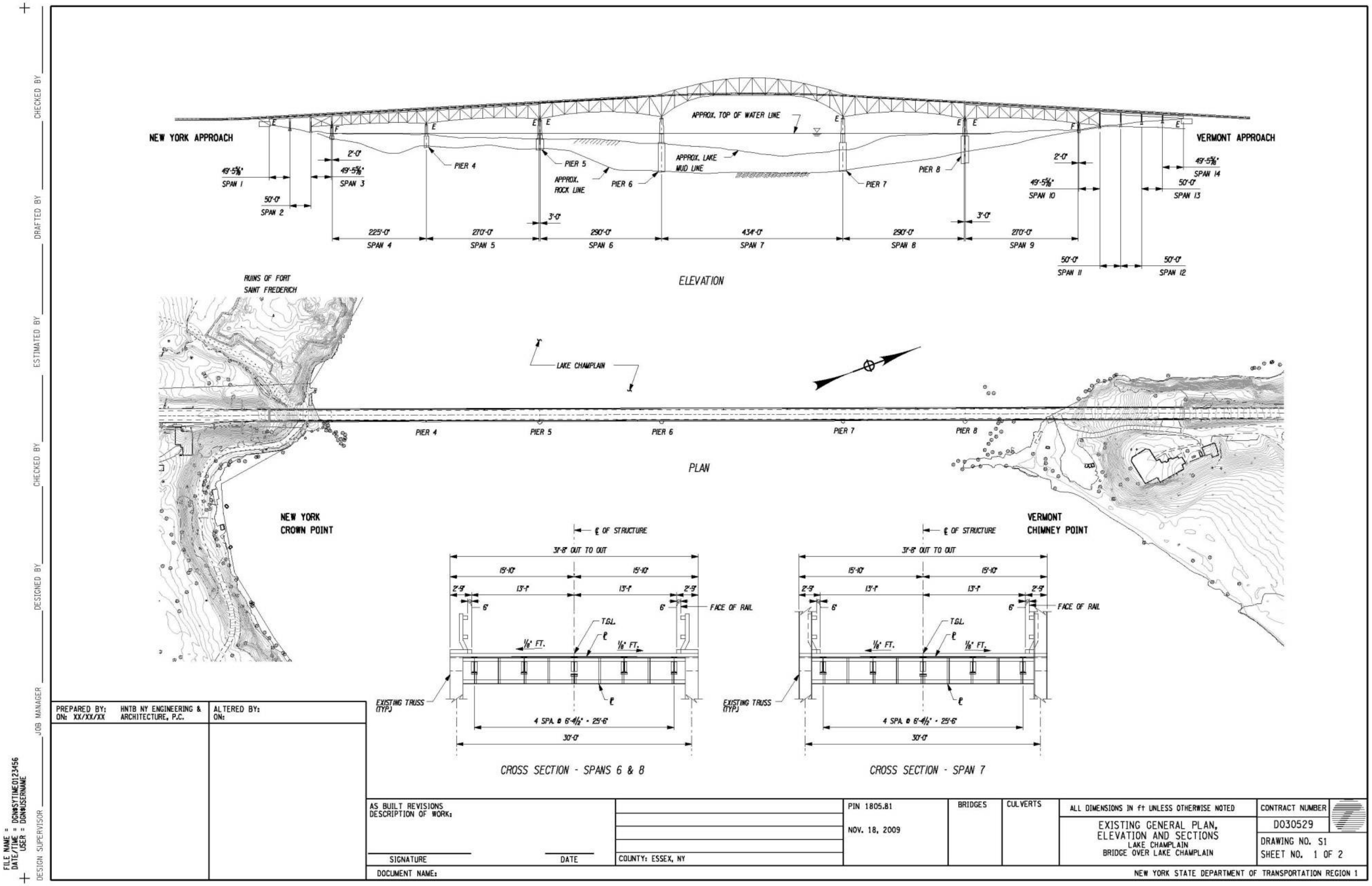
CROWN POINT BRIDGE
Old & New

Richard Marchione, PE
NYSDOT, Office of Structures

Northeast States Materials Engineers Association (NESMEA) Annual Meeting

October 5, 2010



NEW YORK APPROACH
VERMONT APPROACH
APPROX. TOP OF WATER LINE
APPROX. LAKE MUD LINE
APPROX. ROCK LINE
PIER 4
PIER 5
PIER 6
PIER 7
PIER 8
49'-5⅝" SPAN 1
50'-0" SPAN 2
49'-5⅝" SPAN 3
2'-0"
225'-0" SPAN 4
270'-0" SPAN 5
3'-0"
290'-0" SPAN 6
434'-0" SPAN 7
290'-0" SPAN 8
270'-0" SPAN 9
49'-5⅝" SPAN 10
50'-0" SPAN 11
50'-0" SPAN 12
50'-0" SPAN 13
49'-5⅝" SPAN 14
ELEVATION
RUINS OF FORT SAINT FREDERICH
LAKE CHAMPLAIN
PLAN
NEW YORK CROWN POINT
VERMONT CHIMNEY POINT
℄ OF STRUCTURE
31'-8" OUT TO OUT
15'-10"
13'-1"
2'-9"
6"
FACE OF RAIL
T.G.L.
⅛" FT.
EXISTING TRUSS (TYP.)
4 SPA. @ 6'-4½" = 25'-6"
30'-0"
CROSS SECTION - SPANS 6 & 8
CROSS SECTION - SPAN 7
CHECKED BY
DRAFTED BY
ESTIMATED BY
DESIGNED BY
JOB MANAGER
DESIGN SUPERVISOR
FILE NAME = DGN$SYTIME0123456
DATE/TIME = DGN$USERNAME
USER =
PREPARED BY: HNTB NY ENGINEERING & ARCHITECTURE, P.C.
ON: XX/XX/XX
ALTERED BY:
ON:
AS BUILT REVISIONS
DESCRIPTION OF WORK:
SIGNATURE
DATE
DOCUMENT NAME:
COUNTY: ESSEX, NY
PIN 1805.81
NOV. 18, 2009
BRIDGES
CULVERTS
ALL DIMENSIONS IN ft UNLESS OTHERWISE NOTED
EXISTING GENERAL PLAN, ELEVATION AND SECTIONS
LAKE CHAMPLAIN
BRIDGE OVER LAKE CHAMPLAIN
CONTRACT NUMBER
D030529
DRAWING NO. S1
SHEET NO. 1 OF 2
NEW YORK STATE DEPARTMENT OF TRANSPORTATION REGION 1

Pier 8


2009/ 4/30


10/02/2009


07/17/2009


08/20/2009

Bridge Closed

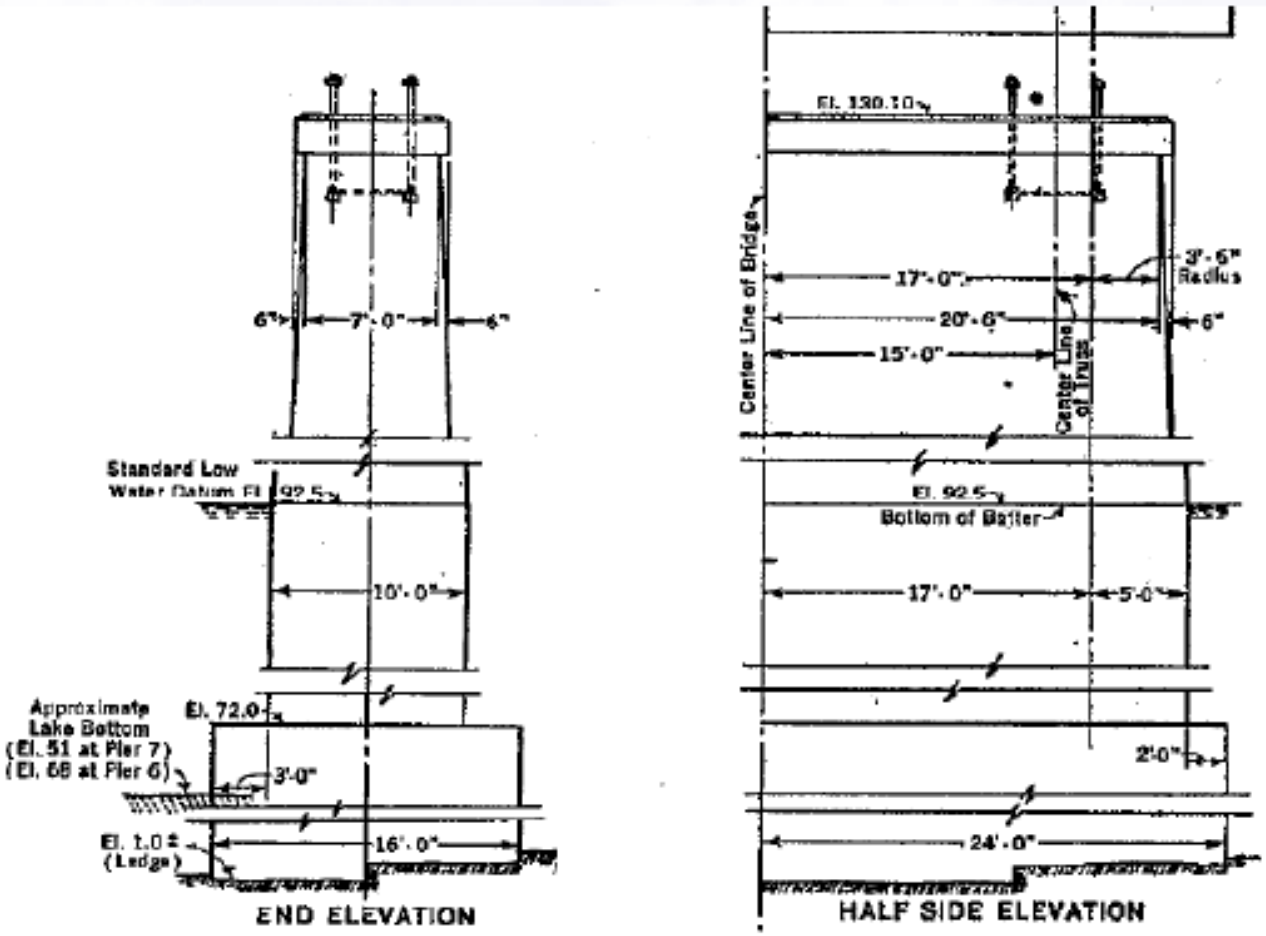
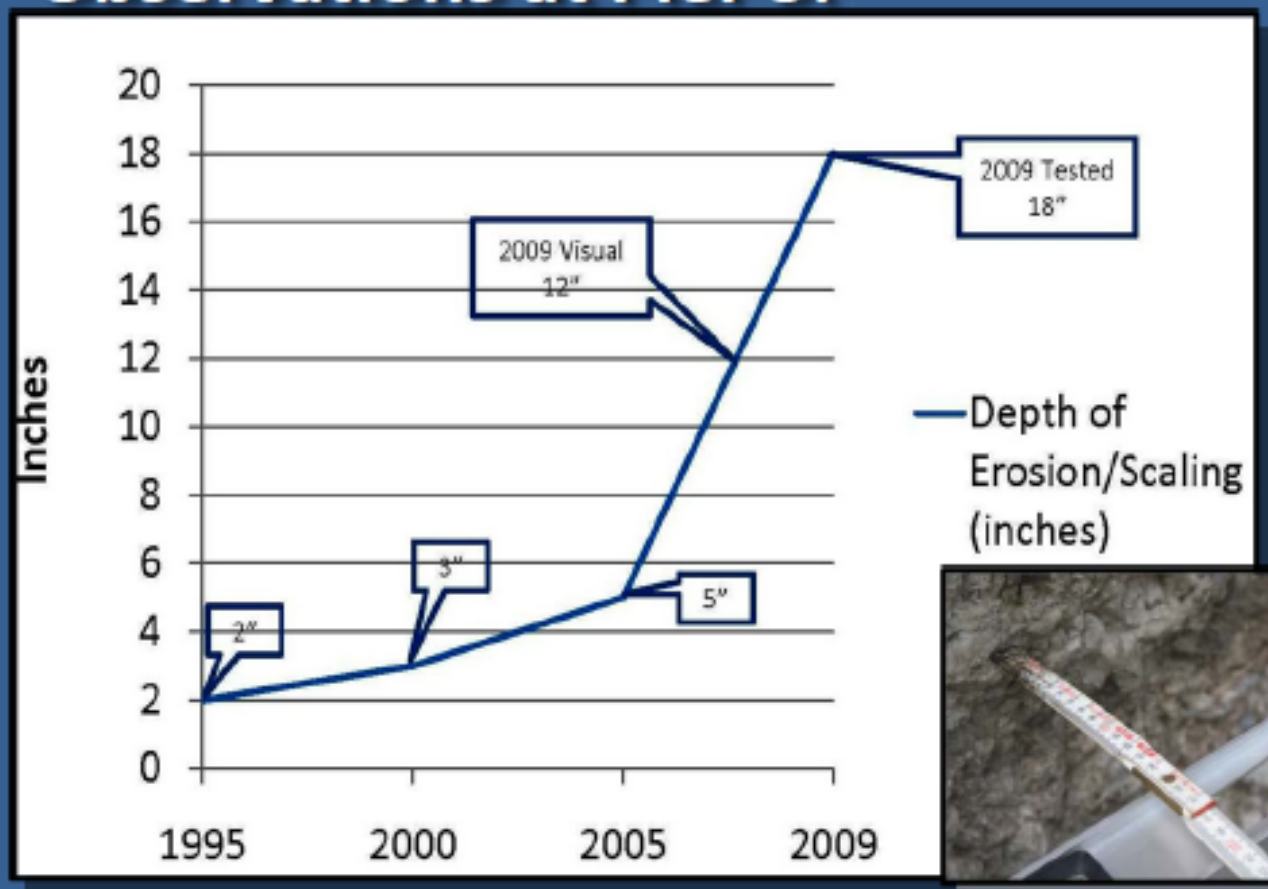


FIG. 8.—DIMENSIONS OF CHANNEL PIERS.

Problem: Pier Deterioration

Observations at Pier 5:



Basis for Bridge Closure

- Weakened structural system
- Recent pier deterioration rapid & significant
- Abrupt failure of unreinforced concrete possible
- Frozen bearings inflexible in cold temperatures
- Freeze/thaw increases damage & risk
- Unacceptable risk to the public

Demolition

Design/Construction Schedule

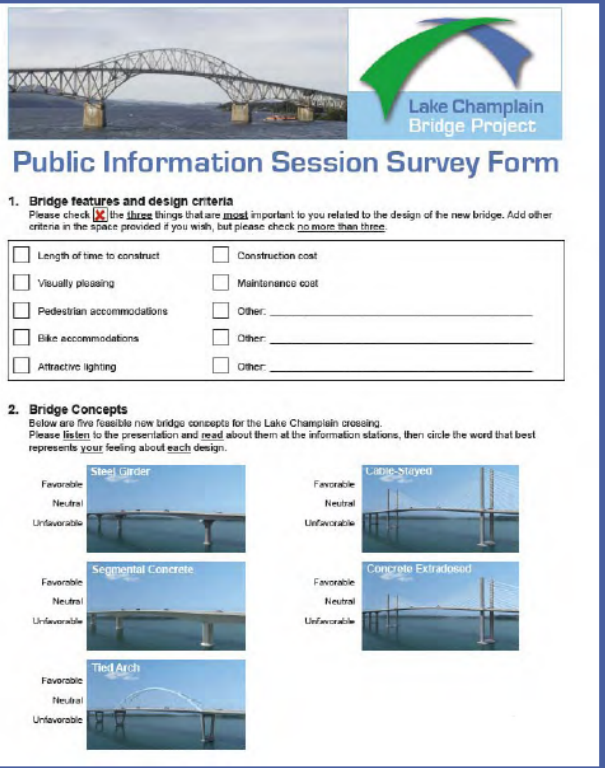
- October 16, 2009: Bridge Closed
- December 28, 2009: Bridge Demolished
- February 5, 2010: FHWA granted Design Approval
- March 17, 2010: Project Advertised
- April 15, 2010: Project Letting
- May 27, 2010: Project Awarded Flatiron Construction Corp.
- December 31, 2011: Project Completion Date

Public Input

Lake Champlain Bridge Project

Summary

- Survey
  - Bridge Features
  - Bridge Concepts



Lake Champlain Bridge Project

Public Information Session Survey Form

1. **Bridge features and design criteria**
Please check ☒ the three things that are most important to you related to the design of the new bridge. Add other criteria in the space provided if you wish, but please check no more than three.

☐ Length of time to construct	☐ Construction cost
☐ Visually pleasing	☐ Maintenance cost
☐ Pedestrian accommodations	☐ Other: _____
☐ Bike accommodations	☐ Other: _____
☐ Attractive lighting	☐ Other: _____

2. **Bridge Concepts**
Below are five feasible new bridge concepts for the Lake Champlain crossing.
Please listen to the presentation and read about them at the information stations, then circle the word that best represents your feeling about each design.

Steel Girder — Favorable / Neutral / Unfavorable

Cable-Stayed — Favorable / Neutral / Unfavorable

Segmental Concrete — Favorable / Neutral / Unfavorable

Concrete Extradosed — Favorable / Neutral / Unfavorable

Tied Arch — Favorable / Neutral / Unfavorable

Alternates


Segmental Concrete Bridge
HNTB

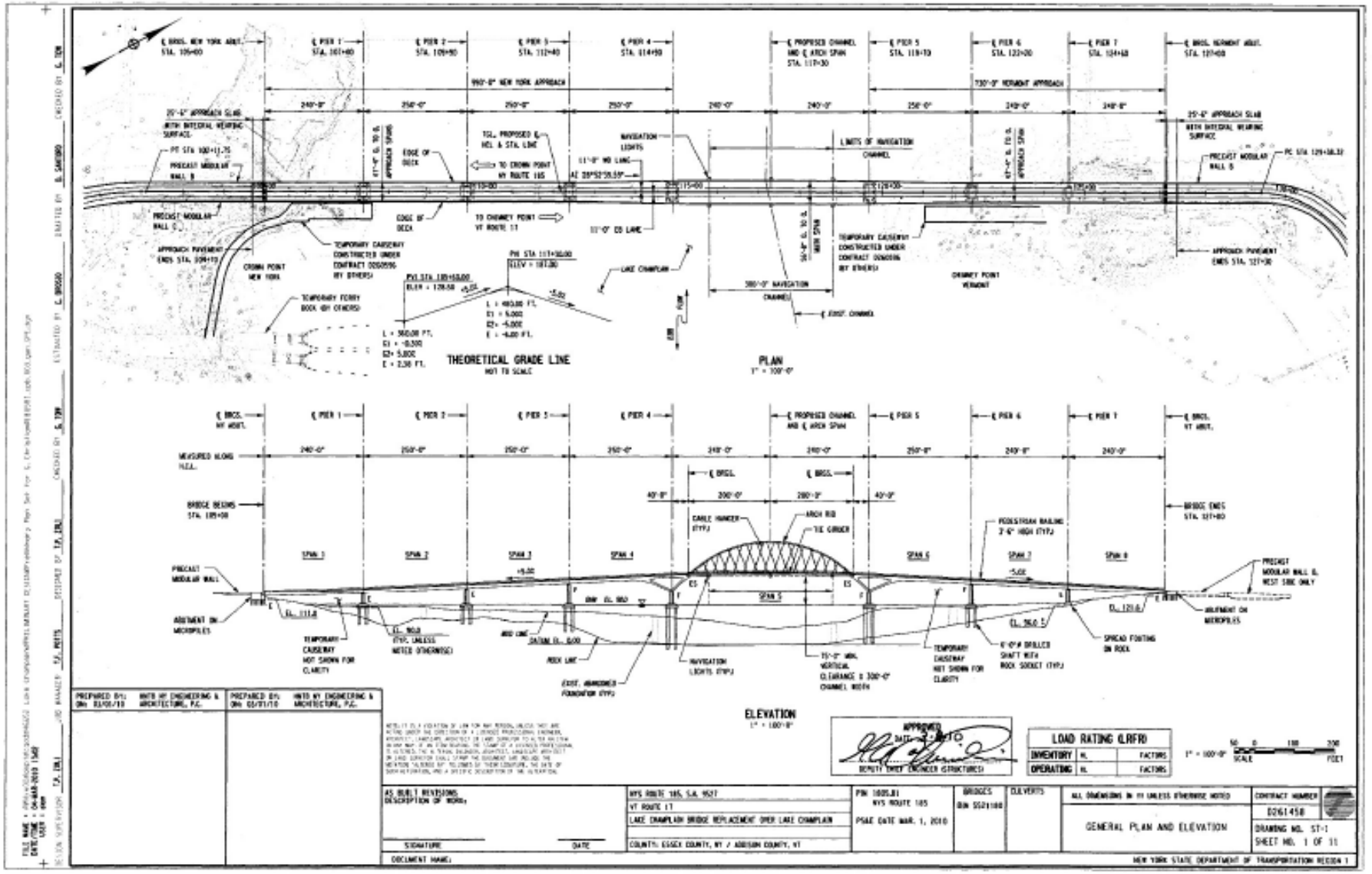

Steel Composite Cable-Stayed Bridge
HNTB


Long-Span Steel Girder Bridge
HNTB


Concrete Extradosed Bridge
HNTB

Network Tied Arch

Old and New


PLAN
1" = 100'-0"
THEORETICAL GRADE LINE
NOT TO SCALE
ELEVATION
1" = 100'-0"
LOAD RATING (LRFD)
INVENTORY
OPERATING
FACTORS
GENERAL PLAN AND ELEVATION
CONTRACT NUMBER
D261458
DRAWING NO. ST-1
SHEET NO. 1 OF 11
NEW YORK STATE DEPARTMENT OF TRANSPORTATION REGION 1

Bridge Statistics

	Old	New
Year Built	1928-29	2010-11
Length	2187’	2200’
Maximum Span	434’	480’
Number Spans	14	8
Cost	$1,149,032.63	$69,613,967.60

Design

	Old	New
AASHTO	Working Stress	LRFD
Design Live Load	H15 [15 tons]	HL 93 [36 tons + lane load]
Roadway Width	24’	32’
Vertical Clearance	95’ / 14’	75’ / 16’ -6”
Sidewalks	none	2 @ 5’

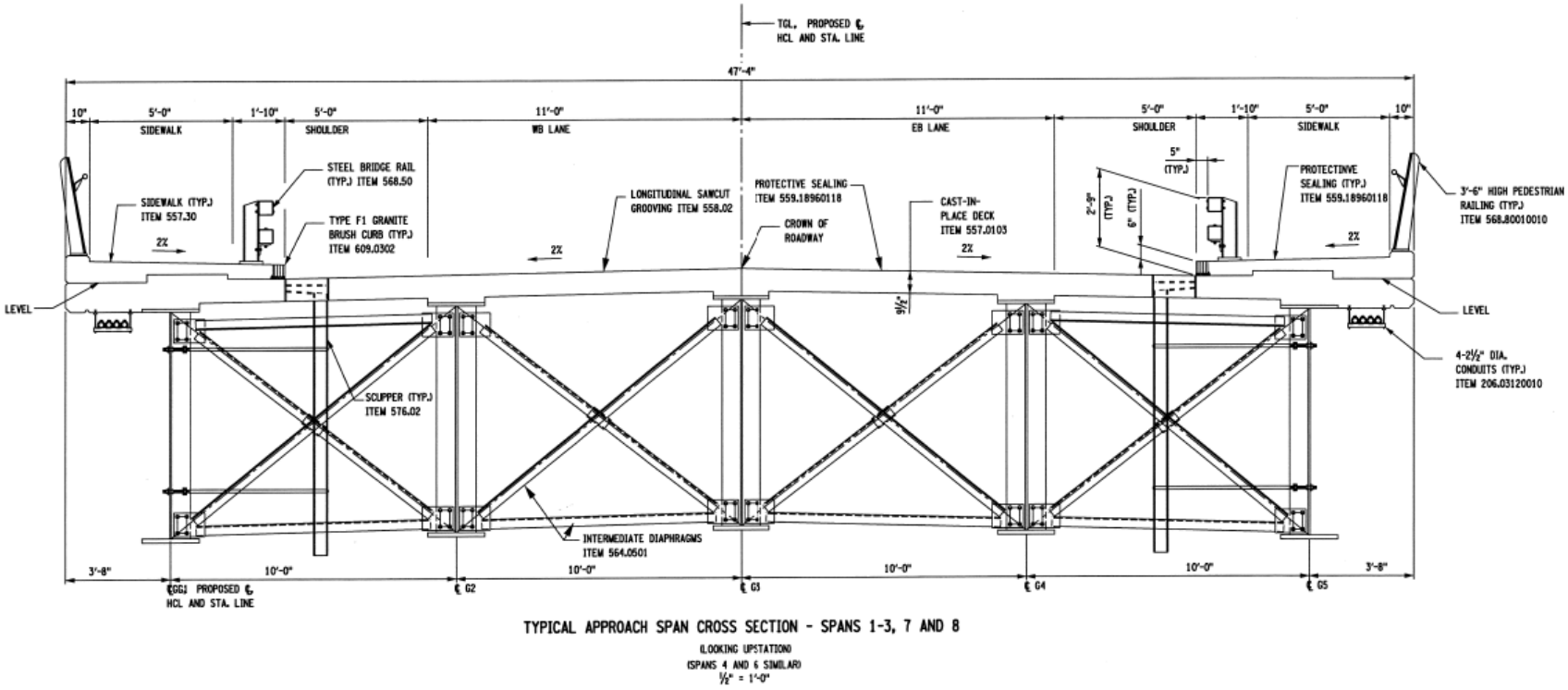
Materials

	Old	New
Structural Steel	A7, Fy = 32 ksi	A709, Fy = 50 ksi, 70 ksi
Concrete	3,000 psi	3,000 psi 5,000 psi [shafts] 5,000 psi [p/c deck]
Reinforcing Steel	Fy = 32 ksi	Fy = 60 ksi

Materials

	Old	New
Connections	Rivets	Bolts, Welds
Bearings	Roller	Disc
Protective Coating	Paint	Metalizing
Pier Protection	Concrete	Granite
Foundation	Spread Footings on Rock	Abut: Micro-piles Piers: 6’ Ø Drilled Shafts

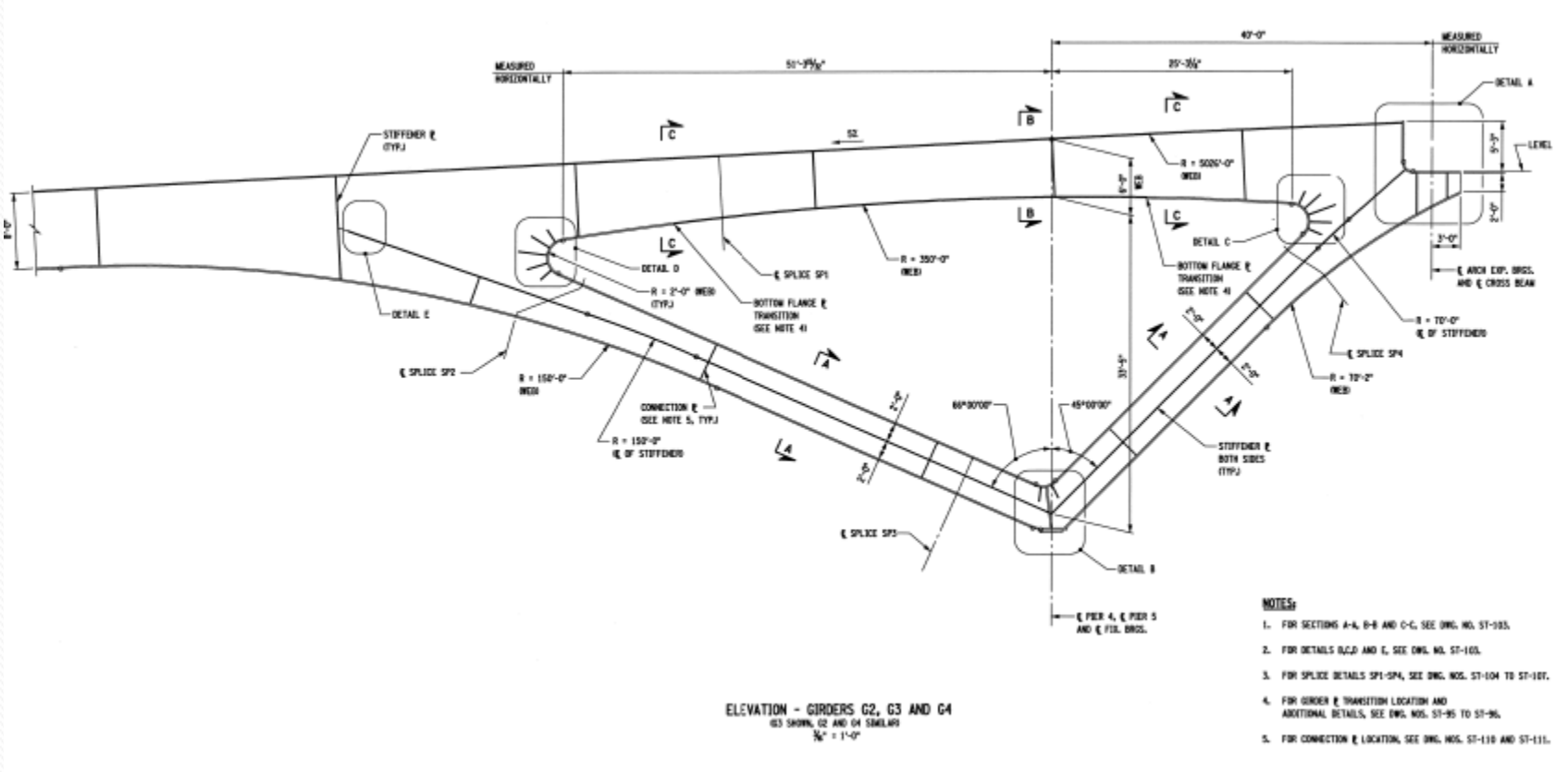
Typical Approach Section

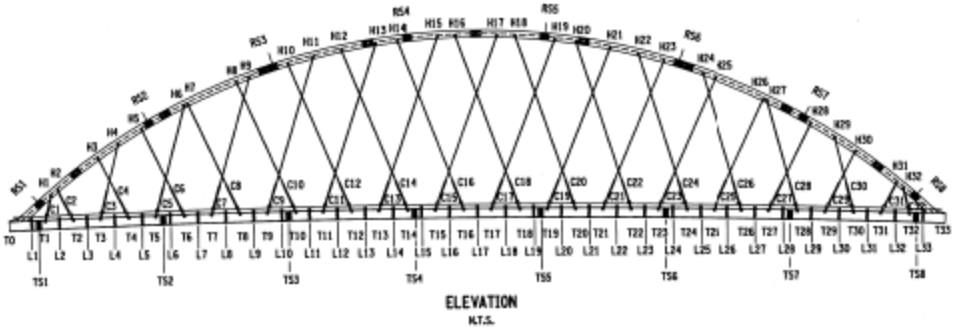


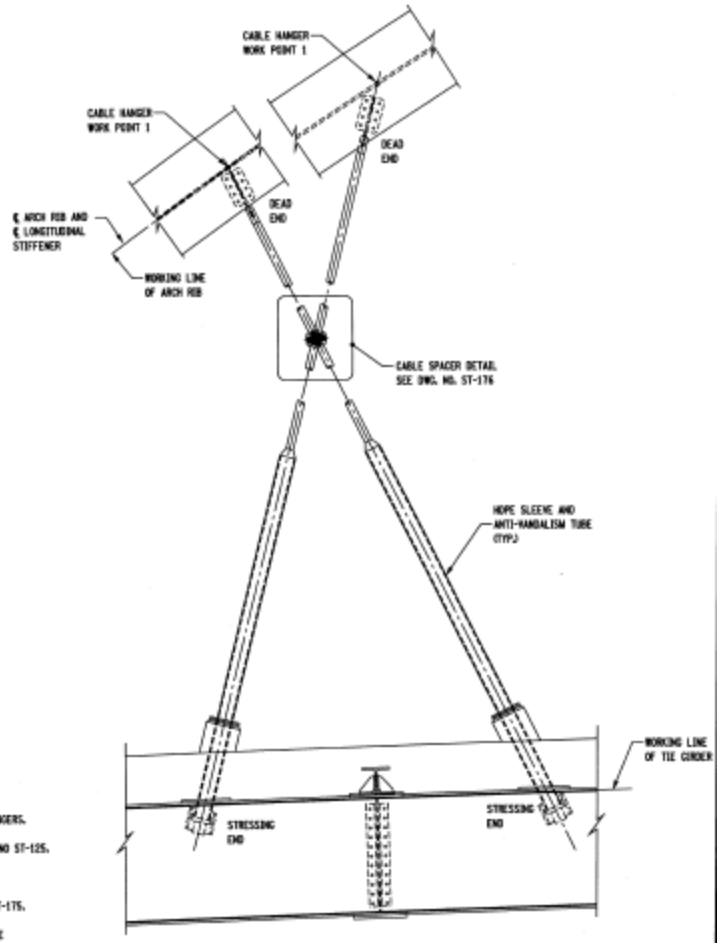
TYPICAL APPROACH SPAN CROSS SECTION - SPANS 1-3, 7 AND 8

(LOOKING UPSTATION)
(SPANS 4 AND 6 SIMILAR)
½" = 1'-0"

Delta Frame


MEASURED HORIZONTALLY
STIFFENER ℄ (TYP.)
DETAIL E
℄ SPLICE SP2
R = 150'-0" (NEB)
CONNECTION ℄ (SEE NOTE 5, TYP.)
R = 150'-0" ℄ OF STIFFENERS
DETAIL D
R = 2'-0" (NEB) (TYP.)
℄ SPLICE SP1
BOTTOM FLANGE ℄ TRANSITION (SEE NOTE 4)
R = 350'-0" (NEB)
℄ SPLICE SP3
DETAIL B
℄ PIER 4, ℄ PIER 5 AND ℄ FIX. BRGS.
R = 5020'-0" (NEB)
DETAIL C
BOTTOM FLANGE ℄ TRANSITION (SEE NOTE 4)
STIFFENER ℄ BOTH SIDES (TYP.)
DETAIL A
R = 70'-0" ℄ OF STIFFENERS
℄ SPLICE SP4
R = 70'-2" (NEB)
℄ ARCH EXP. BRGS. AND ℄ CROSS BEAM
LEVEL
66°30'00"
45°00'00"
ELEVATION - GIRDERS G2, G3 AND G4
G3 SHOWN, G2 AND G4 SIMILAR
NOTES:
1. FOR SECTIONS A-A, B-B AND C-C, SEE DWG. NO. ST-103.
2. FOR DETAILS D,C,D AND E, SEE DWG. NO. ST-103.
3. FOR SPLICE DETAILS SP1-SP4, SEE DWG. NOS. ST-104 TO ST-107.
4. FOR GIRDER ℄ TRANSITION LOCATION AND ADDITIONAL DETAILS, SEE DWG. NOS. ST-95 TO ST-96.
5. FOR CONNECTION ℄ LOCATION, SEE DWG. NOS. ST-110 AND ST-111.





CABLE HANGER FORCE SCHEDULE

HANGER	NO OF STRANDS, SIZE OF STRANDS	STEEL GRADE	STEEL AREA (IN2)	HDPE PIPE DIA.	MIDPOINT SAG	DEAD LOAD		D.L.+I+PL+BR		WS	
						DL W/O FWS (KIPS)	FWS (KIPS)	MAX (KIPS)	MIN. (KIPS)	MAX (KIPS)	MIN. (KIPS)
C1, C32	7 x 0.525 IN. DIA	270	1.52								
C2, C31	7 x 0.525 IN. DIA	270	1.52								
C3, C30	7 x 0.525 IN. DIA	270	1.52								
C4, C29	7 x 0.525 IN. DIA	270	1.52								
C5, C28	7 x 0.525 IN. DIA	270	1.52								
C6, C27	7 x 0.525 IN. DIA	270	1.52								
C7, C26	7 x 0.525 IN. DIA	270	1.52								
C8, C25	7 x 0.525 IN. DIA	270	1.52								
C9, C24	7 x 0.525 IN. DIA	270	1.52								
C10, C23	7 x 0.525 IN. DIA	270	1.52								
C11, C22	7 x 0.525 IN. DIA	270	1.52								
C12, C21	7 x 0.525 IN. DIA	270	1.52								
C13, C20	7 x 0.525 IN. DIA	270	1.52								
C14, C19	7 x 0.525 IN. DIA	270	1.52								
C15, C18	7 x 0.525 IN. DIA	270	1.52								
C16, C17	7 x 0.525 IN. DIA	270	1.52								

NOTES:

1. FORCES SHOWN APPLY TO BOTH EASTBOUND AND WESTBOUND CABLE HANGERS.
2. FOR CABLE HANGER WORK POINTS, SEE TIED ARCH GEOMETRY ON DWG. NO ST-125.
3. FOR CABLE HANGER DETAILS, SEE DWG. NO. ST-170.
4. FOR CABLE HANGER ANCHORAGE DETAILS, SEE DWG. NOS. ST-171 TO ST-175.
5. UPPER GUIDE PIPES TO BE PAINTED XXXXX. LOWER GUIDE PIPES TO BE PAINTED XXXX.

PREPARED BY: HNTB NY ENGINEERING & ARCHITECTURE, P.C. ON: 05/01/10

PREPARED BY: HNTB NY ENGINEERING & ARCHITECTURE, P.C. ON: 03/01/10

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AS BUILT REVISIONS
DESCRIPTION OF WORK:

SIGNATURE _____ DATE _____

DOCUMENT NAME:

NYS ROUTE 185, SJA. 9627
W ROUTE 17
LAKE CHAMPLAIN BRIDGE REPLACEMENT OVER LAKE CHAMPLAIN
COUNTY: ESSEX COUNTY, NY / ADDISON COUNTY, VT

PIN 1805.81
NYS ROUTE 185
PS&E DATE MAR. 1, 2000

BRIDGES
BIN 5521180

CULVERTS

ALL DIMENSIONS IN FT UNLESS OTHERWISE NOTED

CABLE HANGER
GENERAL ELEVATION CABLE FORCES

CONTRACT NUMBER
D261458

DRAWING NO. ST-169
SHEET NO. 264 OF 384

NEW YORK STATE DEPARTMENT OF TRANSPORTATION REGION 1

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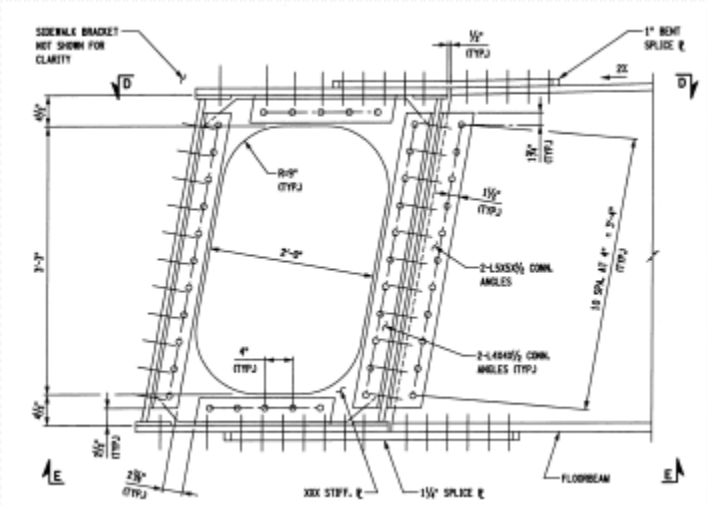
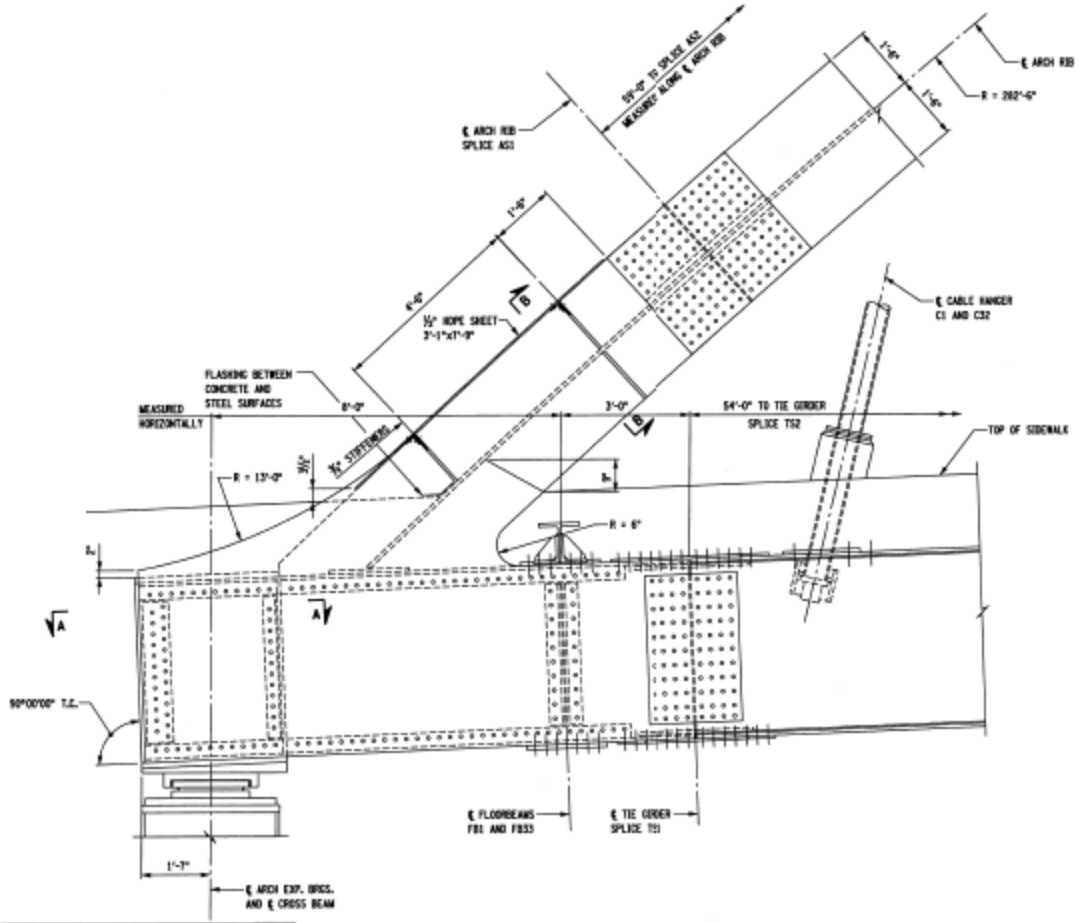
DATE/TIME = 03-MAR-2010 13:08
USER = mcm

DESIGN SUPERVISOR T.P. ZOLI | JOB MANAGER T.G. POTTS | DESIGNED BY J. MCM | CHECKED BY R. ROCKWOOD | ESTIMATED BY C. BROOKS | DRAFTED BY S. LAM | CHECKED BY G. TEW

Tie Girder

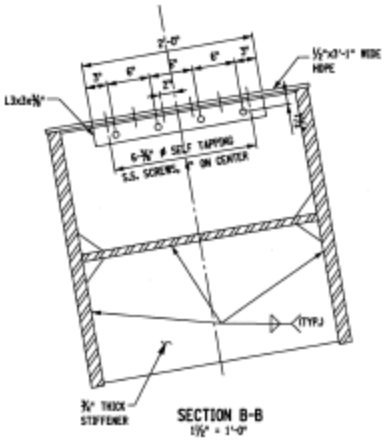

SIDEWALK BRACKET NOT SHOWN FOR CLARITY
1" BENT SPLICE ℄
FLOORBEAM
XXX STIFF. ℄
1½" SPLICE ℄



ELEVATION

(GIRDERS G1 AND G5 NOT SHOWN FOR CLARITY)

½" = 1'-0"



SECTION B-B

1½" = 1'-0"

NOTES:

1. FOR SECTION A-A, SEE DWG. NO. ST-135.
2. FOR TIE GIRDER GEOMETRY, SEE DWG. NO. ST-165.
3. FOR ARCH RIB SPLICE DETAILS, SEE DWG. NOS. ST-146 AND ST-147.
4. FOR TIE GIRDER SPLICE DETAILS, SEE DWG. NO. ST-167.
5. FOR CROSS BEAM DETAILS, SEE DWG. NO. ST-109.

3/4" = 1'-0" SCALE 1 0 1 2 3 FEET

1 1/2" = 1'-0" SCALE 1 0 1 FEET

PREPARED BY: HNTB NY ENGINEERING & ARCHITECTURE, P.C. ON: 03/01/10	PREPARED BY: HNTB NY ENGINEERING & ARCHITECTURE, P.C. ON: 03/01/10

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AS BUILT REVISIONS
DESCRIPTION OF WORK:

SIGNATURE DATE

DOCUMENT NAME:

NYS ROUTE 185, S.H. 9527
VT ROUTE 17
LAKE CHAMPLAIN BRIDGE REPLACEMENT OVER LAKE CHAMPLAIN
COUNTY: ESSEX COUNTY, NY / ADDISON COUNTY, VT

PIN 1805.81
NYS ROUTE 185
PSAE DATE MAR. 1, 2010

BRIDGES
BIN 5521180

CULVERTS

ALL DIMENSIONS IN ft UNLESS OTHERWISE NOTED

KNUCKLE JOINT
ELEVATION AND SECTION DETAILS

CONTRACT NUMBER
D261458

DRAWING NO. ST-134
SHEET NO. 229 OF 324

NEW YORK STATE DEPARTMENT OF TRANSPORTATION REGION 1

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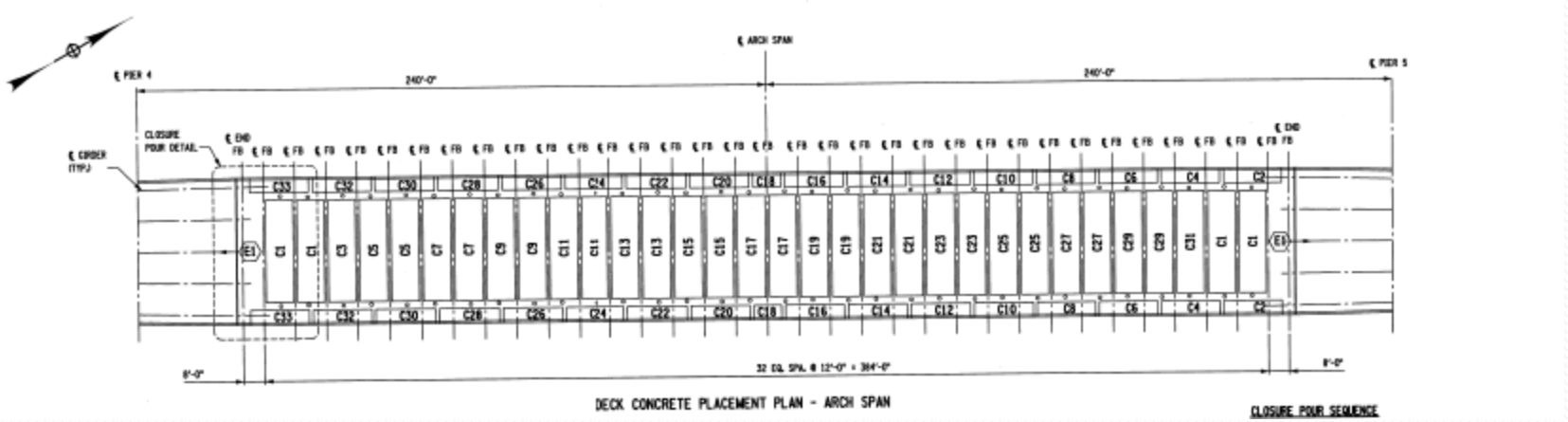
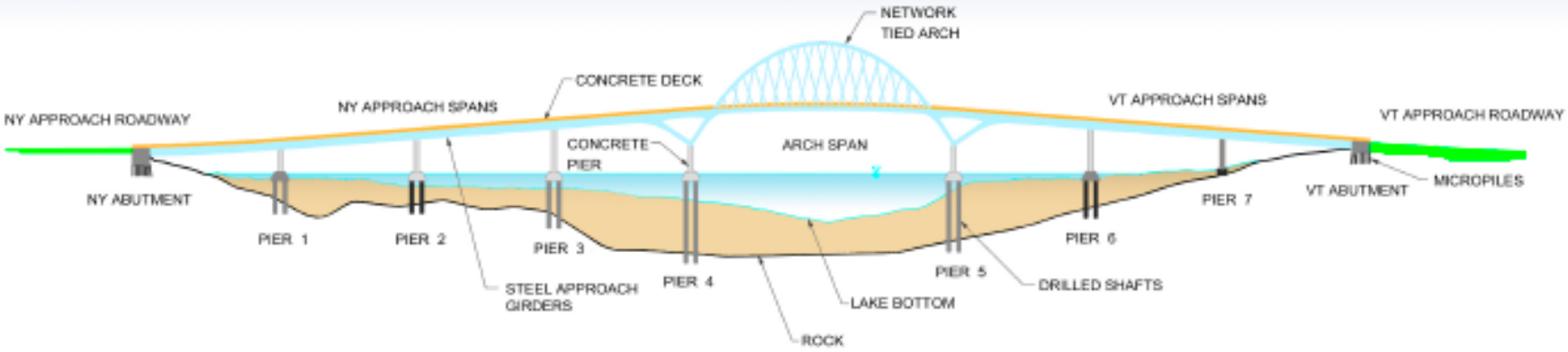
DATE/TIME = 01-MAR-2010 08:37
USER = mm

DESIGN SUPERVISOR T.F. POTTS JOB MANAGER T.F. POTTS DESIGNED BY CHECKED BY ESTIMATED BY G. BROSIO DRAFTED BY CHECKED BY G. TEW

Precast PT Slab, Arch Span



Lake Champlain Bridge - Current Construction Status



LEGEND

FOUNDATIONS
- WORK NOT STARTED
- WORK UNDERWAY
- WORK COMPLETE

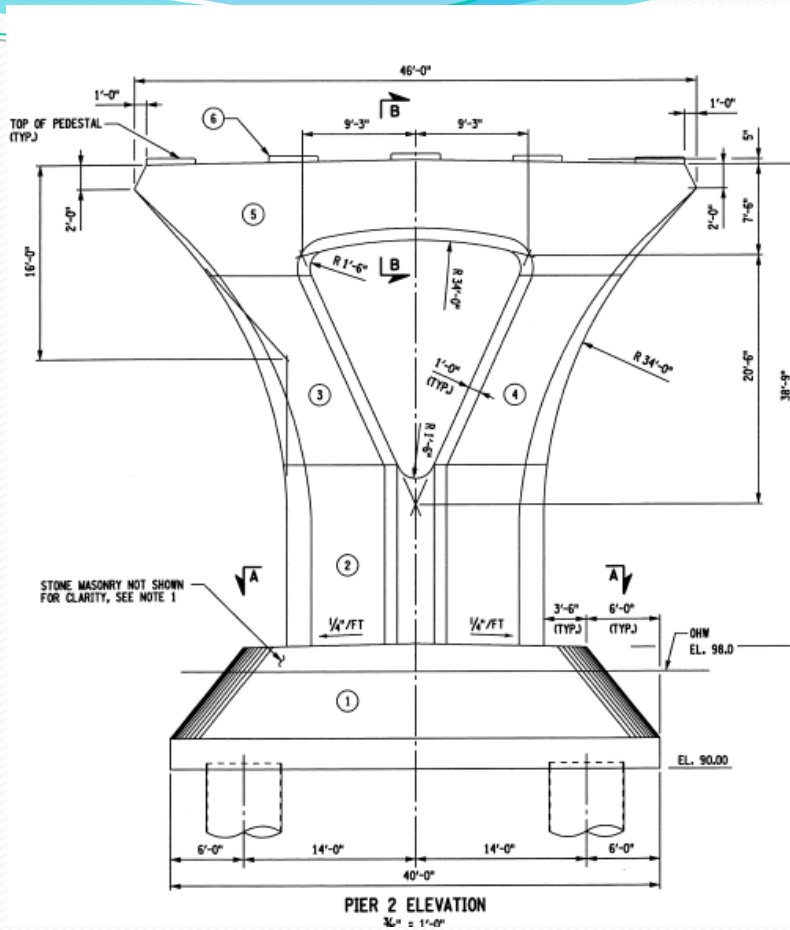
STEEL
- STEEL DETAILING AND FABRICATION ONGOING
- WORK UNDERWAY
- WORK COMPLETE

DECK
- WORK NOT STARTED
- WORK UNDERWAY
- WORK COMPLETE

APPROACH WORK
- WORK UNDERWAY
- WORK COMPLETE

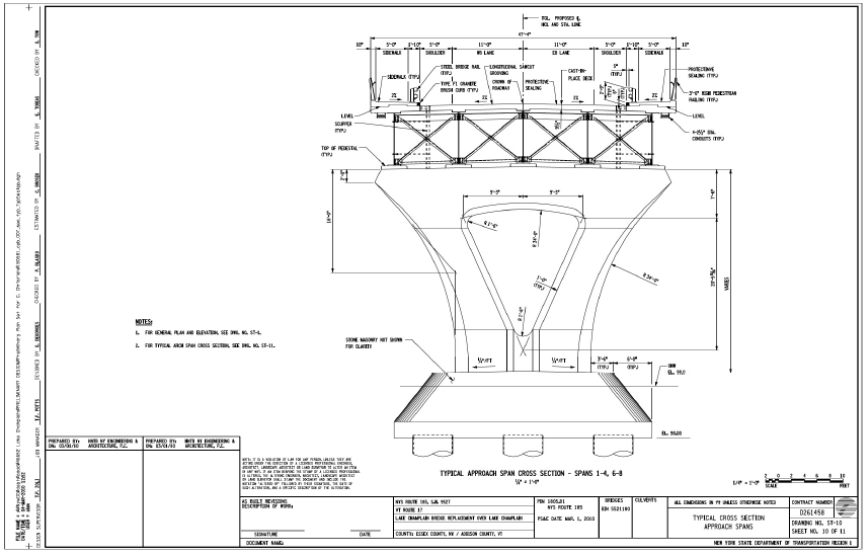
LAST UPDATED
SEP. 24, 2010

Construction



The new bridge will be supported by a total of seven piers. Six of these will be founded on reinforced concrete shafts, 6 feet in diameter, extending up to 100 ft though the lake bottom to anchor into the bedrock. The shafts will be topped with reinforced concrete footings up to 10 feet thick, which will in turn support the piers. The sides of the footings are sloped and they will also be clad in granite masonry, which will help protect them from ice damage and complement the historical significance of the region. On the Vermont side of the lake, the depth to bedrock is shallow enough that one of the piers will be founded directly on the rock.

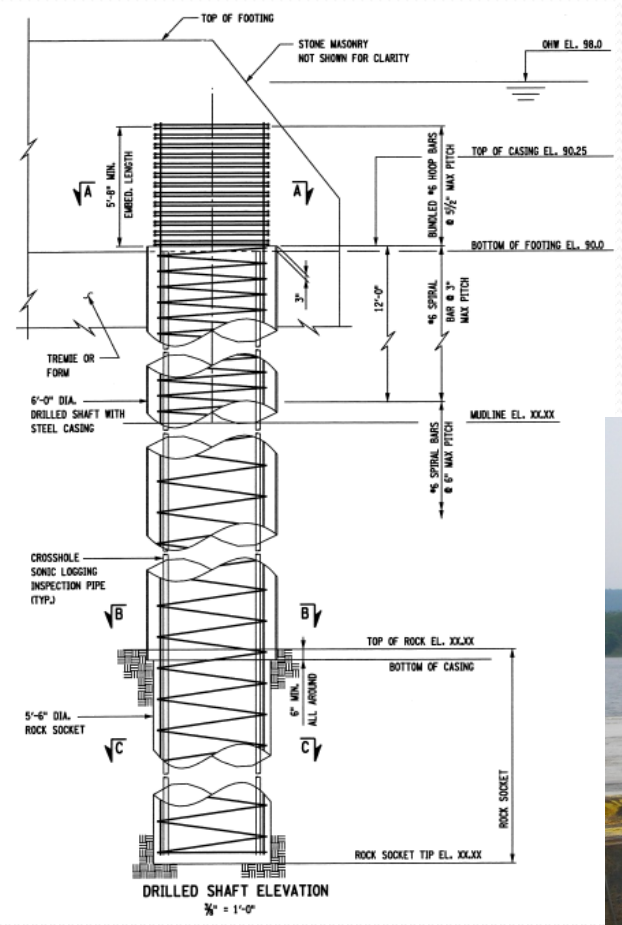
Foundations: Summer - Fall 2010



New York Abutment

Vermont Abutment

Drilled Shaft Design



Pier Foundations


CAT
320C


WIRTH
933

Winter & Summer 2010-2011

The approaches, which include the sidewalks and road leading to the bridge, will be constructed throughout the duration of the project. Once completed, the new bridge will be opened to traffic and the causeways and temporary ferry slips removed.

The inclusion of sidewalks and bicycle accommodations on the bridge, in addition to the selection of this specific bridge design, came about through consultation and collaboration with the people of the region who have a strong understanding of the significance of this crossing.

The New York Approach roadway will remain on the same alignment to avoid impact to the historic Fort St. Frederic and former Champlain Bridge Toll Keeper's House.

In Vermont, the roadway will be shifted approximately 7 feet to the north of the existing alignment, smoothing the approach roadway curve and minimizing impacts to the Chimney Point State Historic Site.

Approaches: On-going throughout construction

The roadway over the approach spans will be supported by a superstructure comprising 5 lines of I-shaped steel girders, with a height of just over 8 feet.

The steel used for the superstructure is a special type of steel known as weathering steel, which is designed to form a thin coat of protective rust. In addition, the steel will be further protected by a process called metalizing which will be used instead of paint.

The result will be a low maintenance structure designed with high durability. Once the superstructure steel has been erected, the concrete deck will be cast and the sidewalk and railings installed.

Approach Superstructure: Winter 2010 - Summer 2011

Arch Superstructure: Summer 2011

Questions?