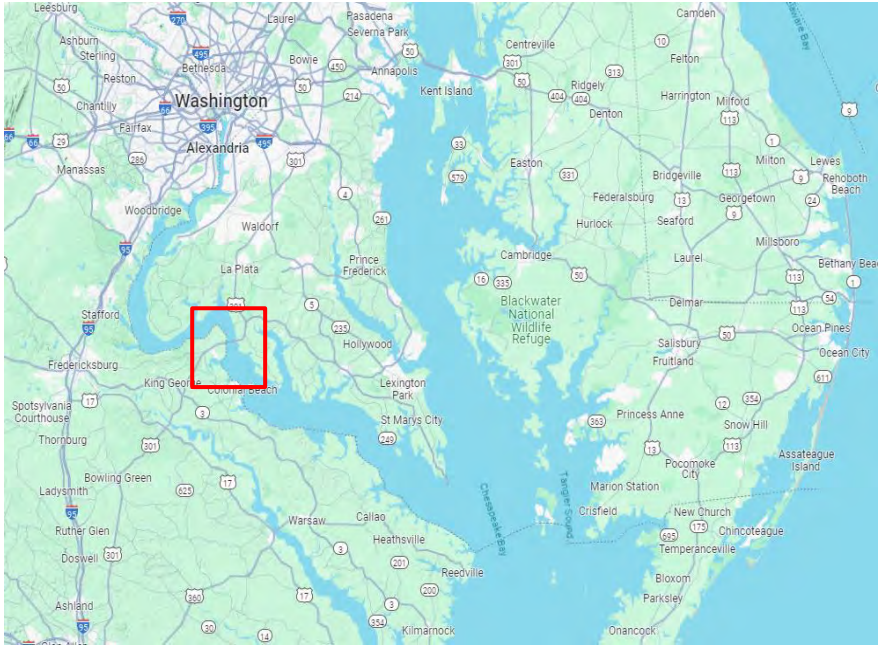
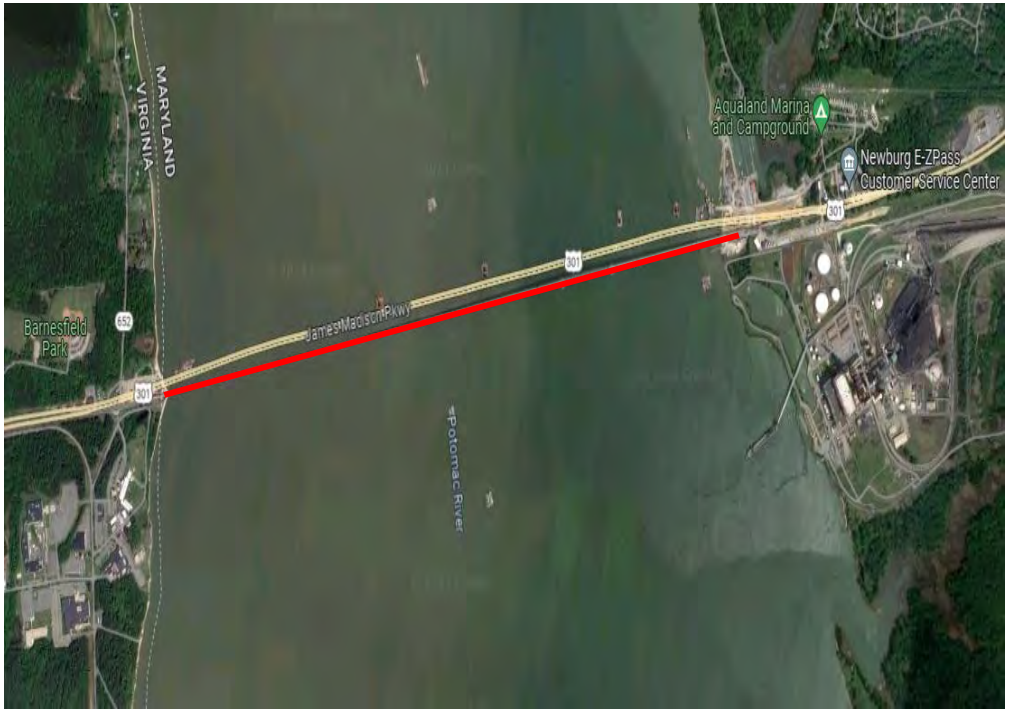
Demolition Challenges of the Harry W Nice/Thomas "Mac" Middleton Bridge

Nikkolas Edgmond (Genesis Structures)
Brian Clark (United Demolition)
IBC 24-78

Presentation Overview:

- General Project Location, Bridge Layout and Demolition Sequence
- Original Construction and Rehabilitation
- Trestle Span Removal
- Girder Span Removal
- Deck Truss Span Removal
- Main Span and Anchor Span Removal


Washington
Alexandria
Fredericksburg
Stafford
Manassas
Woodbridge
Waldorf
La Plata
Prince Frederick
Leesburg
Ashburn
Sterling
Reston
Chantilly
Fairfax
Bethesda
Laurel
Bowie
Annapolis
Kent Island
Centreville
Ridgely
Denton
Easton
Cambridge
Hurlock
Federalsburg
Bridgeville
Seaford
Georgetown
Milton
Lewes
Rehoboth Beach
Millsboro
Laurel
Delmar
Salisbury
Fruitland
Ocean Pines
Ocean City
Bethany Beach
Blackwater National Wildlife Refuge
Hollywood
King George
Colonial Beach
Lexington Park
St Marys City
Spotsylvania Courthouse
Thornburg
Bowling Green
Ladysmith
Ruther Glen
Doswell
Ashland
Warsaw
Callao
Heathsville
Reedville
Kilmarnock
Princess Anne
Snow Hill
Pocomoke City
Assateague Island
Marion Station
Crisfield
New Church
Chincoteague
Temperanceville
Bloxom
Parksley
Onancock
Tangier Sound
Chesapeake Bay

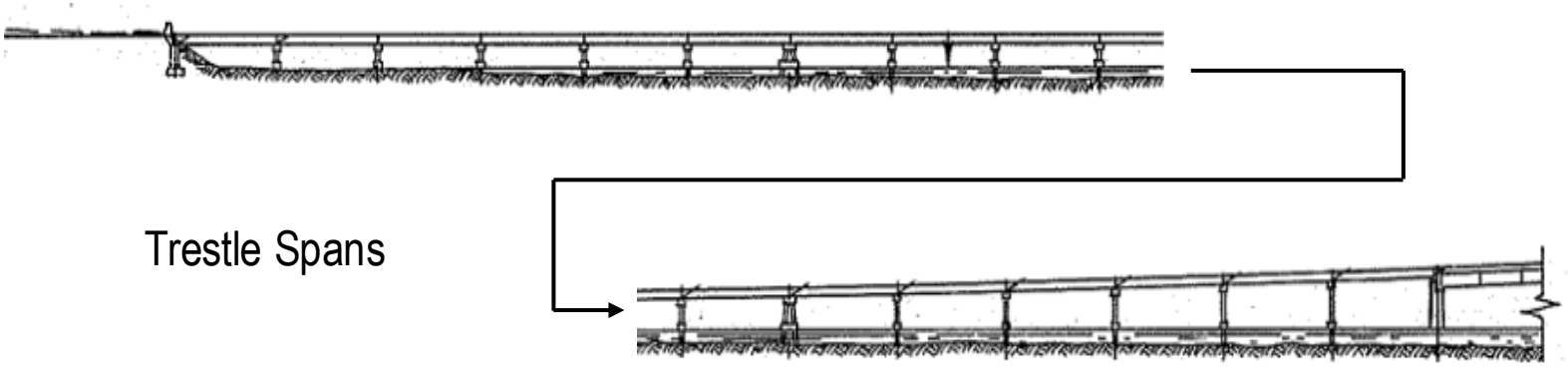

MARYLAND
VIRGINIA
Aqualand Marina and Campground
Newburg E-ZPass Customer Service Center
Barnesfield Park
James Madison Pkwy
Potomac River
301
652

Fast Facts:

Construction Dates: March 1938 – December 1940
Total Length of Bridge: ~1.90 miles
Structural Systems (4 total):
- Trestle Spans
- Girder Spans
- Approach Deck Truss Spans
- Main Span and Anchor Truss Spans

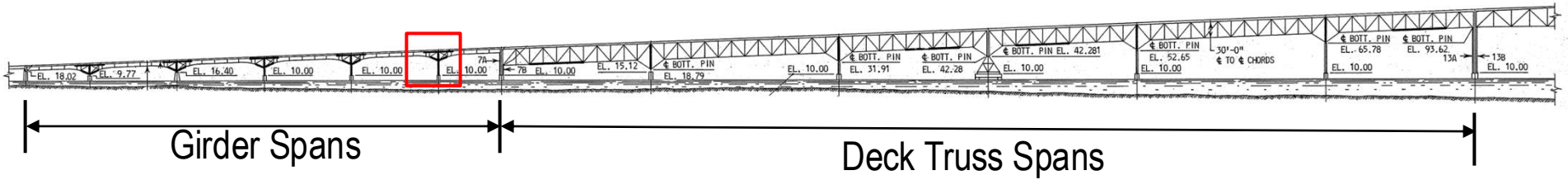
Substructure: Steel 2D truss frames and 3D towers

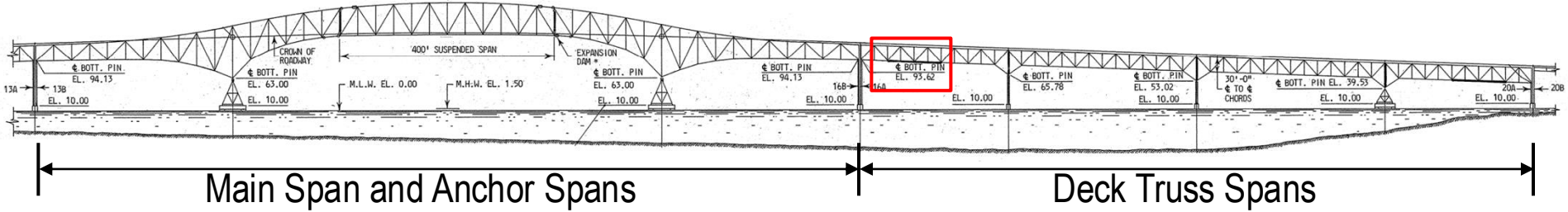
Bridge Layout:

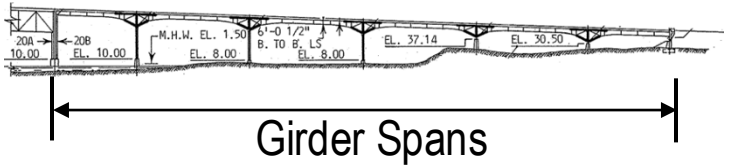


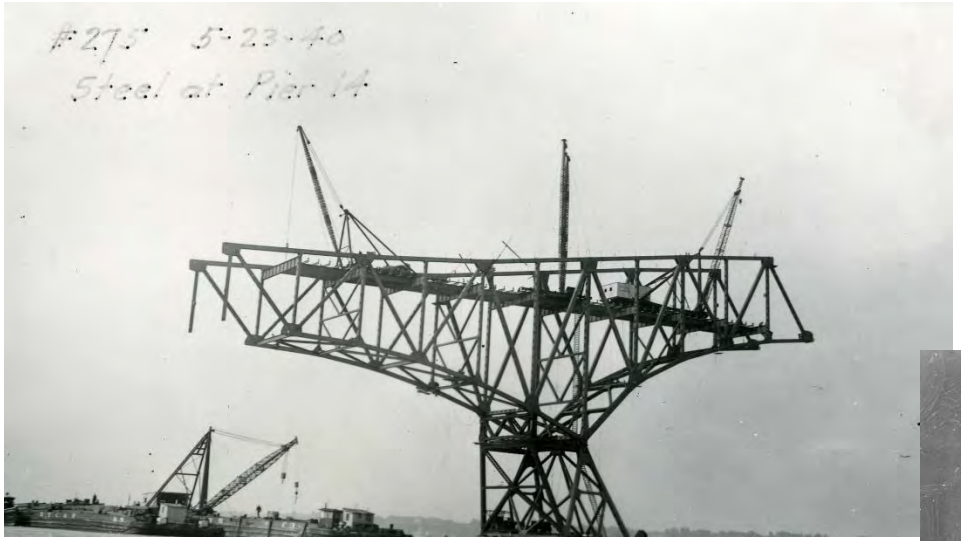
Trestle Spans

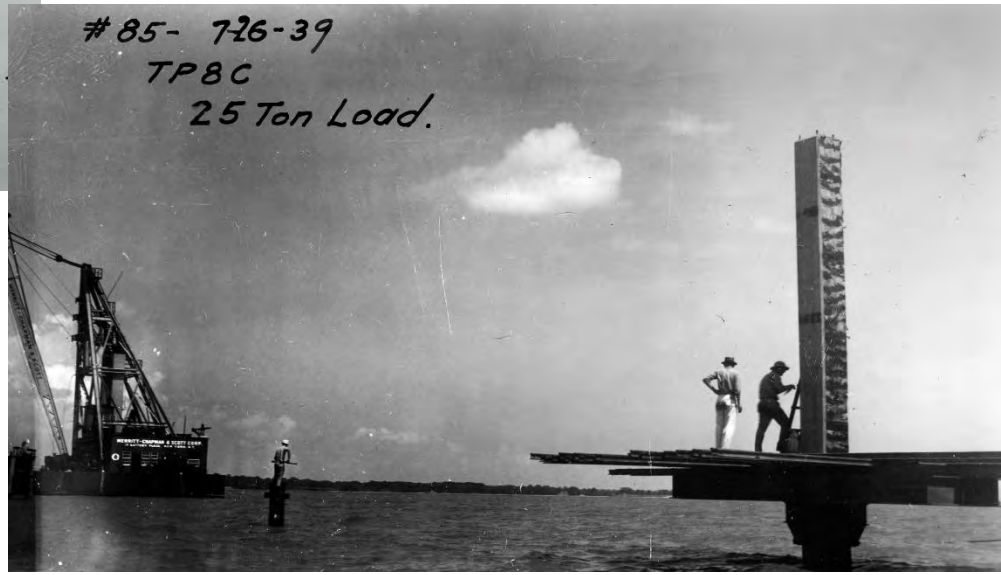
Bridge Layout:



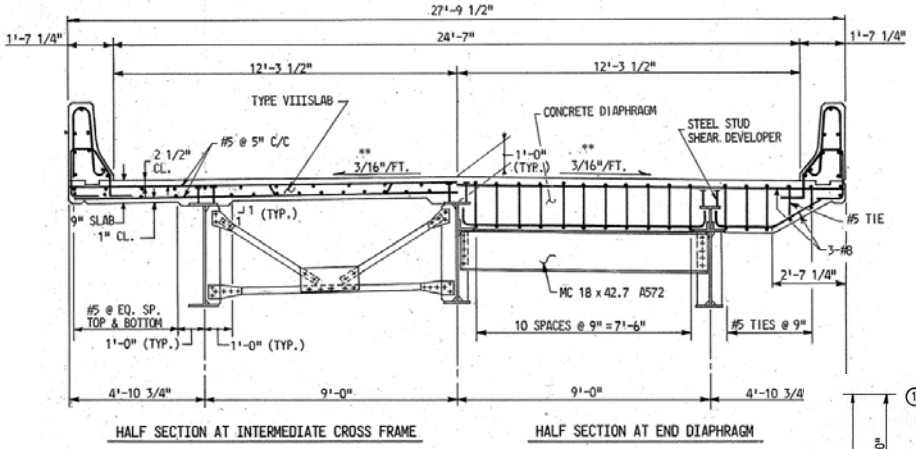




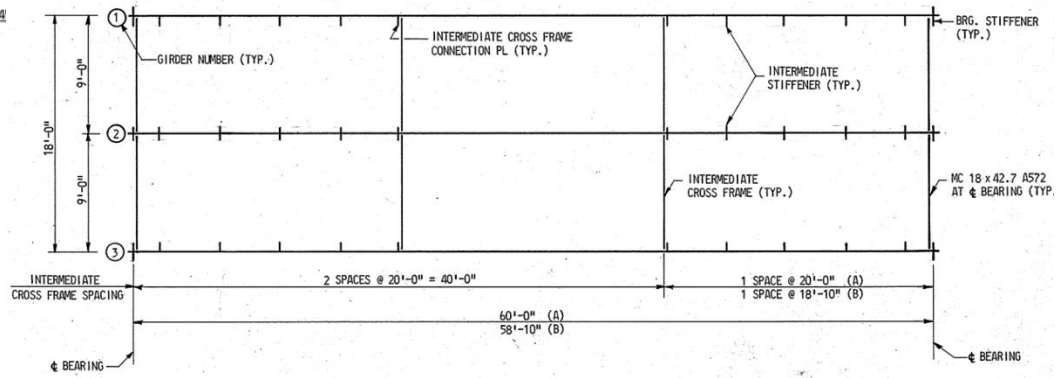

#275 5-23-40
Steel at Pier 14


#85- 726-39
TP8C
25 Ton Load.

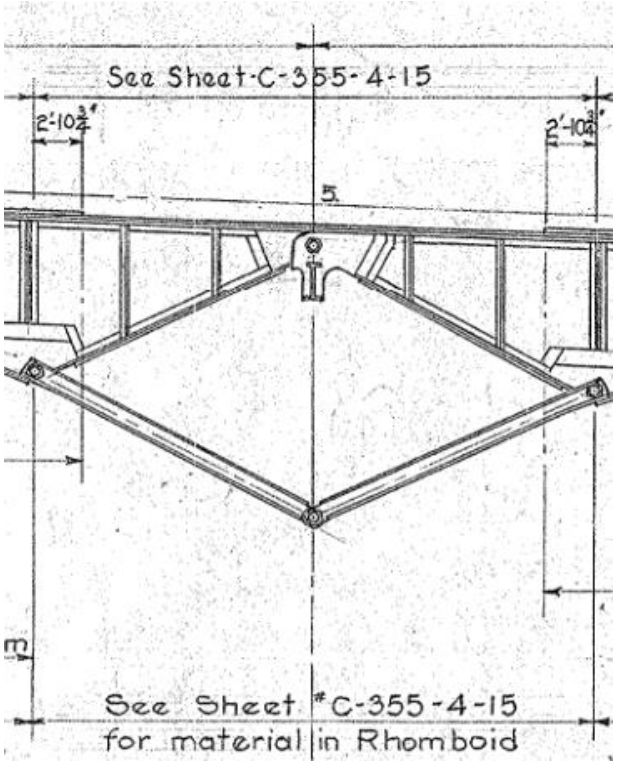
Bridge Rehabilitation:

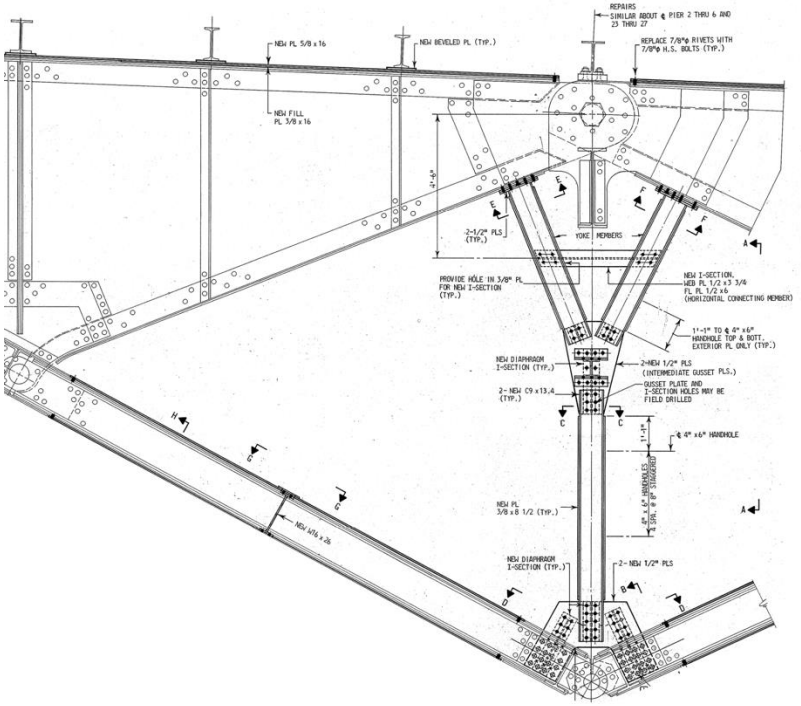


Trestle Spans



Bridge Rehabilitation (cont.):





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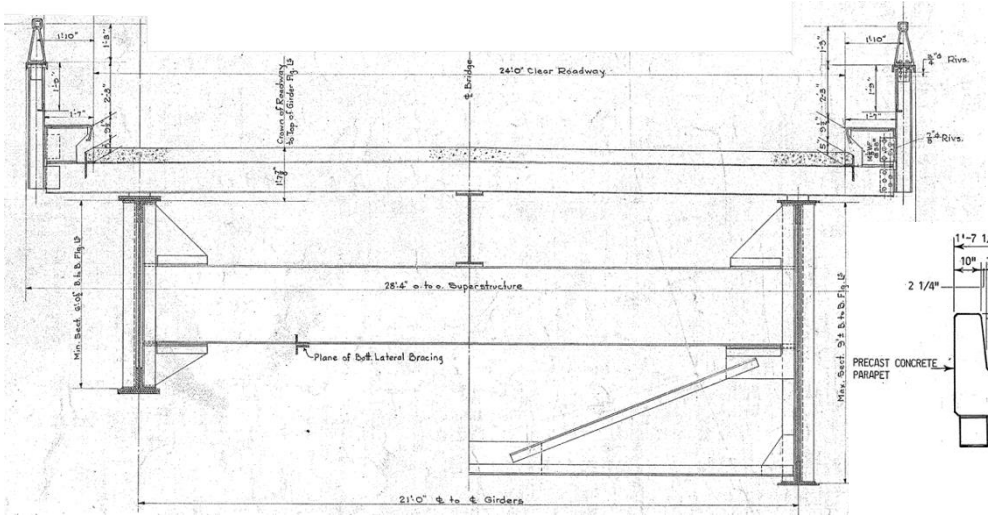
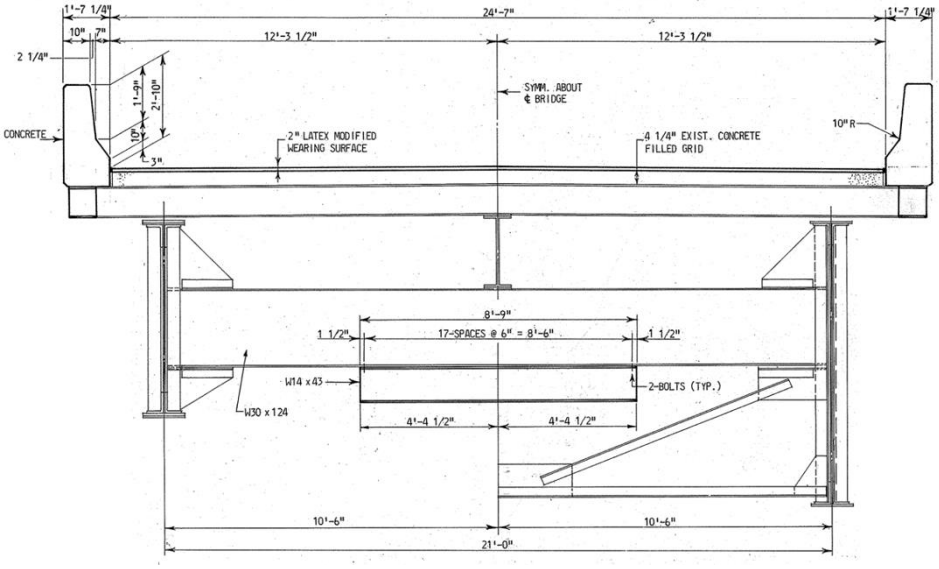
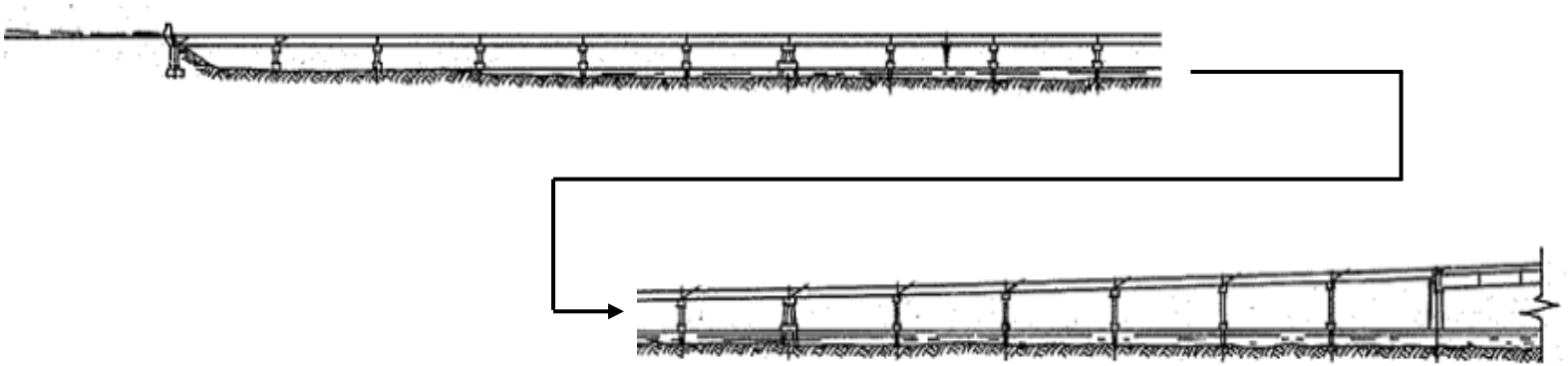
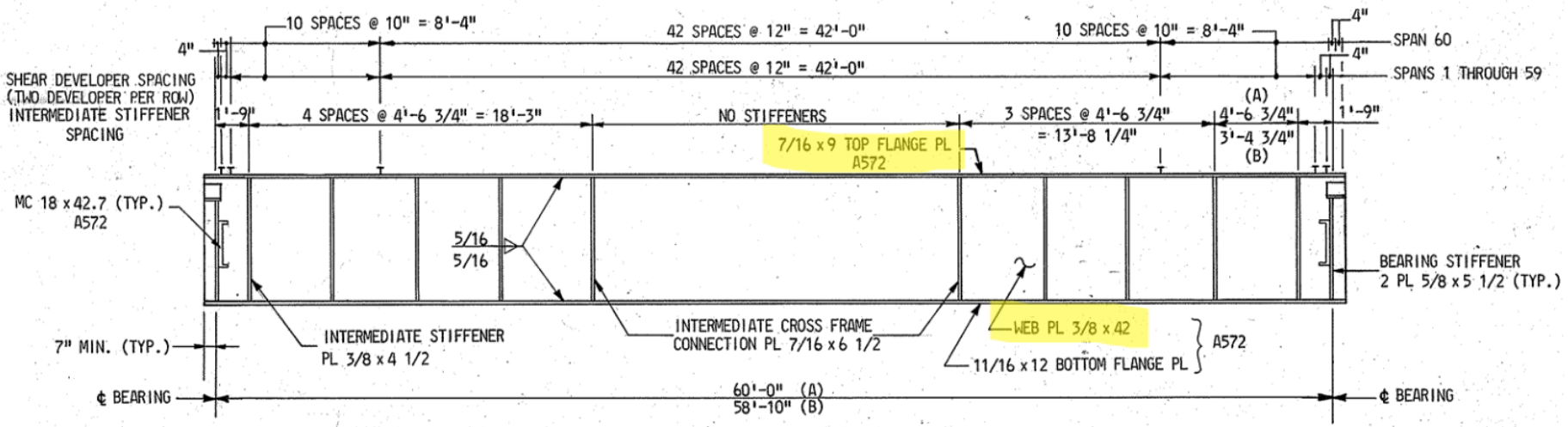




Trestle Span Removal:

Deck and Steel Removal




10 SPACES @ 10" = 8'-4"
42 SPACES @ 12" = 42'-0"
10 SPACES @ 10" = 8'-4"
4"
SPAN 60
SPANS 1 THROUGH 59
SHEAR DEVELOPER SPACING (TWO DEVELOPER PER ROW) INTERMEDIATE STIFFENER SPACING
1'-9"
4 SPACES @ 4'-6 3/4" = 18'-3"
NO STIFFENERS
3 SPACES @ 4'-6 3/4" = 13'-8 1/4"
(A)
4'-6 3/4"
3'-4 3/4"
(B)
7/16 x 9 TOP FLANGE PL A572
MC 18 x 42.7 (TYP.) A572
5/16
5/16
BEARING STIFFENER 2 PL 5/8 x 5 1/2 (TYP.)
7" MIN. (TYP.)
INTERMEDIATE STIFFENER PL 3/8 x 4 1/2
INTERMEDIATE CROSS FRAME CONNECTION PL 7/16 x 6 1/2
WEB PL 3/8 x 42
11/16 x 12 BOTTOM FLANGE PL
A572
℄ BEARING
60'-0" (A)
58'-10" (B)
℄ BEARING

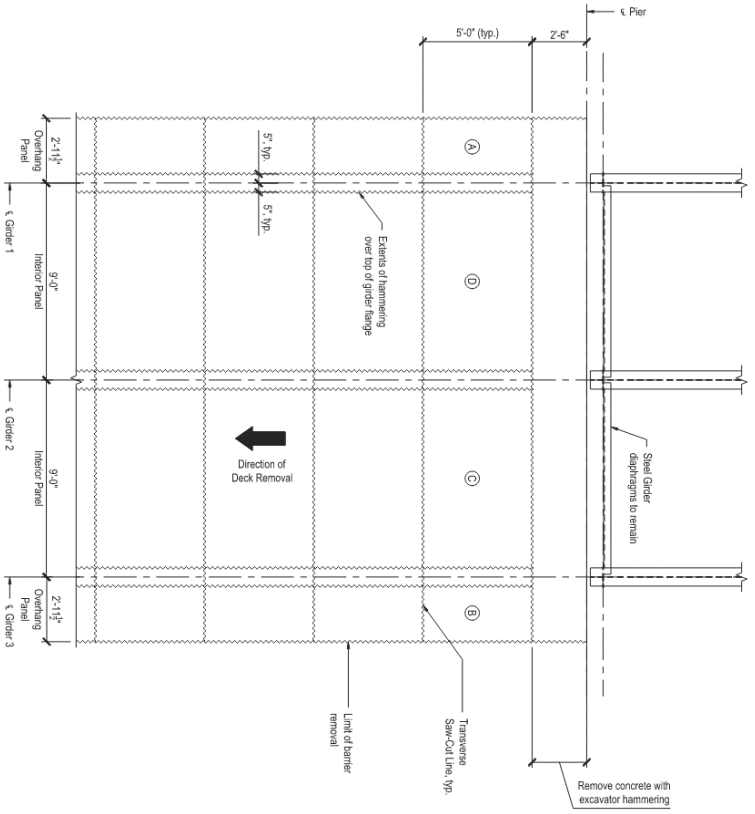
CONSTRUCTION STAGING

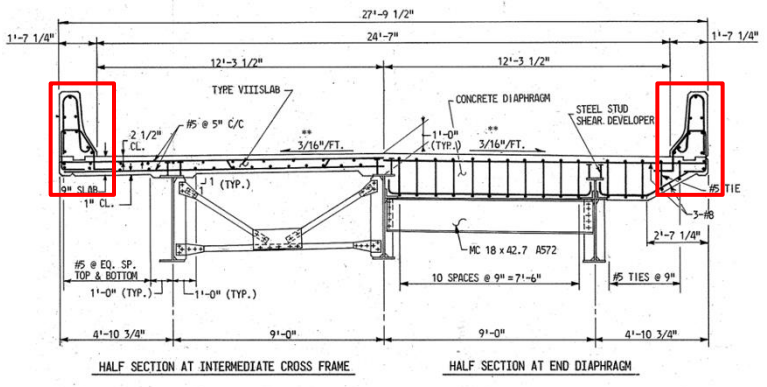
THE REHABILITATION WORK ON THE GIRDER, APPROACH TRUSS AND MAIN TRUSS SPANS SHALL EITHER BE CONDUCTED IN THE WESTERLY DIRECTION IN THE WESTBOUND ROADWAY BEGINNING AT THE MARYLAND ABUTMENT OR IN THE EASTERLY DIRECTION IN THE EASTBOUND ROADWAY BEGINNING AT PIER NO. 1. THE BEAM SPANS SUPERSTRUCTURE REMOVAL AND REPLACEMENT WITH NEW GIRDER SPANS SHALL BE CONDUCTED CONCURRENT WITH THE WORK IN THE GIRDER, APPROACH TRUSS OR THE MAIN TRUSS SPANS, MAY PROCEED IN EITHER DIRECTION AND MAY BE CONDUCTED AT MORE THAN ONE LOCATION CONCURRENTLY.

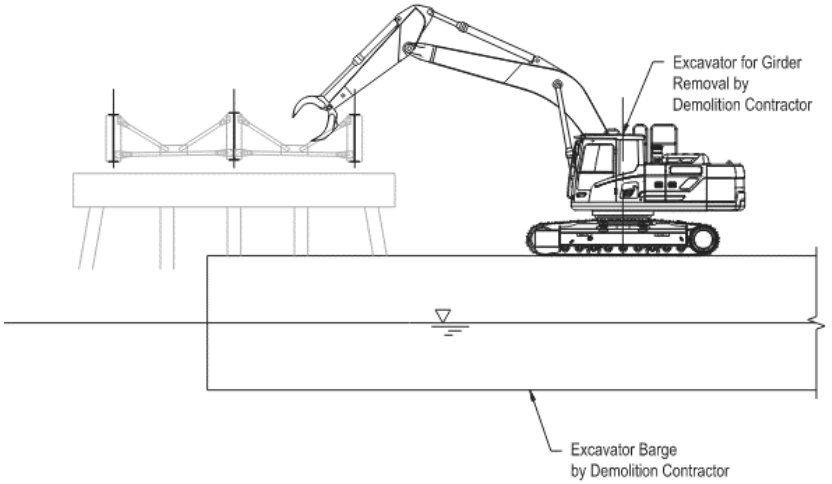
SEQUENCE OF OPERATIONS

NEW GIRDER SPANS (SEE NOTE A)

1. ALL WORK ON THE NEW GIRDER SPANS REQUIRING BRIDGE CLOSURE SHALL BE CONDUCTED ONLY DURING THE EIGHT (8) HOUR NIGHTTIME BRIDGE CLOSURE FROM SATURDAY MIDNIGHT TO SUNDAY MORNING 8 A.M.
2. SET UP ROAD CLOSURE BARRICADES ON BOTH APPROACHES FOR CLOSING THE BRIDGE TO ALL TRAFFIC.
3. REMOVE EXISTING STEEL BEAMS, CONCRETE DECK, STEEL SAFETY WALKS AND RAILINGS.
4. INSTALL TEMPORARY REPLACEMENT SPAN.
5. REMOVE ROAD CLOSURE BARRICADES FROM BOTH APPROACHES AND OPEN THE BRIDGE TO TRAFFIC.
6. THE FOLLOWING TASKS CAN BE CARRIED OUT DURING THE NORMAL WORKING HOURS ON WEEK DAYS.
   - A. REMOVE BEARINGS.
   - B. CUT EXISTING ANCHOR BOLTS AT THE BENT CAP SURFACE.
   - C. REPAIR THE BENT CAP, IF NECESSARY.
   - D. DRILL HOLES FOR NEW ANCHOR BOLTS AND SET NEW ANCHOR BOLTS IN GROUT.
   - E. POUR BEARING PADS.
   - F. INSTALL BEARINGS.
7. ON THE SUBSEQUENT SATURDAY NIGHT REPEAT TASK 2 ABOVE.
8. REMOVE TEMPORARY REPLACEMENT SPAN.
9. REMOVE ONE OTHER EXISTING SPAN AS PER TASK 3.
10. INSTALL TEMPORARY REPLACEMENT SPAN IN LOCATION OF EXISTING SPAN REMOVED IN TASK 9.
11. INSTALL PRECONSTRUCTED GIRDER SPAN (GIRDER, DECK AND PARAPET).
12. REPEAT TASK 5.
13. INSTALL ROADWAY JOINT SEALS IN THE SUBSEQUENT FULL BRIDGE CLOSURE.


℄ Pier
5'-0" (typ.)
2'-6"
Overhang Panel
2'-11½"
Interior Panel
9'-0"
Interior Panel
9'-0"
Overhang Panel
2'-11½"
℄ Girder 1
℄ Girder 2
℄ Girder 3
5' typ.
5' typ.
A
D
C
B
Extents of hammering over top of girder flange
Direction of Deck Removal
Steel Girder diaphragms to remain
Limit of barrier removal
Transverse Saw-Cut Line, typ.
Remove concrete with excavator hammering

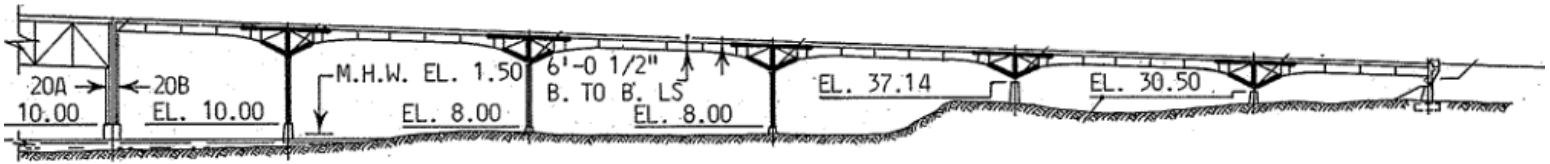

27'-9 1/2"
1'-7 1/4"
24'-7"
1'-7 1/4"
12'-3 1/2"
12'-3 1/2"
TYPE VIIISLAB
CONCRETE DIAPHRAGM
STEEL STUD SHEAR DEVELOPER
2 1/2" CL.
#5 @ 5" C/C
** 3/16"/FT.
1'-0" (TYP.)
** 3/16"/FT.
9" SLAB
1" CL.
#5 TIE
3-#8
2'-7 1/4"
MC 18 x 42.7 A572
#5 @ EQ. SP. TOP & BOTTOM
1'-0" (TYP.)
1'-0" (TYP.)
10 SPACES @ 9" = 7'-6"
#5 TIES @ 9"
4'-10 3/4"
9'-0"
9'-0"
4'-10 3/4"
HALF SECTION AT INTERMEDIATE CROSS FRAME
HALF SECTION AT END DIAPHRAGM

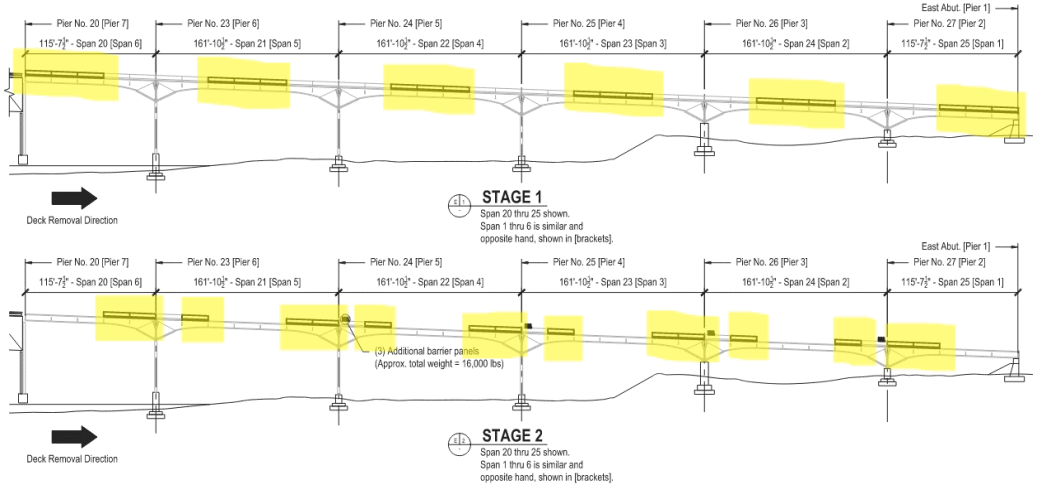

Excavator for Girder Removal by Demolition Contractor
Excavator Barge by Demolition Contractor


SEAWARD 4

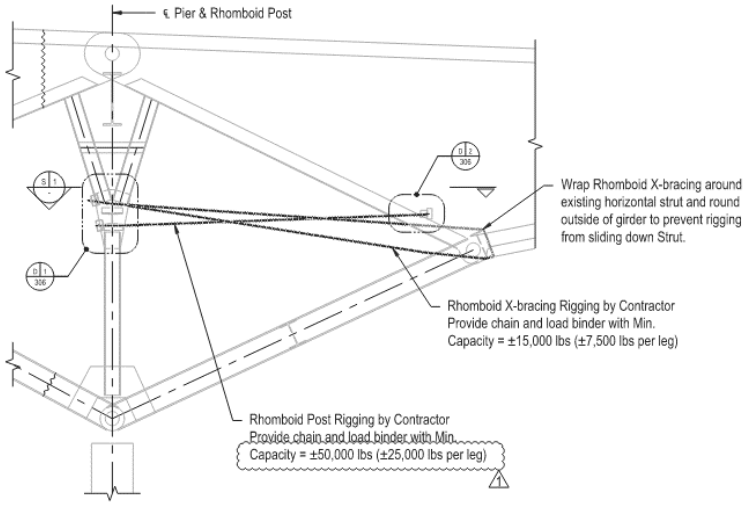
Girder Span Removal:

Deck and Steel Removal

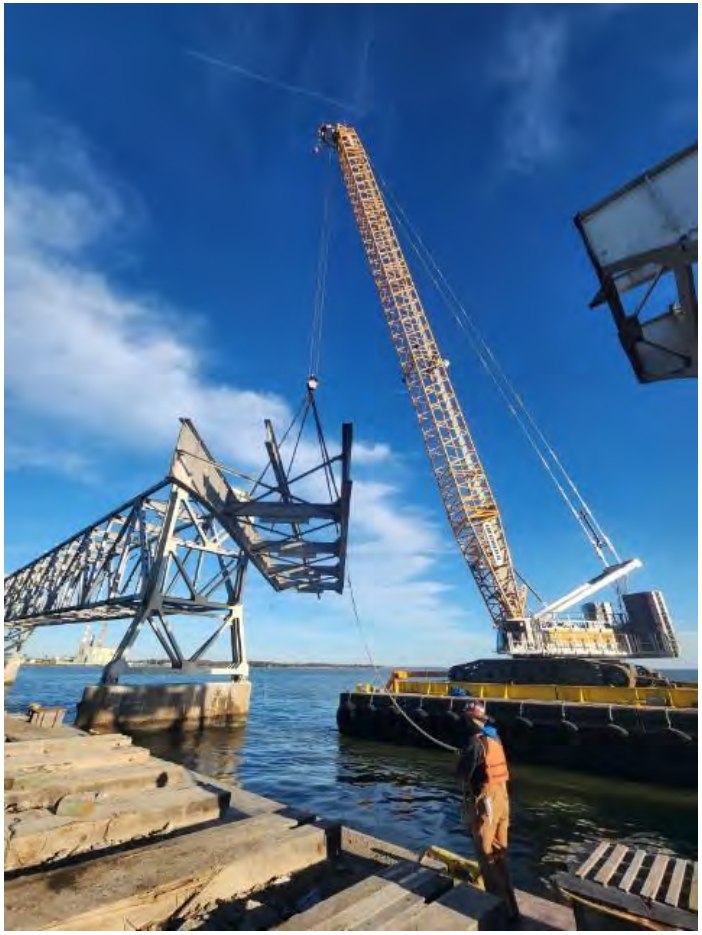




Deck Removal

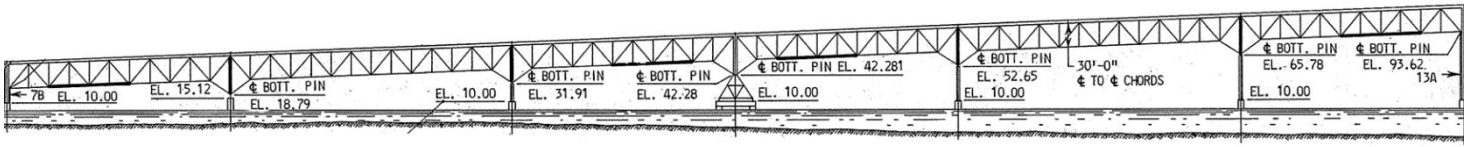


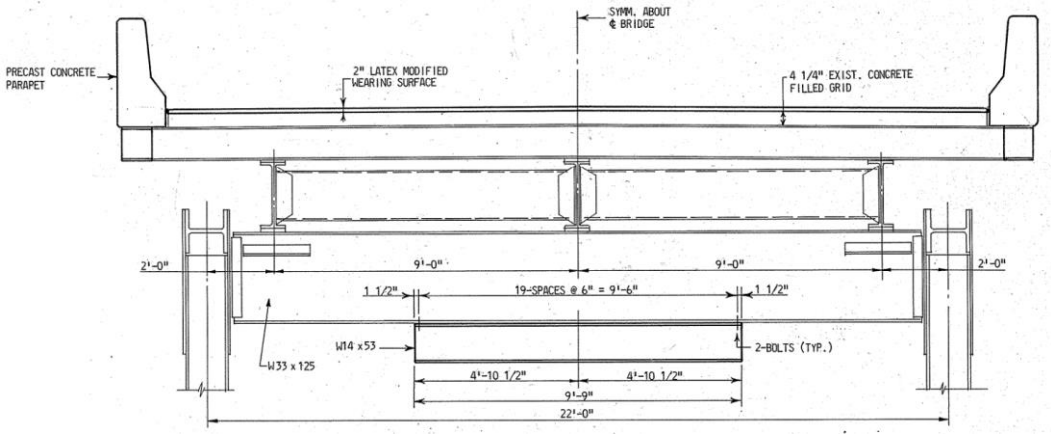
Steel Removal

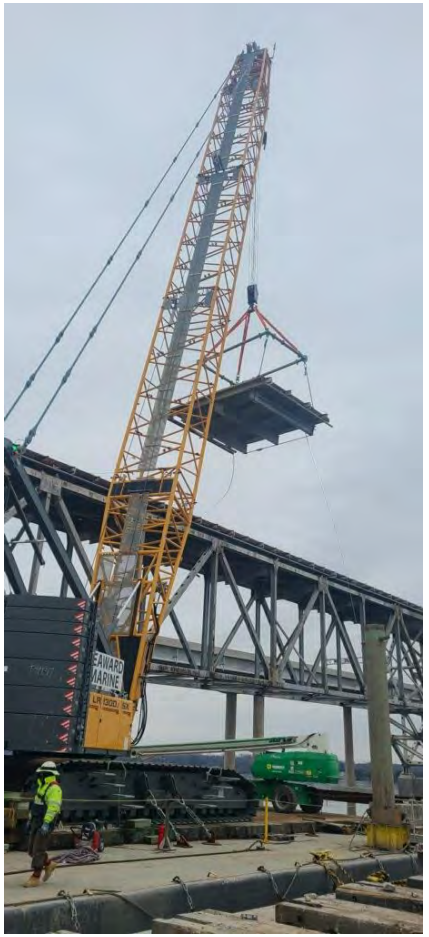


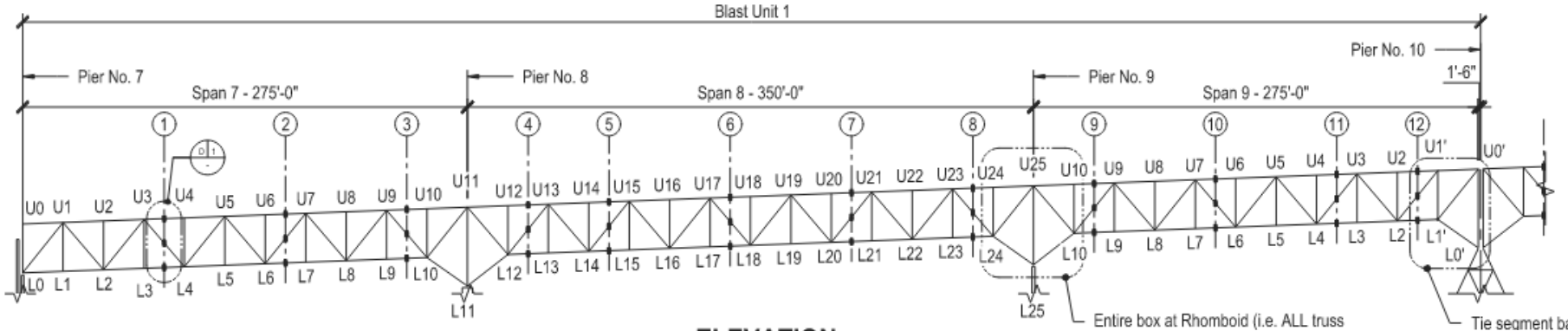
Deck Truss Span Removal:

Deck and Steel Removal




SYMM. ABOUT
℄ BRIDGE
PRECAST CONCRETE
PARAPET
2" LATEX MODIFIED
WEARING SURFACE
4 1/4" EXIST. CONCRETE
FILLED GRID
2'-0"
9'-0"
9'-0"
2'-0"
1 1/2"
19-SPACES @ 6" = 9'-6"
1 1/2"
W14 x53
2-BOLTS (TYP.)
W33 x 125
4'-10 1/2"
4'-10 1/2"
9'-0"
22'-0"


SEAWARD
MARINE

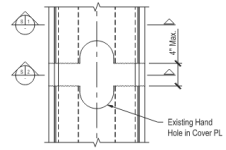


ELEVATION

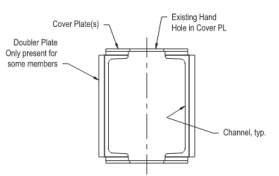
Note: See Table T1 for Precut Detail ID at each member

Span	Precut No.	Top Chord			Bottom Chord			Diagonal			Top Lateral Bracing			Bottom Lateral Bracing		
		Member ID	Precut Detail ID	Timing Restriction	Member ID	Precut Detail ID	Timing Restriction	Member ID	Precut Detail ID	Timing Restriction	Member ID	Precut Detail ID	Timing Restriction	Member ID	Precut Detail ID	Timing Restriction
7	1	U3-U4	1	A	L3-L4	1	A	U3-L4	2	A	U3-U4	3	Z	L3-L4	4	Z
7	2	U6-U7	1	A	L6-L7	1	A	L6-U7	1	A	U6-U7	3	Z	L6-L7	4	Z
7	3	U9-U10	1	A	L9-L10	1	A	U9-L10	2	A	U9-U10	3	Z	L9-L10	4	Z
8	4	U12-U13	1	A	L12-L13	1	A	L12-U13	2	A	U12-U13	3	Z	L12-L13	4	Z
8	5	U14-U15	1	A	L14-L15	1	A	L14-U15	2	A	U14-U15	3	Z	L14-L15	4	Z
8	6	U17-U18	1	A	L17-L18	1	A	U17-L18	2	A	U17-U18	3	Z	L17-L18	4	Z
8	7	U20-U21	1	A	L20-L21	1	A	L20-U21	1	A	U20-U21	3	Z	L20-L21	4	Z
8	8	U23-U24	1	A	L23-L24	1	A	U23-L24	2	A	U23-U24	3	Z	L23-L24	4	Z
9	9	U10-U9	1	A	L10-L9	1	A	L10-U9	2	A	U10-U9	3	Z	L10-L9	4	Z
9	10	U7-U6	1	A	L7-L6	1	A	U7-L6	1	A	U7-U6	3	Z	L7-L6	4	Z
9	11	U4-U3	1	A	L4-L3	1	A	L4-U3	2	A	U4-U3	3	Z	L4-L3	4	Z
9	12	U2-U1'	1	A	L2-L1'	1	A	L2-U1	1	A	U2-U1'	3	Z	L2-L1'	4	Z

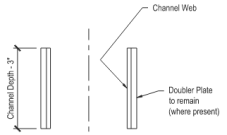
TABLE



PLAN VIEW



SECTION 1 SIDE VIEW



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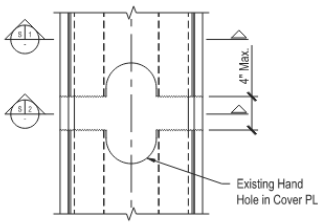
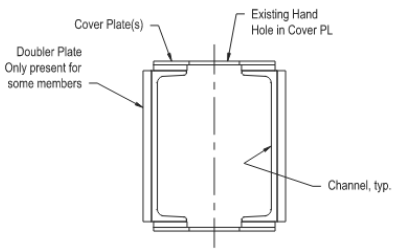
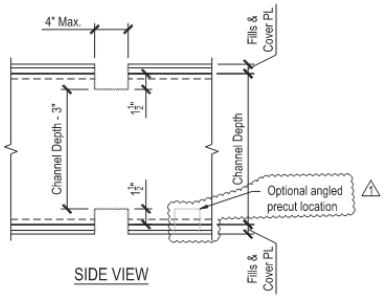


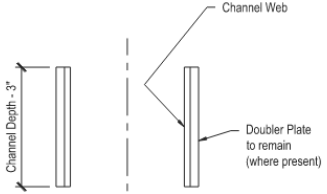
PLAN VIEW



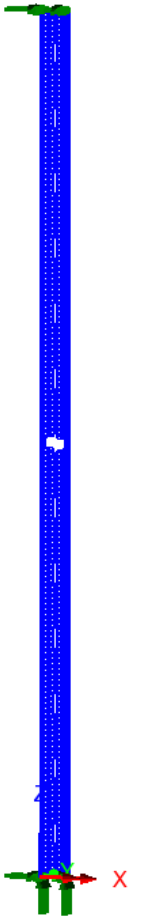
SECTION 1

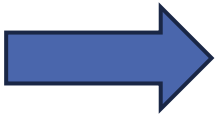


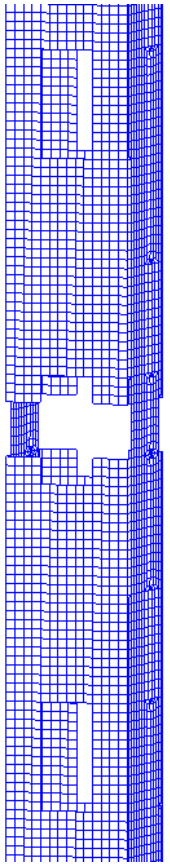
SIDE VIEW



SECTION 2

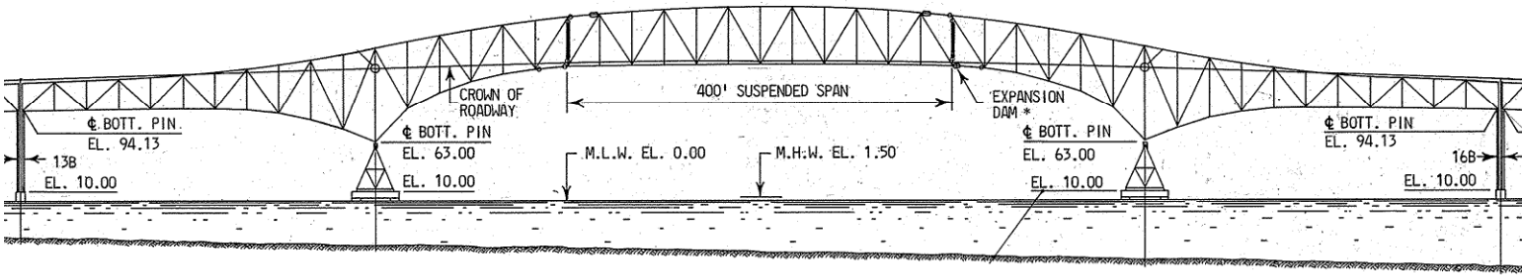


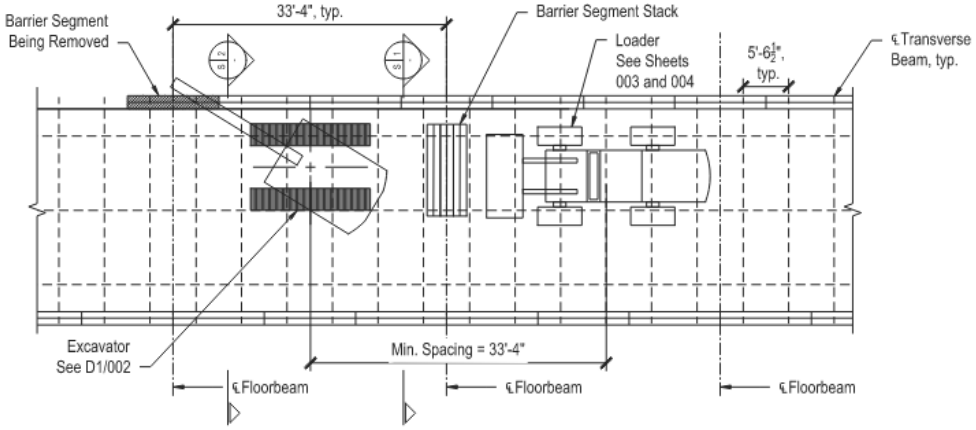




Main Span and Anchor Span Removal:

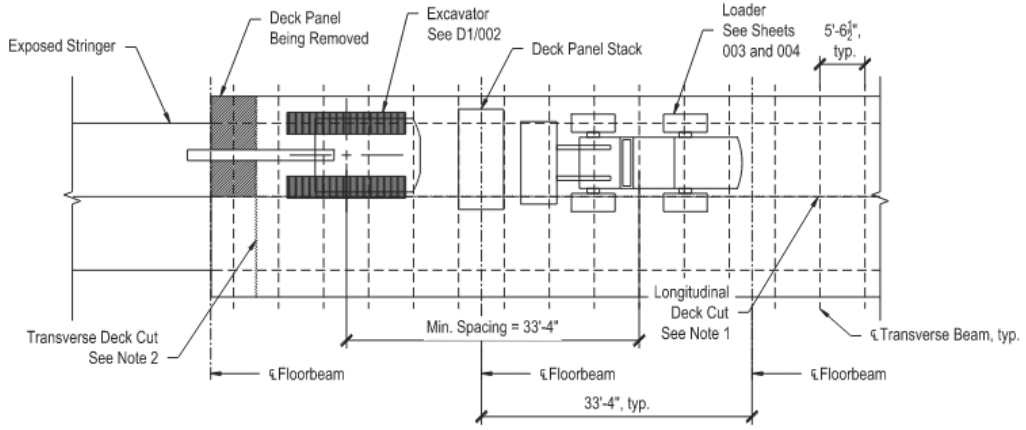
Deck and Steel Removal





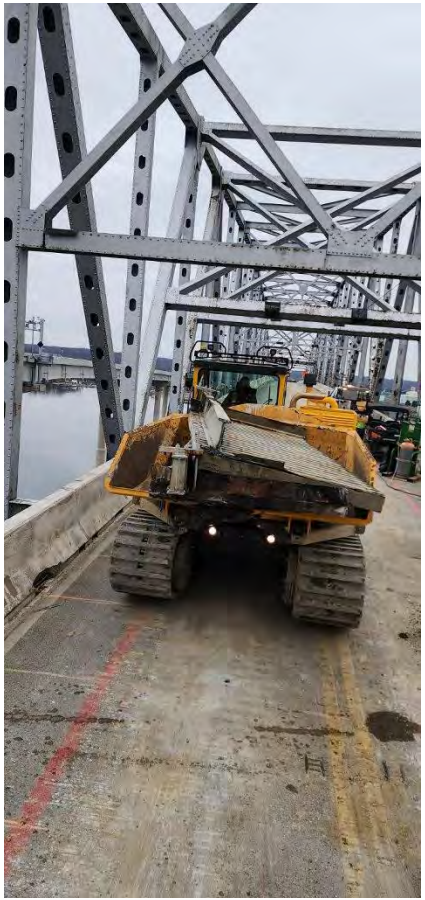
P 1

BARRIER REMOVAL PLAN



P 2

DECK REMOVAL PLAN

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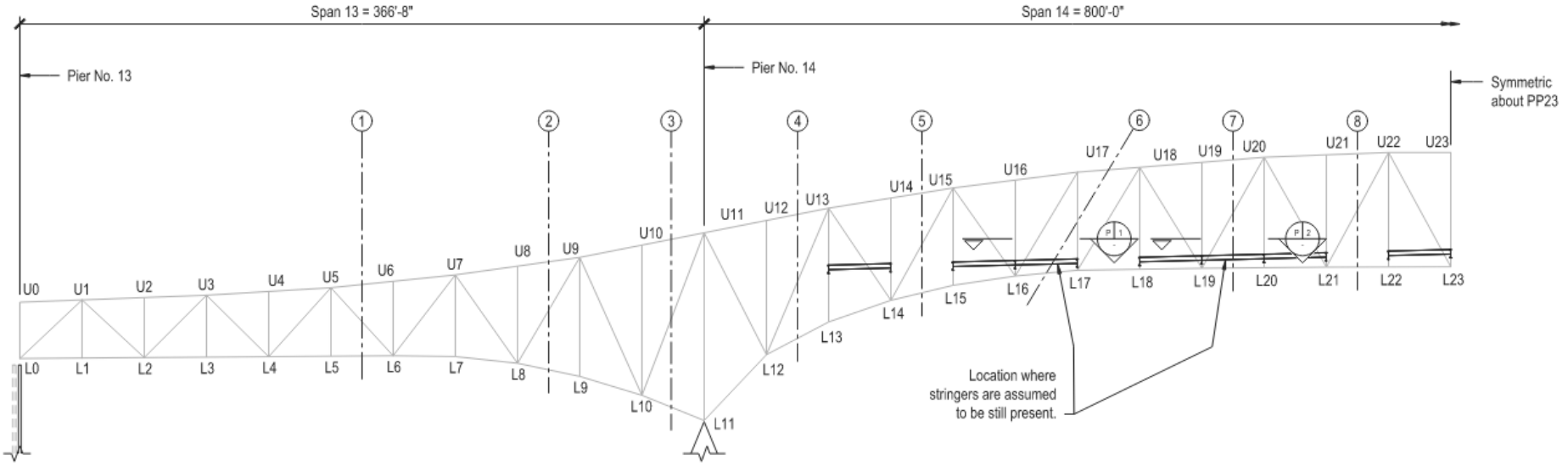
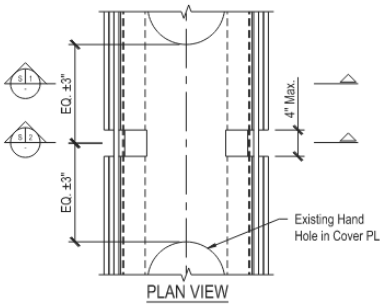
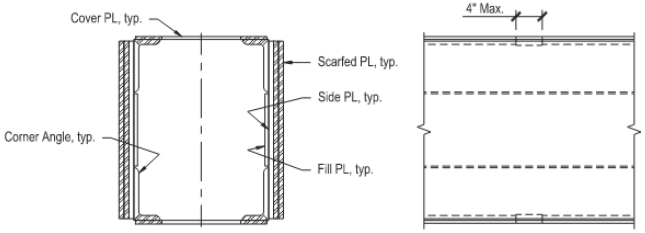


ELEVATION

Contractor to confirm locations of remaining stringers prior to explosive demolition.

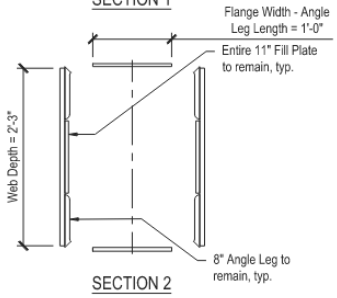


PLAN VIEW

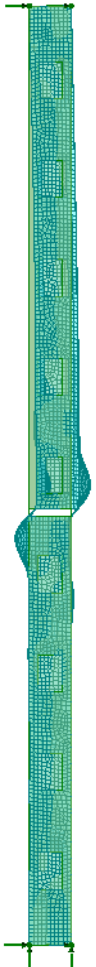


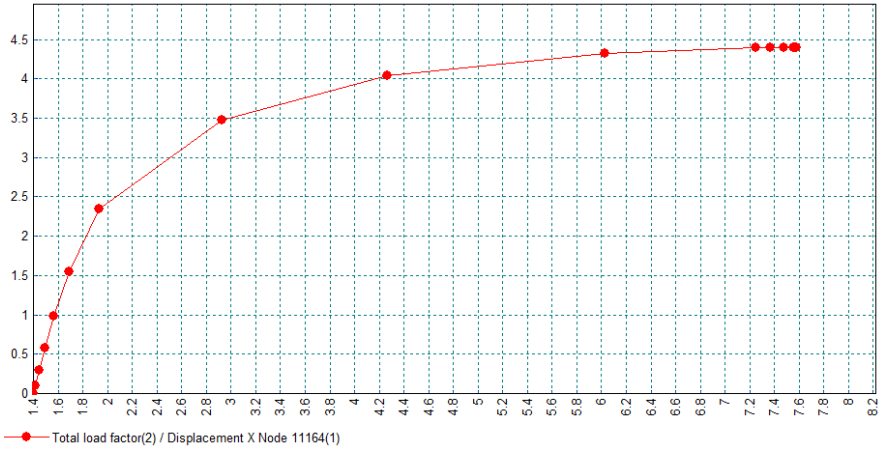
SECTION 1

SIDE VIEW



SECTION 2





LUSAS
Engineering analysis and design software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Presentation Recap

- Key Takeaways:
  - The engineering analysis worked hand and hand with the demolition team to create environmental friendly and cost efficient ways to remove the structure. We had several revisions and modifications as the project developed and contribute that to the success of the project.
  - You can’t always predict how the older structures react, we were amazed at how the steel portals stayed standing after the blast.

Questions?