joints are typically filled with debris and have edge spalls along the joint armor.
- Heavy efflorescence, cracking, delaminations, and spalls with corroded reinforcing throughout all members and underside of deck.

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1456
NOT TO SCALE	NOV, 2017	INFRASTRUCTURE ENGINEERS, INC.	DECK PLAN - SPAN 5 TO EAST APPROACH — PAGE A-2



NORTH EXTERIOR CONCRETE CELLULAR

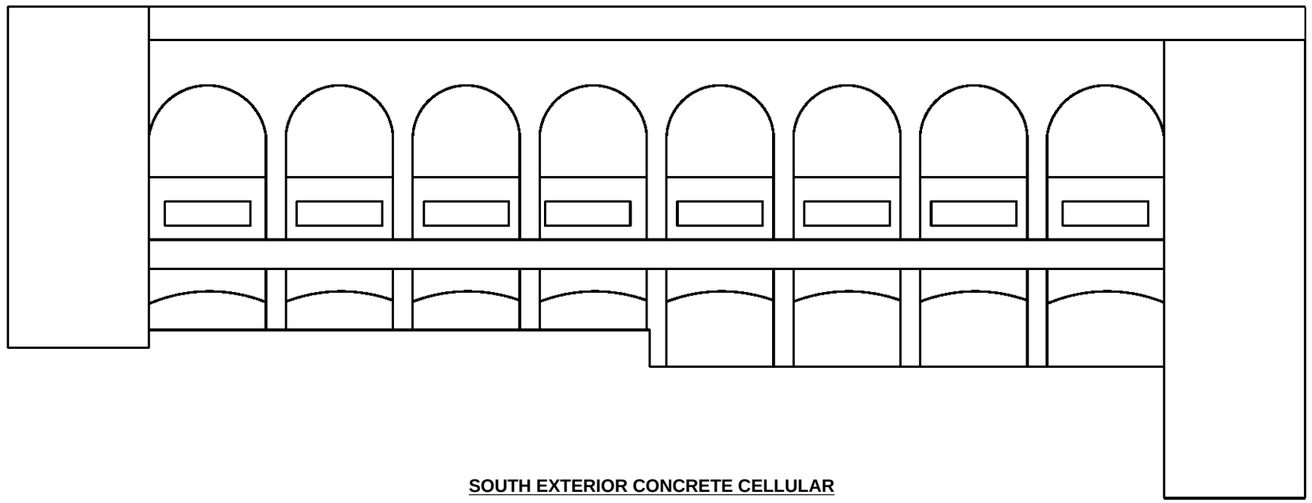


NORTH INTERIOR CONCRETE CELLULAR

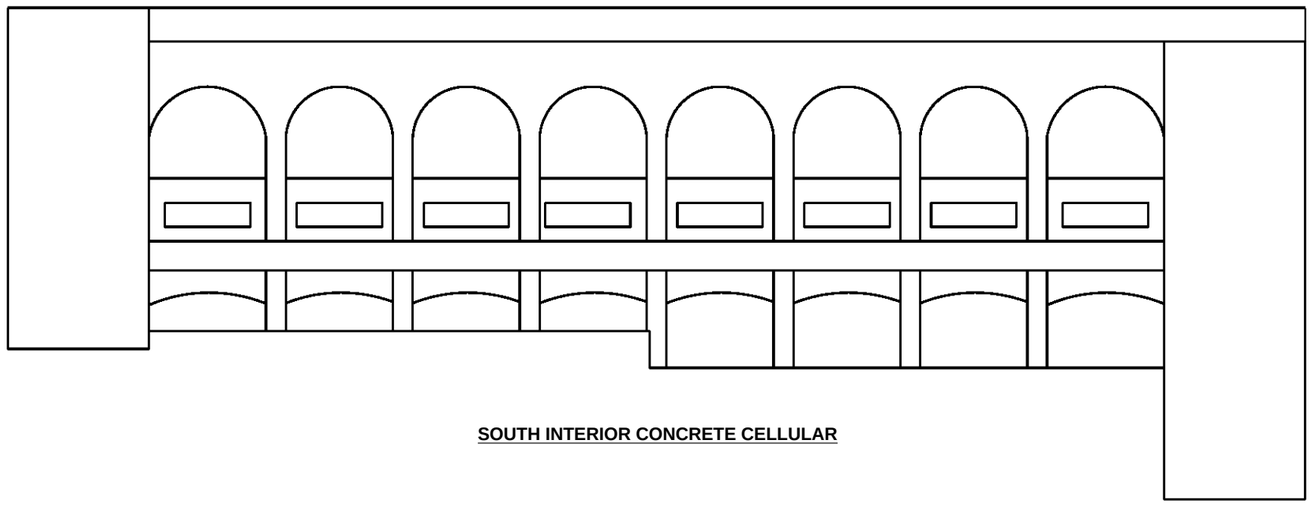
General Notes:

- Arches typically exhibit cracking, spalls, and marked up delaminations throughout.

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 1A PAGE A-3



SOUTH EXTERIOR CONCRETE CELLULAR

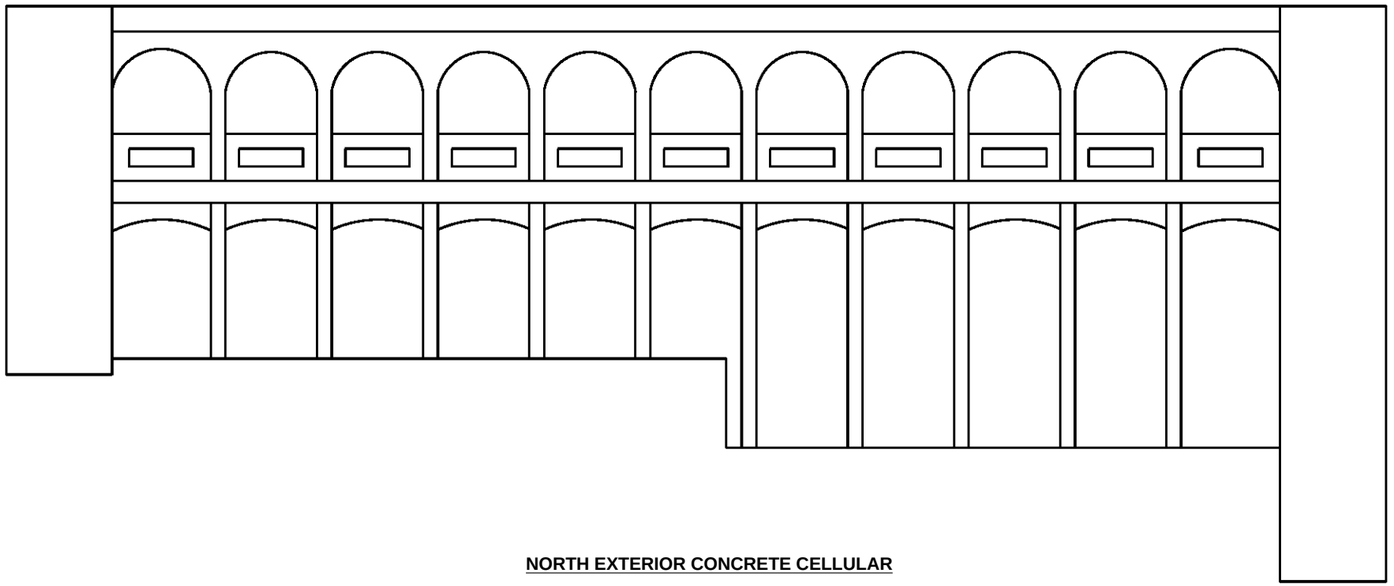


SOUTH INTERIOR CONCRETE CELLULAR

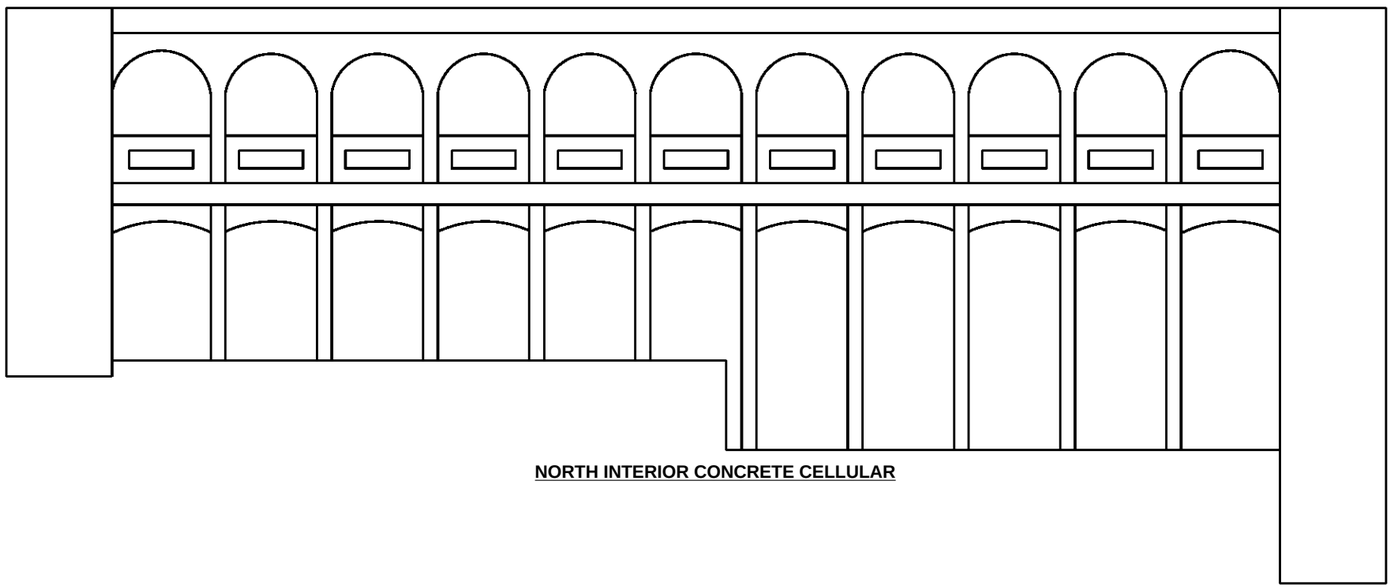
General Notes:

- Arches typically exhibit cracking, spalls, and marked up delaminations throughout.

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 1A PAGE A-4



NORTH EXTERIOR CONCRETE CELLULAR

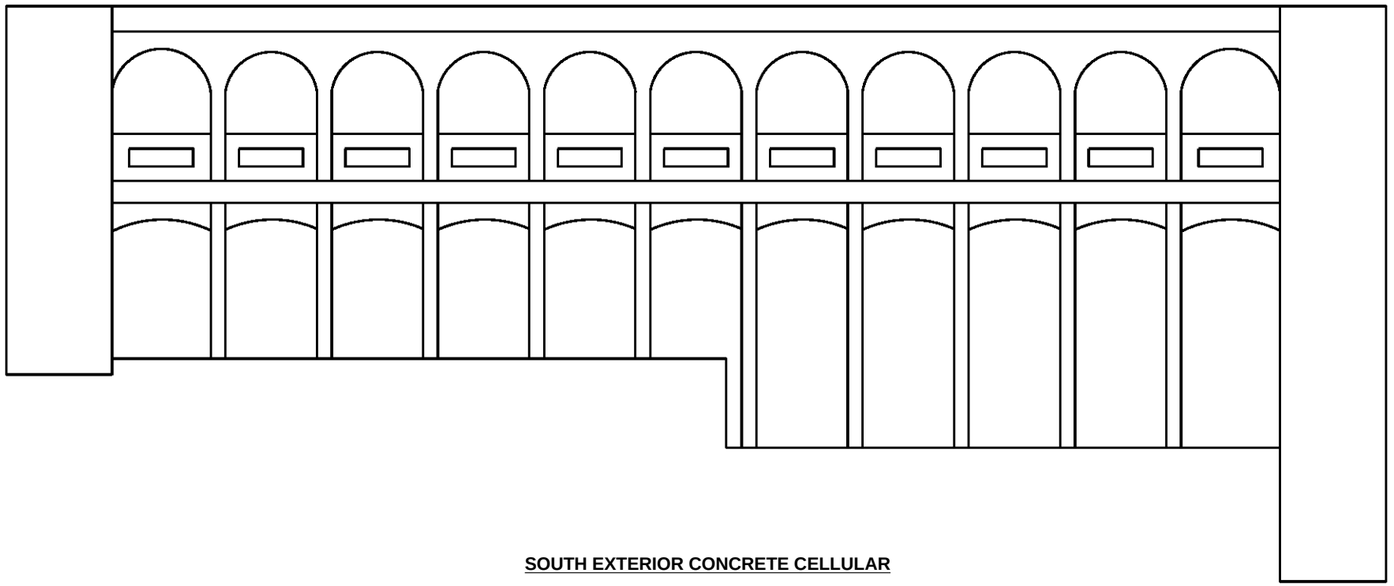


NORTH INTERIOR CONCRETE CELLULAR

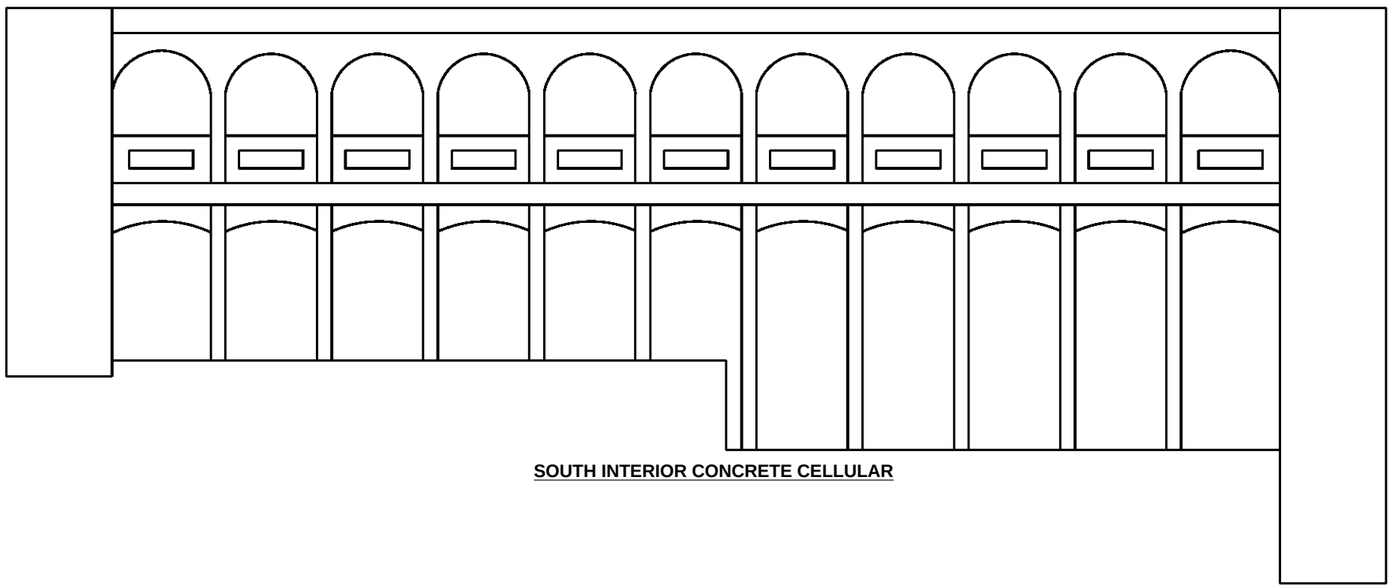
General Notes:

- Arches typically exhibit cracking, spalls, and marked up delaminations throughout.

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 1B PAGE A-5



SOUTH EXTERIOR CONCRETE CELLULAR

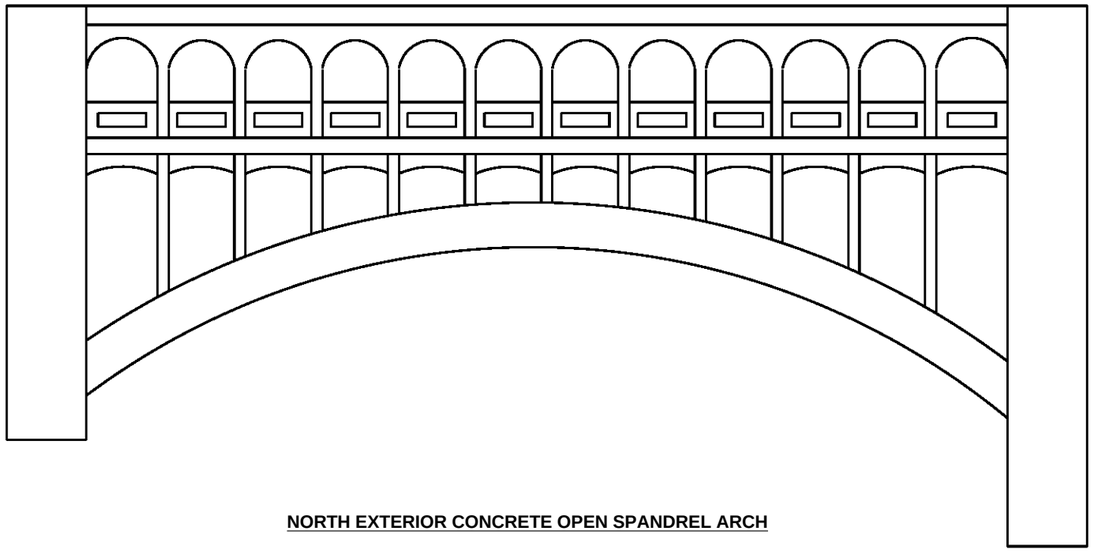


SOUTH INTERIOR CONCRETE CELLULAR

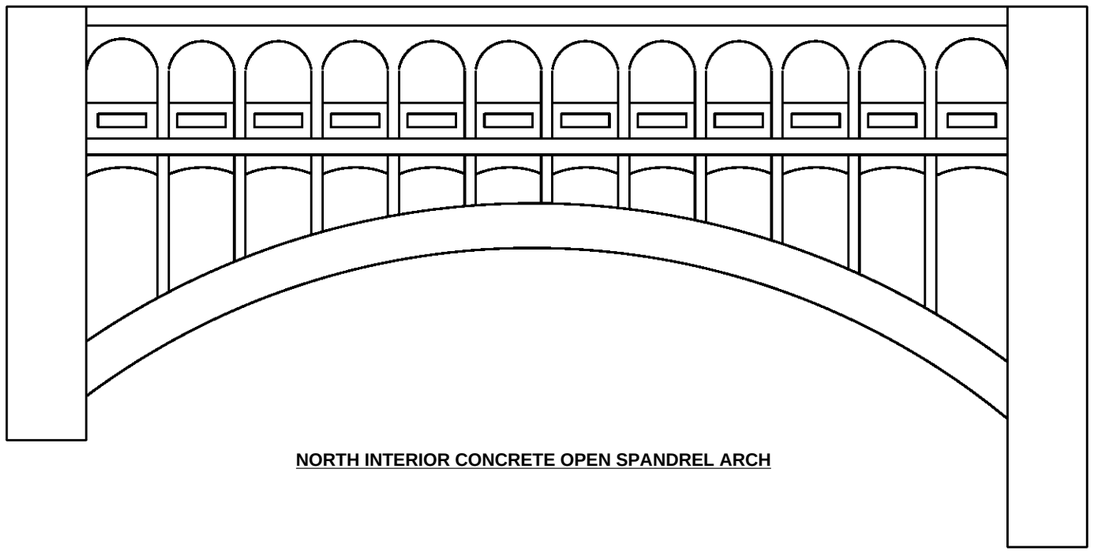
General Notes:

- Arches typically exhibit cracking, spalls, and marked up delaminations throughout.

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 1B PAGE A-6



NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

General Notes:

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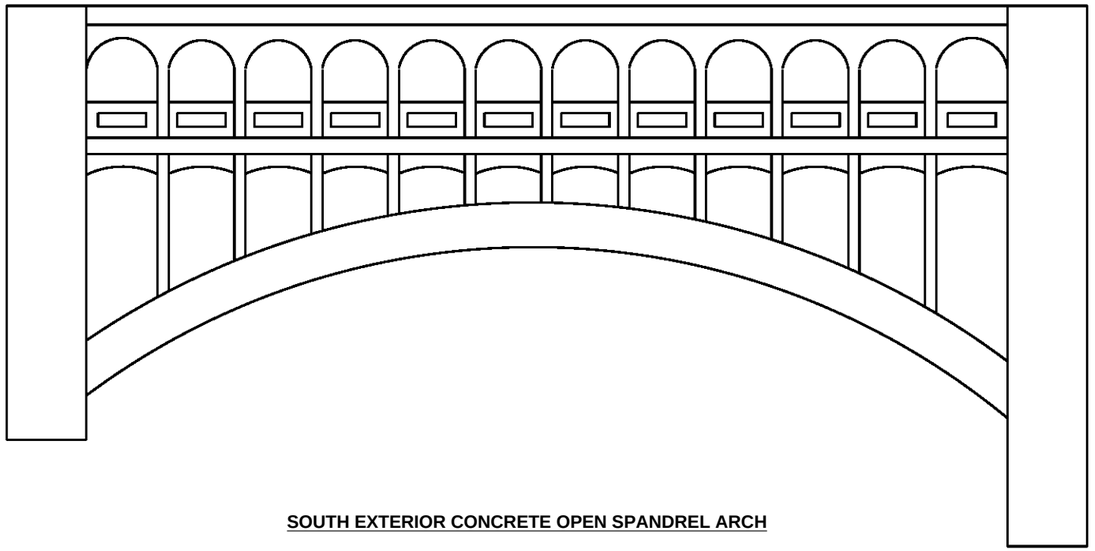
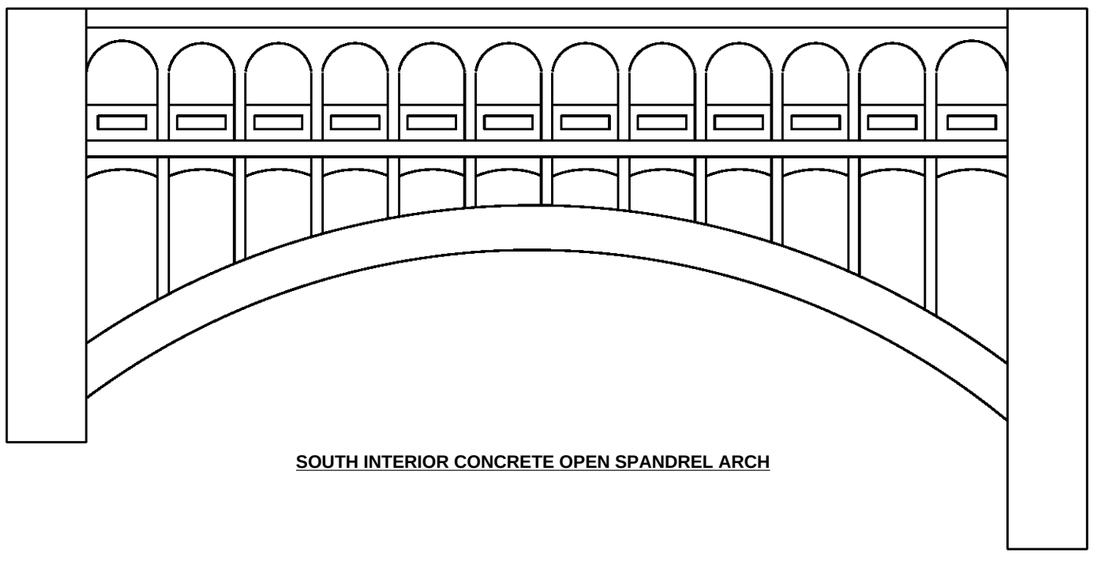
GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 1	PAGE A-7



SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

General Notes:

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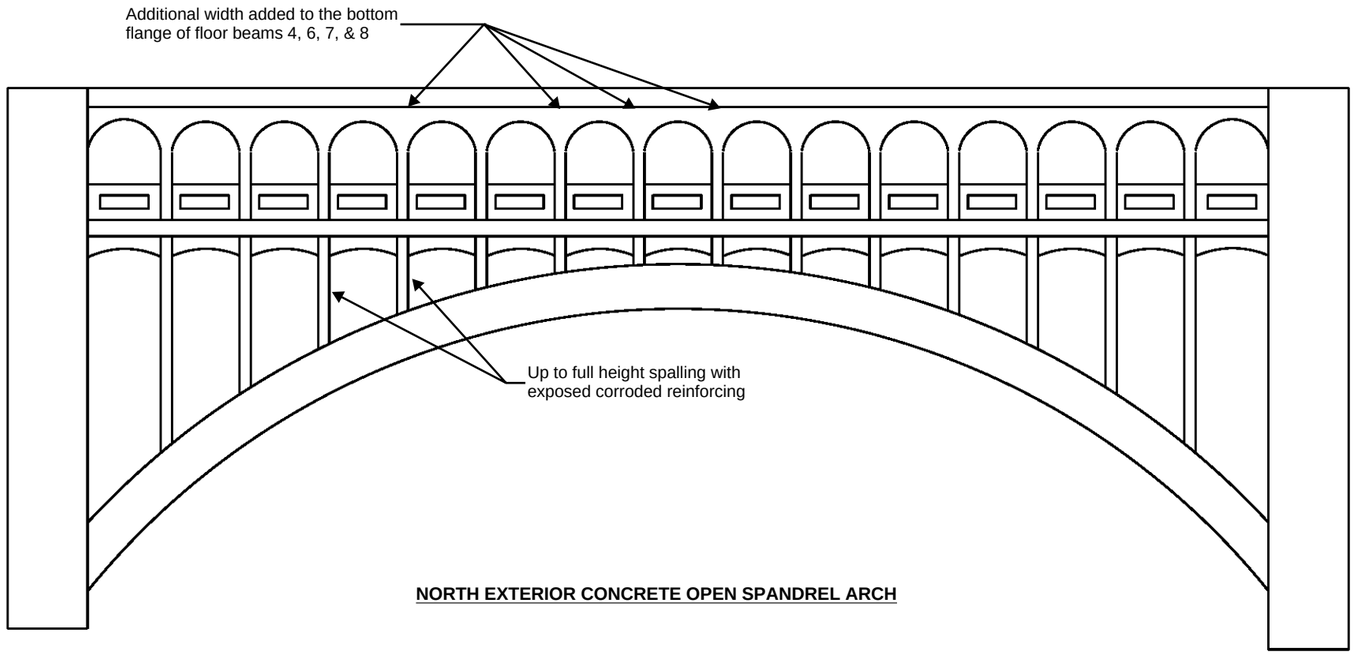
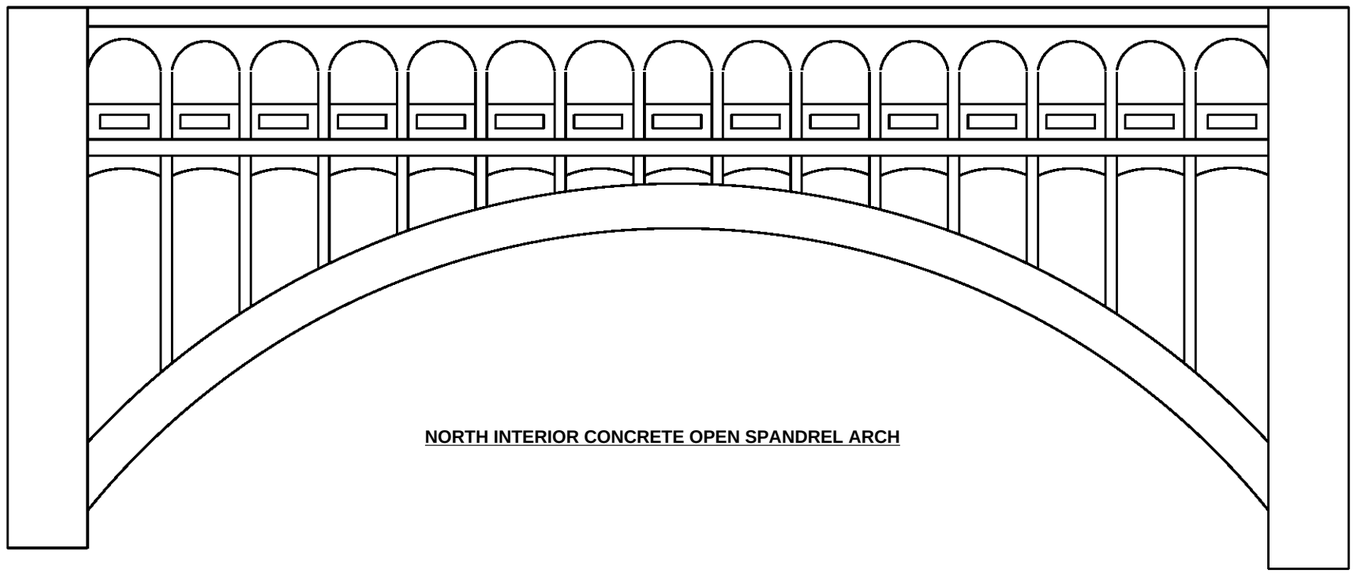
GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 1	PAGE A-8



NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

General Notes:

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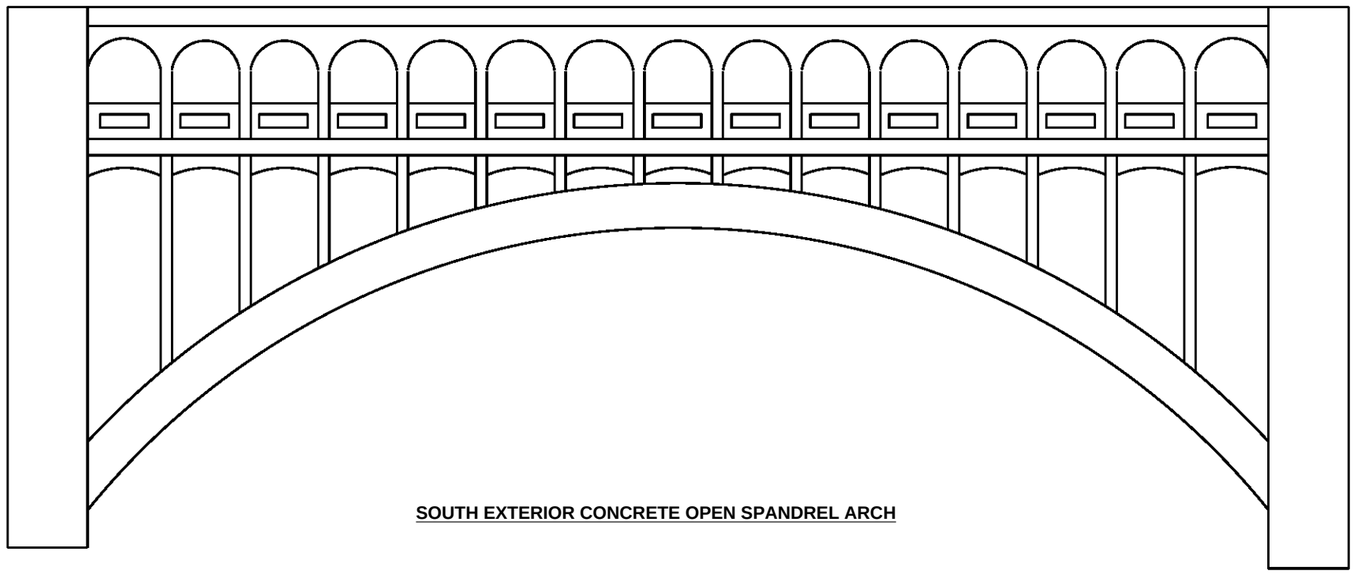
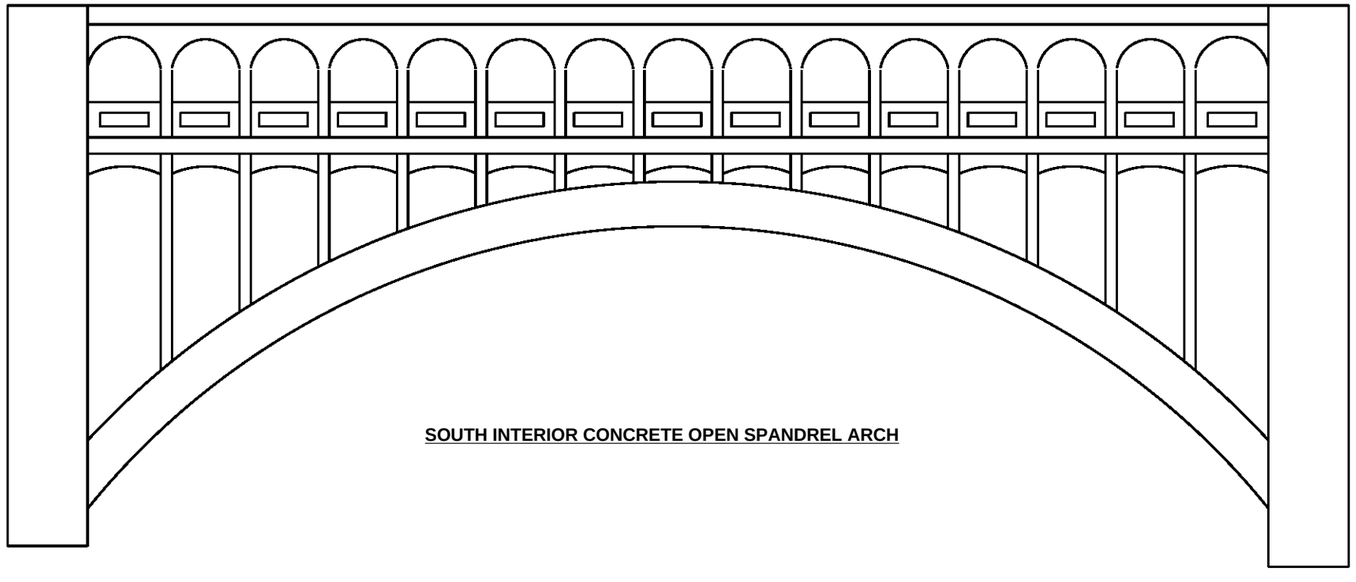


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

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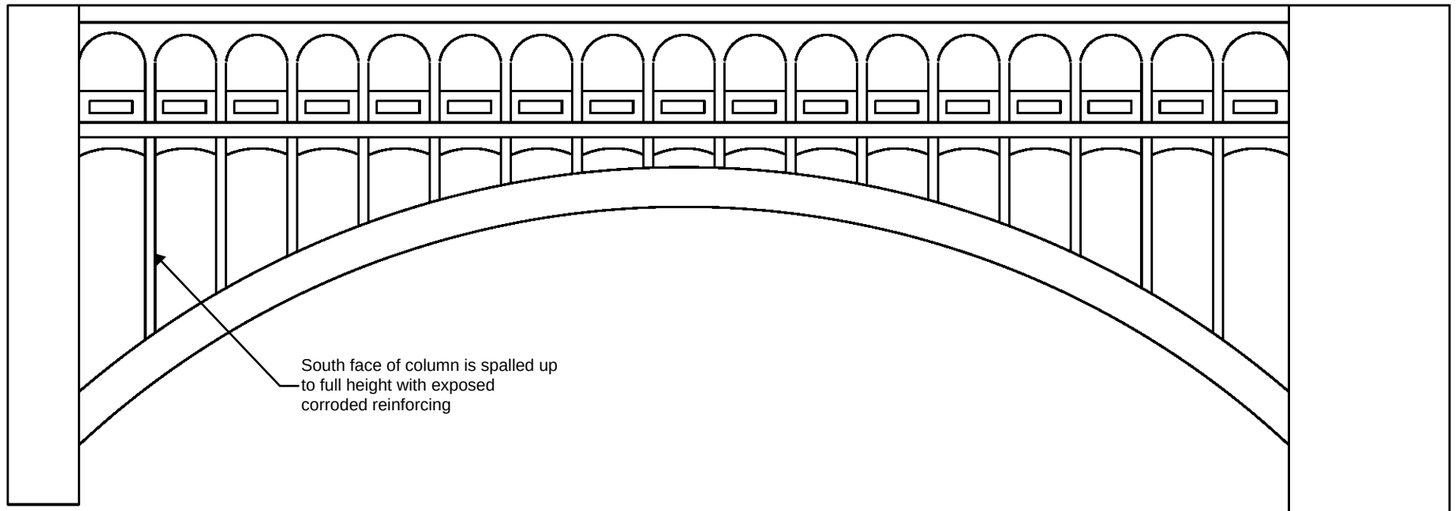
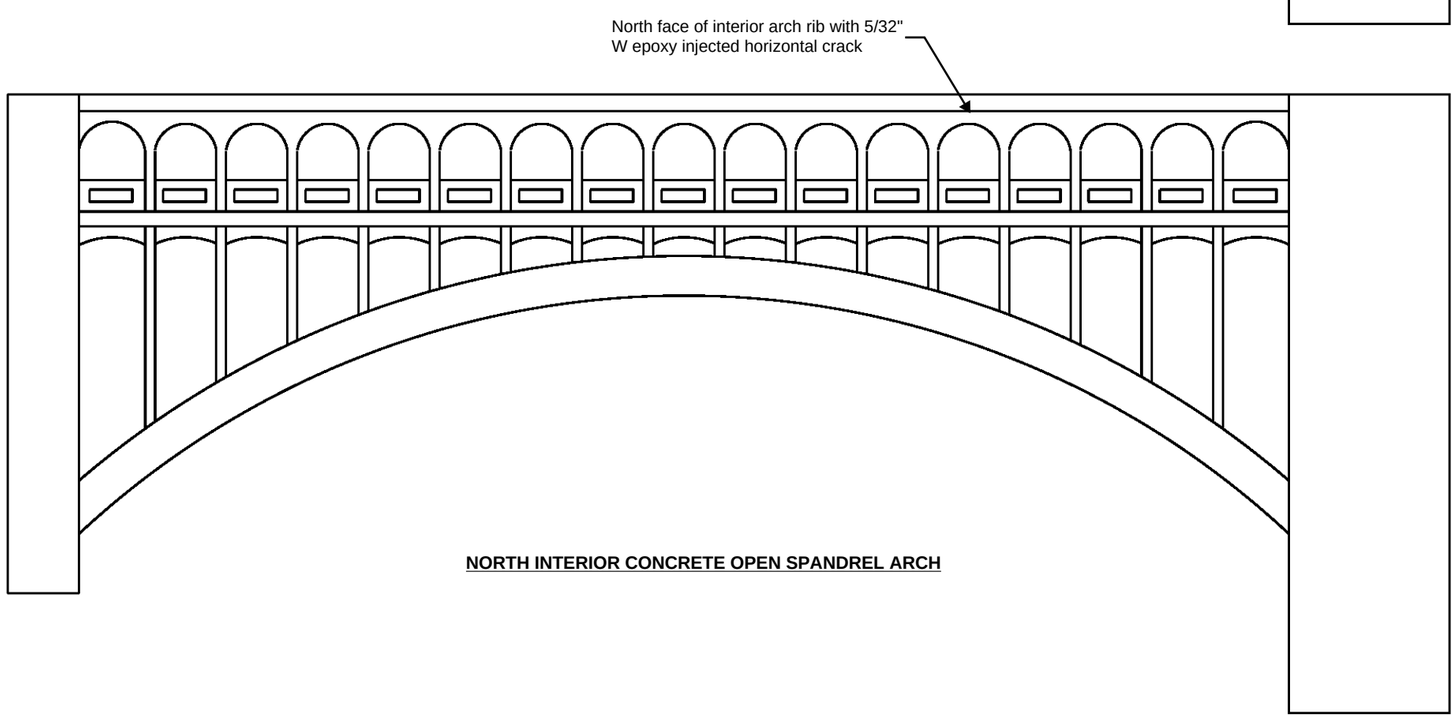
GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 2



NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

General Notes:

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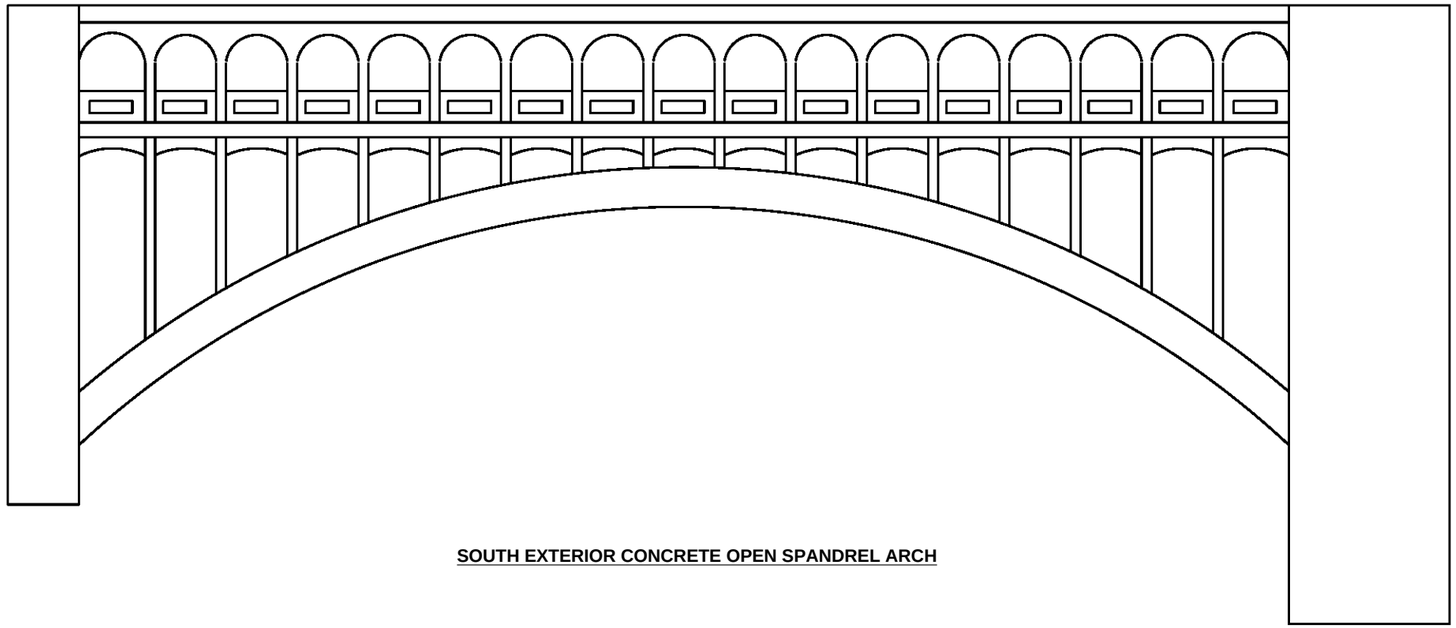
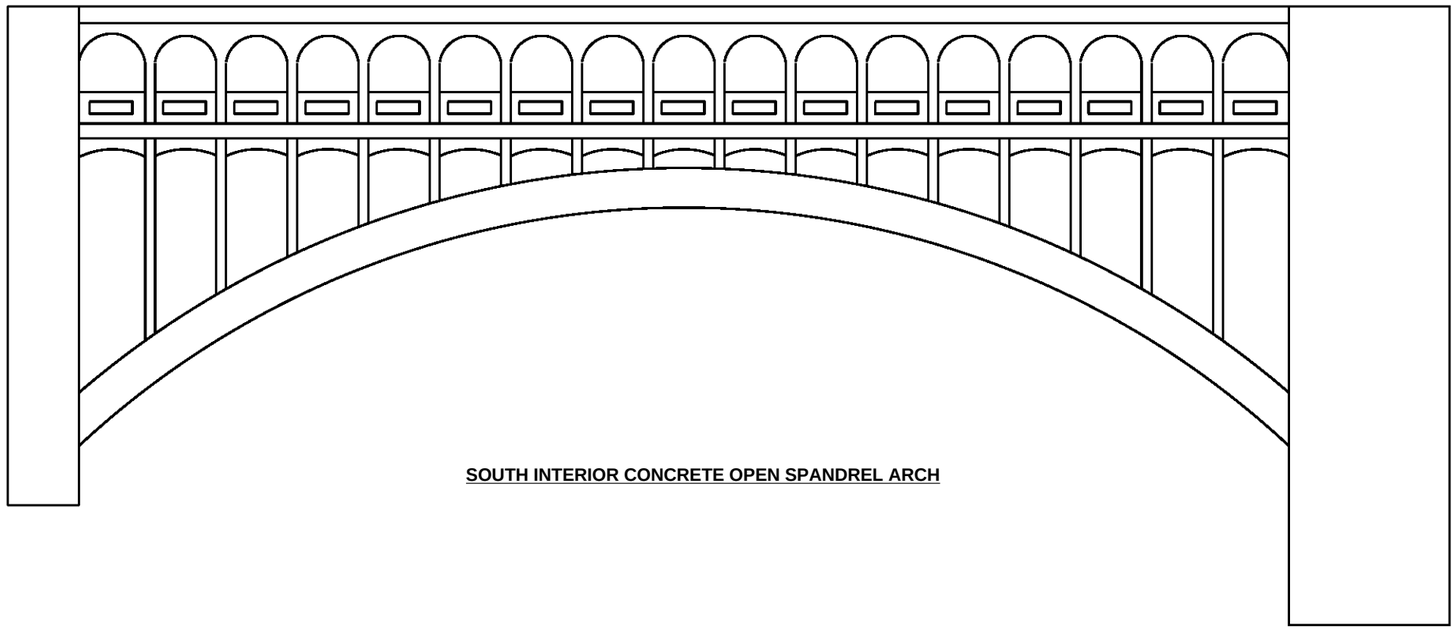
GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 3 — PAGE A-11



SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

General Notes:

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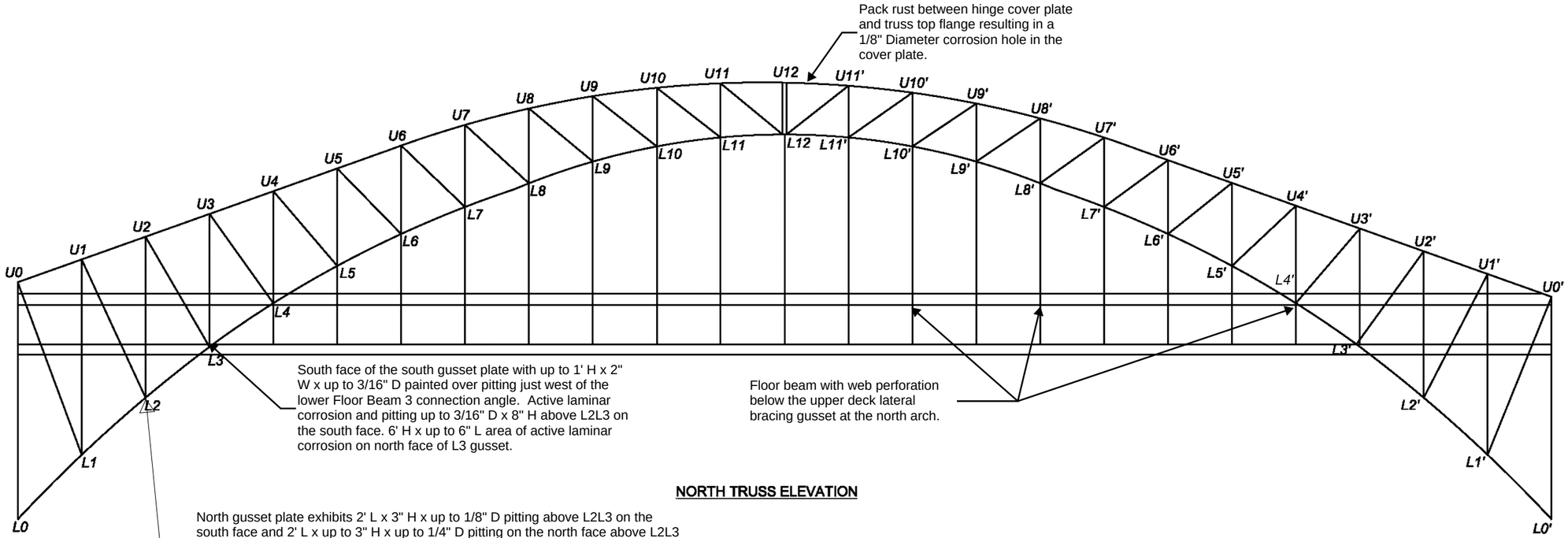
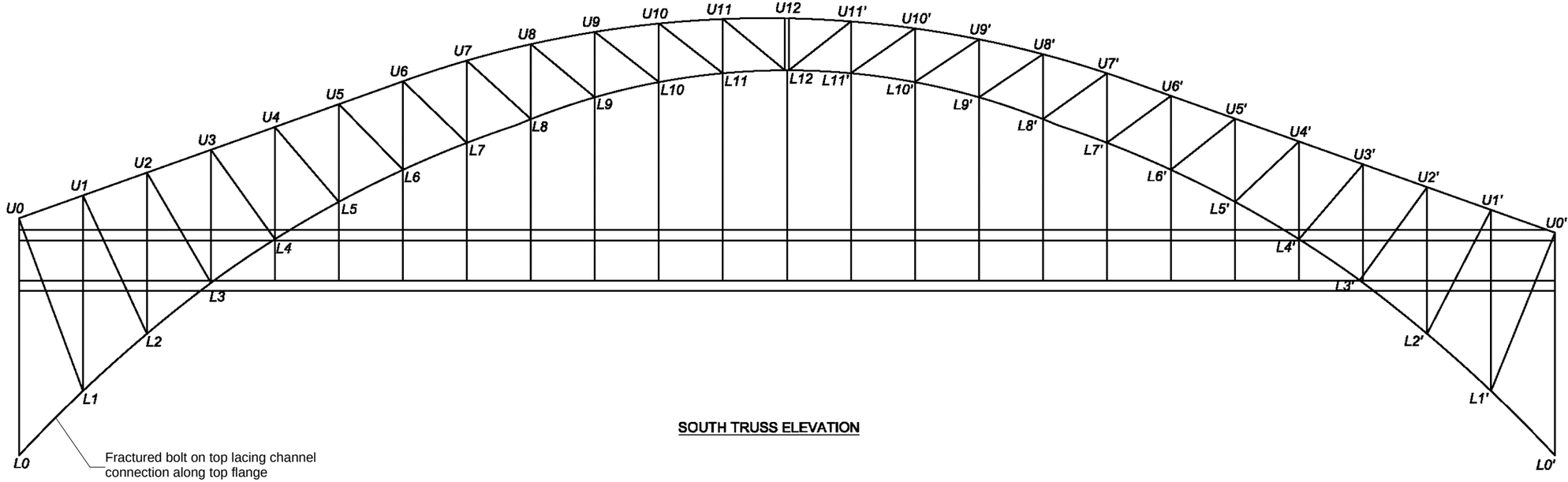
GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 3 PAGE A-12



NORTH TRUSS ELEVATION

North gusset plate exhibits 2' L x 3" H x up to 1/8" D pitting above L2L3 on the south face and 2' L x up to 3" H x up to 1/4" D pitting on the north face above L2L3 with reactivating laminar corrosion . The south gusset plate at L2 exhibits 30" L x up to 4" H x up to 3/8" D pitting on the south face with reactivating corrosion and 2' L x up to 3" H x up to 1/4" D pitting on the north face above L2L3, these section losses are at the same location on the plate . Original plate thickness = 13/16". Above L1L2 at L2, the south face of the south gusset plate exhibits reactivating pitting above the full length of the lower chord up to 4" H x up to 1/4" D.



SOUTH TRUSS ELEVATION

General Notes:

- Lower deck floor beams have light active corrosion below the truss lines.
- Localized perforations on diaphragm plates between the upper and lower decks.
- Uphill transverse angles from L0 to L5 and L5' to L0' have water ponding and debris buildup causing pitting and perforations of the diaphragm plates and transverse angles.
- Isolated perforations at the connections to the truss vertical members.
- Cracks up to 7" L on the non-structural bearing pin cover plates at L0 and L0' on both trusses.
- Random lacing bars above the upper deck have painted over corrosion holes.

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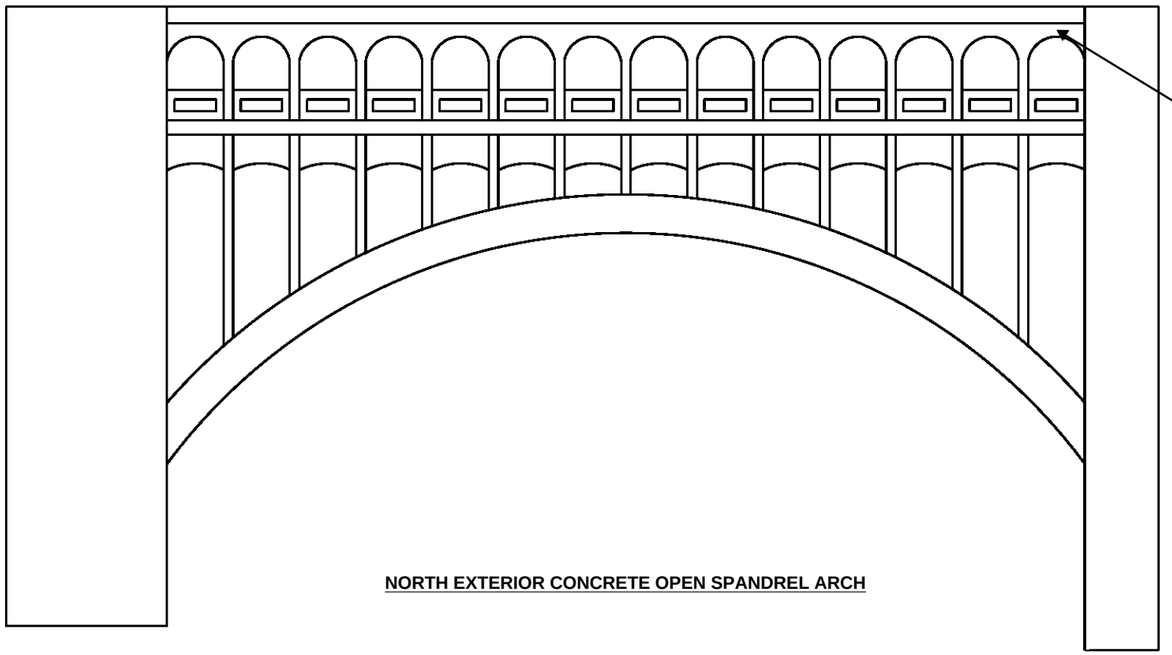
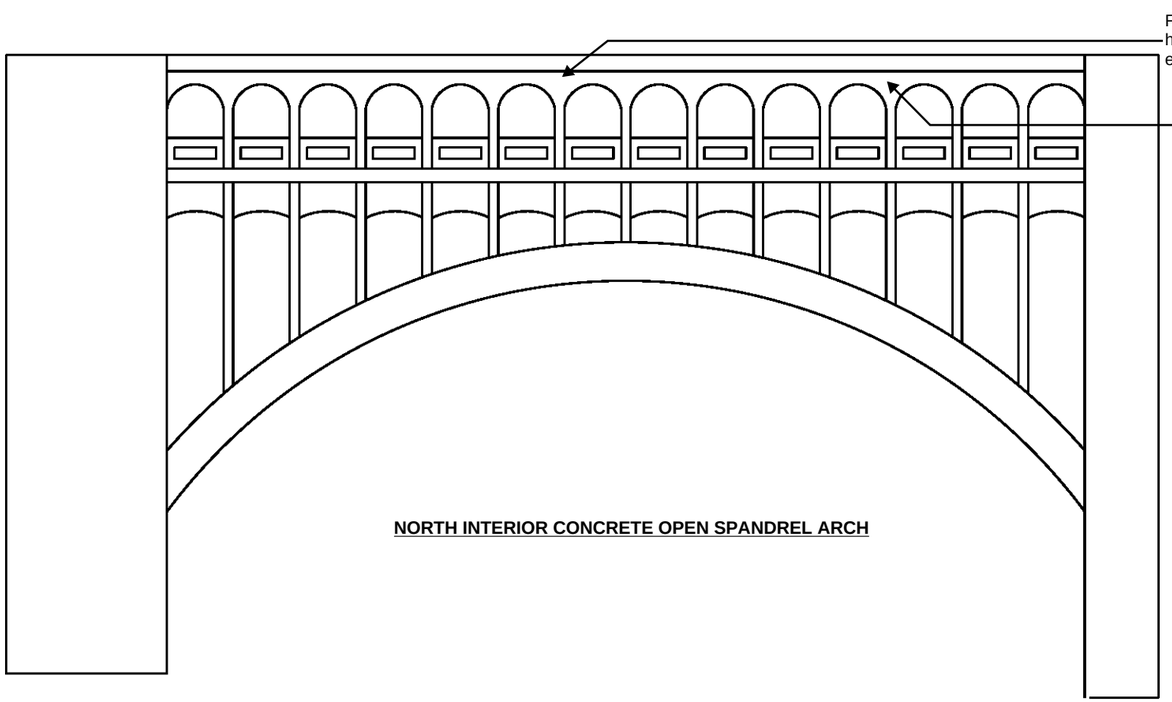
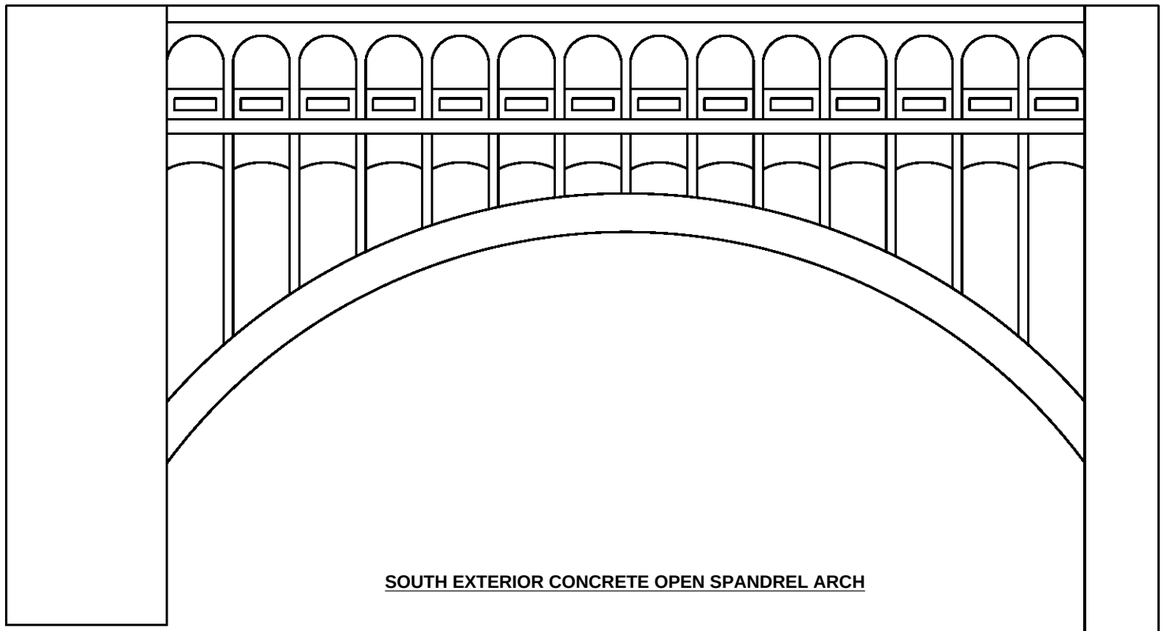


NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

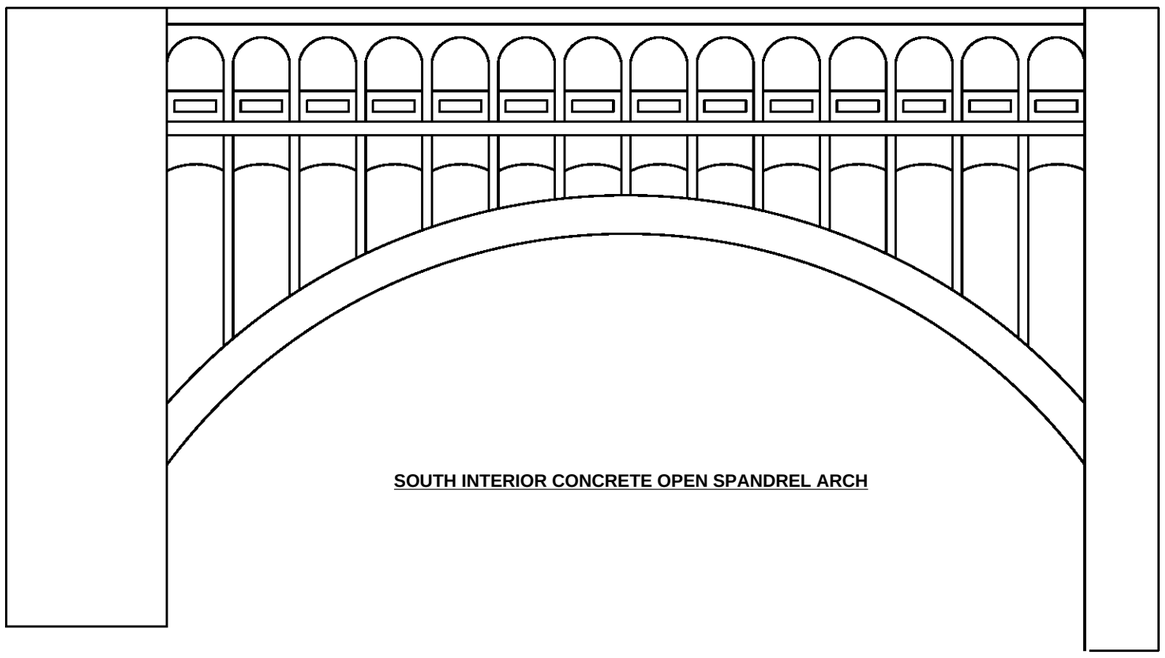


NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 5	PAGE A-14

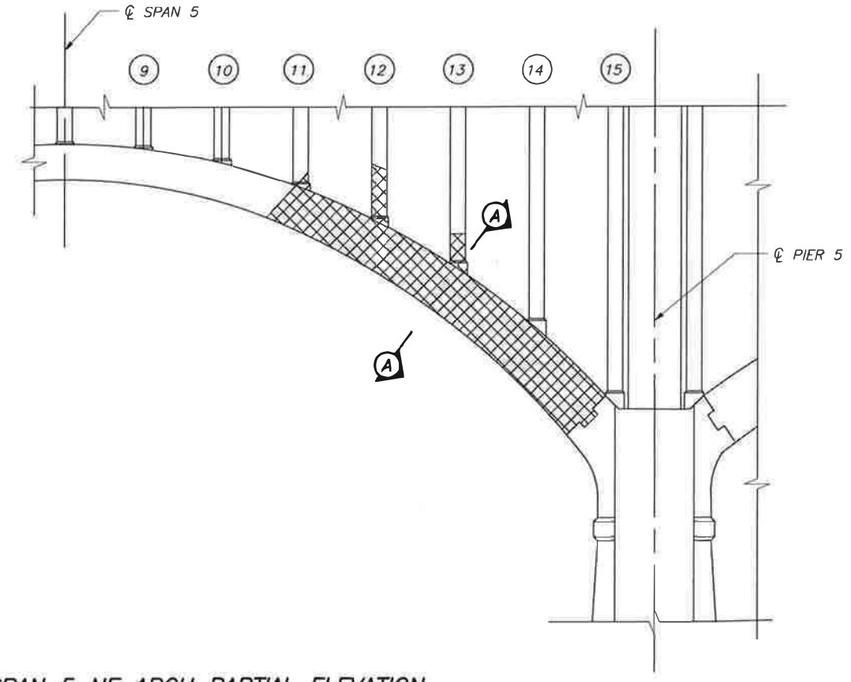


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

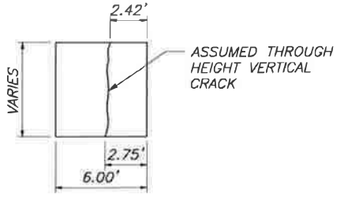
GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 5



SPAN 5 NE ARCH PARTIAL ELEVATION

LOOKING NORTH

CRACK MEASUREMENTS				
PANEL	INTRADOS		EXTRADOS	
	MEASURED CRACK WIDTH	DIST. FROM SOUTH FACE	MEASURED CRACK WIDTH	DIST. FROM SOUTH FACE
11–12	0.030"	3.50'	<0.030"	2.58' TO 3.75'
12–13	0.156"	2.75'	3/32" & 5/8"	2.42'
13–14	0.035" & 0.020"	2.50' & 3.83'	0.040" TO 0.094"	2.75'
14–15	0.012"–0"	2.00'	0.010" TO 0.020"	2.75'

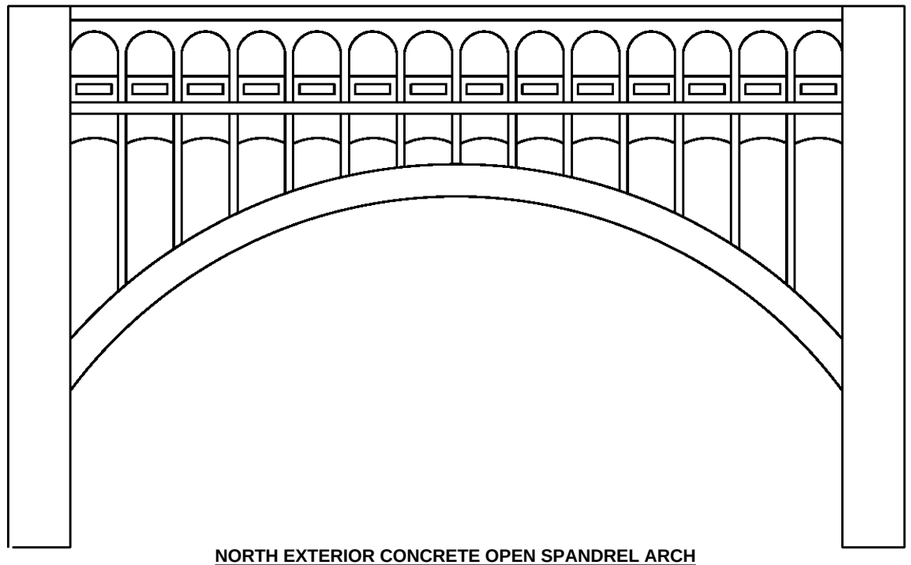


SECTION A–A

LEGEND

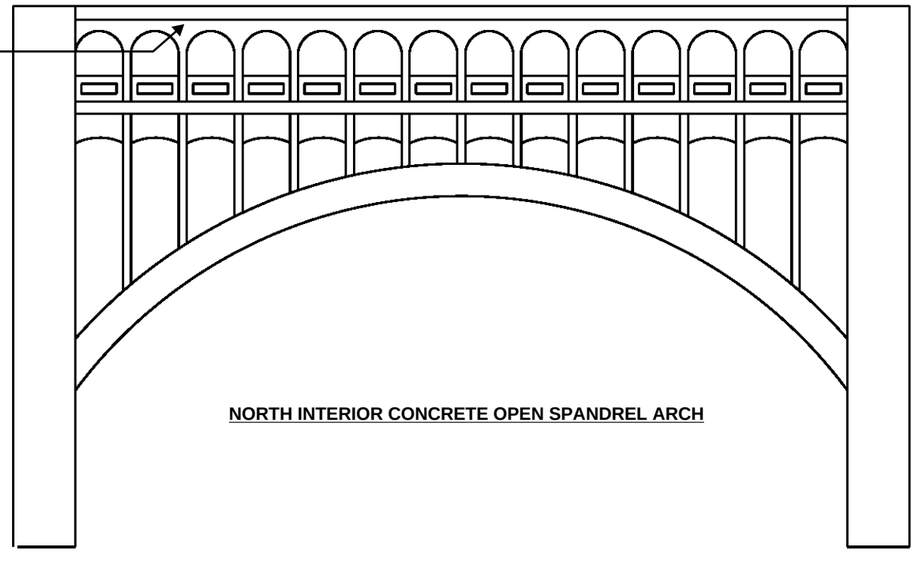
–VERTICAL CRACK LOCATION

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1456
NOT TO SCALE	NOV, 2017	INFRASTRUCTURE ENGINEERS, INC.	OPEN SPANDREL ARCH, SPAN 5 — PAGE A-16



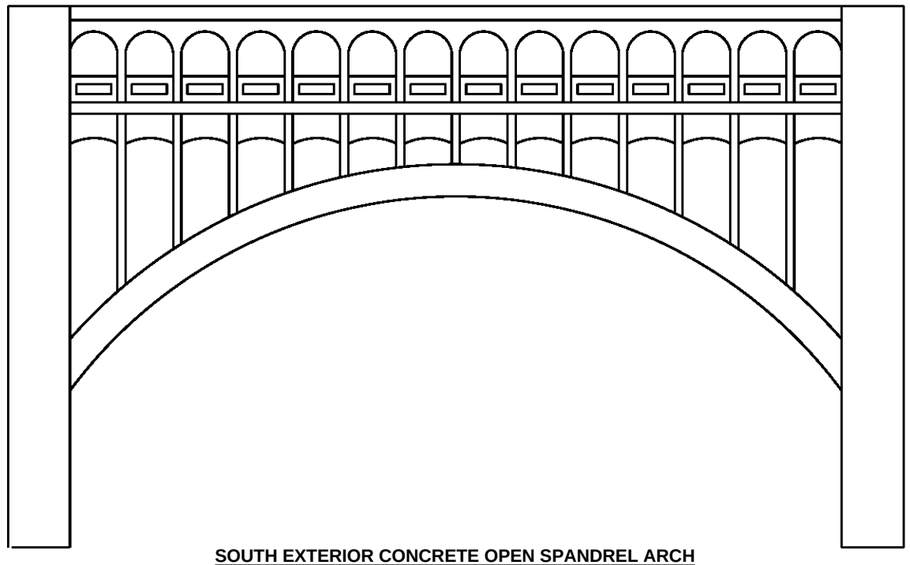
NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

Floor Beam 2 between the interior arches with a full height x 1' W x 4" D spall

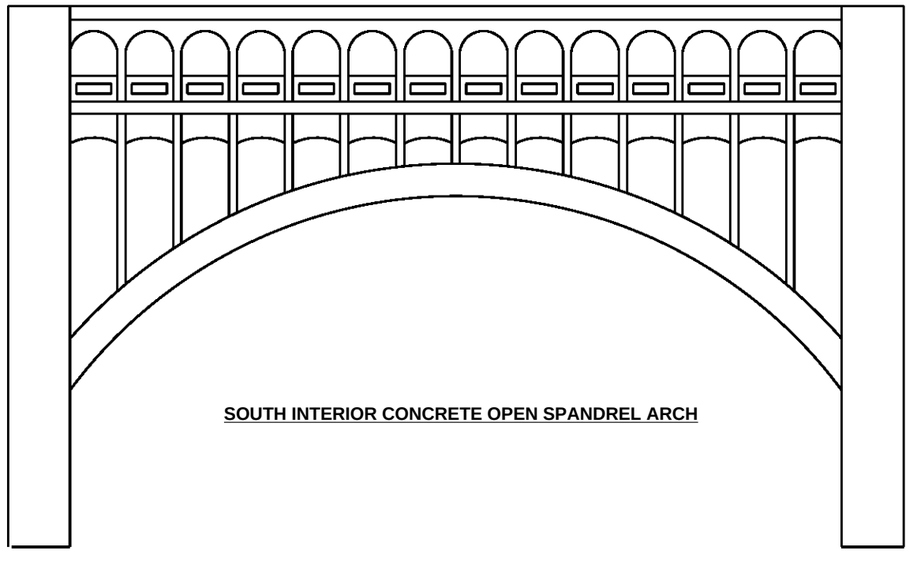


NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 6	PAGE A-17

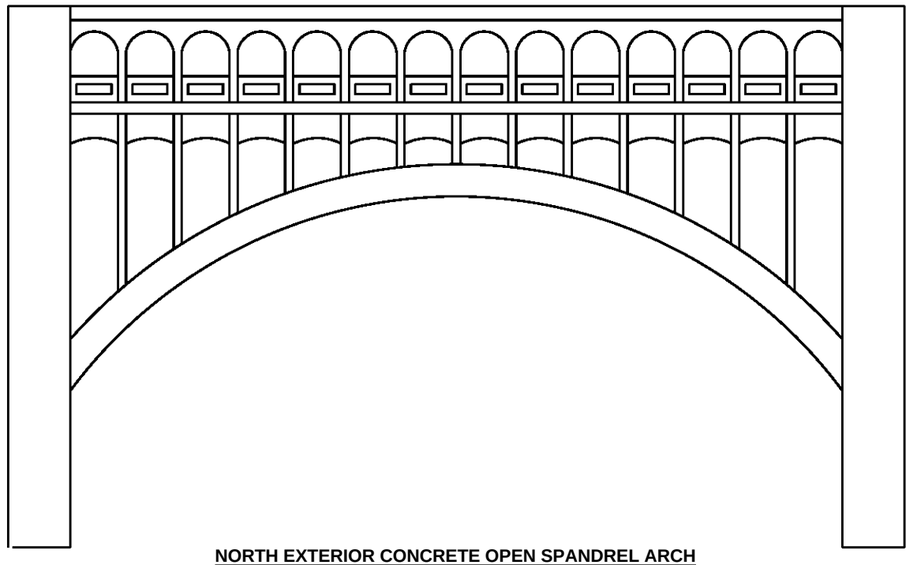


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

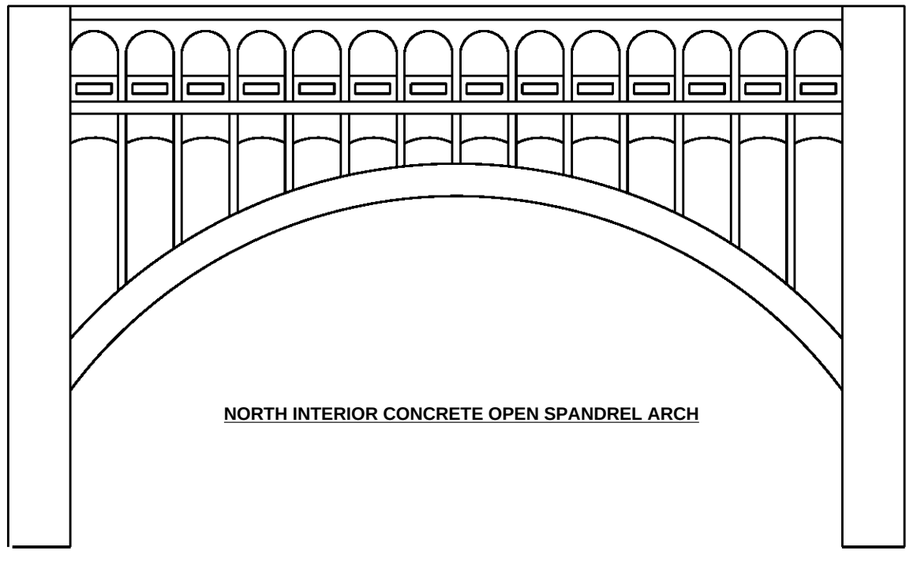


SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 6

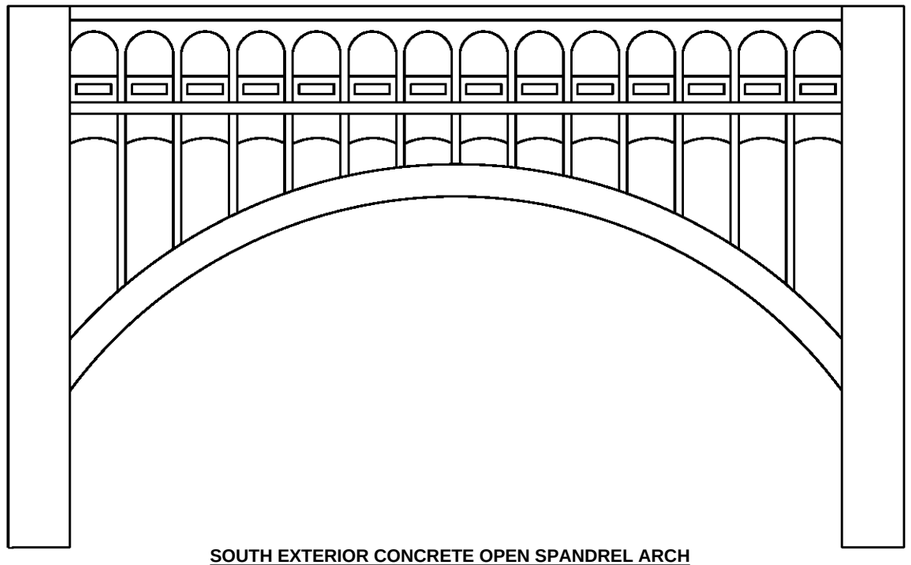


NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

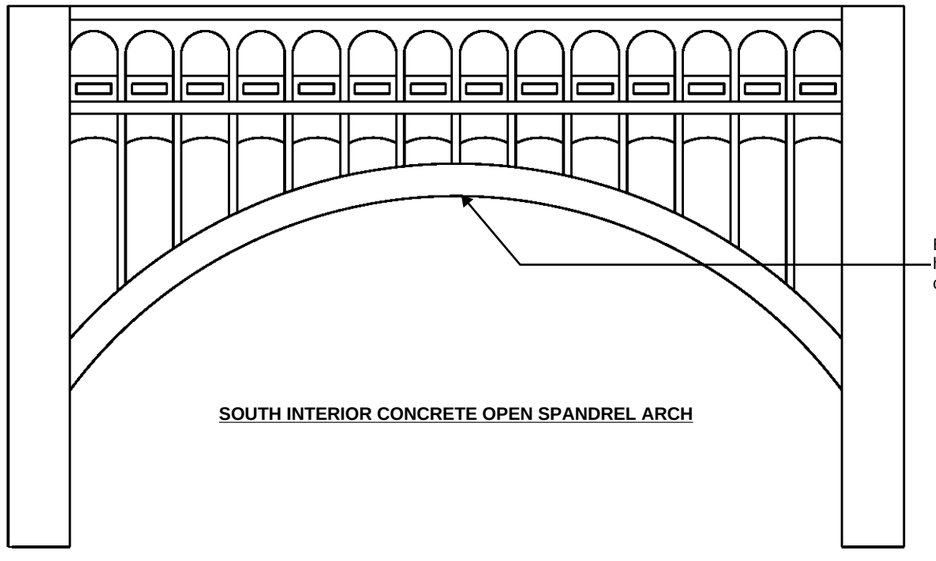


NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 7	PAGE A-19

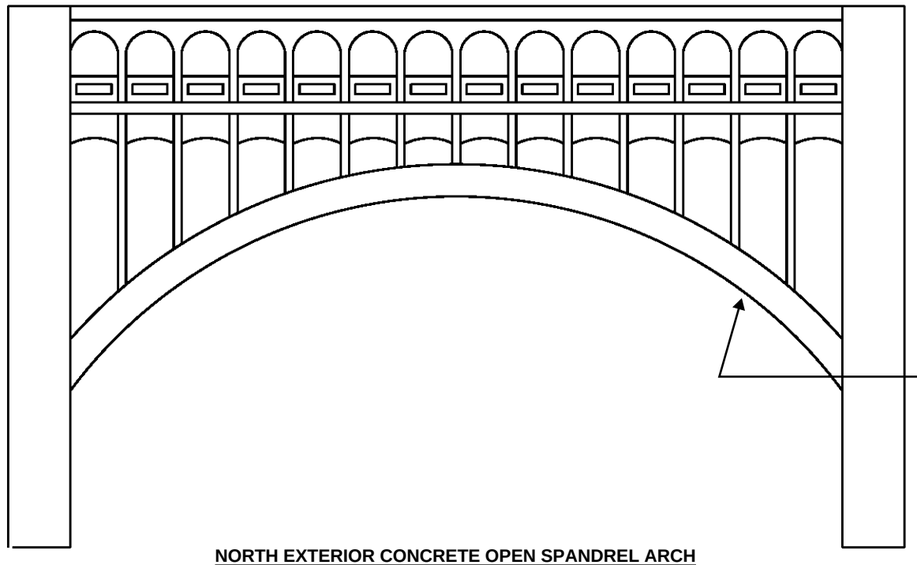


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

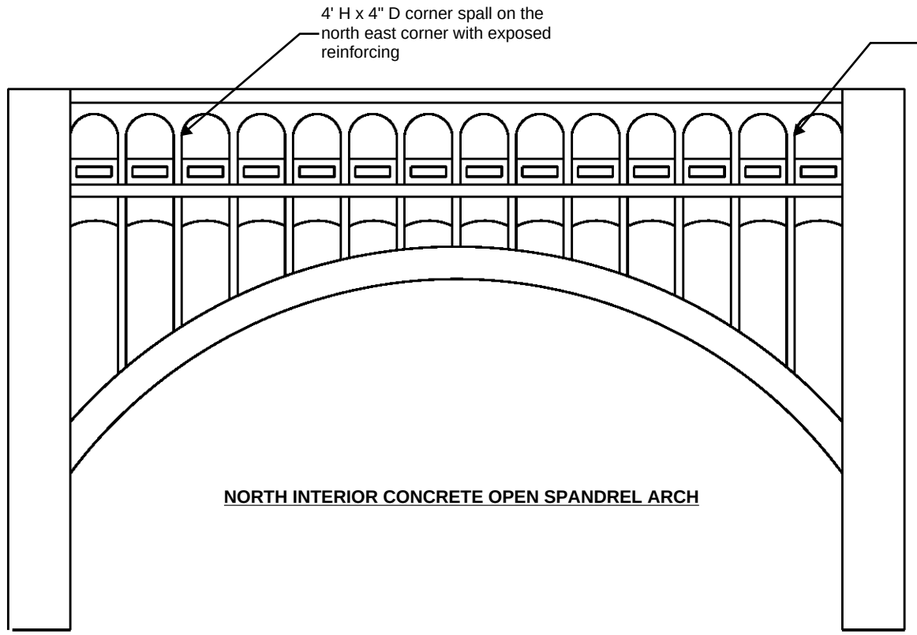


SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 7	PAGE A-20

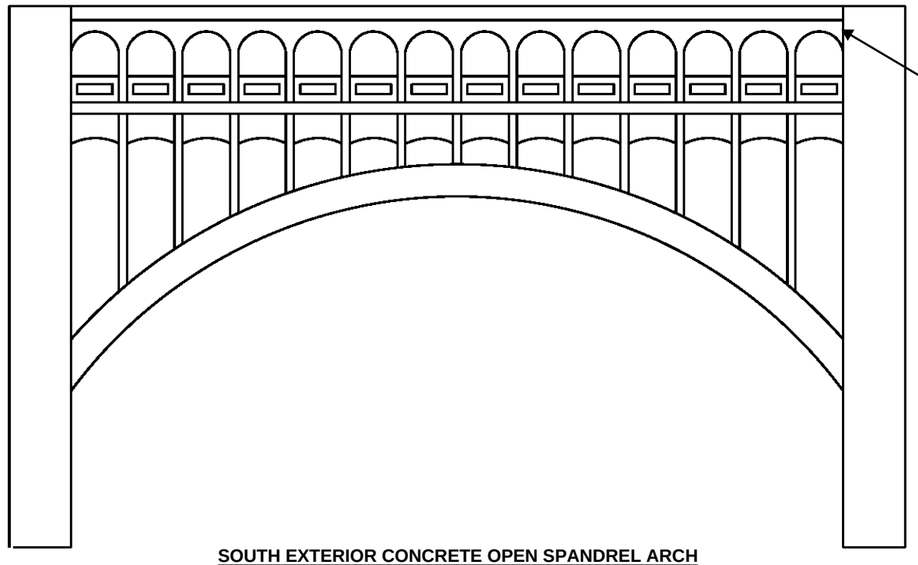


NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH



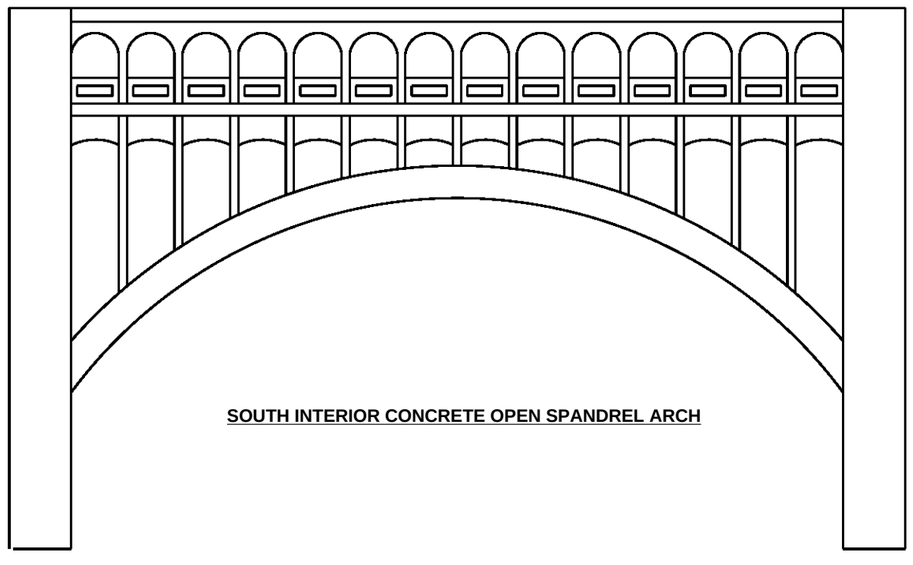
NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 8 — PAGE A-21



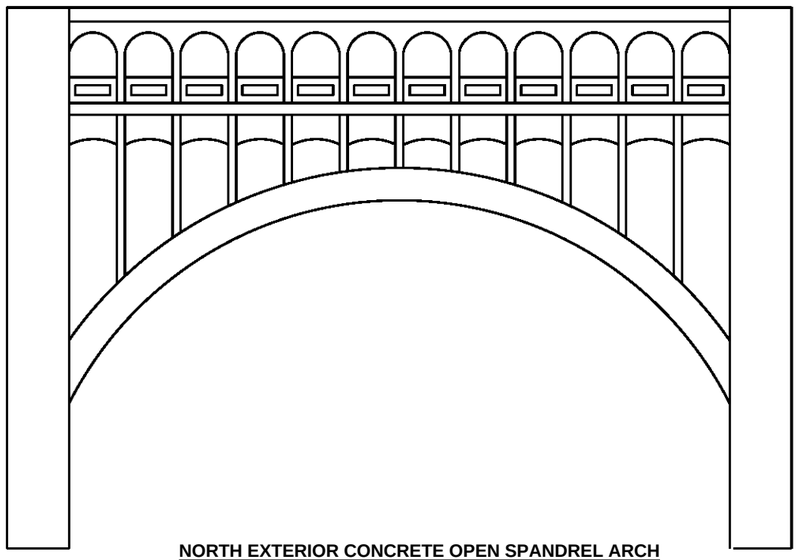
Floor beam 14 between the interior and exterior arches with 3' H x 4' W x 4" D with exposed reinforcing on the west face

SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

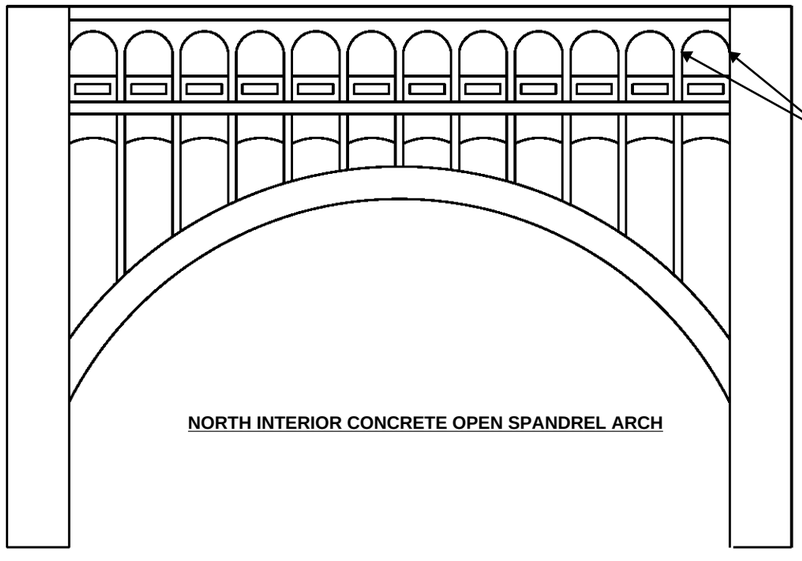


SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 8	PAGE A-22

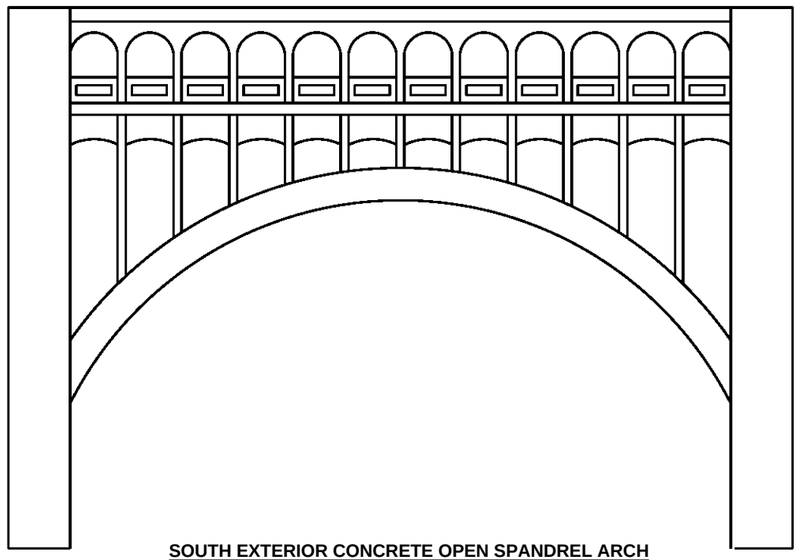


NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

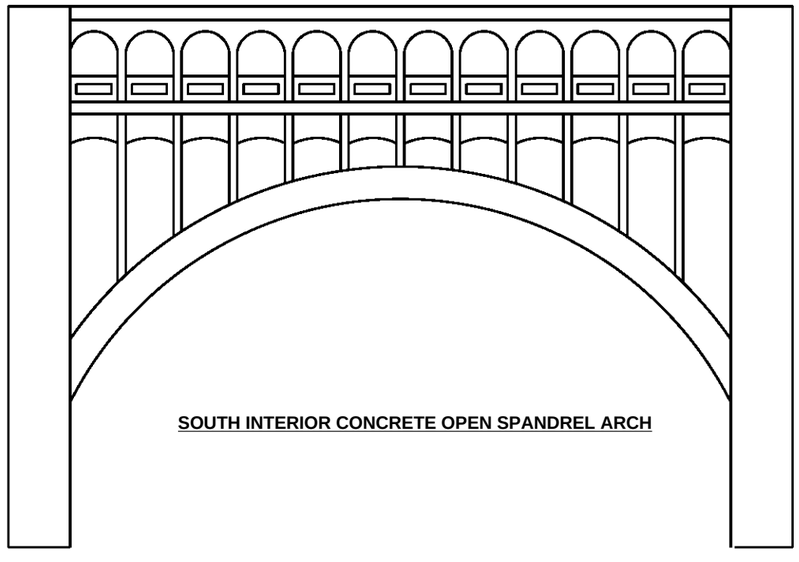


NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 9

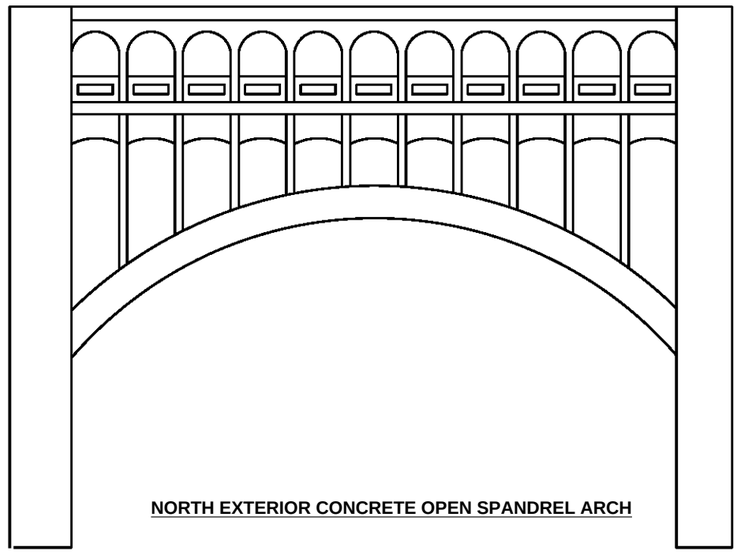


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

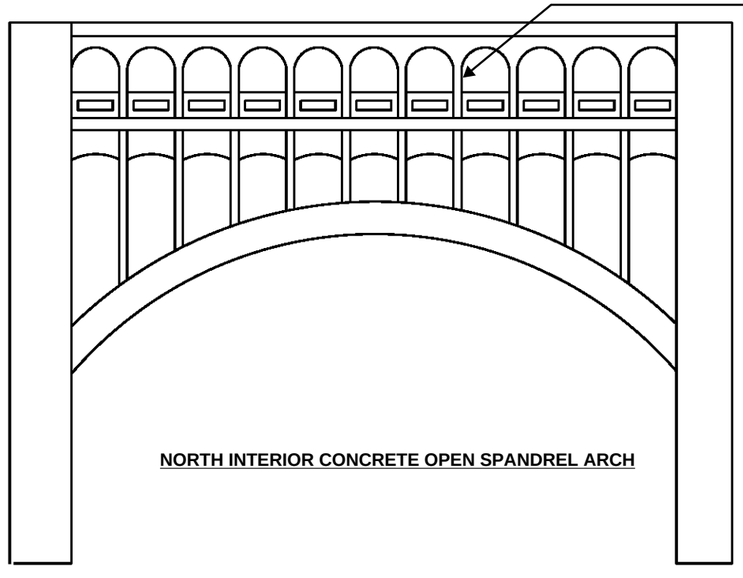


SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 9



NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

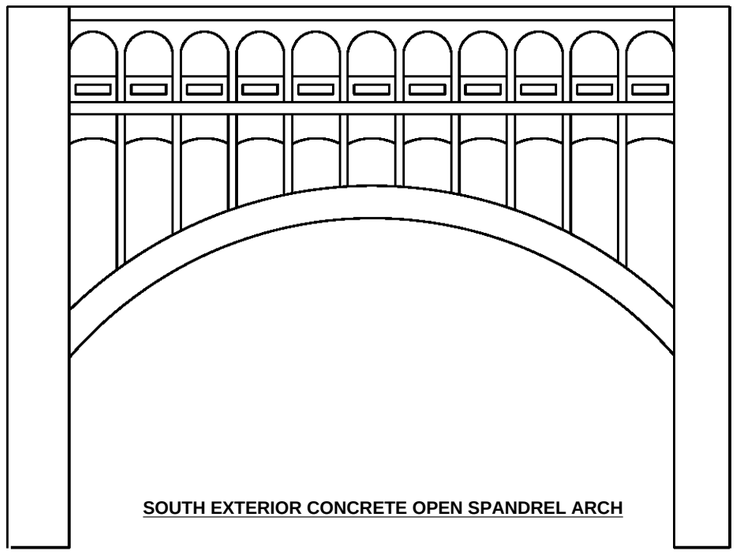


NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

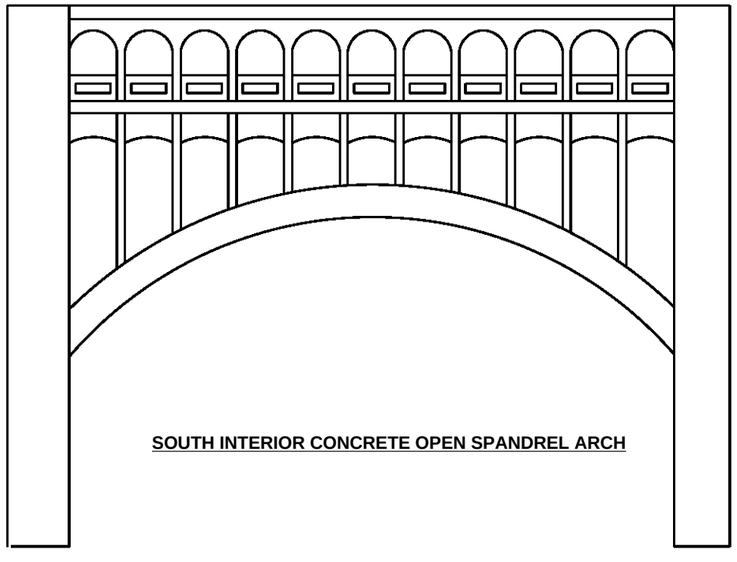
General Notes:

- Floor beams typically have random spalls with exposed corroded reinforcing

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 10

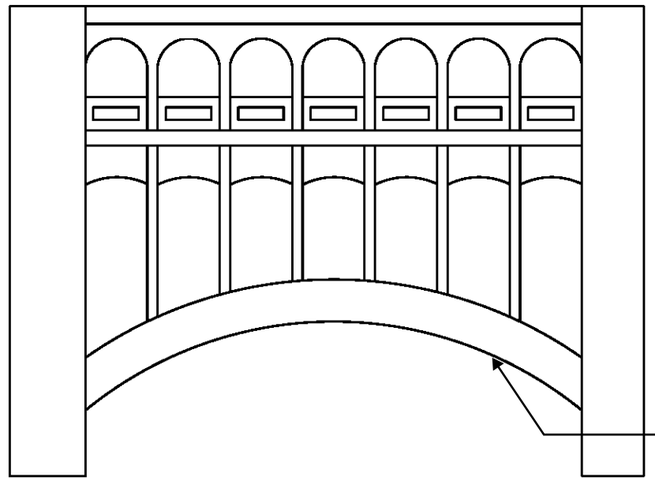


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

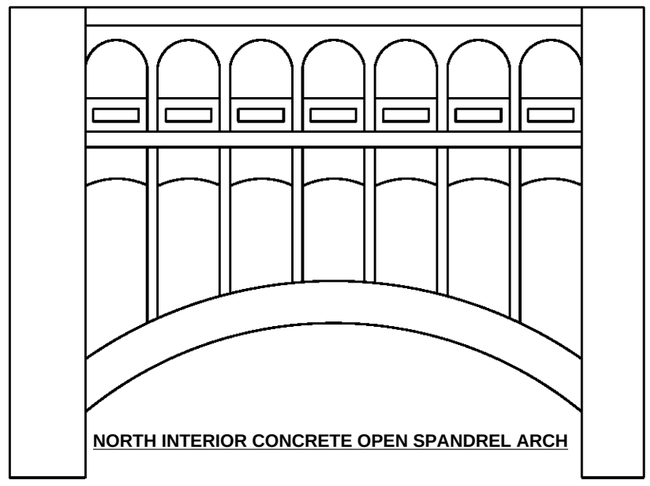


SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 10 / PAGE A-26

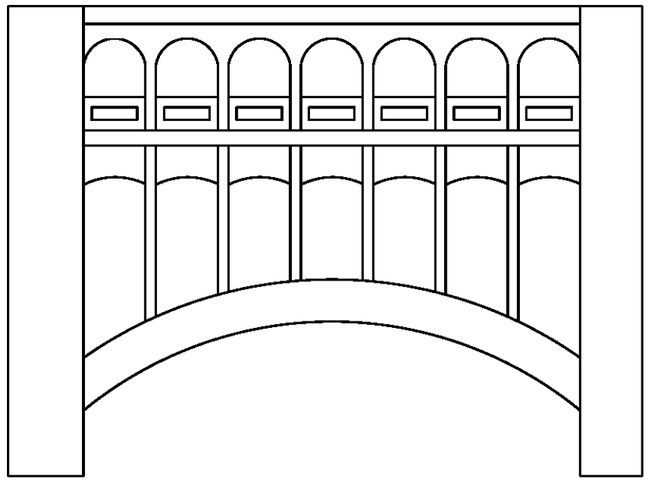


NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

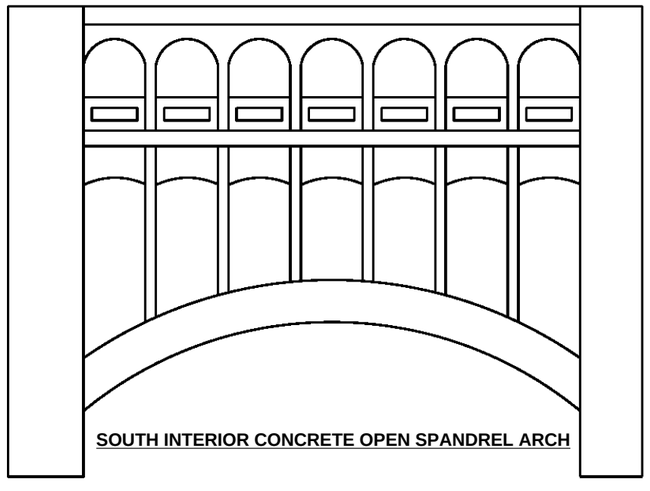


NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET NOT TO SCALE	DATE DEC, 2017	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000 INFRASTRUCTURE ENGINEERS, INC.	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465 STRUCTURE ELEVATION - SPAN 11

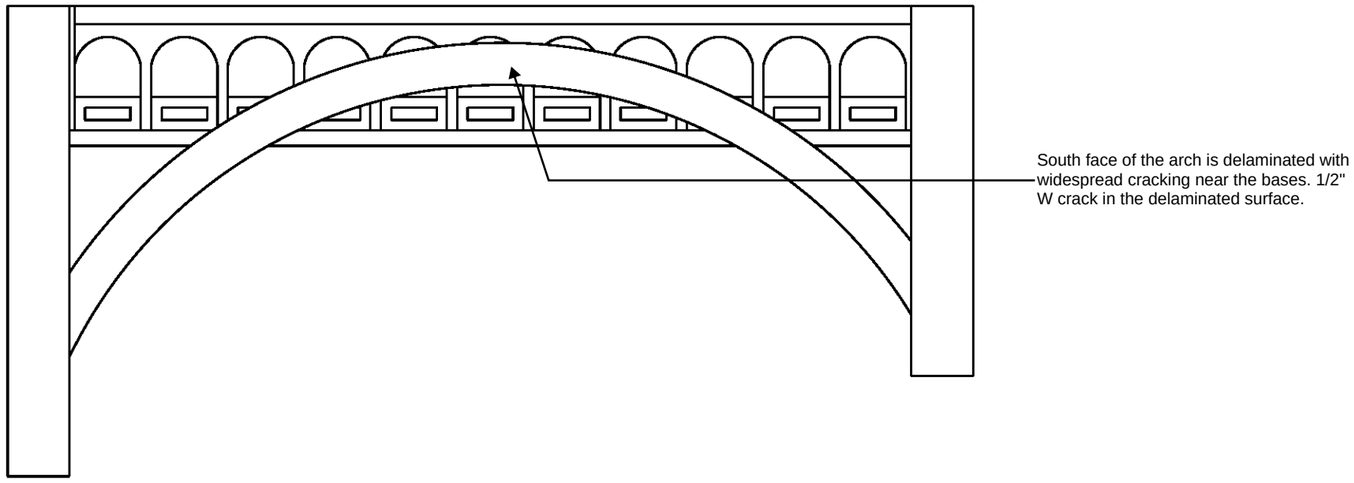


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

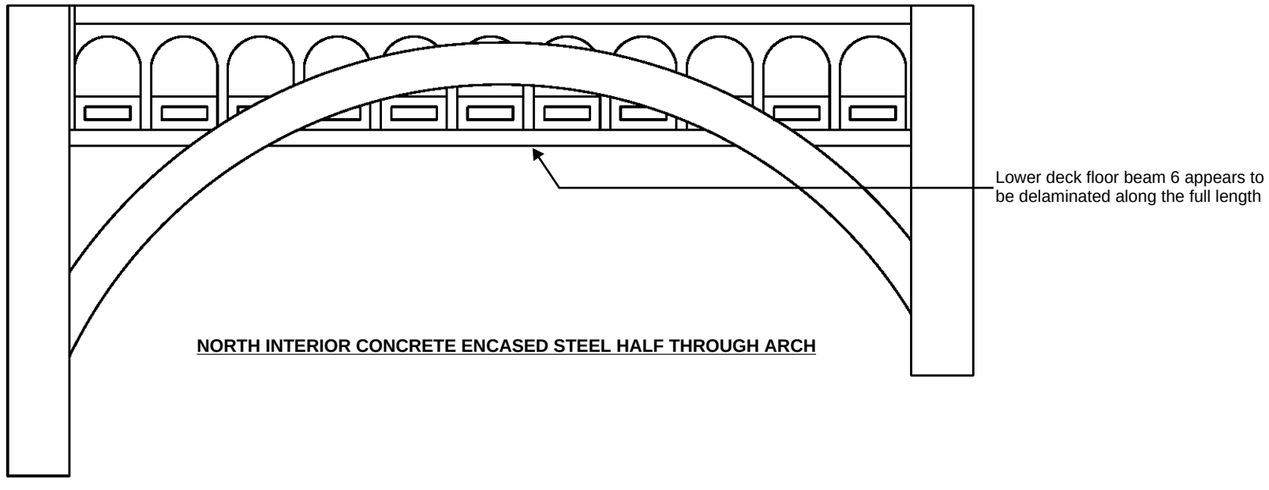


SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 11 / PAGE A-28



NORTH EXTERIOR CONCRETE ENCASED STEEL HALF THROUGH ARCH



NORTH INTERIOR CONCRETE ENCASED STEEL HALF THROUGH ARCH

General Notes:

- Lower deck floorbeams have numerous areas that have been chipped off and painted. Numerous areas are cracked and marked but have not been chipped away.

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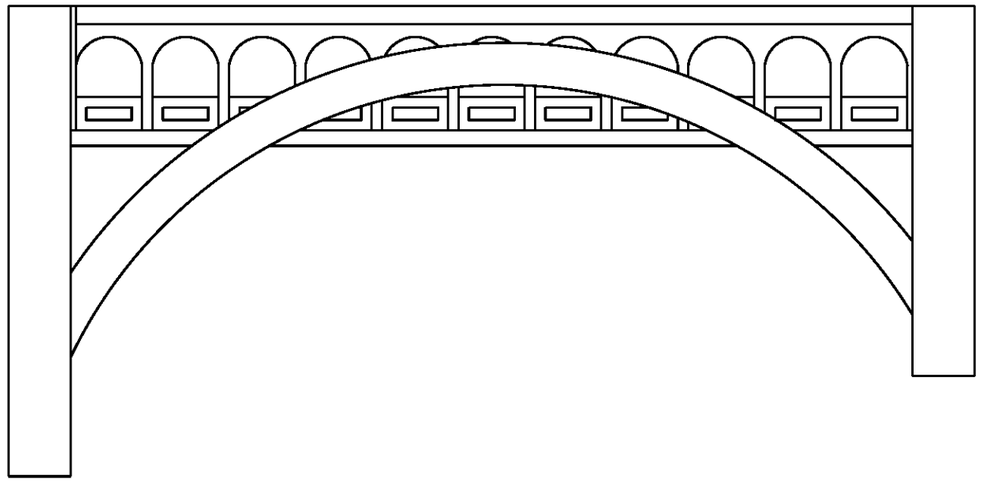
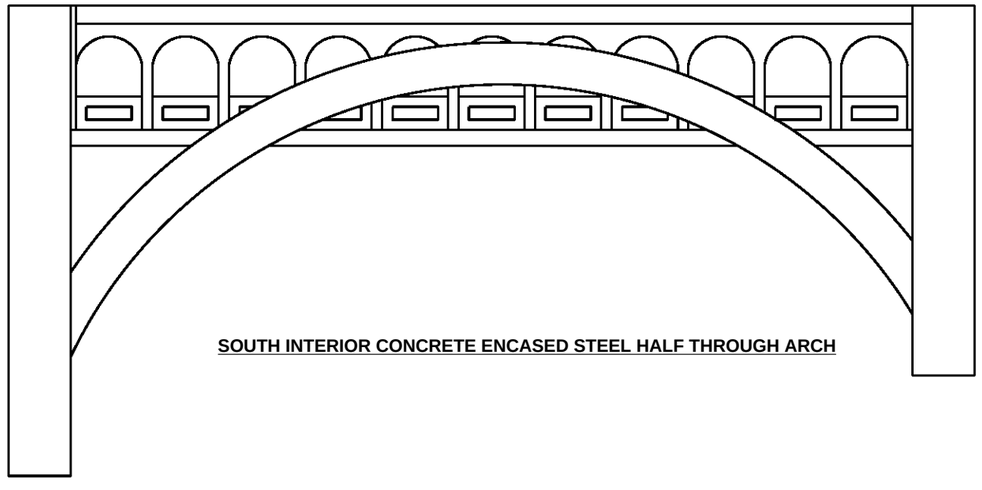


SOUTH EXTERIOR CONCRETE ENCASED STEEL HALF THROUGH ARCH



SOUTH INTERIOR CONCRETE ENCASED STEEL HALF THROUGH ARCH

General Notes:

- Lower deck floorbeams have numerous areas that have been chipped off and painted. Numerous areas are cracked and marked but have not been chipped away.

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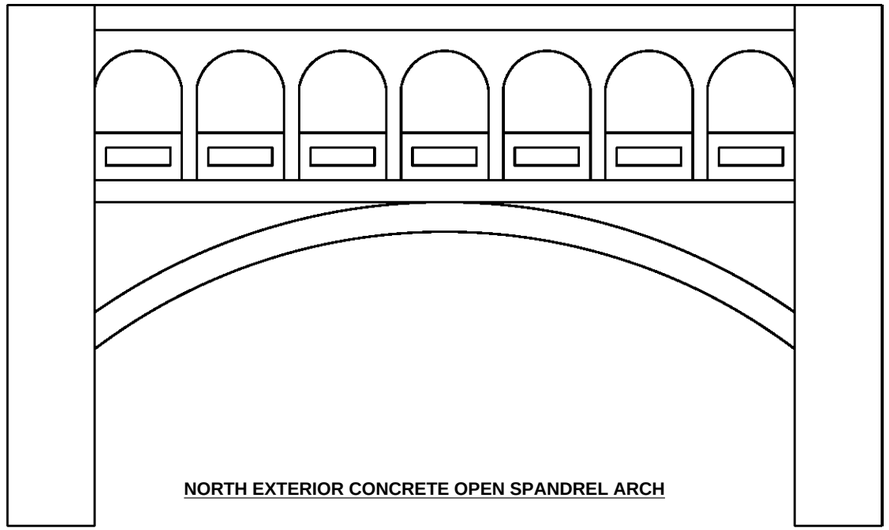
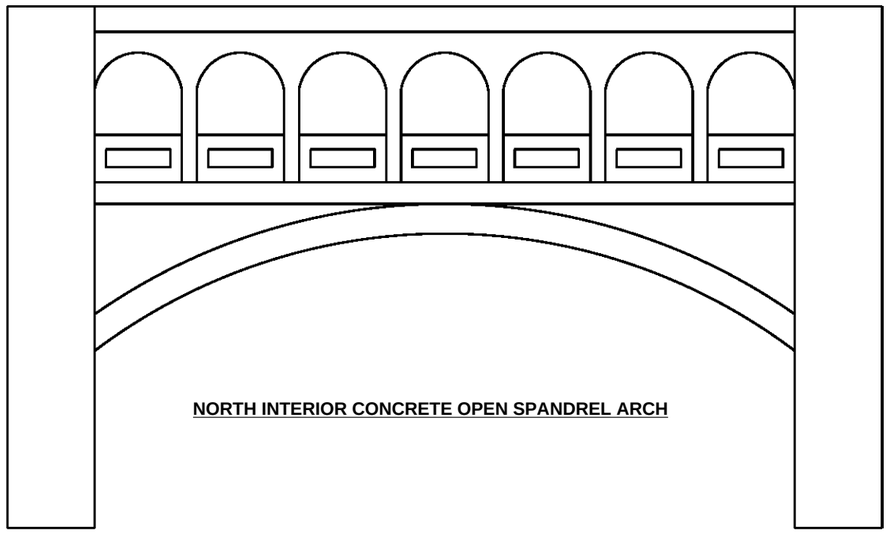
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 12	PAGE A-30

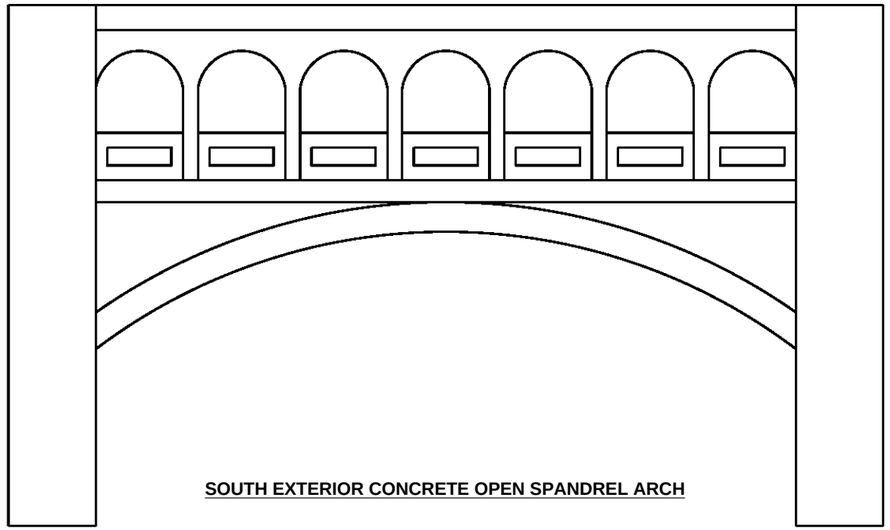


NORTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

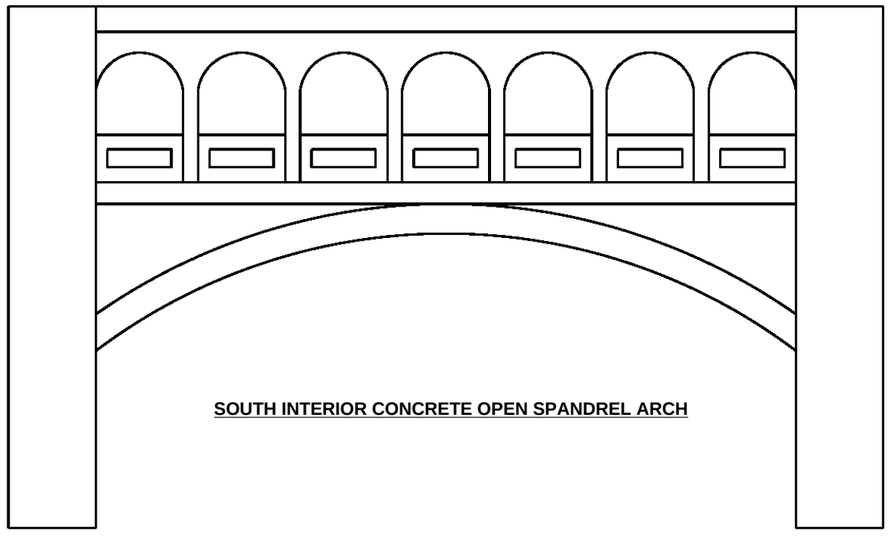


NORTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 13	PAGE A-31

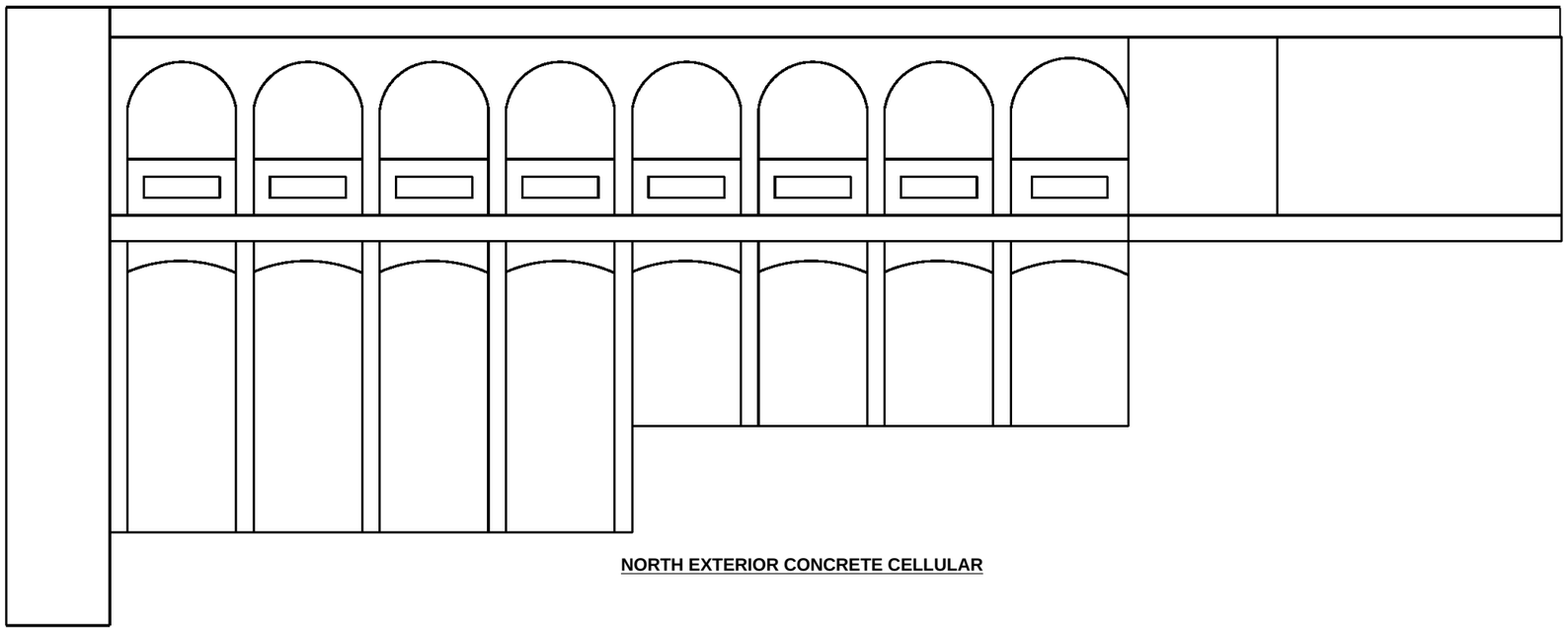


SOUTH EXTERIOR CONCRETE OPEN SPANDREL ARCH

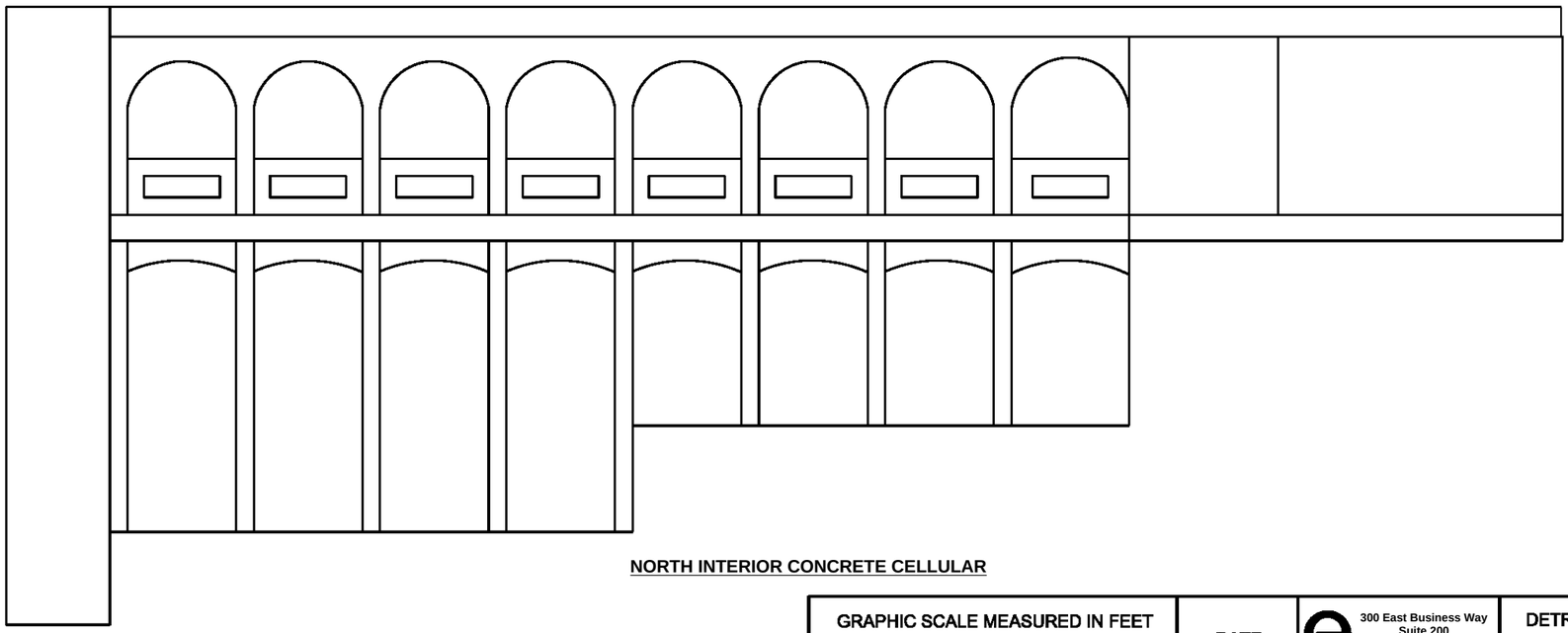


SOUTH INTERIOR CONCRETE OPEN SPANDREL ARCH

GRAPHIC SCALE MEASURED IN FEET	DATE	300 East Business Way Suite 200 Cincinnati, OH 45241 PH.: 614.699.5000	DETROIT-SUPERIOR BRIDGE OVER CUYAHOGA RIVER BRIDGE NO. CUY-6-1465	
NOT TO SCALE	DEC, 2017	INFRASTRUCTURE ENGINEERS, INC.	STRUCTURE ELEVATION - SPAN 13	PAGE A-32



NORTH EXTERIOR CONCRETE CELLULAR



NORTH INTERIOR CONCRETE CELLULAR

General Notes:

- Lower deck floor beams have bottom mat of reinforcement exposed

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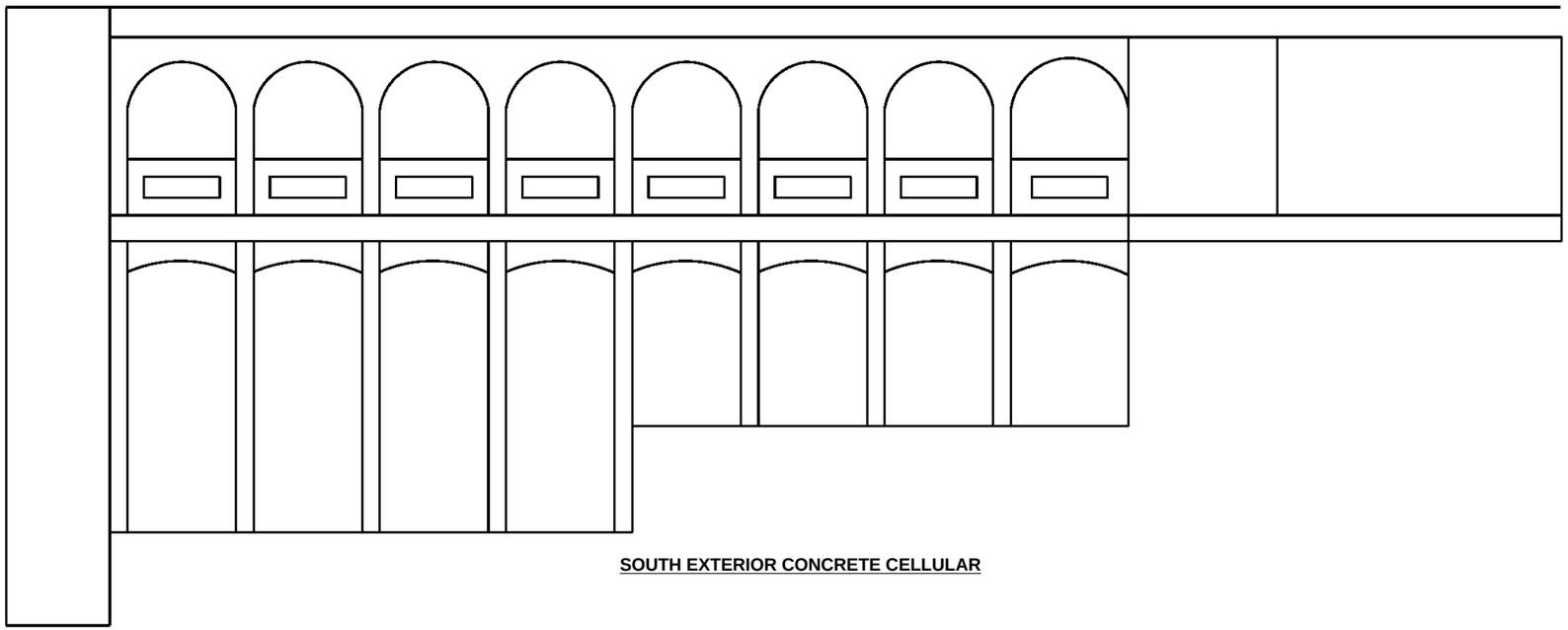
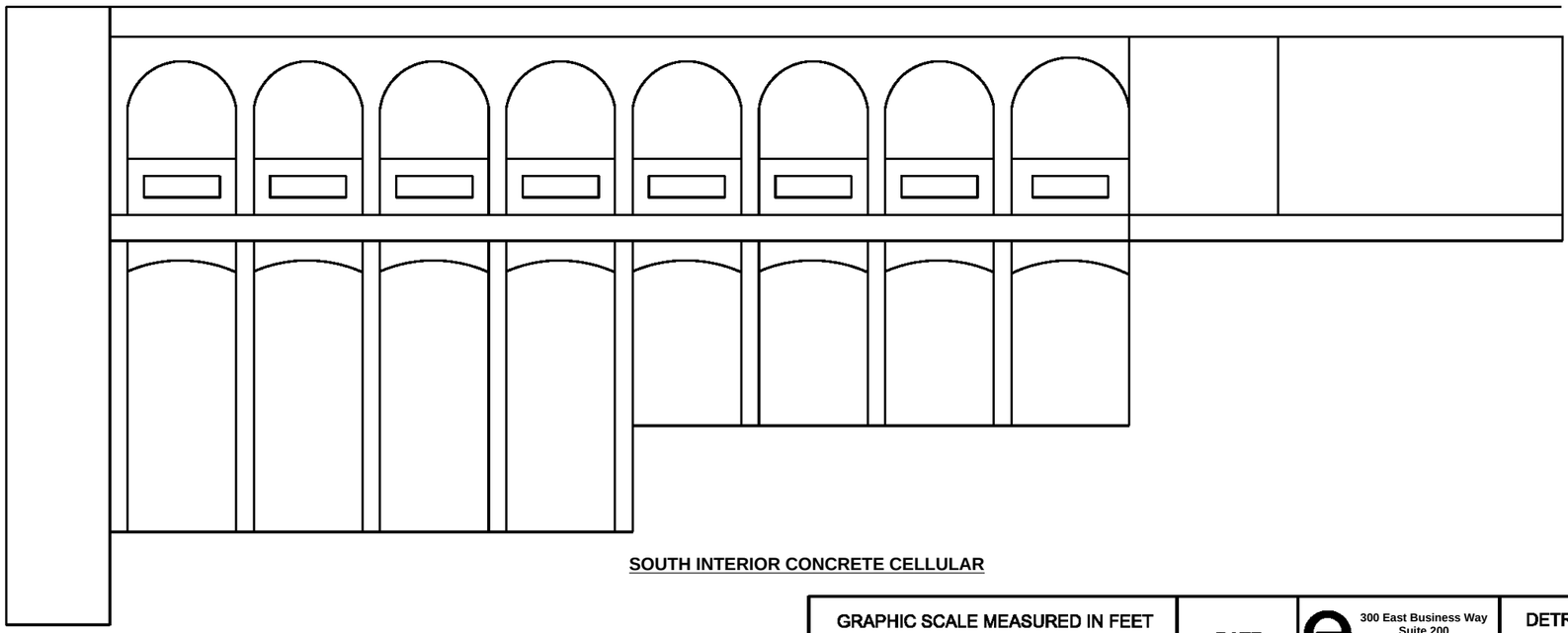


SOUTH EXTERIOR CONCRETE CELLULAR



SOUTH INTERIOR CONCRETE CELLULAR

General Notes:

- Lower deck floorbeams have bottom mat reinforcement exposed

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