NPS Form 10-900
(Oct. 1990)

United States Department of the Interior
National Park Service

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BY

OMB No. 1024-0018

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials and areas of significance, enter only categories and subcategories listed in the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name: Lake Champlain Bridge

other names/site number:

2. Location

street & number: New York State Rt 903
Vermont State Rt 17 [ ] not for publication

city or town: Crown Point (NY)
Addison (VT) [ ] vicinity

state		code	county	code	zip
New York	NY	Essex	031	12928
Vermont	VT	Addison	001	code 05491

3. State/Federal Agency Certification (Joint NY & VT)

As the designated authority under the National Historic Preservation Act, as amended, I certify that this [x] nomination [ ] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property [x] meets [ ] does not meet the National Register criteria. I recommend that this property be considered significant [x] nationally [ ] statewide [ ] locally. [ ] See continuation sheet for additional comments.

Richard Rippont 9/27/07
Deputy SHPO Date

New York State Office of Parks, Recreation & Historic Preservation
State or Federal agency and bureau

In my opinion, the property [x] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet for additional comments.

Jane Lendway March 3, 2008
SHPO Date

Vermont Division for Historic Preservation
State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that this property is: Signature of the Keeper Date of Action

[ ] entered in the National Register.
[ ] See continuation sheet.

[ ] determined eligible for the National Register.
[ ] See continuation sheet.

[ ] determined not eligible for the National Register.

[ ] removed from the National Register.

ke Champlain Bridge
Name of Property

Essex County, NY/Addison County, Vt
County and State

5. Classification

Ownership of Property
(Check as many boxes as apply)

- [ ] private
- [ ] public-local
- [x] public-State
- [ ] public-Federal

Category of Property
(Check only one box)

- [ ] building(s)
- [ ] district
- [ ] site
- [x] structure
- [ ] object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
1 (toll keeper house)		buildings
		sites
1 (bridge)		structures
5 (light standards)		objects
7		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

TRANSPORTATION/road-related/bridge

Current Functions
(Enter categories from instructions)

TRANSPORTATION/road-related/bridge

7. Description

Architectural Classification
(Enter categories from instructions)

Materials
(Enter categories from instructions)

foundation concrete abutments and piers
walls steel structural elements
roof
other

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

Lake Champlain Bridge
Name of Property

Essex County, NY/Addison County, VT
County and State

Statement of Significance

Applicable National Register Criteria
(Mark 'x" in one or more boxes for the criteria qualifying the property for National Register listing.)

[x] **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

[ ] **B** Property is associated with the lives of persons significant in our past.

[x] **C** Property embodies the distinctive characteristics of a type, period or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

[ ] **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria considerations
(mark "x" in all the boxes that apply.)

Property is:

[ ] **A** owned by a religious institution or used for religious purposes.

[ ] **B** removed from its original location.

[ ] **C** a birthplace or grave.

[ ] **D** a cemetery.

[ ] **E** a reconstructed building, object or structure.

[ ] **F** a commemorative property.

[ ] **G** less than 50 years of age or achieved significance.

Areas of Significance
(Enter categories from instructions)

Transportation
Engineering

Period of Significance
1929 -1957

Significant Dates
1929

Significant Person
(Complete if Criterion B is marked above)
N/A.

Cultural Affiliation
N/A

Architect/Builder
Fay, Spofford & Thorndike
American Bridge Company
Merritt-Chapman Scott Corporation
Barker, Elmer Eugene

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographical References

Bibliography
(cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

- [ ] preliminary determination of individual listing (36 CFR 67) has been requested
- [ ] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey # _____
- [ ] recorded by Historic American Engineering Record # _____

Primary location of additional data

- [x] State Historic Preservation Office
- [x] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [ ] Other

Name of repository:
Vermont Agency of Transportation

Lake Champlain Bridge
Name of Property

Essex County, NY/Addison County, VT
County and State

10. Geographical Data

Acreage of property Approximately 7 acres

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing		Zone	Easting	Northing
1	18	626472	4876932	3	18	626066	4876341
2	18	626157	4876257	4	18	626442	4876952

☐ See continuation sheet

Verbal Boundary Description
See attached Continuation Sheet

Boundary Justification
See attached Continuation Sheet

11. Form Prepared By

name/title Preliminary draft by: Alexis Godat' revisions by Robert McCullough (ed by L. Garofalini, NYSOPRHP)

organization University of Veremont Graduate Program in Historic Preservation date December, 2005; revised 2006/2007

street & number Wheeler House, 133 South Prospect St telephone 802-656-9773

city or town Burlington state VT zip code 05405

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets
Maps

A **USGS map** (7.5 or 15 minute series) indicating the property's location.
A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **black and white photographs** of the property.

Additional items
(Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of the SHPO or FPO.)

name NYS/Department of Transportation – Region 1

street & number 328 State St telephone 518-318-0388

city or town Schenectady state NY zip code 12305

name NYS/Department of Environmental Conservation – Bureau of State Land Management

street & number 625 Broadway telephone 518-402-9428

city or town Albany state NY zip code 12233 4255

name State of Vermont/Agency of Transportation

street & number National Life Building – Drawer 33 telephone 802-828-0762

city or town Montpelier state VT zip code 05633 5001

Narrative Description

The Lake Champlain Bridge is a landmark, fourteen-span, steel truss bridge that extends across an especially scenic and historic reach of Lake Champlain between Crown Point in Essex County, New York, and Chimney Point in Addison County, Vermont. The crossing is slightly more than 2,186 feet long and, with causeway approaches, attains an overall length of nearly 2,900 feet. Designed by the Boston engineering firm Fay, Spofford and Thorndike, and completed in 1929, the bridge is distinguished by its elegant channel approaches and crossing, a three-span continuous Warren truss, 1,014 feet in length. That continuous segment of the bridge is designed with single deck trusses flanking each side of a center channel span, and each deck truss swings gracefully into a through truss above the channel, with its curving upper chords rising to an overall height of more than 132 feet. The first American crossing to employ that inventive design, the Lake Champlain Bridge continues to serve principal east-west routes connecting northern New York, Vermont, New Hampshire, and Maine; the crossing's precise position, though, aligns from southwest to northeast, approximately thirty degrees east of north. The bridge retains an exceptionally high degree of integrity in terms of location, design, setting, materials, workmanship, feeling and association.

Setting. The crossing's location was selected by the Lake Champlain Bridge Commission, a six-member body chartered by separate legislative acts in New York and Vermont and formally established as a joint commission in 1927 Commission members, three each appointed by the governors of the two states, selected a site that offered the best ledge foundation for piers at workable depths. In 1929, New York's highway department constructed a four-mile road segment joining the bridge with Route 22, a principal north-south route at the time, and Vermont constructed a similar highway soon after, linking another principal north-south corridor, Route 7 These routes connect the region with major

cities including Albany and New York City. Affirming the economic value of these converging routes, a toll-keeper's booth initially stood at the New York approach. Tariffs stopped in 1987 but a toll-keeper's house continues to stand at the southeasterly side of the New York approach.

Athough the commission selected the site for practical reasons, the historical importance of the crossing did not escape members' notice. The Vermont approach adjoins Chimney Point State Historic Site, where the French established an early 18th century fort and where National Register-listed Chimney Point Tavern, c. 1785, continues to stand. At the New York approach, on the north side of the bridge is the National Historic Landmark Fort Crown Point (aka, Crown Point State Historic Site/ Crown Point Historic Area/Crown Point Reservation) with ruins of another French battlement, Fort St. Frederic (1734), and a British command post, Fort Amherst, aka 'His Majesty's Fort at Crown Point' or 'His Majesty's Post' (1759). On the south side of the bridge is the Champlain Memorial Lighthouse, an early 20th century structure commemorating the discovery of the lake by Samuel de Champlain in 1609. Also from Crown Point, is the Crown Point Military Road, which once extended southeasterly across Vermont to Charlestown, New Hampshire. All these historic resources are in the immediate viewshed from the bridge

Although the bridge stands in the midst of colonial French, British, and American history, Native American cultures established important ties to this part of Lake Champlain centuries before arrival of Europeans and there are several recorded prehistoric archaeological sites on the Crown Point Reservation and on the Chimney Point Historic Site.

Historic sites on both sides of the lake in the vicinity of Crown Point peninsula in New York and a smaller land-projection on the Vermont shore are included in a proposal for the Crown Point/Chimney Point National Historic Landmark, nearly five miles long (north to south) and three miles wide (east to west). Although it is outside the period of significance

for that landmark designation, the Lake Champlain Bridge traverses this important land and water area.

Nor did commission members overlook the area's stunning scenic qualities in selecting both the bridge site and its design. From the crest of the bridge's channel span, travelers can view the peaks of Vermont's Green Mountains to the east and those of New York's Adirondack Mountains to the west, most of which, including Fort Crown Point Historic Site and the property on the New York side of the Champlain Bridge, are included within the NHL Adirondack Forest Preserve. Low approach roads on both sides of the crossing also offer spectacular views of the bridge from a variety of perspectives, some from several miles away. The bridge becomes momentarily visible in the distance but then vanishes from view, only to reappear from a different and closer vantage point. As that pattern of approach is repeated, the experience of crossing the lake is heightened. The bridge's graceful design, and in particular its continuous channel span, was one of four designs considered and was specifically chosen because it best complemented the scenic topography, given the requirements for channel rise and width as determined by the United States Army Corps of Engineers. That Fay, Spofford and Thorndike emphasized the bridge's aesthetic qualities is further revealed by the subtle progression of height given to the trusses' curving bottom chords, gradually increasing from span to span on each side of the channel and countering the increasing truss depth that follows a similarly subtle progression. The roadway's ascending grade, rising at a maximum of five and one-half percent, contributes a slightly curving element as well, and the two grades are connected at the channel span by a parabolic vertical curve 550 feet in length.

Superstructure. The principal segments of the bridge consist of one end-supported Warren deck truss; two continuous Warren trusses, one of which is the three-span channel segment that combines deck and through trusses, and the other a two-span deck truss; eight

plate girder viaduct spans; and two filled causeway approaches. Of the bridge's overall length, roughly 1,500 feet is over water. The structure's fourteen spans are numbered from west to east and are supported by thirteen piers (also numbered from west to east), and two abutments. Spans one, two, and three are plate girder deck viaducts, each fifty feet or slightly less, and the depth of the girder for span three has been increased by a simple truss having a web of cross braces and a short strut extending from mid-point of the bottom chord to the intersection of the laterals. Spans ten, eleven, twelve, thirteen, and fourteen mark the Vermont approach and are structurally identical to their counterparts (one, two and three) on the New York side, with span ten demonstrating a method of reinforcement similar to that for span three. The girders of viaduct spans one, two, eleven, twelve, thirteen, and fourteen were riveted together after the dead load was in place, making them continuous for live loads.

Spans four and five, respectively 225 and 270 feet in length, comprise a continuous Warren deck truss. Each span has ten panels, and truss webs contain verticals at each panel juncture. At the mid-points of spans three and four, truss depths are slightly more than twenty-three feet and twenty-five feet, respectively. Span nine is a simple-span, end supported Warren deck truss, 270 feet in length and with ten panels. Truss depth at mid-span is slightly more than twenty eight feet.

Spans six, seven and eight comprise the continuous channel approaches and span, respectively 290, 434, and 290 feet in length. Spans six and eight both utilize ten panels and span seven, fourteen panels. Truss depth at the two piers framing the channel (piers six and seven), is less than an inch short of sixty-two feet, and truss depth at the center vertical of span seven is slightly more than forty-two feet. In addition to its ninety feet of clearance across a channel width of 186 feet, span seven also accommodates, alternately, seventy-eight feet of clearance across a channel width of 300 feet, or fifty feet of clearance across a still

greater width of 400 feet. Spans six and eight provide navigational clearance of forty feet at piers six and seven, and slightly greater clearance at mid-span, respectively.

As originally designed, the deck systems for the viaduct and truss spans differed. For the viaducts, plate girders supported transverse twenty-four-inch I-beams employed as floor beams but without intermediate stringers. For the truss spans, floor beams carried longitudinal I-beam stringers set slightly more than six feet apart. The deck beams carried a reinforced concrete slab strengthened with unit trusses to counteract shear stresses in the slab. Initially, a patented, two-course plain concrete wearing surface, one-and-one-half inches in depth, was poured above the reinforced concrete slab.

To allow the wearing surface to be removed without damaging the integrity of the reinforced-concrete floor slab beneath it, burlap was embedded into the floor slab before it had acquired its initial set. This cleavage fabric prevented the large aggregate of the slab from bonding with the wearing surface. That floor system remained in use until 1964, when the wearing surface was replaced with a two-inch bituminous concrete surface, separated from the reinforced-concrete floor slab by membrane waterproofing. Expansion joints, located above each abutment and over piers five and eight, were repaired or replaced at the same time. In turn, the entire deck system was replaced during the decade of the 1970s.

The bridge's structural width from center to center of trusses is eighteen feet for the two-span continuous deck truss (spans four and five), the end supported truss (span nine), and each of the girder viaduct spans (center to center of girders). Width for the three-span continuous channel truss (spans six, seven and eight) is thirty feet (center to center of trusses). The truss and girder systems were designed for a live-loading of H-15 as determined by the Standard Specifications for Steel Highway Bridges issued by the U.S. Department of Agriculture, and the floor system was designed to carry twenty-ton trucks.

As designed, the roadway width extended twenty-four feet between curbs across the entire structure and along most of the approach causeways. At each end of the approaches, however, the roadway was widened to accommodate toll collection. Double-height concrete curbs were originally added to the bridge's floor system as a safety precaution for motorists, but those curbs have been modified. Railings were designed with steel wire mesh (similar to modern chain-link fencing) connected top and bottom to wire cables stretched between railing posts of steel. A steel channel rail was installed at the top of the railing, more than four feet above the top curb. Cables and top railings were separated by a space of slightly more than eleven inches, a design judged adequate to afford protection as well as views of the lake and mountains. The original railings have been replaced by box beam railings. The bridge's design offered no sidewalk for pedestrians, who were forced to rely on narrow foot walks (slightly more than two-feet wide) above the curbs on each side of the bridge within the railings. Curb openings, a foot wide and spaced every three feet, provided drainage channels and reduced the bridge's dead load. When the curb design was modified, drainage ducts were installed.

Light standards with incandescent lamps were placed approximately 125 feet apart on alternating sides of the bridge, partly as an aid to motorists and partly to advertise the bridge. As designed, those standards on the truss and viaduct spans were erected with tapered posts of wood or concrete (plans specified either) reinforced by steel. Those on the approach spans and in the toll collection area were reinforced concrete. Although the lamps have been replaced, most of the light standards have survived. Two sets of navigational lights were also installed, one electric and one oil, the latter for emergency use only: it was later replaced with an electrical system.

Substructure. Piers three through nine are concrete and footings for the steel bents used for piers one, two, ten, eleven, twelve, and thirteen are also concrete, as are both

abutments. Piers three to eight were built in the water, pier nine was dry-laid, and all except piers six and seven (the channel piers), were originally designed for construction with open coffer dams. Bids for piers six and seven were solicited for both the open coffer-dam process and the pneumatic caisson process, but the former proved substantially less costly and was selected. Site conditions, namely a soft lake bed overlying bed rock at a depth of 100 feet, a fresh water lake without rapid changes in water level, and comparatively little current, made reliance on the unusually deep coffer-dam method possible. In addition, the surfaces of bed-rock had been scored by glacial action and contained potholes, as well, ensuring a good bond between concrete pier and bed-rock. Piling for the coffer dams was driven to bed-rock with a steam hammer, and a system of horizontal bracing was constructed between interior steel sheet piling and exterior wooden piles. Struts in the form of I-beams also extended across the full width of the coffer dam, and segments of that bracing were left in place in those parts of the piers in which concrete was laid beneath water level.

Piers are tapered bottom to top, and constructed in segments that are staggered in dimension as well. For example, channel piers at bed-rock are forty-eight feet by sixteen feet, a block that rises to an elevation of seventy-two feet, approximately twenty feet above the lake bed. The next pier segments ascend to an elevation well above standard low water level, approximately ninety-two feet in 1929, and dimensions are roughly forty-four feet by ten feet, although end elevations are rounded. At its bearing pads, taper has reduced the dimensions of these channel piers to approximately forty feet by seven feet. Slightly protruding pier caps beneath those pads provide the only relief in the otherwise smoothly faced concrete surfaces, but the piers have been reinforced with steel plates and tension rods.

The design of bearing systems varies to accommodate either stresses in the simple and continuous spans or to facilitate the original assembly. The bearing at pier 3 is fixed; that on pier 4, the center span for the two-span continuous truss, is a rocker; two bearings on pier five

are rollers, one for the two-span continuous truss, and one for the three-span continuous channel truss; the bearing on pier six is fixed; that on pier seven is a roller, as are the two bearings on pier eight, one for the three-span continuous channel truss and one for the single-span simple truss; and the bearing on pier nine is fixed. All roller and rocker nests were placed in steel boxes filled with grease and installed with sides that can be removed for maintenance. They are currently not in place.

Structural Components and Materials. Steel structural components were designed using a combination of riveted plate girders, riveted box girders, rolled beams, and forged or cast steel. Riveted plate girders used in the approach spans are assembled with paired angle bars at top and bottom and as vertical stiffeners. Box girders used in the fixed span and continuous trusses vary in size and compositional structure. For example, the top and bottom chords for the simple span Warren deck truss (span nine) are both box girders. Bottom chords were assembled with channel section rolled beams as sides joined by lattice bars top and bottom, with large stay plates at panel junctures. Top chord box girders, in contrast, are assembled with riveted plates and angles that form channel section sides, with lattice bar on the bottom but a full plate along the entire length of the chord top. Verticals and diagonals in the truss web for that span are typically box girders built up from pairs of rolled channel sections joined by lattice bars. Rolled channel beams for the vertical members are slightly smaller than those used for diagonals. Box girders forming the end-panel diagonals are slightly larger than other web members and use riveted angles and plates to form channel sections joined by lattice bars. Trusses are braced laterally at panels, top and bottom, with I-section girders assembled with paired angles joined by lattice bars.

Similar compositional designs are used for the structural members in the continuous trusses, but box girders for the top and bottom chords are larger. In addition, top chords in the deck truss portions of those continuous spans join floor beams at the same height. The

box girders forming truss chords are assembled with riveted plates and very large angles rather than rolled channel beams, and they typically employ double lattice bars on only the bottom side. In addition, a greater number of large stay plates are used. Portal and lateral bracing for the through truss above the channel employs riveted I-section girders with large paired angles and lattice bars, as well as paired-angle struts.

Structural components in the floor systems are also different. For the approach spans, floor beams are rolled I-section beams supported by the plate girders and stiffened by paired and single angle diagonal bracing. Floor beams, in turn, support the deck but without stringers, and they have also been extended with small lengths of rolled I-section beams attached with gusset plates. For the fixed-span Warren deck truss (span nine), floor beams are large rolled I-section beams, as are the smaller stringers held in place by brackets mounted on the floor beams. For the continuous trusses, floor beams become large riveted plate girders similar to those supporting the approach spans, and stringers are rolled I-section beams.

Vertical bents supporting the approach spans alternate between box girders with rolled pairs of channel section beams joined by lattice bars and stay plates on two sides, or rolled wide-flange beams; those beams at pier three are splayed outward. Bents are joined to the bearing points of approach spans with large pins, presumably cast steel, and concrete footings support housings for these joints. Footings, in turn, are covered by a steel apron. Truss spans are also connected to bearing houses with similar pins.

Steel for the superstructure was fabricated by the American Bridge Company and, following common practice for that period, design specifications mandated use of open hearth furnace steel rather than Bessemer steel. Forged steel parts could be produced through either the open hearth or electric furnace methods, and cast steel could, in addition, be produced through the crucible method.

The bridge was painted a light gray color with the specific goal of establishing harmony with the surrounding landscape and preventing the bridge from becoming too conspicuous. Two field coats of tinted white lead paint covered the shop coat of red lead, and the second field coat was carefully developed from a mixture of raw umber in linseed oil, white lead, and a small quantity of ferrite yellow.

The contract for construction of the substructure was awarded to the Merritt-Chapman Scott Corporation; that for the lighting system was awarded to Alvin E. Bennett of Crown Point New York; and that for construction of the toll-collector's dwelling was given to Charles E. Malone of Port Henry, New York.

Maintenance and Repairs. During the many decades it owned the bridge, the Lake Champlain Commission kept scrupulous records involving repairs and maintenance. With the exception of bearings, certain deck components, travel surface, railings, and light standards, the bridge stands much as it did at the opening ceremony in 1929. Apart from repairs to the abutments and approach slabs on the New York side, undertaken not long after the bridge had opened, the earliest major repairs were for weatherproofing at the base of the steel structure resting on concrete piers. Painting occurred from 1948 to 1950, again between 1956 and 1958, and again in small sections during 1973.[i]

Resurfacing of the roadway was first conducted in 1962, limited principally to cleaning and patching areas of eroded concrete and raising and repairing expansion joints. Resurfacing continued in 1964 with installation of a two-inch layer of bituminous concrete over membrane waterproofing. Studies for an entire deck replacement were undertaken during the late 1960s, and plans for a complete restoration of the deck and curbs were developed by Fay, Spofford and Thorndike by 1970. Work began that year and continued in several stages during that decade. Membrane waterproofing was placed between the deck and a bituminous wearing surface, aluminum guard rails were installed, and a narrow

concrete safety walk was added outside the rails, supported by short channel beams. However, the travel-corridor remained twenty-four feet wide. Repairs to the deck and curbs continued in 1975, 1978, 1979, and 1980. Repairs to Piers 6 and 7 also occurred during the 1970s, again according to plans developed by Fay, Spofford and Thorndike. Pre-stressed steel arms, fabricated by the Stressteel Corporation of Wilkes Barre, Pennsylvania, were added as exterior panels to those piers. Bearings were replaced during this period as well.[ii]

Toll Booth and Toll-Collector's House. Facilities for toll collection were placed on the New York approach, and the bridge generated revenue from its inception until 1987 when tolls ended. The toll booth and plaza were removed at that time, and only the widened travel lanes provide physical evidence of that plaza. A toll-collector's dwelling built in 1929 and located adjacent to the toll collection area provided living quarters for the collector, an office for the Lake Champlain Commission where the traffic counter tabulations were recorded, and a second office from which the bridge could be viewed for the purpose of controlling navigation and travel-corridor lights. Collection lane gates could be lowered to direct cars toward the lane closest to the dwelling, permitting the collector to remain in the house during times of light traffic. Although the toll plaza is gone, the dwelling continues to stand and today serves as a tourist information center operated by the Lake Placid-Essex County Tourism Bureau and owned by New York State Department of Environmental Conservation. As does the bridge, the toll-collector's house displays substantial integrity in terms of location, design, setting, materials, workmanship, feeling and association.

The building is a three-by-three bay, one-and-one-half story, eaves-front, shingle-clad frame house in the Colonial Revival style that borrows heavily from Cape Cod type houses. Its features include grey and black slate roof, low-pitched eaves with narrow molded cornice returns, a full-story concrete foundation exposed on three sides of the main block, and a small one-story, gable-front ell occupying the right bay of the front or northwesterly façade. That

ell, part of the building's original design, extends outward to the travel corridor and once served as an office from which tolls could be collected; its southwesterly façade is flush with the southwesterly gable end of the main block. A gable-roof dormer, also with narrow cornice returns, pierces the southeasterly eaves of the building, and the ridge of its roof rises to the same height as that of the main block. A second but much larger single story ell, constructed in 1945 and also clad in shingles but with a fully exposed foundation wall of concrete, extends from the rear or southeasterly eaves side of the building. The ell's northeasterly façade is flush with the northeasterly gable end of the main block.

Although the office ell provides the building's most visible means of access, it also disrupts the fundamental symmetry of the front facade, evident in the careful centering of the dwelling's principal entrance on that same elevation. That entrance door opens beneath an elliptical fanlight with sunburst motif and a molded surround tucked just beneath the shallow eaves. The door, accessible via a wide concrete landing fronted by two steps, is framed by three-quarter sidelights above flat molded panels, in turn framed by narrow, molded pilasters with narrow fluting and simple block capitals. The door opens into a shallow vestibule, also with three-quarter sidelights. A pair of windows with nine -over- six double-hung sash, wide flat surrounds, and narrow border molding flank the door to the left, and a single identical window occupies the bay immediately to the right of the door, adjacent to the ell vestibule. Nearly all windows on this and other facades have fixed two -over- two storm sash. Two very small, three-pane, horizontal foundation windows light the basement from the front façade, and a square, fluted, decorative copper drainage spout (currently painted) descends at the northerly corner of the front facade.

Entrance to the office is attained through a modern door placed on the ell's northeasterly façade at its front corner. That door has sixteen small window panes above a single large molded panel. The door opening is elevated to accommodate an accessibility

ramp that wraps the ell, and is sheltered by a small hood with exposed rafters and stick brackets with chamfered edges, part of the original design. The door is flanked on the left by a window with nine -over- six sash, and a prominent Palladian window consumes most of the ell's northwesterly or front façade. That window has a large central light with nine -over- six double-hung sash that opens beneath a segmental-arch fanlight with a shallow molded hood and narrow drip cap. That central window is slightly recessed, set within a wide surround and flanked by two narrow windows with six -over- four sash and a similarly wide surround with narrow drip caps. Paired adjoining windows with nine -over- six sash light the vestibule from the ell's southwesterly façade.

Fenestration on both gable ends of the main block is nearly identical and symmetrically arranged, or nearly so. A pair of small windows, each with six -over- six sash, are tucked just beneath each gable peak, lighting the half-story. Two larger window openings, each with nine -over- six sash, occupy the first two bays, front to rear, of the first floor, and a third, smaller window with six -over- six sash fills the third or rear bay. A very small window with six -over- six sash ventilates the dormer. A single window opening with six -over- six sash, roughly centered on the northeasterly gable end foundation wall, lights the basement. An identical window opens at a similar location on the southwesterly gable end to an area of the basement originally used as a garage. That window is flanked to the left by a recessed, half-height door with vertical board, and a flight of six concrete steps ascend to the vestibule adjacent to the foundation. A set of six-panel, hinged, Lowden stock garage doors with 'round the corner tracks' consume most of the exposed, full-story foundation wall on the rear or southeasterly side of the main block. Those doors fold vertically into two sets, each with three panels, and each narrow panel contains four rectangular fixed window sash, above four square molded panels, above a pair of similarly molded, elongated panels. The hinged door

panels are held in place vertically by a track mounted above the door opening, and a metal post has been installed in front of the doors to support the opening's frame.

The large ell extending from the rear elevation of the main block, added in 1945, dominates that side of the building. The ridge of its gable roof is substantially lower than that of the main block and joins the main block awkwardly at the face of the rear dormer; the eaves line of the ell slashes across the façade of that dormer, as well. Five windows (a single window flanked by two sets of narrow paired windows), light the ell's southeasterly façade; five windows light the southwesterly façade, and four (two sets of paired windows) the northeasterly façade. Window openings are arranged symmetrically, or nearly so, and each window contains six -over- six double-hung sash with molded surrounds similar to those on the main block. A modern overhead garage door with a horizontal row of four glazed panels consumes fully half of the ell's southeasterly foundation wall, and that garage door is flanked on the left by a modern ground-level entrance door with nine panes over molded wooden panels. Sets of two windows, each with six -over- six sash, light both the southeasterly and northeasterly foundation walls of that ell, and a small half-circle louvered vent is tucked beneath the ell's gable peak. A small, square, one-story bay with shed roof is cantilevered over the exposed foundation walls of the main block and the ell where the two intersect. That bay, now enclosed, was once a small open landing at the top of a long rise of steps ascending to the building's back door. Single window openings with six -over- six sash are centered on each of the bay's two exposed sides. A concrete water table extends around the ell on two sides and joins a retaining wall adjacent to the garage.

Despite these changes to the exterior of the house, most of the building's original features remain, including flooring, moldings, windows, and various decorative features.

Light Standards. Two, free-standing concrete light standards have survived in front of the house, where they were placed to light the toll collection area, and three identical

standards have survived at the Vermont approach. The standards are four-sided and gracefully tapered, with pyramidal caps. The steel channel beam arm that supports the light fixtures is supported by a metal bracket.

Narrative Description - Endnotes

[i] LCBC *Annual Report* (1944)

[ii] Records of maintenance and repair are documented by the commission s annual reports and in plans held at the Vermont State Archives See for example plan titled 'Lake Champlain Bridge Commission Deck Replacement Study by Fay Spofford and Thorndike undated but c 1969 Similar plans involving deck rehabilitation are dated 1962 1970 1974, and 1978 All are in Oversize Folder 4

Statement of Significance

The Lake Champlain Bridge is a nationally significant engineering landmark and one of the country's most technologically inventive and aesthetically sophisticated designs for highway bridges of its period. It served as a prototype for adapting continuous-truss technology, developed for railroads during the late nineteenth and early twentieth centuries, to long-span highway bridges in America during an era of rapidly increasing automobile travel. The result is a bridge that incorporates structural efficiency, improved rigidity, economy of materials, cost-effective construction methods, and aesthetic appearance for scenic crossings beset by automobile traffic. In particular, the Lake Champlain Bridge is the first American truss bridge to employ channel anchor spans (cantilevered during construction) that form graceful swings from the bridge's Warren deck-truss approach spans to a channel-span through truss with curving upper and lower chords, continuous over three spans. Fay, Spofford and Thorndike specifically selected a continuous design for this swinging channel transition, rather than a suspended span with cantilever anchors, because it offered a more pleasing aesthetic solution for the relatively short channel span, and their very successful design was quickly copied at other important crossings. When the bridge opened in the summer of 1929, the first vehicular bridge to cross Lake Champlain and connect Vermont with New York, the firm immediately joined the ranks of America's most innovative bridge engineers.

The bridge also demonstrates inventive engineering in the design and construction of its channel piers, erected using the open, single-wall coffer-dam process to a depth of more than 100 feet below extreme low water. Pier construction is especially important in the design of continuous trusses, necessitating the founding of piers on bedrock of stabile bearing quality. When completed, piers for the Lake Champlain Bridge were among the country's deepest

examples built using that design, selected as a more cost efficient system than the pneumatic caisson method at that site.

It is thought that the continuous arched truss type bridge originated in Europe. Though no longer extant, the Ludendorff Bridge (1918) across the Rhine at Ramagen, Germany. probably is the most famous. It was the only Rhine River bridge standing after the Allies invaded Germany towards the end of World War II facilitating Allied victory. Other possible precedents are the former Treskow Bridge (1904) in Berlin, built by the engineer Karl Bernhard, who was inspired by the Passerelle Debilly (1900), designed for the Paris Exposition of 1900. Passerelle Debilly. which still spans, was designed by the French engineer Jean Resal. An even earlier example is the Rhine Bridge in Bonn (1895-98), designed by Reinhold Krohn, engineer. and architect Bruno Moehring. It was considered by contemporaries to be a new bridge type: a combination of a central arched truss with two continuous side spans. [i]

In the United States, the Lake Champlain Bridge became the prototype for similar moderate-span highway bridges such as the General Sullivan Bridge (1934) in New Hampshire; the Bourne and Sagamore Bridges (1935) over Cape Cod Canal in Massachusetts, the Sakonnet River Bridge (1956) in Rhode Island; and the Piscataqua River Bridge (1972) between New Hampshire and Maine.

The Champlain Bridge is also significant for its important record of travel scrupulously maintained by the Lake Champlain Bridge Commission throughout the period when tolls were in place, 1929 to 1987 The commission was established in 1927 by a compact and treaty between Vermont and New York, authorized by legislative resolutions in each state and ratified by an act of Congress. The project provided a new traffic route between the Adirondack, Green and White mountains, and linked up-state New York with northern New England's major cities and coastal resorts. The Commission retained Fay. Spofford and

Thorndike to conduct traffic predictions, principally to calculate financing requirements and to anticipate repayment of bonds. However, when the bridge officially opened on August 26, 1929, few could have predicted that the country's financial markets would crumble two months later, almost to the day – October 29th Although the firm's traffic estimates exceeded actual use during the ensuing decade, bridge traffic steadily increased from year to year, offering a valuable glimpse of Depression era automobile travel related to commerce, agriculture, industry, and tourism in the country's northeastern region.

The collaborative venture by these two states, for public benefit and at no direct cost to taxpayers, also adds a measure of significance to the bridge, as does the superb documentation of the project in all its details. These materials include site studies, preliminary design sketches and cost estimates, contract plans, bidding proposals, construction and maintenance records, design of the correspondence among commission members, its engineers, and the public. These records have been carefully preserved and are housed in the Vermont State Archives in Montpelier where they provide opportunity for an exhaustive study of a major bridge project during this important era.

Project Origins. Lake Champlain has been a much-used travel corridor throughout American history. Yet it has also been an extended barrier, 120 miles long, to communication and commerce between New York and northern New England. Ferry crossings have been active places throughout the lake's recent history, and by the mid-1920s seventeen ferry lines were operating, including seven in the lake's southerly regions between Essex and Wrights. Ferries continue to operate today, albeit at fewer locations. For many decades, however, operations were seasonal, typically confined to daylight hours, and hampered by fogs, headwinds, rough water, difficult landings, and mechanical failures.

Service during the busy summer tourist season was often inadequate, as well, and traffic volume suggested no signs of decreasing.

Following an application, in 1920, by the Addison Railroad to construct a bridge between Shoreham, Vermont and Ticonderoga, New York, public attention began to focus on potential sites for a highway bridge, and demands finally reached the Vermont legislature in 1923. That year, lawmakers appointed a commission to investigate the feasibility of a joint project with New York, and not quite two years later, New York's legislature followed Vermont's example and created a special committee. State Senator Mortimer Y Ferris from Ticonderoga chaired the New York group and emerged as a key figure in advancing the project. George Z. Thompson from Proctor chaired Vermont's commission.[iiii]

In 1925, the joint bodies began investigating potential locations and conducted public hearings in Plattsburgh, Rouses Point, Port Henry, Ticonderoga and Wrights, New York, and in St. Albans, Burlington, Middlebury, and Brandon, Vermont. As might be expected, with substantial economic benefits hanging in the balance, these hearings generated intense public debate about the best location for a bridge. Commission files contain long lists of endorsements favoring specific sites from organizations such as the New York State Automobile Association, United Commercial Travelers, and Adirondack Resorts Association. Numerous local chambers of commerce joined in the fray, and editorials filled the pages of newspapers as well. The committee forged ahead and in April, 1926, issued a preliminary report summarizing its findings, which convinced the New York legislature to authorize funding for surveys and borings in the lake's southerly regions. That summer, a contract to conduct these borings was awarded to a firm from Scranton, Pennsylvania, Sprague and Henwood, Inc., and that company proceeded under the supervision of Roy G. Finch, New York State Engineer. With drill cores available, C. A. Hartnagel, New York

State Geologist, evaluated geologic conditions at the five sites where borings were conducted.[iv]

In January, 1927 the joint committees issued a full report describing the inadequacy of existing ferry service and providing estimates of future traffic volume and potential revenue from a toll bridge. The report also summarized possible locations for a bridge and provided cost estimates and options for several bridge designs prepared by engineers Roy Finch and J. A. L. Waddell, the latter one of the country's leading authorities on bridge design. Based on these findings, the two committees narrowed consideration of sites to a single location stretching between Crown Point in New York and Chimney Point in Vermont. In the report to its legislature, New York's committee emphasized the increasing volume of traffic, the need for year-round, 24 hour passage for vehicles, and the urgent need to remove the handicap posed by the lake to commerce, industry, agriculture, and tourist travel. Costs would be divided between the two states, 60% for New York and 40% for Vermont, to be recovered by the collection of tolls.[v]

These recommendations led to passage of joint resolutions by New York and Vermont legislators in 1927 creating a compact between the two states that approved construction of the bridge, and the compact was ratified by Congress in 1928. As authorized by this compact, a permanent organization, the Lake Champlain Bridge Commission, was established during the spring of 1927, and its six members were appointed by the governors of the two states, three members from each state. George Z. Thompson, Charles E. Schoff, and William R. Warner represented Vermont, and Mortimer Y Ferris (as chairman), Marion L. Thomas, and Albert E. Phelps represented New York, although Phelps died three months after the bridge opened. In August, 1927 the newly created commission retained the firm of Fay, Spofford and Thorndike, with offices at 44 School Street in Boston, to conduct traffic estimates, develop preliminary options for bridge designs, oversee additional borings, prepare

surveys for the structure's precise alignment, design the structure, and oversee its construction.[vi]

Fay, Spofford and Thorndike. The firm of Fay, Spofford and Thorndike was established in 1914 by three graduates of civil engineering programs at the Massachusetts Institute of Technology. Frederic H. Fay, Charles M. Spofford, and Sturgis H. Thorndike. Fay graduated in 1893, Thorndike in 1895, and both began working as engineers for the City of Boston soon after graduation, although Fay worked briefly for Boston Bridge Works before joining the city's engineering department. In Boston, both men became actively involved in bridge projects, Fay eventually as chief engineer for the Bridge and Ferry Division in the Department of Public Works, and Thorndike as engineer in charge of bridge design and, later, as a designing engineer in the Bridge and Ferry Division. Both men left the city in 1914 when they formed their consulting partnership with Charles Spofford. However, Fay remained active in city and regional planning and guided the firm on many large-scale planning projects. He also served as the principal figure in securing the contract for the Lake Champlain Bridge.

Spofford, who with Fay, graduated from M.I.T in 1893, worked for the Phoenix Bridge Company during summers for several years and, at the same time, began teaching courses at M.I.T In 1905, he accepted a full-time appointment to the faculty of Polytechnic Institute of Brooklyn, a position he held until 1909, when he returned to M.I.T as Hayward Professor of Civil Engineering. He remained in that post until his retirement in 1954. In addition to his teaching and consulting work, Spofford also authored several engineering textbooks, including a 1937 treatise titled *The Theory of Continuous Structures and Arches* and a subsequent edition titled *The Theory of Structures*.[vii]

The firm's earliest commissions involved projects in the Boston area, including a very large undertaking for the Boston Army Supply Base during the years 1918 to 1920. In 1921,

however, they were selected to supervise the construction of streets, utilities, water systems, and other infrastructure for the new town of Mariemont, Ohio, a project that helped to put the firm in a national spotlight and may have impressed the Lake Champlain Bridge Commission.[viii]

However, the commission's annual reports are generally silent on the process by which Fay, Spofford and Thorndike were selected, mentioning only that the group investigated the standing and ability of a number of engineers and engineering partnerships or corporations with the goal of finding the engineer or engineers who could satisfactorily address the engineering problems presented by the project. Minutes of the commission's meetings and records of correspondence are only slightly more informative. The commission first convened on June 20, 1927, and, after electing Ferris as chairman, Thompson as Vice-Chairman, Schoff as Treasurer, and Phelps as Secretary, apparently assigned the task of soliciting interest among the country's bridge engineers to one or more members, including Marion Thomas. Thomas's inquiries included a letter to the American Institute of Mining and Metallurgical Engineers requesting recommendations, and the names of J. V W Reynders, Ralph Modjeski, J A. L. Waddell, and Gustav Lindenthal were offered in reply.[ix]

At its meeting of August 2, 1927 the commission established a separate engineering sub-committee comprised of Ferris, Thompson, and Thomas and authorized this sub-committee to engage engineering services and to close contracts. At that same meeting, too, Ferris introduced Frederic Fay to the commission and later that day, the engineering sub-committee executed a contract with Fay's firm. Attached to the contract were sketches of four designs, including two designs for simple-span trusses, one swinging continuous truss similar to the design eventually selected, and a suspension bridge. Charles Spofford almost certainly prepared those drawings in anticipation of securing the contract, indicating that members of the firm, Fay in all likelihood, had been in communication with commission

members, probably Ferris, for some time. Spofford's drawings may have been particularly influential in the selection process, as well, complementing Fay's energetic abilities as a project planner.[x]

Although Spofford ultimately played a principal role in designing the Lake Champlain Bridge, Fay served as the primary contact between the firm and the commission during much of the project, and he also approved designs for the substructure. Letters between Fay and commission members, usually Ferris, reveal Fay to be a capable figure, prompt in his correspondence, who worked diligently for the commission and who addressed a multitude of obstacles in seeing the complex project through to completion. Fay's partner, Carroll A. Farwell, joined him at the site in August of that year as the firm prepared to conduct field surveys, and another partner, George Mirick, began serving as the resident engineer in May. 1928. In particular, Fay proved adept at confronting the slow progress of the contractor for the sub-structure, Merritt-Chapman & Scott Corporation, during the fall of 1928, and he relied considerably on Mirick for information about emerging problems. The rapid completion of the successful project is a tribute to Fay's abilities, and also to Mortimer Ferris's administrative skills as chair of the commission. Thorndike, sadly, died in 1928, at age sixty, before seeing the bridge completed.[xi]

Design Selection. The design process required little more than three months, August 2, 1927 to November 15, 1927 the date when the commission selected a design. Field surveys were completed by September 20th including soundings to determine elevation of the lake bed and measurement of water flow. The B. F. Smith & Company of Boston conducted additional borings, thirty-five in all, between October 12th and November 18th, and James E. Cashman, Inc. of Burlington drove test piles during October, as well. Spofford submitted preliminary sketches for different types of bridges early in October, and the commission narrowed consideration to two structural types, truss and suspension. By November 15th

three design proposals were being reviewed, Scheme C-2, Scheme D-2, and Scheme D-3. The latter two designs involved suspension bridges, and the commission selected Scheme C-2, the swinging continuous truss. Project plans were available for review by the War Department by February 1, 1928, and contract drawings for were in the hands of bidders by March, 1928.[xii]

Subsequent writings by Charles Spofford indicate that during this period, four specific structural types of bridges were considered: end supported truss, also called a fixed truss or simple-span truss; cantilever truss; continuous truss; and suspension bridge. Selection was influenced by a number of constraints that weighed against some of the designs. For example, navigational requirements imposed by the U.S. Army Corps of Engineers established a fixed clear span and height for the channel segment and prevented the use of falsework for that span during construction. As to the latter, the engineers considered constructing the channel span off-site and hoisting it in place, but the absence of suitable anchorage basins made this approach impractical. Consequently, assembly of the channel span could best be achieved by use of cantilevers from adjoining approach spans. This method favored either a cantilever or continuous truss but would have been more costly for an end-supported truss. In addition, an end-supported truss would have required larger piers, adding to costs.

With respect to the cantilever bridge, the engineers expressed concern that the suspended channel span would be shorter than advisable, require a larger number of expansion joints than a continuous truss, and would be subjected to greater and more rapid deflection. In turn, this deflection would increase maintenance costs as well as be objectionable to motorists using the bridge.

Two designs for suspension bridges were carefully considered as well, one with a center span of 700 feet, and the other with a center span of 1,000 feet. Both however, were more

costly than the continuous truss, particularly the longer of the two. An arch bridge was not considered because of the cost of carrying the arch's springing points to bedrock, at a substantial depth.

In addition to these practical considerations, three of the alternatives considered (end-supported truss, cantilever, and suspension), were rejected for aesthetic reasons, as well. An end-supported truss bridge would have required deck trusses for the approach spans and a through truss for the channel span, but without the transitional swing available for either the cantilever or continuous truss bridges. The steep gradient of the road would have made that transition from deck to through truss visually very awkward, at best. Moreover, the end-supported trusses would have had greater bulk in profile, and Charles Spofford admitted that he had been unable to sketch any simple-span design that proved to be satisfactory in appearance. The cantilever design, too, was rejected because of the awkward proportion of the short, suspended span in relation to the cantilever anchors.

With respect to the suspension bridges, that with the shorter center span, 700 feet, employed two flanking spans of a length insufficient to stretch from shore to shore, thus necessitating two short approach spans and creating a visually awkward appearance. The longer-span suspension bridge, although capable of extending across open water and admittedly attractive, was nevertheless too large for its site, creating concerns about scale and visibility as well as unnecessary cost.

In addition to its favorable aesthetic appearance, consistent with economy, the continuous truss offered advantages over the other bridge types in several key areas. For example, greater economy of materials translated into considerable cost savings for its long spans. Moreover, deflections in the continuous spans were less severe than in the cantilever, and occurred with less rapidity. Although continuous trusses are statically indeterminate, Fay, Spofford and Thorndike were able to account for stress distributions to a satisfactory

degree through extended mathematical computations, albeit very time consuming. And, concerns about pier settlement, which can cause severe secondary stresses in the trusses, were resolved by the test borings confirming the adequacy of bedrock beneath the lake bottom, and by proper design that addressed the contingency of pier settlement following erection of the trusses.[xiii]

Continuous-Truss Highway Bridges. By 1927 when the Lake Champlain Commission and its engineers selected a design for the bridge, the long era of structural advances made possible (and necessary) by railroads was drawing to a close. Continuous truss bridges had gained modest attention during the last quarter of the nineteenth century, offering in theory a substantial improvement in the distribution of stresses throughout the entire structure, thereby reducing the quantity of materials required (as well as weight and cost). In addition, continuous trusses offered greater stiffness and lateral resistance to wind loads. However, engineers were cautious about several problems associated with the design of continuous trusses, and were thus slow to fully exploit the potential benefits of the design for long-span bridges.[xiv]

For one reason, continuous trusses are statically indeterminate, requiring extensive and difficult calculations to account for stress distributions. In addition, pier settlement creates extreme and unpredictable secondary stresses, which nevertheless decrease as the length of the span increases. Thus, sinking piers to bedrock is essential. Addressing rapid shifts in bending moment also proved to be vexing. For continuous trusses, bending moment changes from positive at mid-span to negative at intermediate supports, and the fluctuation in bending moment from a minimum at end points to a maximum at intermediate supports occurs rapidly. To solve this problem, engineers deepened the truss at intermediate supports – either by adding haunches below the bottom chords or by elevating the top chord. However, these circumstances also influenced placement of the expansion joints that must absorb the effects

of thermal expansion, which can be considerable in continuous trusses, but which must also be capable of transmitting heavy loads to the structure. To address these concerns, the expansion joints must be located at points where the bending moment is zero, specifically the point between mid-span and intermediate support where the bending moment changes from positive to negative.[xv]

Concerns notwithstanding, a colossal bridge across the Ohio River at Sciotoville, erected by the Chesapeake and Ohio Railway between 1914 and 1917, marked a turning point in the development of long-span continuous truss designs. Austrian engineer Gustav Lindenthal, who had been retained as a consultant to assist the railroad's engineering staff, designed the structure and successfully addressed the many problems associated with continuous trusses, aided by the fact that bedrock and riverbed were practically the same, and lay in nearly a horizontal plane from shore to shore, as well. Engineers subsequently focused considerable attention on the bridge, principally because of its great length – two spans, each 775 feet in clear span, for a full length of 1,550 feet -- making it the longest continuous truss in the world, a distinction it held for two decades. A year later, 1918, a second long-span continuous truss bridge was erected over the Allegheny River at Pittsburgh, to carry the Pittsburgh and Lake Erie Railroad.[xvi]

Debate among engineers persisted concerning the merits of continuous trusses and focused on analysis of indeterminate structures as well as the overall economy of the design, relative to simple spans. Lindenthal became a chief proponent of the type and urged engineers to consider it as an economic alternative for short span bridges, as well. Debate continued to swirl around the question of assessing stresses, particularly secondary stresses, but by the early 1930s these issues had been put to rest by Hardy Cross, whose analysis of the distribution of fixed-end bending moments reduced computations to a manageable process. And, by 1927 Lindenthal had designed two continuous truss highway bridges of moderate

span in Portland, Oregon – the Sellwood Bridge and the Ross Island Bridge. Thus, Fay, Spofford and Thorndike's 1927 design for the Champlain Bridge is among the first examples of a continuous truss adapted to highway bridges in the country.[xvii]

Although both of Lindenthal's continuous-truss highway bridges in Portland precede the Lake Champlain Bridge by several years, and although both still cross the Willamette River, the Lake Champlain Bridge represents important advances in the design of continuous trusses. The Sellwood Bridge, the first of the two Portland bridges, opened in December, 1925, but utilizes common Warren deck trusses with parallel upper and lower chords across four continuous spans. In addition, the two longest of these trusses (each 300 feet) serve as the channel spans and are substantially shorter than the channel span and its two continuous approach spans at Lake Champlain (294, 434, and 294 feet respectively). Channel clearance (75 feet) is considerably lower than the Champlain bridge (90 feet), as well.

The second of Lindenthal's highway bridges, the Ross Island Bridge, opened in 1926 and also utilizes Warren deck trusses as channel approach spans. One is continuous over two spans and the other is fixed, but both employ curving bottom chords that descend to the anchor piers for the channel span. However, the curving chords of the 535 foot channel span rise much more steeply and are cantilevered rather than continuous to achieve an arched channel clearance of 100 feet. Thus, at the all-important channel span, Lindenthal's design differs substantially from Spofford's Lake Champlain Bridge. The latter offered substantial economy at attaining the necessary channel clearance, and it also provided a more graceful transition from the approaches to the channel crossing.

Copying the success of their prototype at Lake Champlain, Fay Spofford and Thorndike produced a nearly identical design for the General Sullivan Bridge at Dover, New Hampshire, completing it in 1934. Two identical bridges across the Cape Cod Canal, the Bourne Bridge and the Sagamore Bridge followed in 1934 and 1935, respectively, employing a similar

design to that of the Lake Champlain Bridge but with deeper trusses and a taller arch to achieve a longer span. Together, these four bridges by a single engineering firm (with the Lake Champlain Bridge serving as the prototype), mark the beginning of a significant era in the development of continuous truss highway bridges in America.[xviii]

Fay, Spofford and Thorndike's design also incorporates elements derived from advances in the design of cantilever truss bridges, inventive developments that occurred during the late nineteenth and early twentieth centuries, as well. During this period, engineers began employing cantilever systems as expedients in the both the construction and design of truss bridges, and one of the first examples of a continuous truss to exploit cantilevers to facilitate the assembly of continuous spans was built between 1885 and 1887 to carry the Canadian Pacific Railway across the St. Lawrence River at the Lachine Rapids near Montreal. Its engineer, Charles Shaler Smith, had much earlier formed a partnership with Benjamin H. Latrobe that eventually became the Baltimore Bridge Company, and Smith subsequently made important contributions to the development of cantilever designs. The four principal channel spans of his Lachine Bridge, continuous over five piers, were erected with cantilever anchors to carry dead load during construction, but were then riveted together to form the continuous spans that carried live loads.[xix]

Equally important, Smith devised an ingenious method for establishing the transition from deck truss approach spans to through truss channel spans. Generally, through-truss bridges offered a practical solution to the problem of attaining vertical clearance over channels, allowing less-costly deck trusses to be employed on approach spans. Although this method addressed the principal objective of clearance, the two truss types, very different in appearance, produced a visually awkward progression of simple span structures. At the Lachine Bridge, Smith used the cantilever anchors for the two channel spans as transitional forms, curving the bottom and top chords appropriately to provide a graceful rise from deck

to through truss. By this process, the transition could be easily disguised and the bridge could become a single, visually and structurally integrated span from end to end.[xx]

Shaler's Lachine Bridge was the first North American structure to employ that inventive combination of constructional cantilever anchors designed to achieve a swinging transition between deck and through trusses for continuous spans, and Fay, Spofford and Thorndike's Lake Champlain Bridge was the first to use it on a highway bridge in America. Application of the design to highway bridges proved to be especially workable because the rising grade of the highway could be more easily concealed as it moved from span to span, cresting above the channel. By increasing highway grade, but doing so in a visually unobtrusive manner, the design thus offered opportunity to maximize clearance at the channel span and, at the same time, minimize the cost of approach spans.[xxi]

At the time that Fay, Spofford and Thorndike developed their design, plans for another truss bridge with a transitional swinging deck / through truss design were being developed for an elevated expressway between Newark and Jersey City, New Jersey. Designed by Danish engineer Sigvald Johannesson, but not completed until 1932, the Pulaski Skyway was quickly heralded as the country's most sophisticated example of this form, a design to match the elegance of arch bridges. As does the Lake Champlain Bridge, the skyway employs constructional cantilever anchors that form continuous channel spans. However, although Johannesson began work on the New Jersey project as early as 1923, the Champlain Bridge was completed three years before the Pulaski Skyway opened. When Charles Spofford presented a paper to the American Society of Civil Engineers in October, 1929, discussing the history of the Lake Champlain Bridge and its design, members of the audience referred to plans for the Pulaski Skyway, but the extent to which Fay, Spofford and Thorndike considered that project is not known. Presumably, though, Spofford was aware of the project during the period that designs for the Lake Champlain Bridge were being developed.[xxii]

Regardless, the decade of the 1920s represents an important period in the evolution of bridge design when engineers specifically sought aesthetic solutions to accompany rapidly advancing structural technology. In part, emphasis on aesthetic contributions had been sharpened by competition between the rapidly growing concrete industry and steel manufacturers. This competition led to a national awards program adopted by the American Institute of Steel Construction in 1929, providing annual recognition for aesthetic solutions to problems in steel bridge design. The American Institute of Architects and the American Society of Civil Engineers joined the AISC in appointing jury members for those awards.[xxiii]

However, some engineers had been calling for greater emphasis on bridge aesthetics for many years. For example, Henry Tyrell's 1912 treatise, *Artistic Bridge Design*, enters a strong plea for the important relationships between bridges and their settings. Arrival of the automobile added accent to this dialogue, particularly where new locations for crossings had become necessary to accommodate motorists. Both the annual reports prepared by the Lake Champlain Bridge Commission and the subsequent presentations by Charles Spofford to the American Society of Engineers and, separately, to the Vermont Society of Engineers in 1928, underscore their shared concern for an aesthetically satisfactory design.[xxiv]

Construction. Thus, when Congress ratified the compact creating the Lake Champlain Bridge Commission in February 1928, the design-selection process had been completed and bridge construction could begin. Advertisements soliciting proposals were published in April, 1928, and bids were submitted separately for substructure and superstructure by May 8th. Ten days later, the commission awarded contracts to the low-bidders in each category, the Merritt-Chapman & Scott Corporation from New York City for the substructure ($385,000.00), and The American Bridge Company, with its central works in Ambridge, Pennsylvania, for the superstructure ($535,177.05), for a total projected cost of $920,177.05. Actual construction of the substructure began on June 14, 1928, and piers were substantially

completed by the end of that year. Fabrication of the steel began soon after bids were selected, and erection of the steel superstructure began in December. By the end of the year, the three viaduct approach spans on the New York side were also in place.[xxv]

Piers. Test borings had established that bedrock beneath the lake bed consisted primarily of Chazy limestone, reasonably level, free from disintegration, and thus of suitable bearing quality. The lake-bed itself was primarily clay. However, the depth of the lake, more than 100 feet for the channel spans, posed potential difficulties. Piers three through eight had to be built in the water, and bid advertising had specified that all but the two channel piers, six and seven, would be constructed using the open-coffer dam method. Only pier nine was laid 'in the dry. Bidders were given the option of using either the pneumatic caisson method or the open-coffer dam method for piers six and seven. However, bids proposing the open-coffer method were substantially lower in cost, despite the water depth, principally because of the soft lake-bed above bedrock, stabile water level, and absence of underwater currents. Thus, piers were built with single-wall coffer dams using a deep concrete seal deposited under water, and Spofford opined that the piers for the Lake Champlain Bridge were probably the deepest examples of their type.[xxvi]

Construction of the piers began with wooden piles driven around the general perimeter of the pier sites. Piles were capped by timbers, which provided a foundation for a working floor. Waling pieces were then attached to the working floor to serve as guides for sinking the steel sheet-piling (sixteen inches by four inches corrugated), driven to bedrock to provide a continuous wall for the coffer dams. For the two deep channel piers, piles were spliced vertically in lengths of fifty-eight and forty feet. German sheet piling, described as the Larssen type, was selected because its undulating pieces locked together. The piles were delivered by rail to Port Henry, but then carried to the site by tugs and launches that had arrived from New York City via the Hudson River and Champlain Canal.[xxvii]

To withstand water pressure once dredging of the lake bed began within the coffer dams, Merritt, Chapman and Scott devised a system of internal bracing consisting of rectangular frames of steel I-beams riveted and reinforced at the corners by knee braces, and with three cross-struts, also I-beams, in each frame. Above the water level, where concrete was to be placed 'in the dry. bracing was added to the exterior of the coffer dams, but with lighter members.

For piers built with concrete laid in the water, frames and struts were left in place after the concrete had been poured. Coffer dam walls were built with a four-foot clearance from the specified dimensions for the piers, and the horizontal members of these frames rested outside the pier perimeters; struts, however, extended through the piers and became embedded in the concrete. The contractor used clam shell buckets to excavate the lake bed within the coffer dams, and excavation occurred in twelve-foot increments, with horizontal frames lowered into place at those intervals. As excavation proceeded, upper frames were then wedged against the sides of the coffer dams until excavation reached the next interval. When all the horizontal frames had been lowered into place, divers connected the frames by tie rods that served as spacers, holding the framing system in place vertically. Lake-bed clay remaining against the coffer dam walls and frames was removed by hydraulic jets set at 150 pounds pressure using a one-and-one-quarter-inch iron pipe with a three-quarter-inch nozzle, guided by divers. Excavated material was removed by scow and dumped in twelve feet of water at an area of the lake called Bulwagga Bay. The method proved successful, and once excavation had been completed, water within the coffer dams contained less sediment than the lake water outside the dams.[xxviii]

In his presentation to the Vermont Society of Engineers in 1928, resident engineer George Mirick described the concrete compositional proportions as one cement (Ironclad Brand from Glen Falls), one-and-one-eighth sand, and three-and-six-tenths fine stone

aggregate, which had been acquired from Mineville, New York. That composition translated into 1:2:4 concrete with a ten percent excess of cement. The concrete was mixed with a Blaw-Knox Batcher, which governed proportions of the mix automatically, and a one-cubic yard Smith mixer. Concrete was deposited underwater using a patented Bottom-Dump Bucket, capable of holding a yard of concrete. Spofford noted that when lowered, the bucket worked best when full rather than partially full, to prevent water from scouring the bucket's contents as it submerged. When the bucket reached the dumping surface, doors opened automatically with the help of a sliding bail and locked in open position as the bucket was raised.[xxix]

The concrete was placed at the center of each space between the cross braces, allowing the concrete and laitance (soft exterior surface) to flow toward the sides of the coffer dams beyond the pier dimension lines. Typically, the contents of a single bucket covered a circle roughly ten to twelve feet in diameter. Mirick noted that the dump bucket worked better than the more common Tremie method, which relies on a tube through which the concrete is pumped into the pier, principally because of the depth and small size of the piers and the maze of framework. After the under-water concrete pier reached the elevation of seventy-two feet (twenty feet below the water line), the coffer dams were pumped dry and the remaining concrete was set 'in the dry. Piers were tested after twenty-eight days, and the concrete achieved a crushing strength of between 3,000 and 3,500 pounds per square inch.[xxx]

Superstructure – Stress Computations and Assembly. In his address to the American Society of Civil Engineers, Charles Spofford noted that preliminary stress computations for the continuous spans were based on values provided in the 2nd edition of "Kontinuierliche Trager Tabellen, by German engineer Gustav Griot 'containing influence data for shear and moment for continuous beams of constant moment of inertia. Spofford's method of erection eliminated the statical indeterminateness of the dead stresses by establishing the dead

reactions at both ends of the three-span approach and channel continuous truss (spans six, seven, and eight). For these spans, the 'values of the dead reactions, as obtained at piers five and eight from the preliminary design, were used as final values, and once the trusses were in place, the ends were raised by hydraulic jacks fitted with gauges to secure these predetermined reactions before the concrete deck was installed. Presumably a similar method was used for the two-span continuous truss on the New York side. Before final determination of reactions after jacking, "the Method of Least Work was used to determine the dead-load reactions. That same method, more precise than the preliminary calculations, also was used to calculate live-load stresses accounting for the elasticity of the members and the irregular depths of the trusses.[xxxi]

The riveted box-beams used extensively for the continuous and fixed-span trusses, albeit of components that vary in dimension, represented standard design for the period. However, lateral bracing was omitted from the panels over the intermediate piers where the trusses swing from deck to through design. Lateral stiffening in this intermediate area was accomplished with heavy portal braces on panels nine and ten (span six), twelve and thirteen (span seven), twenty-one and twenty-two (span seven), and twenty-four and twenty-five (span eight). Wind forces on the top chords in panels where bracing was omitted were transferred to the bottom chords by sway-bracing installed below the deck. Overhead sway bracing was used at all other panel points for the through truss. The engineers' original calculations for the total quantity of structural steel required, 6,000,000 pounds, exceeded final estimates based on payments, by sixty tons.[xxxii]

The sizes of truss members were determined on the assumption that spans four, five six, eight, and nine would be erected on false-work. Spans four, six, eight and nine were supported at alternative panel points by square timber piles, each which consisted of two bents driven to bedrock and braced together. Travelers running on the floor of the bridge

were used to place the falsework, driven by a steam hammer suspended from the boom of the traveler.

However, the contractor modified the method of assembly for span five, extending it outward by cantilever a distance of six panels. At that point, the structure was supported by a vertical bent, jacked to a point where stresses on the top chords connecting spans four and five were cancelled. The remainder of span five was then erected as a cantilever, its end panel finally lowered to pier five by reducing the height of the vertical bent. This method of assembly necessitated enlarging some of the truss members in span four to a minor degree, but the cost to the contractor was nominal.[xxxiii]

The projecting ends of span seven were extended from each side by cantilever until they met, a process that required careful computations for horizontal movements in end panels of the cantilevered spans during assembly. As closure of this span progressed, various panel points in the span were moved toward final positions via jacking until calculated end reactions were achieved.

Once the superstructure stood in place, the deck system was added, beginning with a reinforced concrete slab strengthened with unit trusses. Above that, a patented plain concrete wearing surface was poured, designed to be removed without damaging the integrity of the floor slab beneath it. D.H. Waits, the inventor, had transferred his patent to the Sheet Concrete Pavement Corporation of America, and royalty payments were assigned to that company as part of the construction costs.[xxxiv]

Lighting, Toll Booth, Gates, and Toll Collector's Dwelling. By the spring of 1929, with construction of the bridge rapidly advancing toward completion, plans for the bridge's lighting systems, a toll booth with islands and gates, and approach roadway alignments were in place. Carroll Farwell oversaw the development of these aspects of the project, including design of the toll booth. He also established a formal and carefully organized entry to the

bridge from the New York approach. Contract drawings include a toll collection area on the northwesterly side of the Vermont approach, but those plans were abandoned.[xxxv]

Farwell placed twenty-five street lights, each with 400 candle power, on alternating sides of the bridge, and his plans specified tapered wooden or concrete poles, eighteen feet in height, with arm extensions from which lighting units with bell-shaped lamps and acorn globes were hung. Although the globes have been replaced, the standards remain. Four concrete lamp posts, two of which survive, were placed on each side of the travel way at the toll collection plaza; identical standards were placed at the Vermont approach, and three of these survive. A twenty-four inch revolving airways beacon, based on designs provided by the U.S. Department of Commerce, Airways Division, was also installed on the bridge.[xxxvi]

At the New York side, the roadway widened to ninety-six feet in the area of toll collection, and a long, seventy foot island, eight feet in width, divided that road into two principal travel paths, each forty-four feet wide. A narrow toll booth, approximately twenty feet long and six feet wide, stood directly opposite the toll collector's dwelling at the southwesterly end of the island, and the booth's shingle-clad walls matched those of the dwelling. The long, southwesterly slope of the booth's three-quarter gable roof, roughly twice the length of its short northeasterly slope, extended over an open corridor on the island, in which two traffic registers were placed, one facing each lane. Three window openings with eight-pane fixed sash (southeasterly, northwesterly, and northeasterly elevations), and two large sign boards (southeasterly and northwesterly elevations) dominated the booth's facades.

To the northeast of the booth (toward Vermont), single smaller gate-islands divided each of the two travel lanes into two more lanes, each twenty feet in width. Rectangular frame 'roadway gates' with four panels, each panel web containing cross bracing, extended from posts placed on the roadway shoulder opposite these islands, and cables extended from the

tops of those posts to the ends of each gate; posts were capped by round steel castings. Tolls thus could be collected from cars moving in both easterly and westerly directions and from four possible points: easterly and westerly approaches and from each side of the central island.[xxxvii]

The center of the gate-island permitting passage to cars traveling from New York to Vermont was placed approximately eighteen feet from the toll booth (toward Vermont), and that for traffic moving in the opposite direction was placed approximately thirty-two feet from the booth (also toward Vermont). Thus, travelers from New York paid the toll and advanced toward the gate, which presumably had begun opening. Vehicles arriving from Vermont at the opposite gate-island, in contrast, waited until the toll operator opened the gate before proceeding to the booth to pay the toll. That unusual design may have been intended to allow the toll collector to control the number of cars arriving at the booth simultaneously, but desire to place all the electronic gate equipment in close proximity also may have been a factor. Electromatic traffic counters were placed in the roadway at each of the four gates, as well. Mushroom lights (also a noteworthy if short-lived roadway feature in use during the 1920s and early 1930s), were imbedded in the roadway surface at the New York entrance to the toll collection area.[xxxviii]

Design of the toll collection system, and in particular the staggered arrangement of the gates, followed a careful study of major American bridges and their toll houses in use at the time, including the Peace Bridge in Buffalo, the Bear Mountain Bridge across the Hudson River, and the movable Kennebec Bridge at Bath, Maine. Results of the firm's study were summarized in its *Memorandum on Methods of Toll Collection*, dated December 28, 1928. That document emphasized that most large bridges relied on toll houses at both ends of the crossing, as well as vouchers, which were received at one end and returned at the other. However, the bridge at Bath had abandoned the second toll booth for sake of economy. In

addition, a single toll house that allowed collectors to accept tolls from vehicles moving in two directions simplified procedures during times of limited traffic, in one or both directions. The study indicated that ticket sellers were capable of handling about 220 cars per hour, and the gate design adopted by Carroll Farwell probably sought to maximize both efficiency and accuracy.[xxxix]

Windows in the toll booth were replaced in 1959, and the original toll booth, islands, gates, and electrical systems were completely rebuilt in 1968 based on the designs of Frank Lincoln from Fay, Spofford and Thorndike. Lincoln extended the length of the toll-booth island and protected it with a tapered concrete barrier. Plans called for road surfaces painted with reflectorized paint and installation of a new traffic detector treadle. In addition, a new transformer building was built on the southeasterly edge of the toll collector's lot.[xl]

The toll-collector's dwelling faced the collection area, with the front ell serving as an office. A surface paved with granolithic concrete provided an entrance area to both the office ell and to the house. The building's center-bay front door opened from a small stoop, also granolithic concrete, and framed by high-back bench seats. An entrance vestibule and center-hall led to the large commissioner's room (front, left) and living room (front right), which also contained a closet bed as well as separate entry to the office-ell. Dining room, kitchen and bath extended across the rear portion of the house, also accessible via a long flight of steps, open porch sheltered by a shed roof, and small entrance hall. The building's upper story contained a hall, two bedrooms, and attic storage areas in the front and rear eaves. The basement contained a fireproof vault for the money collected, two-car garage with Lowden stock garage doors mounted on 'round-the-corner tracks, and a coal-fired furnace. Plans also called for a black slate roof on the main block and office ell, wooden Elhide shingles laid eight inches to the weather, and rock-wool insulation. Designs for the building were

developed by architect D. Jackson in association with Fay, Spofford and Thorndike, and plans were signed in April, 1929. However, very little is known about Mr. Jackson.[xli]

By November, 1928, landscape architect Elmer Eugene Barker had prepared a site plan for the dwelling house, toll collection area, and roadway approach at the Crown Point Reservation. Barker, born in Crown Point in 1886, attended Cornell University as an undergraduate, followed by study at Harvard University, where he obtained a degree in landscape architecture. He later returned to Cornell for doctoral studies and then taught plant breeding at that institution. His career as a landscape architect included employment for the Westchester Park Commission, the federal government, and the New York State Department of Public Works. However, his expansive career activities extended to history, conservation, and regional planning, and he authored several books on topics as diverse as the iron industry in the Crown Point region, the Civil War, and botany.[xlii]

For the toll-keeper's dwelling's relatively simple plan, Barker introduced a grass-covered traffic circle (similar to a modern roundabout) at the entrance to the toll plaza, planted trees (mountain ash and thorn-apple) and shrubbery (barberry, aromatic sumac, and vines) at strategic locations around the house and on the slopes of the bridge approaches, and he also created a border hedge around a garden on the building's southwesterly side. Many of those plantings survive.[xliii]

The commission enlarged the dwelling in 1945, adding an ell on the building's back or southeasterly side based on plans prepared by L. C. Heney for the Champlain Valley Construction Company of Westport, New York. The ell added a sunroom to the dwelling's first floor and a storage area below, subsequently converted to a garage. A flight of steps ascended to a small deck at the building's back door. Toll collection ended in 1987, and the bridge's new owner, the state of New York, dismantled the plaza at that time. However, the dwelling continues to stand.[xliv]

Project Costs and Financing. The Lake Champlain Bridge Commission estimated that total project costs, including land acquisition, construction, engineering and legal expenses, and financing services would reach $1,200,000. That amount also included construction of the toll-keeper's residence, the construction contract for which had been awarded to Charles E. Malone of Port Henry, New York, who bid $9,593.00. To pay those total costs, New York and Vermont advanced $200,000 (New York $120,000 or 60% and Vermont $80,000), and thirty-year bonds in the amount of $1,000,000 were issued. National City Company of New York City and Old Colony Company of Boston successfully bid to jointly underwrite those bonds, with maturities beginning in 1940 and continuing in increasing amounts up to and including the year 1958. Tolls were set at $1.00 for passenger automobiles (less than the cost of ferries), $1.00 to 2.00 for trucks (depending on weight), and up to $3.00 for motor buses; pedestrians paid .25 cents and horse drawn vehicles .50 cents. To the credit of the commission and its engineers, construction was completed on schedule and below budget, with a final tally of $1,149,032.63. Toll collection began on August 27 1929, the day after opening ceremonies, netting $550 during the first seventeen hours of operation. Revenue during the remainder of the year added more than $33,000.00 to the commission's coffers – possibly inspiring confidence during a time of growing financial uncertainty.[xlv]

Opening Day. The completed bridge was dedicated on August 26, 1929, at a grand ceremony beginning at two o'clock in the afternoon and observed, according to most estimates, by more than 40,000 people. Betty Ferris, the daughter of Mortimer Y Ferris, joined New York Governor Franklin D Roosevelt and Vermont Governor John E. Weeks for a ribbon-cutting ceremony at mid-bridge. The group then journeyed to Vermont before returning to Crown Point to review a parade of floats crossing the bridge, estimated at more than ten miles long. Floats representing more than twenty-five Vermont towns included a flower-covered airplane from Bristol, as well as Montpelier's entry, a large model of the State

House, which survives and is now owned by the Montpelier Historical Society. A smaller parade of boats organized by the Burlington Yacht Club passed beneath the bridge during the procession, with boat-owners anticipating the symbolic burning of the Henry Proctor, a local ferry made obsolete the moment the bridge opened. Motor-boat races, a fireworks display launched from the Henry Proctor, and music provided additional entertainment for spectators. Speeches began at mid-afternoon, led by Governor Weeks and then Governor Roosevelt, who remarked that Vermont and New York were once again joined.[xlvi]

Automobile Travel. Accurate estimates of the automobiles expected to use the Champlain Bridge were a critical part of the project's early stages of development, principally because the project's financing depended upon the sale of bonds to be repaid by a specified date. In turn, predictable repayment of principal and interest depended upon the amount of tolls taken, which influenced the individual toll rates to be charged. Fay. Spofford and Thorndike conducted extensive traffic studies, taking into account a broad ranger of factors including: the growth in automobile registration; increased traffic on New York and Massachusetts highways; service previously provided by ferries on Lake Champlain; the extent of ongoing highway construction in the region that may have impeded travelers prior to 1929: expectations regarding development of the historic sites at Crown Point Reservation; and the stimulating effect of the new bridge on tourist travel.[xlvii]

In particular, the firm observed that the opening of new bridges across the country's major waterways had been accompanied by a marked increase in traffic, more than seventy percent in the instances of the Carquinez Strait Bridge across an arm of San Francisco Bay and the Philadelphia-Camden Bridge over the Delaware River. The firm also noted that tourist travel seemed to be increasing at a greater rate than other types of automobile travel. During the two decades between 1931 and 1951, the year that the bonds were expected to be retired, the firm estimated that travel across the bridge would increase rapidly for the first

several years, but then the rate of increase would gradually become more stabile, conforming to the general rate of increase on other roads.

Curiously, though, the estimates provided by Charles Spofford in his 1928 address to the American Society of Civil Engineers differ substantially from the firm's predictions, as reported by the commission in its annual report for 1928. Specifically, Spofford calculated that use would double from 30,000 cars in 1930 to 60,000 cars in 1931, and reach 100,000 cars by 1936. By 1951, he expected 148,000 cars to cross the bridge. The commission's report, however, anticipates a minimum of 95,000 cars in 1930, increasing to 123,000 cars in 1931, and reaching 222,000 cars by 1940.[xlviii]

Regardless, the most important figures are the records of actual use during the decades of travel across the bridge, especially the years between 1930 and 1940. Generally, substantially fewer cars used the bridge than either Spofford or the commission predicted, other than during 1930 when more than 75,000 vehicles crossed the lake. However, records show a steady increase in use during the 1930s, rising from nearly 49,000 in 1933 to almost 65,000 by 1940. Although travel declined during World War II, in 1950 more than 100,000 travelers used the bridge. Statistics such as these, carefully gathered and recorded at a strategically important site, represent valuable evidence concerning America's rapidly growing car culture during a decade of overbearing economic decline. And, those records will continue to hold value as the enormous influence of automobile, and in particular the cost of building highways to accommodate that form of travel, receives increasing attention.[xlix]

Statement of Significance - Endnotes

[i] Letter from Eric DeLony Chief (retired), Historic American Engineering Record, National Park Service to Ruth Pierpont, Director Historic Preservation Field Services Bureau NYSOPRHP dated June 17 2007

[ii] Lake Champlain Bridge Commission, *Annual Report* (1929) See also "Application of Addison Railroad to Construct a Bridge Across Lake Champlain Between Shoreham, Vermont and Ticonderoga New York, dated August 25 1920 Lake Champlain Bridge Commission Collection (LCBC Collection), Office of the Vermont Secretary of State Archives Division Box 3

[iv] Letter from Herbert W Baker Secretary of the New York State Automobile Association to Mortimer Y Ferris, dated January 19 1926 See also 'Champlain Bridge Must be Built Eventually Why Not Now? in *Essex County News* (December 26 1925) and J L Southwick 'Bridges Will Help Make Vermont a Tourist Mecca," in *Burlington Free Press* (1926) All in LCBC Collection Boxes 3 and 5 See also LCBC Minutes (December 27, 1926) LCBC Collection, Box 1

[v] New York State Joint Legislative Committee on the Champlain Bridge 'Report to the Legislature January 26 1927 Vermont Office of the Secretary of State Division of State Archives Lake Champlain Bridge Commission Collection, Box 10 Folders 1-2 See also Fay Spofford and Thorndike 'Lake Champlain Bridge Memorandum of Data and Plans Received from Chairman M Y Ferris August 3 1927 Box 5, Folder 1

[vi] Lake Champlain Bridge Commission, Annual Report (1927)

[vii] Charles M Spofford, *The Theory of Structures* New York McGraw Hill Book Company Inc 1939

[viii] Richard M Casella 'National Historic Context and Significance of the General Sullivan Bridge " Typewritten report October 2005

[ix] Letter from H Foster Bain Secretary of the American Institute of Mining and Metallurgical Engineers, to M L Thomas July 12 1927

and letter of M L Thomas to J V W Reynders, July 14 1927 LCBC Collection Box 3 Folder 1

[x] LCBC Minutes (August 2, 1927 and September 13 1927) LCBC Collection Box 1

[xi] LCBC Minutes August 2, 1927 and September 13 1927 LCBC Collection Box 1, Folder 2 See also "Agreement Engineering Services for Proposed New Lake Champlain Bridge between Fort Frederick in the Town of Crown Point New York, and Chimney Point in the Town of Addison Vermont, dated August 2 1927 LCBC Collection, Box 10, Folder 2 See also letter from Frederic H Fay to Honorable Mortimer Y Ferris, August 13, 1927 letter from Frederick Fay to Mortimer Ferris dated April 24, 1928 and letter from Frederic Fay to H Hopson Chief Engineer of Merritt-Chapman & Scott Corporation September 25 1928 LCBC Collection, Box 5 Folder 1

[xii] Letter from Frederick Fay to the LCBC, dated November 1, 1927 LCBC Collection Box 5, Folder 1 See also LCBC *Annual Report* (1927)

[xiii] Charles Spofford "Lake Champlain Bridge, in *Transactions of the American Society of Civil Engineers* 98 (1933) 622-659

[xiv] Carl Condit *American Building Art The Twentieth Century* (New York Oxford University Press 1961), 92-98 See also Richard M Casella, "National Historic Context and Significance of the General Sullivan Bridge Typewritten report October 2005

[xv] *Ibid*

[xvi] *Ibid*

[xvii] Ibid See also Hardy Cross, Analysis of Continuous Frames by distributing Fixed-End Moments " in *Transactions of the American Society of Civil Engineers* 96 (1932) 1-10 discussion 11-156

[xviii] Lindenthal also designed two determinate continuous truss highway bridges in the Pittsburgh area during the 1880s and 1890s, but these

designs employed counterweights to cancel bending stresses in the trusses, a method described as the funicular principle See Gustav Lindenthal 'Bridges With Continuous Girders in *Civil Engineering* (July 1932), 424

[xix] Condit *American Building Art The Twentieth Century* New York: Oxford University Press 1961 104-110 See also Henry Tyrrell *History of Bridge Engineering* (Chicago Published by the author 1911) 265 and J A L Waddell *Bridge Engineering* 2 vols (New York John Wiley & Sons 1916) 62 and 1072

[xx] Condit *American Building Art The Twentieth Century* 104-110

[xxi] *Ibid*

[xxii] Spofford, 'Lake Champlain Bridge in *Transactions of the American Society of Civil Engineers* 98 (1933) 622-659

[xxiii] Casella, 'National Historic Context and Significance of the General Sullivan Bridge

[xxiv] LCBC *Annual Reports* (1927 and 1929) See also Spofford, "Lake Champlain Bridge in *Transactions of the American Society of Civil Engineers* 98 (1933) 622-659

[xxv] LCBC *Annual Report* (1928)

[xxvi] Spofford Lake Champlain Bridge in *Transactions of the American Society of Civil Engineers* 98 (1933) 622-659 See also George Thompson, Charles Spofford and George Mirick 'History and Design of the Lake Champlain Bridge, in *Proceedings of the Vermont Society of Engineers* (October 1928)

[xxvii] *Ibid*

[xxviii] *Ibid*

[xxix] *Ibid*

[xxx] *Ibid*

[xlii] 'Dr E Eugene Barker Dies; Noted as Historian, Author," in *Ticonderoga Sentinel* (April 2, 1964) See also archival files Cornell University

[xliii] See plan titled 'Landscape Development at the Superintendent's House " Crown Point Reservation by Elmer Eugene Barker undated but c 1928 In a letter dated November 15 1928 from Frederic H Fay to Mortimer Y Ferris Fay acknowledges receipt of the landscape plan LCBC Collection, Oversize Folder 2 and Box 5 Folder 8

[xliv] See plan titled 'Toll-Keeper s Addition," by L C Heney for the Champlain Valley Construction Co , dated December 18 1945 LCBC Oversize Folder 4

[xlv] LCBC *Annual Reports* (1928 and 1929)

[xlvi] Gregory Sanford "Did the Henry Proctor Burn? *Country Courier* (September 15 1989)

[xlvii] Charles Spofford 'Lake Champlain Bridge in *Transactions of the American Society of Civil Engineers* 98 (1933) 622-659

[xlviii] LCBC *Annual Report* (1928)

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[xxxi] Spofford, Lake Champlain Bridge," in *Transactions of the American Society of Civil Engineers* 98 (1933) 622-659

[xxxii] *Ibid*

[xxxiii] *Ibid*

[xxxiv] Frederic Fay "Memorandum of Conference at Albany, New York with Arthur W Brandt Commissioner of Highways dated January 4 1928 LCBC Collection, Box 5

[xxxv] LCBC Collection Plan 42 Sheet No 22 Oversize Folders 1 2 and 3

[xxxvi] See plan titled "Contract 4 Lighting Detail of Street Light and Connections by Fay Spofford and Thorndike dated April 1929 and plan titled 24-Inch Revolving Airways Beacon " by the Department of Commerce Airways Division, dated February 21 1928 LCBC Collection, Oversize Folders 1, 2, and 3

[xxxvii] LCBC Collection, Oversize Folder 3

[xxxviii] *Ibid*

[xxxix] Fay Spofford, and Thorndike 'Memorandum of Methods of Toll Collection," typewritten report dated December 28, 1928 LCBC Box 3, Folder 15

[xl] See plan titled "Toll Booth and Plaza Modification, by Fay Spofford and Thorndike dated January, 1959 plan titled "Rebuilding the Toll Plaza and Electrical System - General Plan " by Fay Spofford and Thorndike, dated July, 1968 and plan for a "Collector Protector " by Taller and Cooper Inc Brooklyn, dated October 14 1969 All are in LCBC Collection Oversize Folder 4

[xli] LCBC Collection Oversize Folder 3 Inquiries about Jackson produced no information from the Boston New York Vermont and Washington offices of the American Institute of Architects However further investigation of the national data base is warranted

Section 10: Geographical Data

Verbal Boundary Description

The boundary of the property is the bridge and its abutments, piers, adjoining land and approach causeways and slopes, former toll collection plaza, and former toll collector's dwelling. The bridge carries Vermont Route 17 and New York Route 903 across Lake Champlain between Chimney Point in the town of Addison, Vermont, and Crown Point, in the town of Crown Point, New York. That property is further described as follows:

Parcel 1

Beginning at a point in Crown Point Reservation southerly of Fort Saint Frederick, herein designated as Point A, which Point A is on a line bearing true north 60 degrees 37 minutes west and is 40 feet distant from the hub established by the State Engineer of the State of New York in 1926, on a knoll about 70 feet southerly of the southeasterly salient of said Fort, which hub is known as 'Station 10' on the center line of the Lake Champlain Bridge as said bridge was shown and described on the map or plan of said bridge by Fay. Spofford, & Thorndike, Engineers, Boston, Massachusetts, entitled 'Land To Be Occupied and Used For the Construction and Maintenance of Lake Champlain Bridge, dated May 24, 1928. File No V1-8a, Plan No. R-4;

Thence from Point A true south 65 degrees 23 minutes west about 195.3 feet to Point B; thence true south 29 degrees 23 minutes west about 174.0 feet to Point C; thence true south 60 degrees 37 minutes east about 34.2 feet to Point D; thence curving easterly to the left along the arc of a circular curve, tangent to line C-D, the radius of the curve being 80 feet, the angular distance measured along the arc being about 78.2 feet to Point E; thence true north 63 degrees 23 minutes east about 29.5 feet to Point F; thence true south 26 degrees 37 minutes east 40 feet to Point G; thence true south 66 degrees 7 minutes east about 17.5 feet to Point H; thence true north 74 degrees 23 minutes east 40 feet to Point I; thence true south 15 degrees 37 minutes east about 129 feet to Point J; thence true north 82 degrees 33 minutes east about 84 feet to Point K; thence true north 29 degrees 23 minutes east 380 feet, more or less, to Point L at low water mark in Lake Champlain; thence following the low water mark of said lake in a general northerly direction to Point M in said low water mark, which Point M is 40 feet distant northwesterly from the center line of the said Lake Champlain Bridge; thence along a line parallel to and 40 feet northwesterly from the said center line, true south 29 degrees 23 minutes west 350 feet, more or less, to Point A, the point of beginning.

The parcel of land above described being a portion of the Crown Point Reservation, the fee title to which is in the State of New York, the use of which for the purposes of the bridge has

☐ See continuation sheet

been consented to pursuant to the provisions of Chapter 321 of the Laws of New York, 1927 and the definite boundaries as above detailed being the same as those contained in the approval of the Conservation Department of the State of New York heretofore granted to the Lake Champlain Bridge Commission.

Parcel 2
All of the right of the Lake Champlain Bridge Commission to use and occupy the lands under water in Lake Champlain described as follows:

Beginning at a point at low water mark in Lake Champlain, easterly of the ruins of Fort Saint Frederick, and designated in the parcel of land last above described as Point M, which Point M is on a line parallel to and 40 feet distant northwesterly from the center line of the said Lake Champlain Bridge; thence from Point M, following the low water mark of said lake, which low water mark is also the boundary of land to be so occupied and used in the Crown Point Reservation, in a general southeasterly direction to Point N in said low water mark, which Point N is 40 feet distant southeasterly from the center line of the said Lake Champlain Bridge; thence along a line parallel to 40 feet southeasterly from said center line, true north 29 degrees 23 minutes east 868 feet, more or less, to Point O in the boundary line between the states of New York and Vermont, which Point O is 40 feet distant southeasterly from the said center line of the said Lake Champlain Bridge; thence following the said state boundary line in a general northwesterly direction to Point P in said boundary line, which Point P is 40 feet distant northwesterly from the center line of the said Lake Champlain Bridge; thence along a line parallel to and 40 feet northwesterly from the said center line true south 29 degrees 23 minutes west 868 feet more or less to Point M, the point of beginning.

Being the same premises described in a petition heretofore presented to the land board of the State of New York for the purpose of obtaining a definite description of the lands under water in Lake Champlain to the used and occupied by the said Lake Champlain Bridge.

Parcel 3
All the right to use of lands under water within the State of Vermont necessary or useful for the operation of the bridge, described as follows:

Beginning at a point at low water mark in Lake Champlain westerly of the Chimney Point Ferry Slip, herein designated Point R, which Point R is on a line parallel to and 40 feet distant southeasterly from the center line of the said Lake Champlain Bridge; thence following the low water mark of said lake, which low water mark is also the boundary of land to be taken from Millard F. Barnes, in a general northwesterly direction to Point Q in said low water

mark, which Point Q is 40 feet distant northwesterly from the center line of the said Lake Champlain Bridge; thence along a line parallel to and 40 feet northwesterly from said center line true south 29 degrees 23 minutes west 385 feet, more or less, to Point P in the boundary line between the states of New York and Vermont; thence following the said state boundary line in a general southeasterly direction to Point O in said boundary line, which Point O is 40 feet distant southeasterly from the center line of the said Lake Champlain Bridge; thence along a line parallel to and 40 feet southeasterly from the said center line true north 29 degrees 23 minutes east 370 feet, more or less, to Point R, the point of beginning.

Parcel 4

All the right, title and interest in that tract or parcel of land situate, lying and being in the Town of Addison, County of Addison and State of Vermont conveyed in fee by Millard F. Barnes to the Lake Champlain Bridge Commission, which tract is described as follows:

Beginning at a point, herein designated Point U. on the fence line marking the boundary between lands now or formerly owned by Millard F. Barnes and Richard P Watson, said point being approximately 30 feet westerly of the center line of the driveway leading to the residence of Richard P Watson and being also on the center line of the said Lake Champlain Bridge, produced at approximately Station 36 plus 14; thence true south 69 degrees 23 minutes west 460 feet, more or less, to Point V at low water mark in Lake Champlain; thence following the low water mark of said lake in a general southerly and southeasterly direction to Point S in said low water mark, which Point S is 45 feet distant southeasterly from the center line of the said Lake Champlain Bridge; thence along a line parallel to and 45 feet southeasterly from the said center line, true north 29 degrees 23 minutes east 980 feet, more or less, to Point T which Point T is approximately opposite Station 35 plus 63 on the said center line produced and is approximately 66 feet southerly of the said fence line; thence true north 12 degrees 2 minutes west a distance of 68 feet, more or less, to Point U, the point of beginning.

Boundary Justification

Parcels 1, 2, 3, and 4 are all the same land described in Indenture of Mortgage dated June 1, 1928, between the Lake Champlain Bridge Commission, Mortgagor, and Guaranty Trust Company of New York, Mortgagee, recorded on July 13, 1928 in Book 84 of Mortgages Page 264, Essex County Clerks Office, New York, and recorded July 18, 1928 in Book 26 Page 295, Office of the Addison Town Clerk. That property includes all the land historically associated with the bridge, its toll plaza, and the toll collector's dwelling.

Fee title to the land described in Parcels 1 and 2 was conveyed to the State of New York by deed recorded March 1, 1928, in Book 189 of Deeds, Page 99. and by deed recorded May 28, 1927 in Book 186 of Deeds, Page 451, Essex County Clerks Office. That land is under the jurisdiction of the New York State Department of Environmental Conservation, Bureau of Land Management. Fee title to the land described in Parcel 4 (and Parcel 3 to the extent that interest in the lake bed of Lake Champlain had vested in adjoining landowners) was conveyed to the State of Vermont by deed dated September 5, 1928, recorded September 7, 1928, in Book 25, Page 128 in the office of the Addison Town Clerk.

In 1987 all of the assets, functions and powers possessed by, and all of the rights, duties and obligations of the Lake Champlain Bridge Commission, were transferred and assigned to, and assumed by, and vested in the New York State Department of Transportation and the Vermont Agency of Transportation, to be shared in accordance with an agreement entered into between the New York State Department of Transportation and the Vermont Agency of Transportation, pursuant to Act 59. Vermont Public Acts, 1987 Session, and Chapter 918 of the Laws of New York, 1986 Session.

Section 12: Photograph Labels

The following information is the same for Photographs 1 to 7:

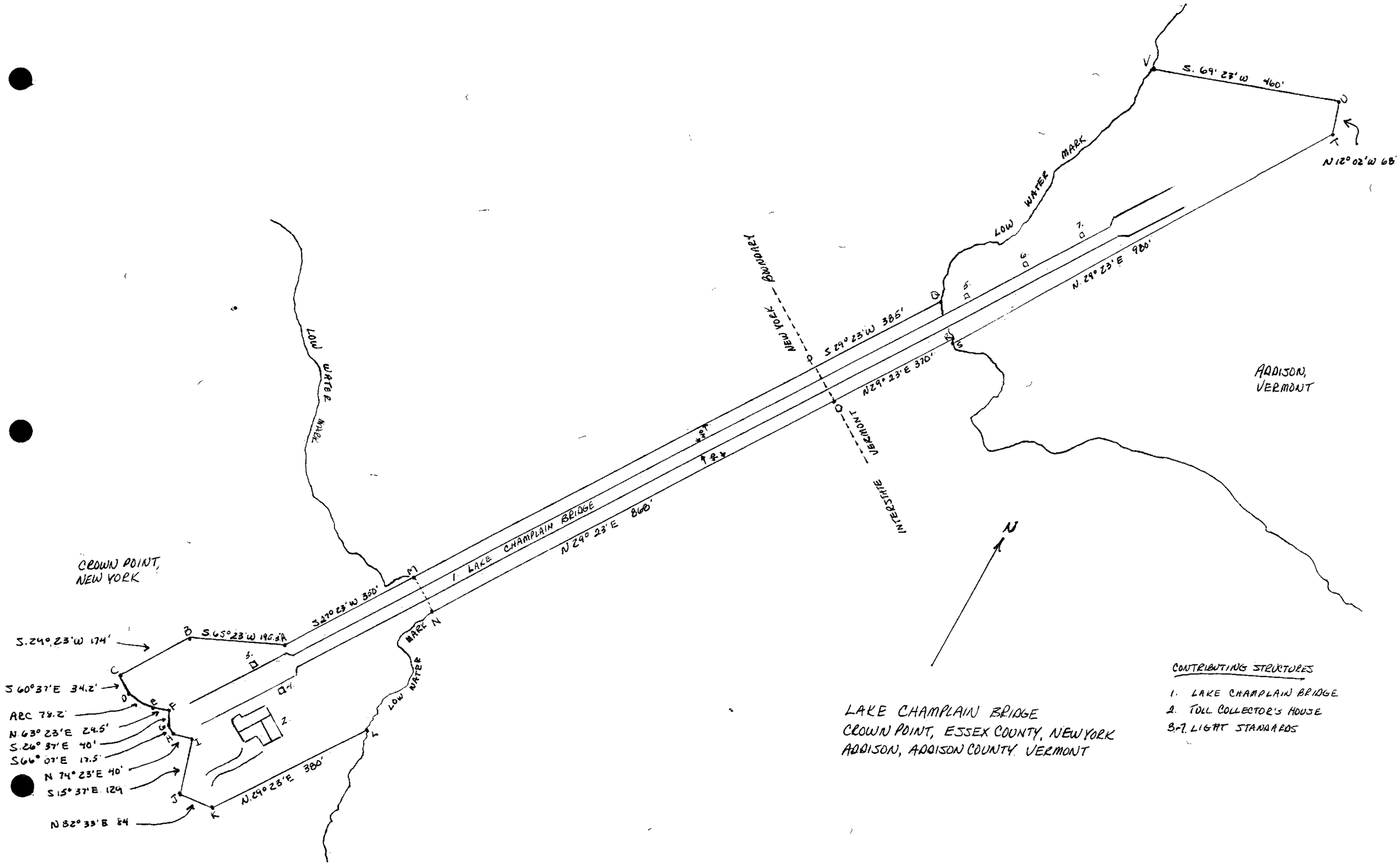
Name of Property:	Lake Champlain Bridge
Location:	Chimney Point in the town of Addison, County of Addison, Vermont Crown Point in the town of Crown Point, County of Essex, New York
Negatives:	Filed at the Vermont Office of the Secretary of State, Archives Division

Photograph No. 1	Aerial View, looking southeasterly, 1929
Photograph No. 2	View from New York side, looking easterly, 1929
Photograph No. 3	View from Vermont side, looking westerly, 1929
Photograph No. 4	View of channel span, constructional cantilever joined to form continuous truss, 1929
Photograph No. 5	View of channel span under construction, 1929
Photograph No. 6	View of channel span under construction, 1929
Photograph No. 7	View of floats and toll booth, dedication ceremony, August 26, 1929

The following information is the same for Photographs 8 to 16

Name of Property:	Lake Champlain Bridge
Location:	Chimney Point in the town of Addison, County of Addison, Vermont Crown Point in the town of Crown Point, County of Essex, New York
Date:	Spring, 2007
Credit:	Robert McCullough
Negatives:	Filed at the Univ. of Vermont, Graduate Program in Historic Preservation

Photograph No. 8	View from Vermont side, looking northerly.
Photograph No. 9	View from Vermont side, looking southwesterly
Photograph No. 10	View from the Vermont side, looking westerly
Photograph No. 11	View from the Vermont side, light standards, looking northerly
Photograph No. 12	View from the New York side, looking northeasterly
Photograph No. 13	View from the New York side, looking northerly
Photograph No. 14	View from the New York side, looking easterly
Photograph No. 15	Toll Keeper's House and light standard, looking southerly
Photograph No. 16	Toll Keeper's House and light standard, looking easterly



LAKE CHAMPLAIN BRIDGE
CROWN POINT, ESSEX COUNTY, NEW YORK
ADDISON, ADDISON COUNTY, VERMONT

CONTRIBUTING STRUCTURES

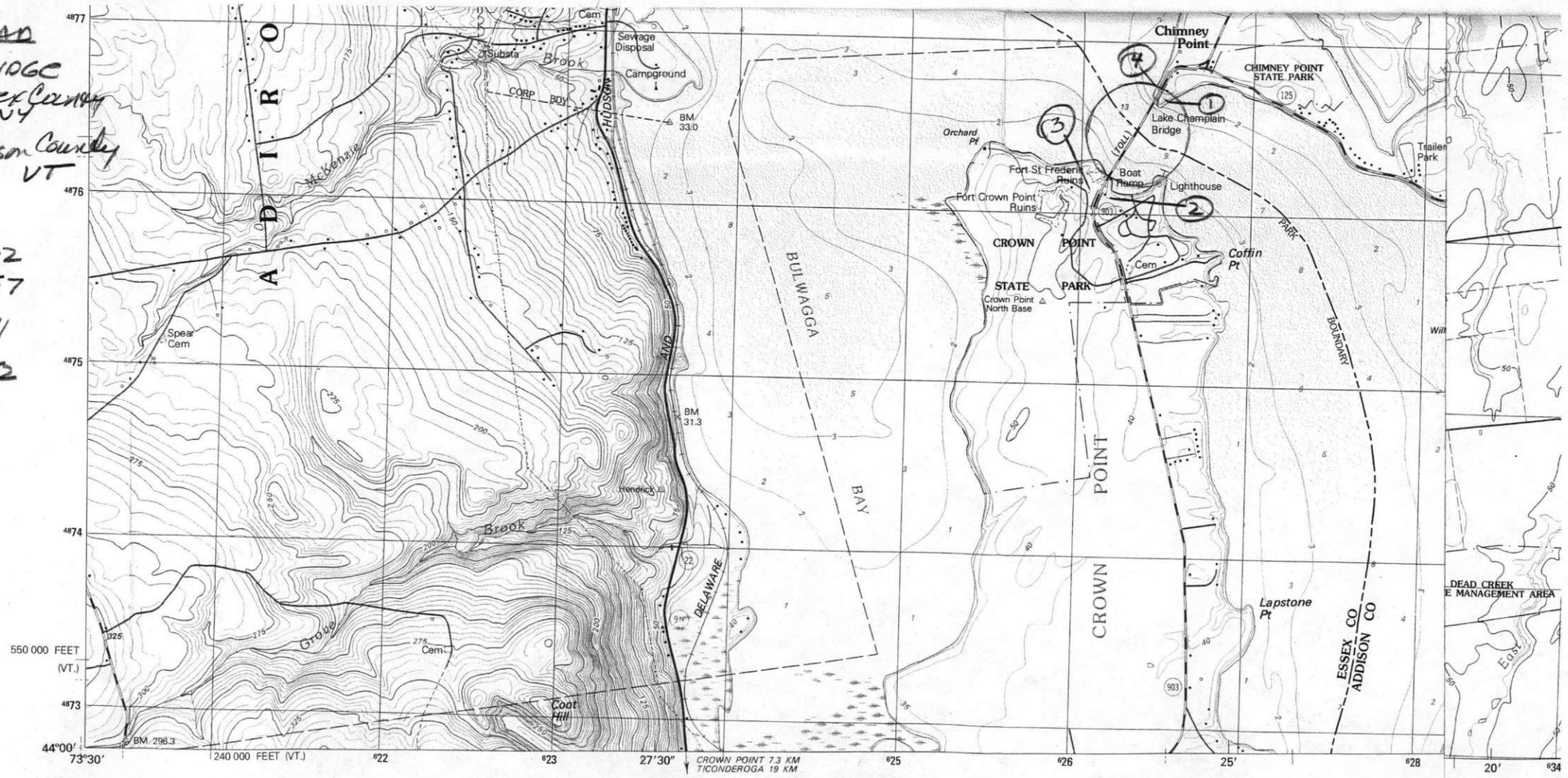
1. LAKE CHAMPLAIN BRIDGE
2. TOLL COLLECTOR'S HOUSE
3-7. LIGHT STANDARDS

PORT HENRY NY-VT QUAD

LAKE CHAMPLAIN BRIDGE
- NY9 CROWN POINT, ESSEX COUNTY NY
- VT17, ADDISON, ADDISON COUNTY VT

Zone: 18

	E	N
1	626472	4876932
2	626157	4876257
3	626066	4876341
4	626442	4876952



INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1981

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Robert McCullough
Date: Spring, 2007
Negatives: Filed at the University of Vermont
Description: View from New York side, looking easterly
Photograph: No. 14

05/07/07

8438600 8438600_8438600-R1-E011_023

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Robert McCullough
Date: Spring, 2007
Negatives: Filed at the University of Vermont
Description: View from New York side, looking northerly
Photograph: No. 13

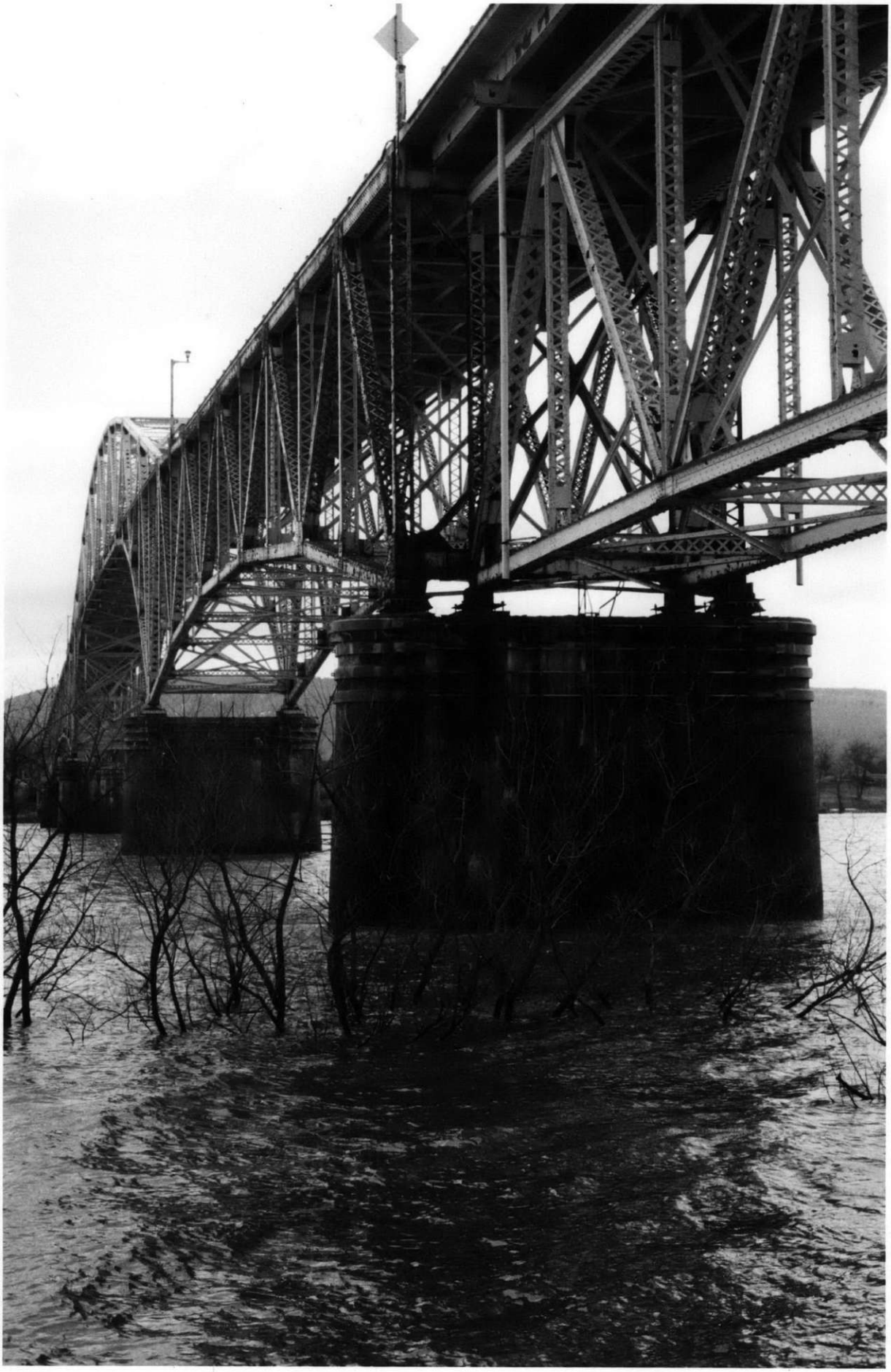
05/07/07

8438600 8438600_8438600-R1-E006_018

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Robert McCullough
Date: Spring, 2007
Negatives: Filed at the University of Vermont
Description: View from New York side, looking northeasterly
Photograph: No. 12

8438600 8438600_8438600-R1-E007_019

05/07/07



Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Robert McCullough
Date: Spring, 2007
Negatives: Filed at the University of Vermont
Description: View from Vermont side, light standards, looking northerly
Photograph: No. 11

8438600 8438600_8438600-R1-E010_022

05/07/07

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York

Credit:	Robert McCullough
Date:	Spring, 2007
Negatives:	Filed at the University of Vermont
Description:	View from Vermont side, looking southwesterly
Photograph:	No. 9

8438600 8438600_8438600-R1-E009_021

05/07/07

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Robert McCullough
Date: Spring, 2007
Negatives: Filed at the University of Vermont
Description: View from Vermont side, looking westerly
Photograph: No. 10

8438600 8438600_8438600-R1-E005_017

05/07/07

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: 1929
Negative filed at the Vermont State Archives
Description: View of channel span under construction
Photograph No. 5

8373300 LCBridgeConstruction3_006

02/22/07

UNITED
AT
LAST

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: August 26, 1929
Negative filed at the Vermont State Archives
Description: View of floats and toll booth, dedication ceremony
Photograph No. 7

02/22/07

8373300 LCBridgeOpenning1929_010

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Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: November 2006
Negative filed at the University of Vermont
Description: View from Vermont side, looking northerly
Photograph No. 8

03/08/07

8380100 8380100_8380100-R1-E001_002

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: 1929
Negative filed at the Vermont State Archives
Description: View of channel span under construction
Photograph No. 6

02/22/07

8373300 LCBrideeConstruction2_009

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NEW YORK & VERMONT

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Robert McCullough
Date: Spring, 2007
Negatives: Filed at the University of Vermont
Description: Toll keeper's house and light standard, looking southerly
Photograph: No. 15

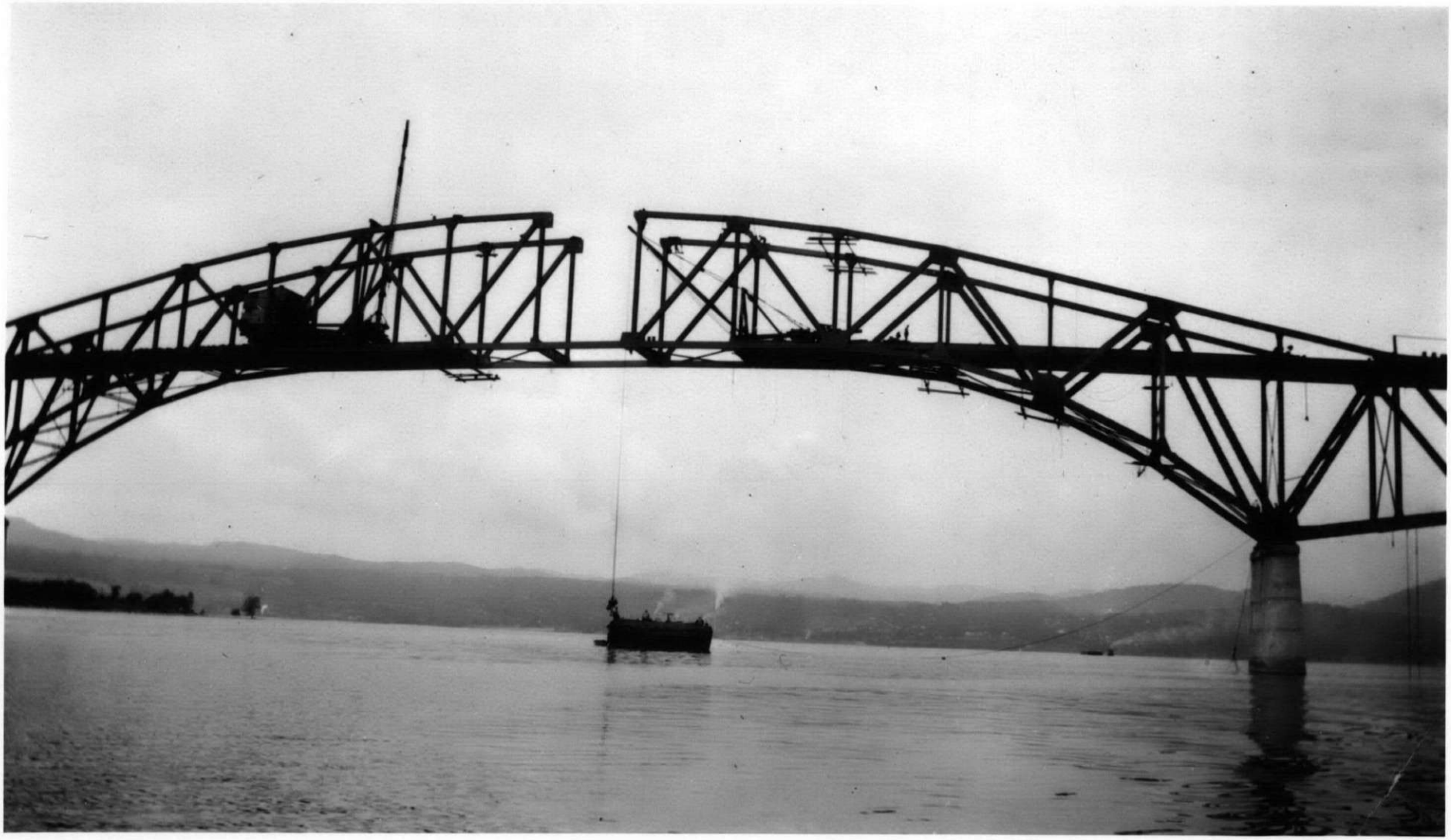
05/07/07

8438600 8438600_8438600-R1-E008_020

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Robert McCullough
Date: Spring. 2007
Negatives: Filed at the University of Vermont
Description: Toll keeper's house and light standard, looking easterly
Photograph: No. 16

05/07/07

8438600 8438600_8438600-R1-E004_016



Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: 1929
Negative filed at the Vermont State Archives
Description: View of channel span, constructional cantilever joined to form continuous truss, looking westerly
Photograph No. 4

02/22/07

8373300 LCBridgeConstruction_004

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: 1929
Negative filed at the Vermont State Archives
Description: View from Vermont side, looking westerly
Photograph No. 3

8373300 LCBridge-003

02/22/07

5

Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: 1929
Negative filed at the Vermont State Archives
Description: View from New York side, looking easterly
Photograph No. 2

02/22/07

8373300 LCBridgeCrownPointNY_007

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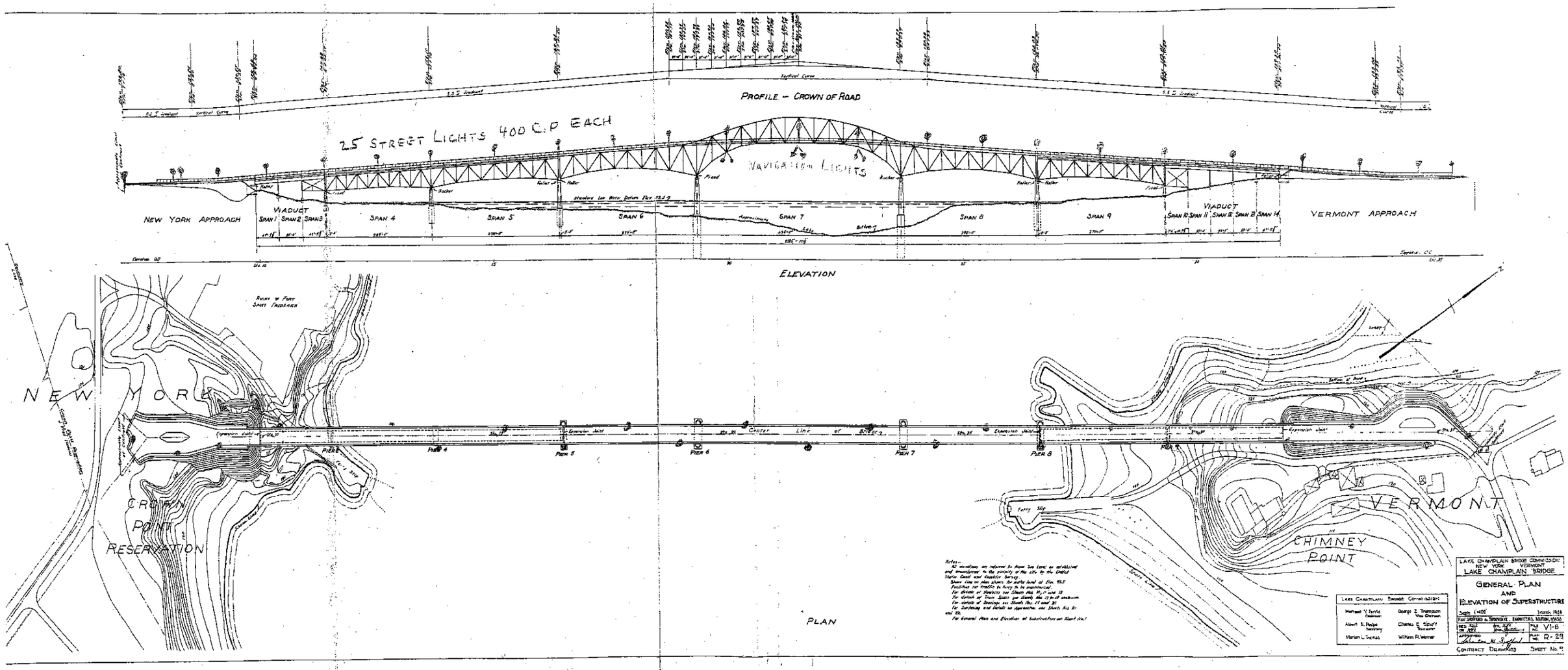
FAIRCHILD AERIAL SURVEYS, INC. N.Y.C.

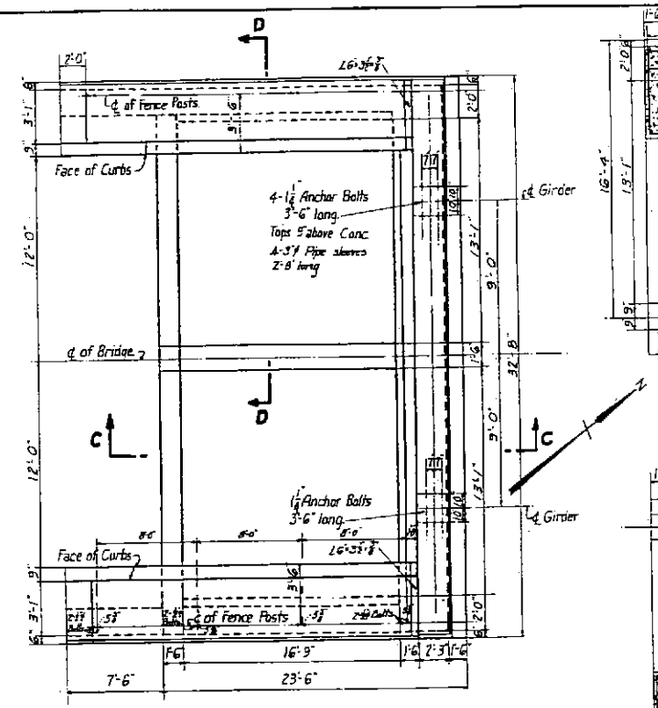
Lake Champlain Bridge, Addison, Addison County, Vermont
Crown Point, Essex County, New York
Credit: Lake Champlain Bridge Commission
Date: 1929
Negative filed at the Vermont State Archives
Description: Aerial view looking southerly/southeasterly
Photograph No. 1

02/22/07

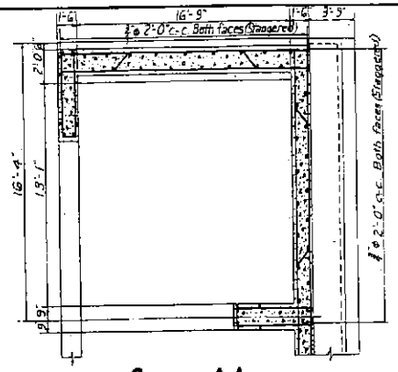
8373300 Fairchild Aerial Survey 55339 Po


PROFILE — CROWN OF ROAD
25 STREET LIGHTS 400 C.P EACH
NAVIGATION LIGHTS
NEW YORK APPROACH
VIADUCT
SPAN 1
SPAN 2
SPAN 3
SPAN 4
SPAN 5
SPAN 6
SPAN 7
SPAN 8
SPAN 9
SPAN 10
SPAN 11
SPAN 12
SPAN 13
SPAN 14
VERMONT APPROACH
ELEVATION
NEW YORK
CROWN POINT RESERVATION
PIER 4
PIER 5
PIER 6
PIER 7
PIER 8
FERRY SLIP
VERMONT
CHIMNEY POINT
PLAN
LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK VERMONT
LAKE CHAMPLAIN BRIDGE
GENERAL PLAN AND ELEVATION OF SUPERSTRUCTURE
Scale 1"=100'
March, 1926
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.
FILE NO. VI-B
PLAN NO. R-29
CONTRACT DRAWINGS
SHEET No. 9

LCBC
Lake Champlain
Bridge
Design + Construction
#28



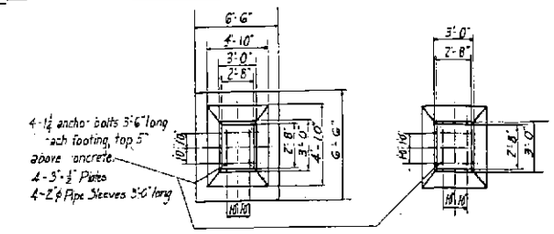
PLAN OF NEW YORK ABUTMENT

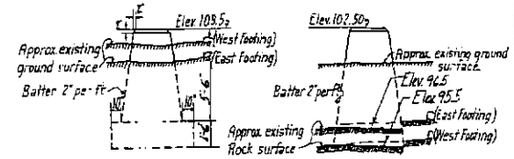


SECTION A-A

NOTE ON STRUCTURAL STEEL AND ANCHORAGES

Fence posts to be furnished and set under Superstructure Contract; fence post anchor bolts, expansion joint steel in top of parapet and curb channels to be furnished under Superstructure Contract; otherwise all anchorages and steel to be furnished and set under Substructure Contract.





VIADUCT FOOTINGS

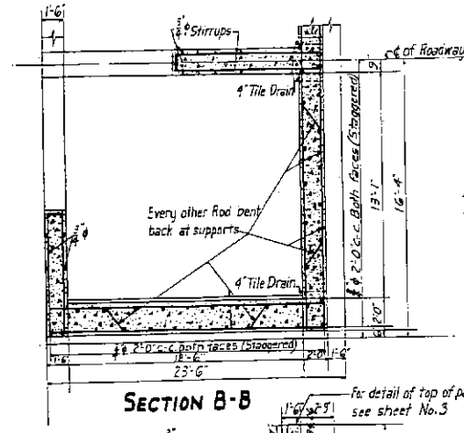
(Two at each bent)

Legend

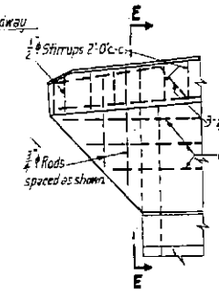
Concrete in section shown thus:
Reinforcing in section shown thus:
Reinforcing in elevation shown thus:
Existing ground surface shown thus:
Existing rock surface shown thus:

Notes

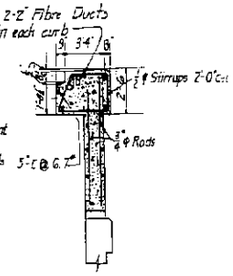
All elevations are referred to Mean Sea Level Datum.
For General Plan and Elevation of Substructure see: Sheet No. 1
For detail of top of parapet see Sheet No. 3
For Topography and Embankment see Sheet No. 7
All anchor bolts shall be furnished with nuts and washers.
All reinforcing in Abutments shall be 2" clear from face of concrete.



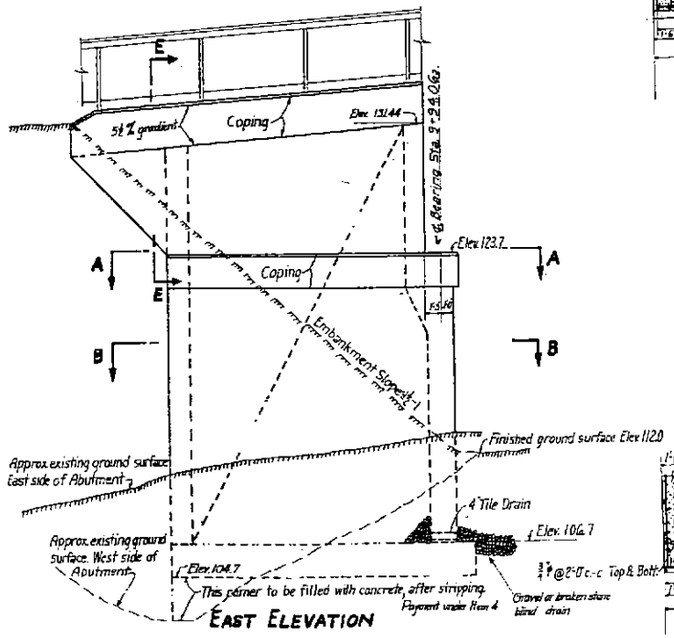
SECTION B-B



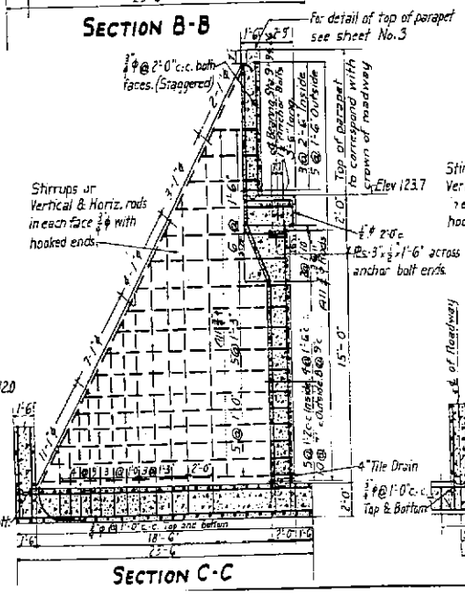
ELEVATION OF WING



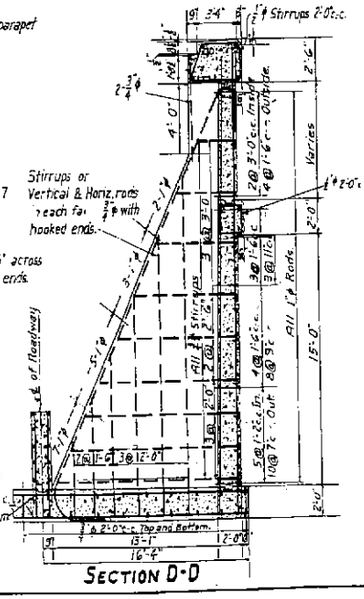
SECTION E-E



EAST ELEVATION



SECTION C-C



SECTION D-D

LAKE CHAMPLAIN BRIDGE COMMISSION	
Martiner Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Marion L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

NEW YORK ABUTMENT AND VIADUCT FOOTINGS

Scale 1/8" = 1'-0" March 1928

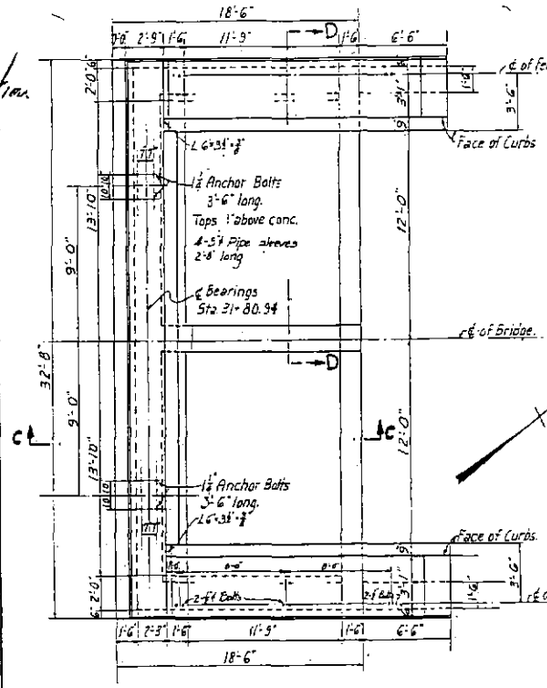
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

DES. L.B.T. DD. L.B.T. TR. L.W.H. CHK. J.H.W. APPROVED Fay, Spofford & Thorndike

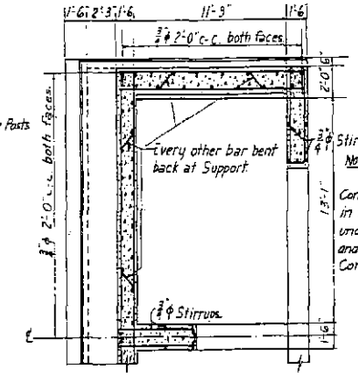
FILE NO. VI-8 PLAN NO. 22

CONTRACT DRAWINGS SHEET No. 2

CBC
Lake Champlain
Bridge
Design + Construction
#
29

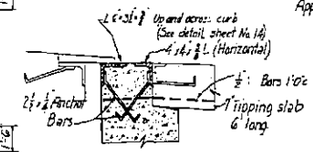


PLAN OF VERMONT ABUTMENT

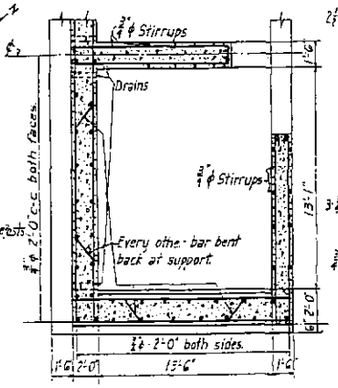


HALF SECTION A-A

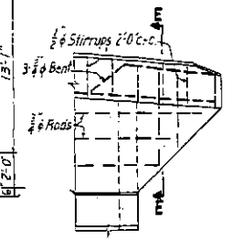
NOTE ON STRUCTURAL STEEL AND ANCHORAGES
Fence posts to be furnished and set under Superstructure Contract; fence post anchor bolts, expansion joint steel in top parapet and curb channels to be furnished under Superstructure Contract, otherwise all anchorages and steel to be furnished and set under Substructure Contract.



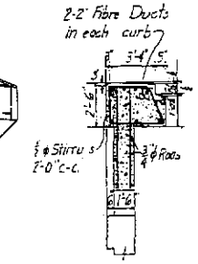
TOP OF PARAPET
Scale 1"=1'-0"



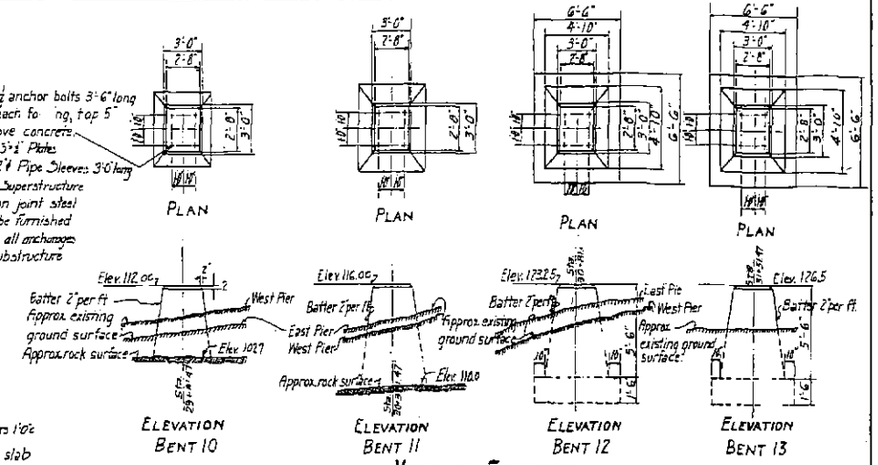
HALF SECTION B-B



ELEVATION OF WING
Showing Reinforcing Steel.



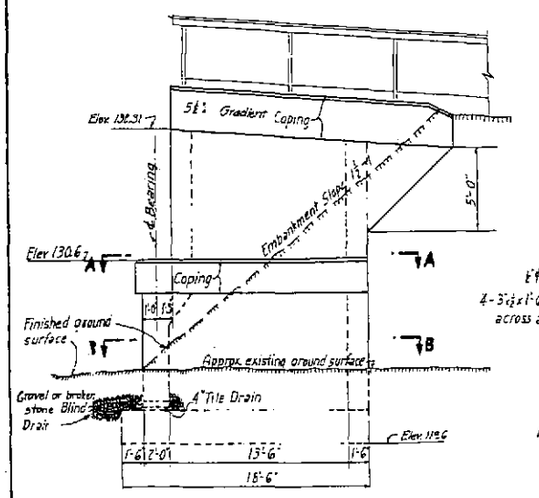
SECTION E-E



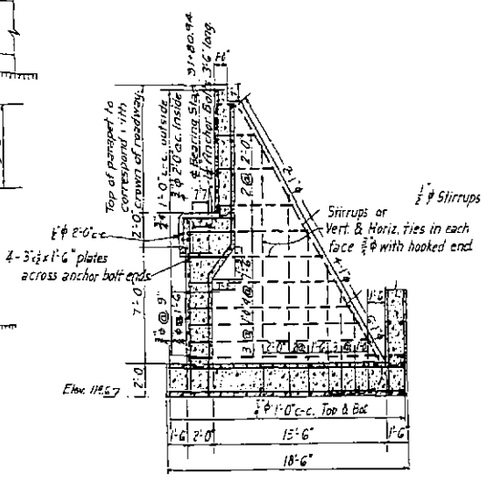
VIADUCT FOOTINGS
(Two at each Bent)

Legend
Concrete in section shown thus
Reinforcing in section shown thus
Reinforcing in elevation shown thus
Existing ground surface shown thus
Existing rock surface shown thus

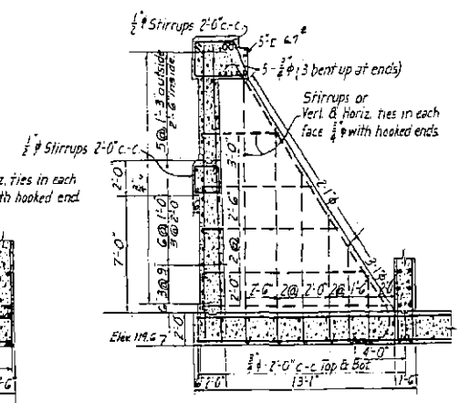
Notes
All elevations are referred to Mean Sea Level Datum.
For General Plan and Elevation of Substructure see: Sheet No. 1
For Topography and Embankment see Sheet No. 8
All anchor bolts shall be furnished with nuts and washers.
All reinforcing in Abutments shall be 2" clear from face of concrete.



ELEVATION



SECTION C-C



SECTION D-D

LAKE CHAMP BR COMMIS	
Mortimer Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Marion L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

VERMONT ABUTMENT AND VIADUCT FOOTINGS

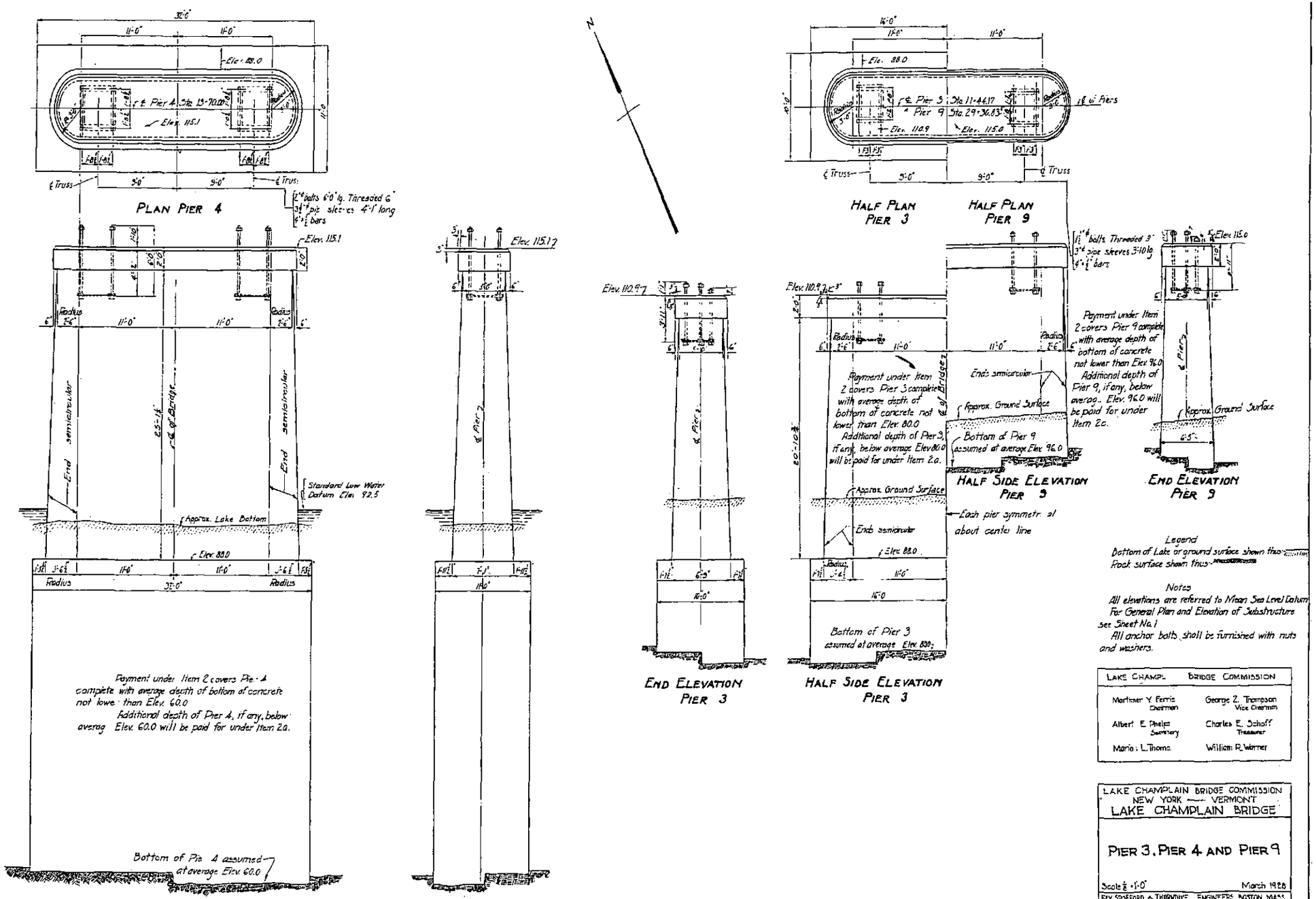
Scales ¼" = 1'-0" except as noted — March 1928

FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

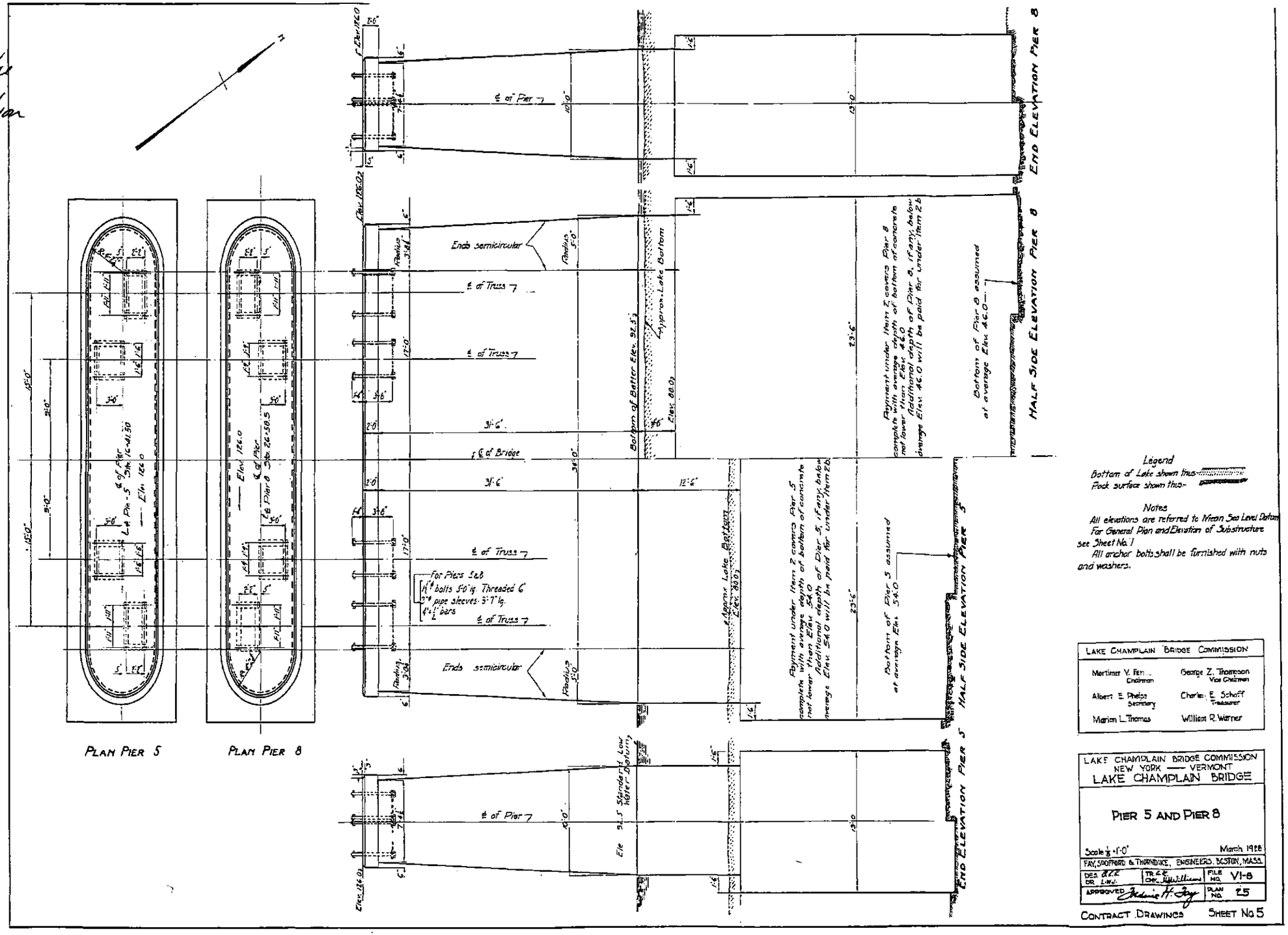
DES. L.B.T. / DR. L.B.T.	TR. L.W.J. / CHK.	FILE NO. VI-8
APPROVED		PLAN NO. E3

CONTRACT DRAWINGS SHEET No. 3

LCBC
Lake Champlain
Bridge
Design + Construction
#30

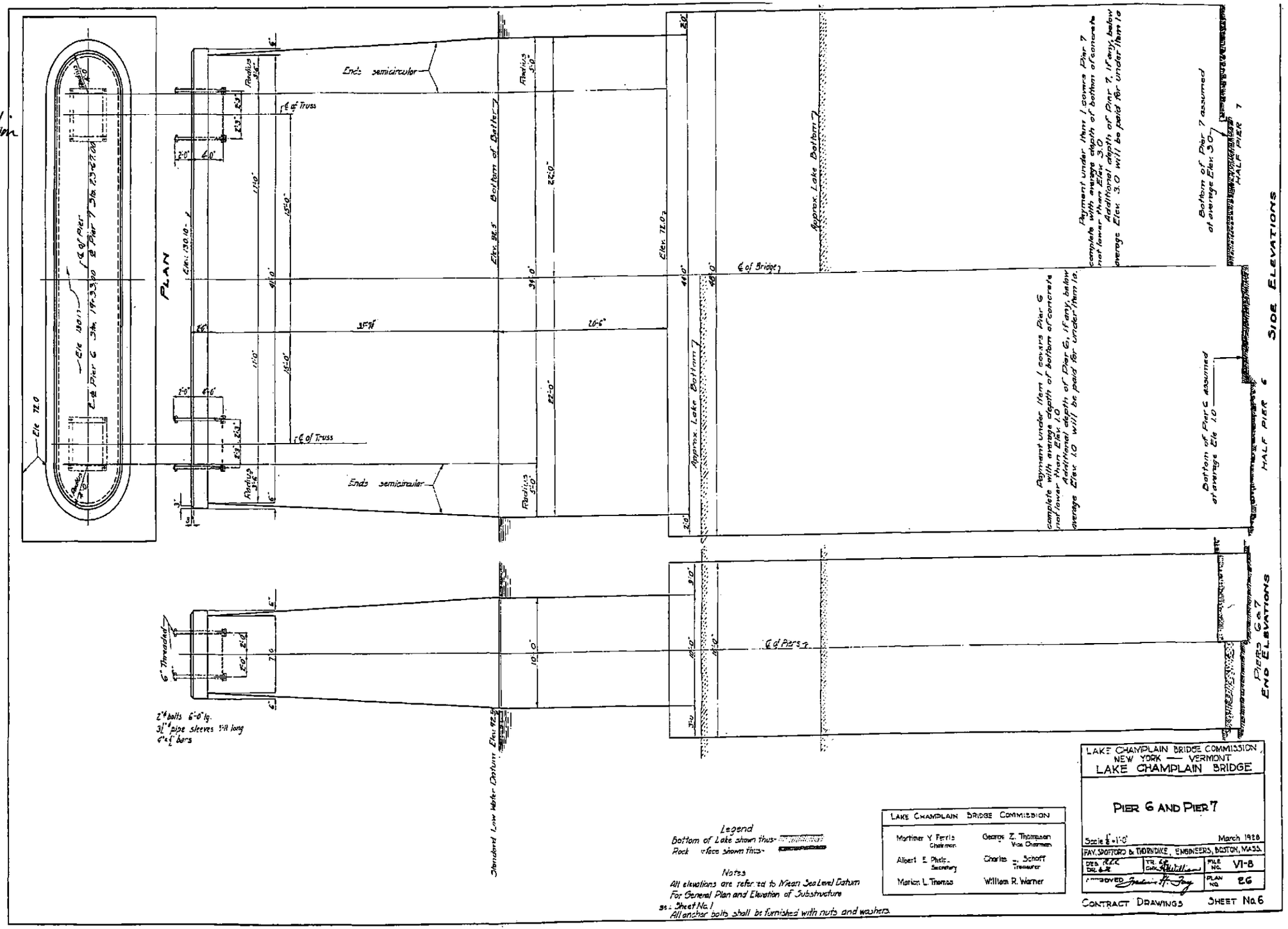


ABC
Lake Champlain Bridge
Design + Construction
#31



LCBC
Lake Champlain
Bridge
Design + Construction

#
32



Legend
Bottom of Lake shown thus
Rock surface shown thus

Notes
All elevations are referred to Mean Sea Level Datum
For General Plan and Elevation of Substructure
see Sheet No. 1
All anchor bolts shall be furnished with nuts and washers

LAKE CHAMPLAIN BRIDGE COMMISSION	
Mortimer Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles J. Schoff, Treasurer
Morton L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

PIER 6 AND PIER 7

Scale ½" = 1'-0" March 1928

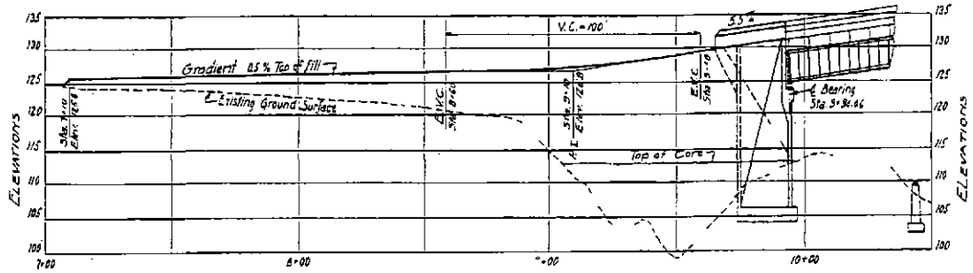
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

DES. R.E.K. DR. G.E. TR. G.E. CHK. A.H.Williams FILE NO. VI-8

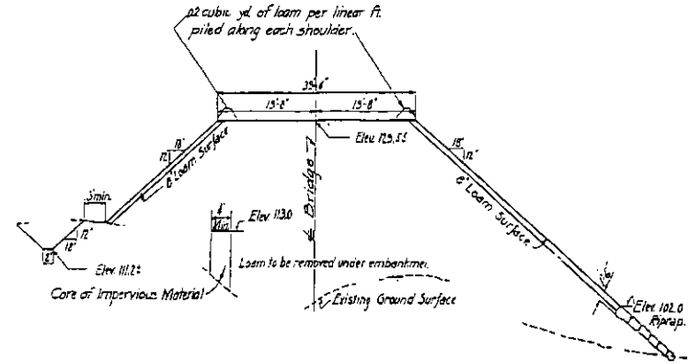
APPROVED Frederick H. Fay PLAN NO. 26

CONTRACT DRAWINGS SHEET No. 6

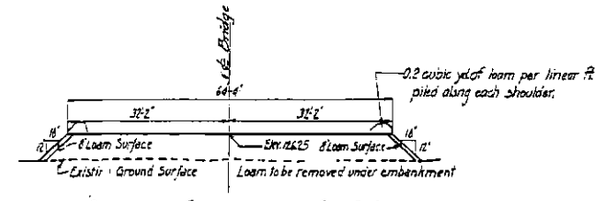
LCBC
Lake Champlain
Bridge
Design + Construction
#33



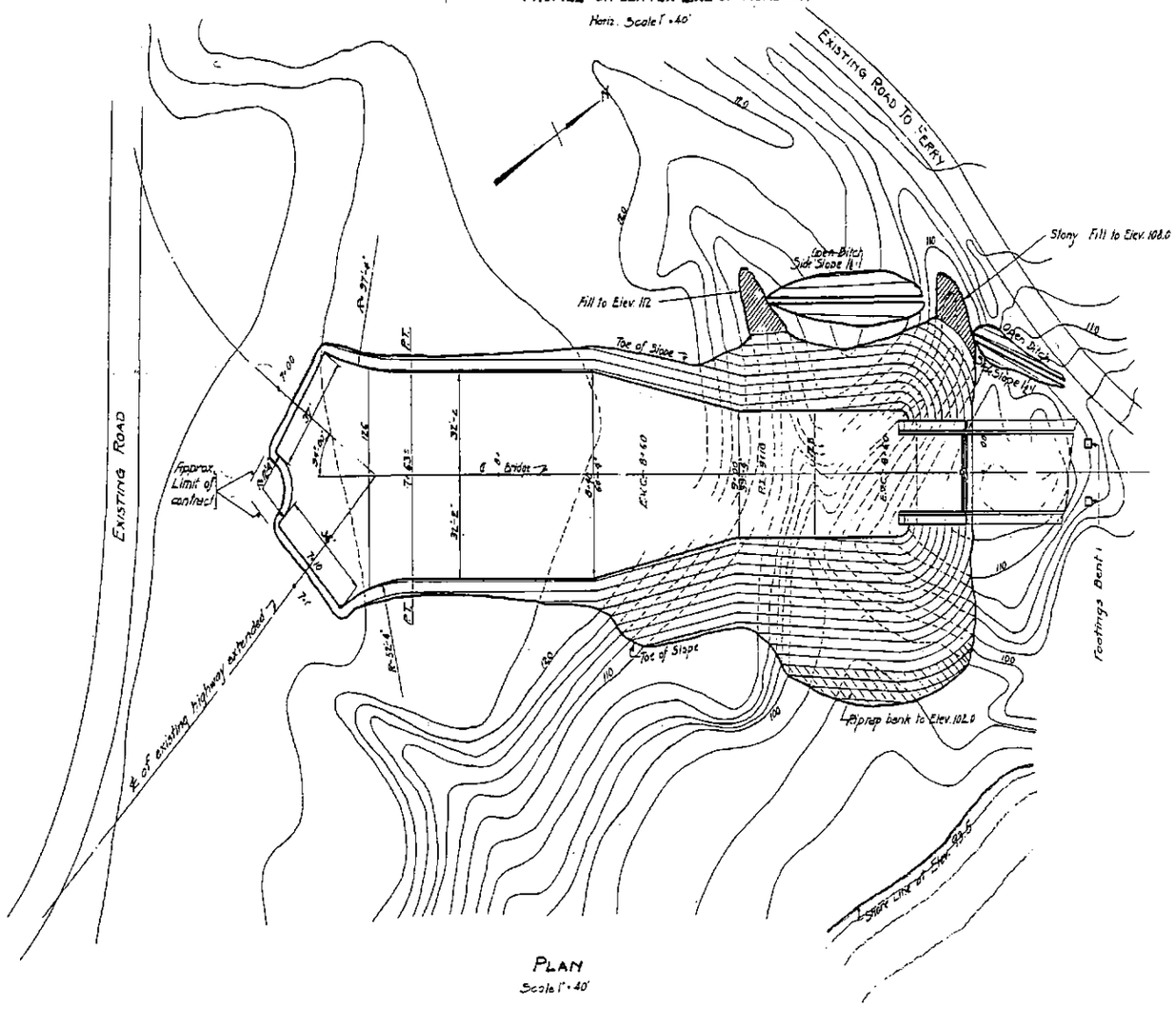
PROFILE ON CENTER LINE OF ROADWAY
Horiz. Scale 1" = 40'



SECTION OF EMBANKMENT AT STA. 9+60
Scale 1" = 20'



SECTION OF EMBANKMENT AT STA. 8+00
Scale 1" = 20'



PLAN
Scale 1" = 40'

Notes
All elevations are referred to Mean Sea Level Datum
For General Plan and Elevation of Substructure see Sheet No. 1
For details of Abutment and Viaduct Footings see Sheet No. 2
Surfacing etc. to be built as part of Superstructure.

LAKE CHAMPLAIN BRIDGE COMMISSION	
Mortimer Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Marion L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

NEW YORK APPROACH EMBANKMENT

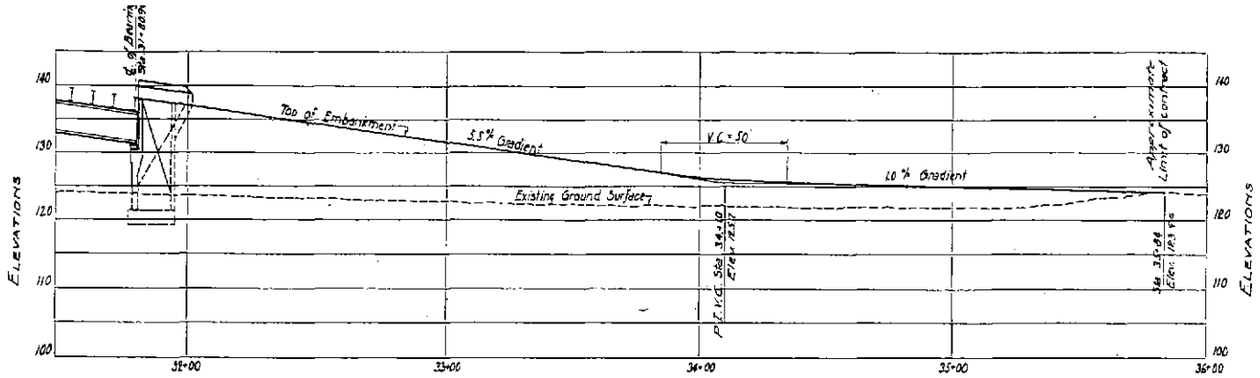
Scale as noted — March 1928

FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

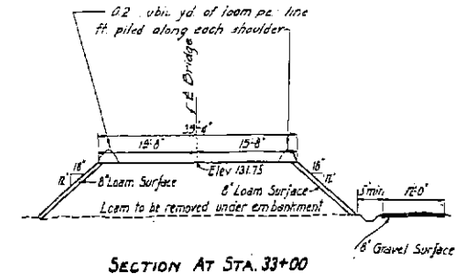
DES.	TR.	FILE No. VI-8
DR.	CHK.	
APPROVED		PLAN No. 27

CONTRACT DRAWINGS — SHEET No. 7

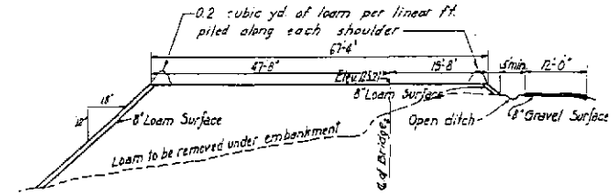
LCBC
Lake Champlain Bridge
Design + Construction
#34



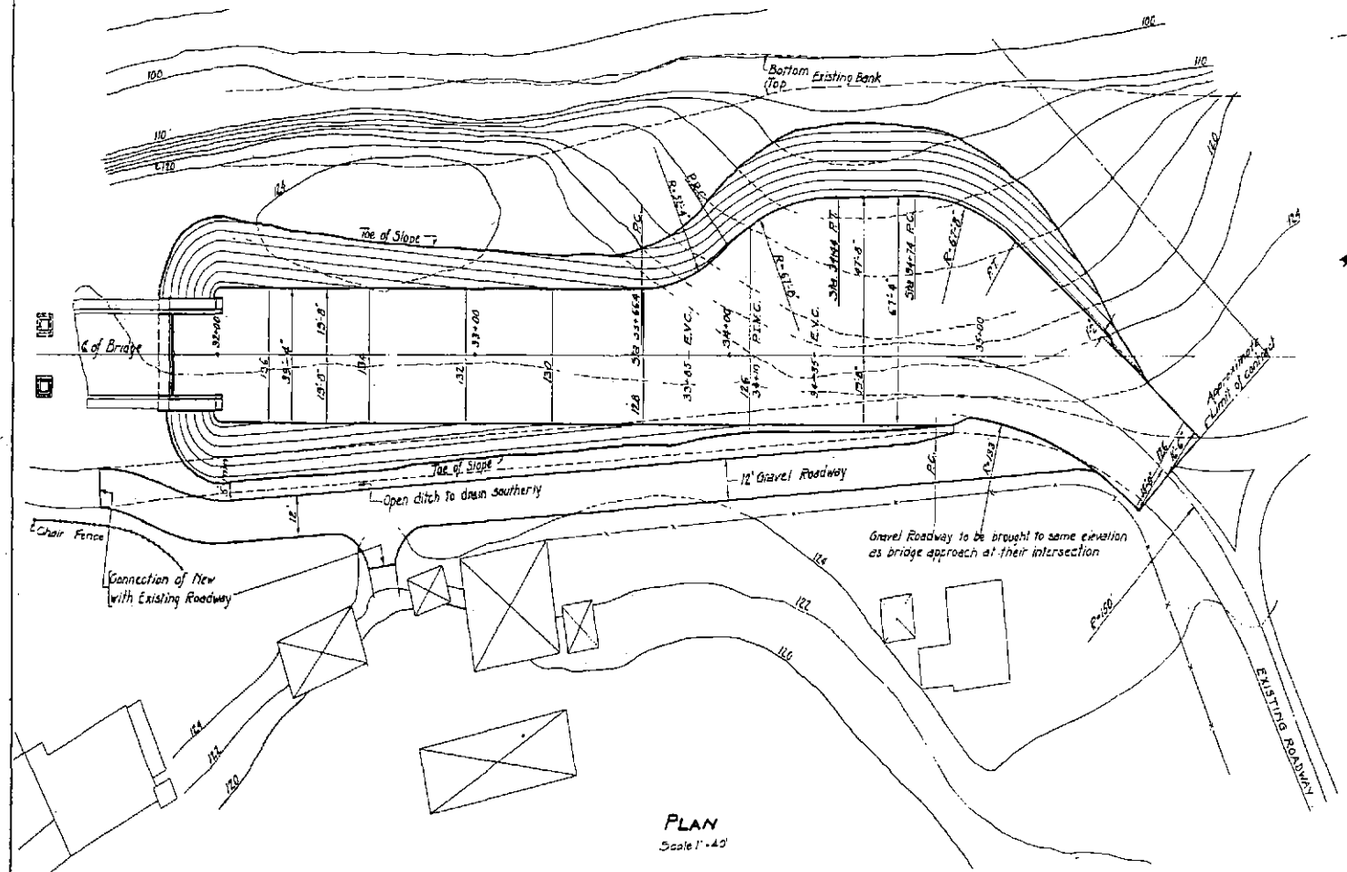
PROFILE ON CENTER LINE OF APPROACH
Horiz. Scale 1" = 40'



SECTION AT STA. 33+00
Scale 1" = 20'



SECTION AT STA. 34+59
Scale 1" = 20'



PLAN
Scale 1" = 40'

Notes
All elevations are referred to Mean Sea Level Datum.
For General Plan and Elevation of Substructure see Sheet No. 1
For details of Abutment and Viaduct Footings see Sheet No. 3
Surfacing etc. to be built as part of Superstructure.

LAKE CHAMPLAIN BRIDGE COMMISSION	
Martin L. Fern, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Marion L. Thomas	William R. Warn

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

VERMONT APPROACH EMBANKMENT

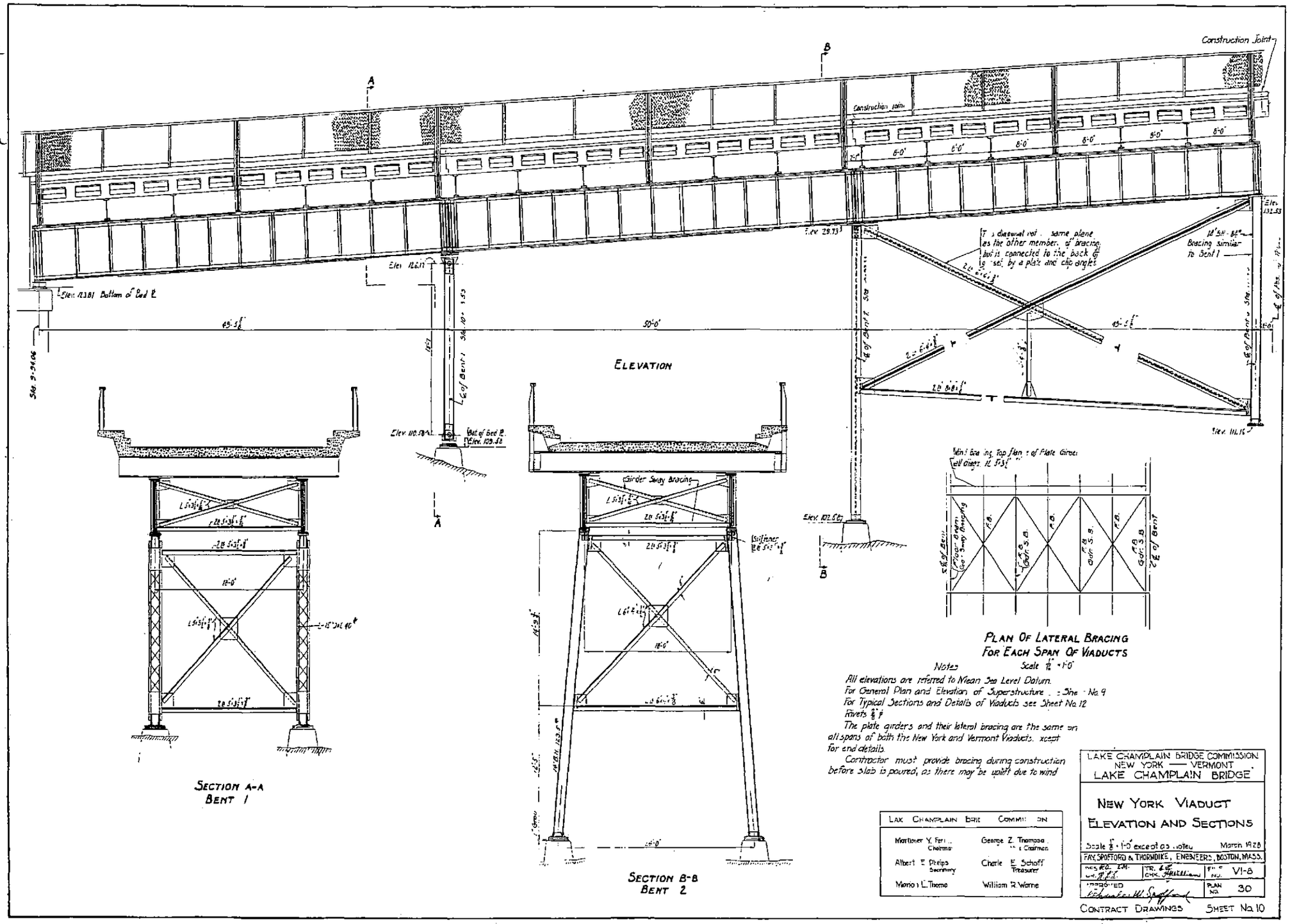
Scale as noted — March 1928

FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

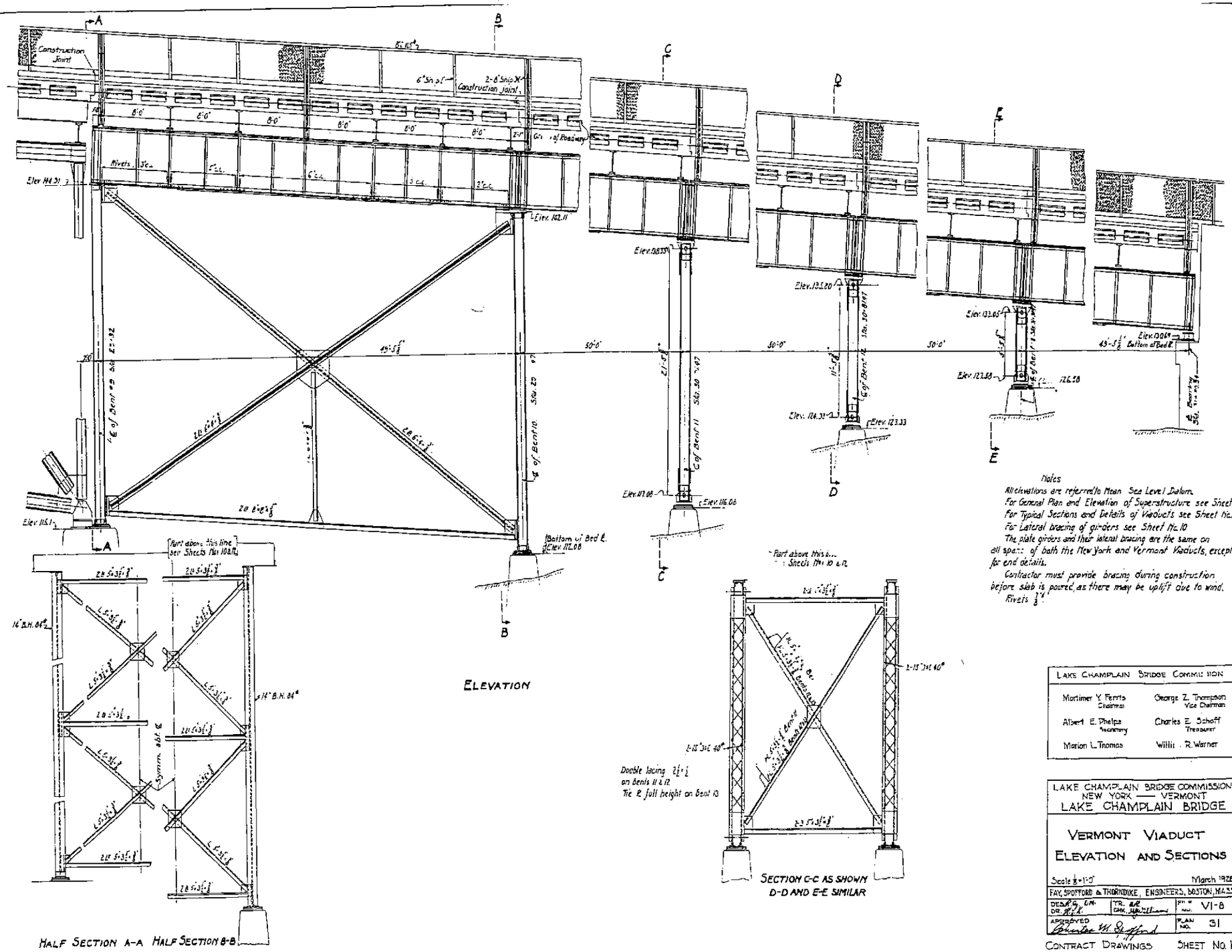
DES.	TR.	FIT. & NO.
DR.	CHK.	VI-8
APPROVED		PLAN NO. 28

CONTRACT DRAWINGS — SHEET No. 8

LCBC
Lake Champlain
Bridge
Design +
Construction
#36



LCBC
Lake Champlain Bridge
Design + Construction
#37



Notes

All elevations are referred to Mean Sea Level Datum.
For General Plan and Elevation of Superstructure see Sheet No. 9
For Typical Sections and Details of Viaducts see Sheet No. 12
For Lateral bracing of girders see Sheet No. 10
The plate girders and their lateral bracing are the same on all spans of both the New York and Vermont Viaducts, except for end details.
Contractor must provide bracing during construction before slab is poured, as there may be uplift due to wind.
Rivets ¾"

Lake Champlain Bridge Commission	
Mortimer Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Marion L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

VERMONT VIADUCT
ELEVATION AND SECTIONS

Scale ⅛"=1'-0" March 1928

FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

DES. R.G. CHK. TR. DR. R.J.K. CHK. W.H.W.

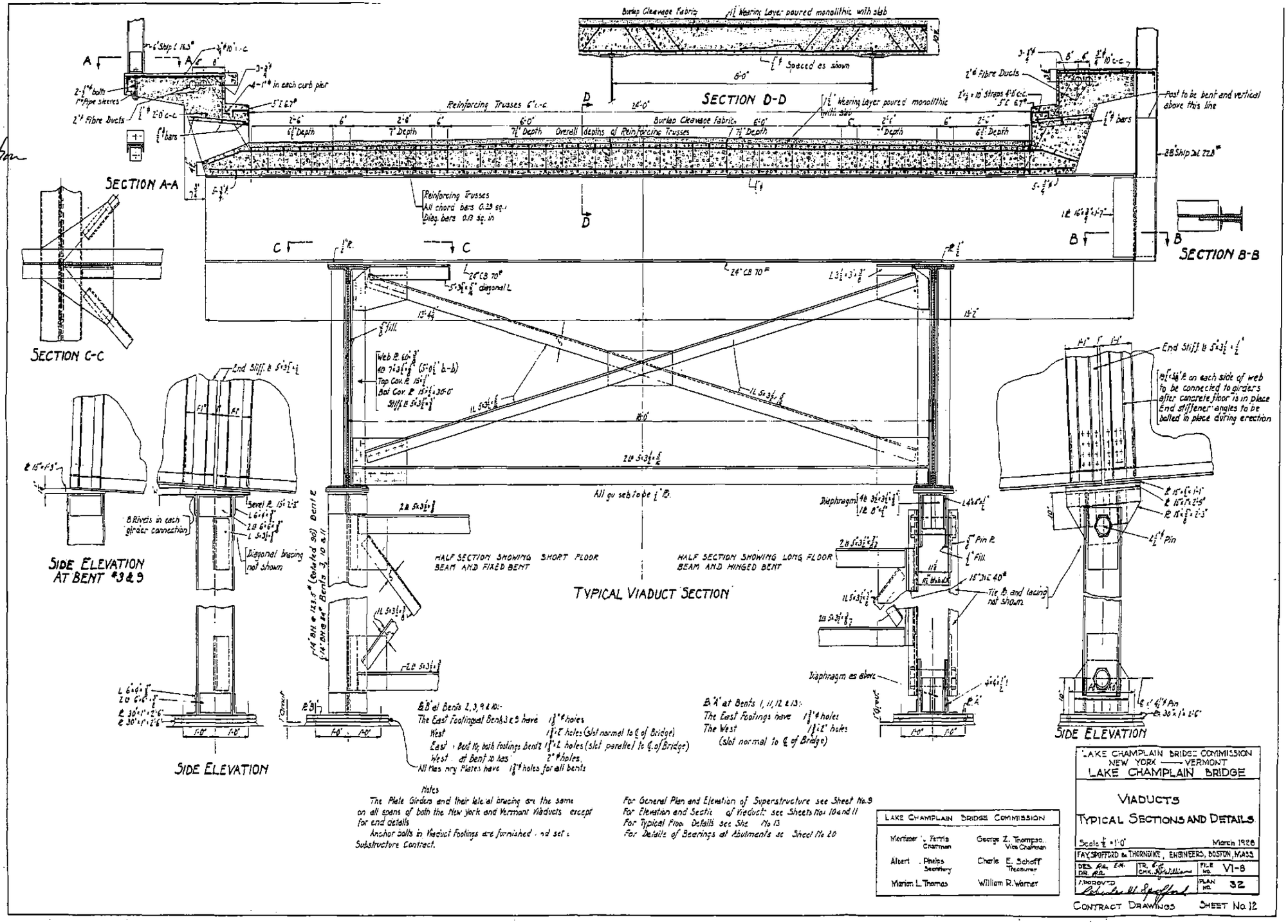
DWG. NO. VI-8

APPROVED Charles M. Spofford

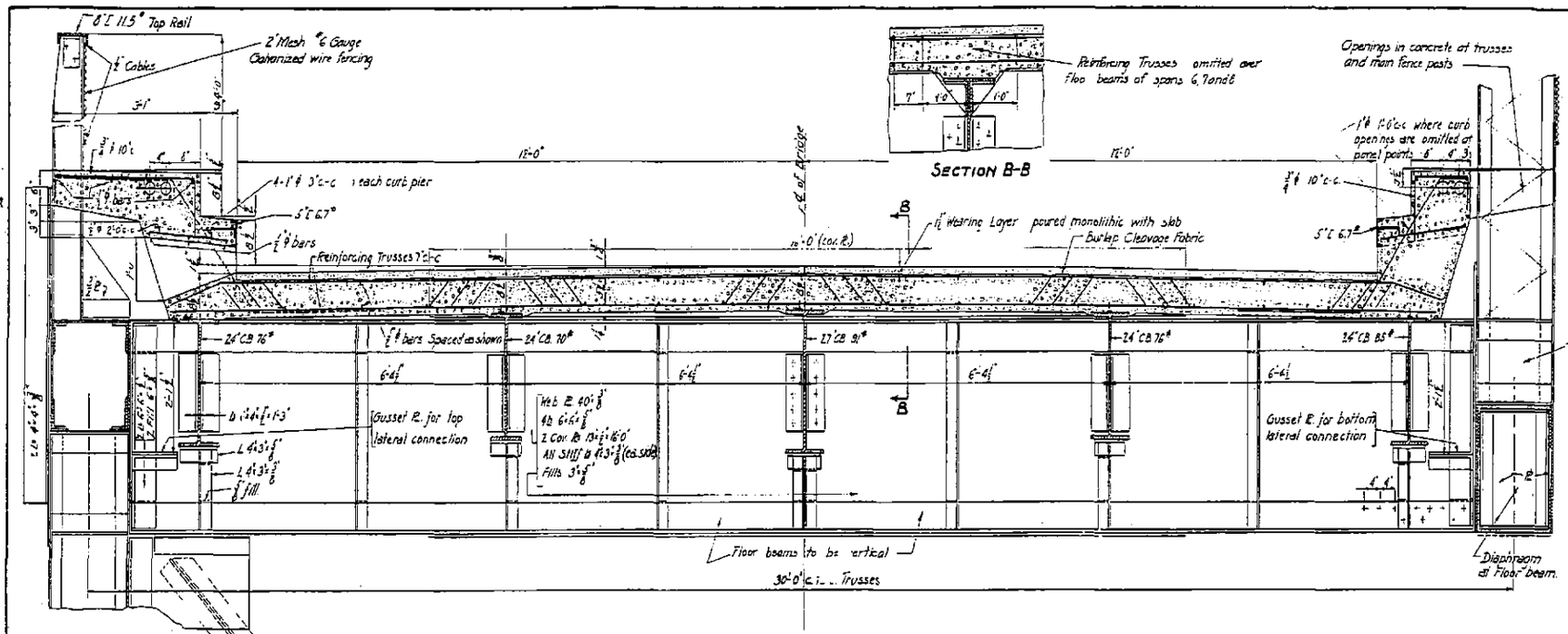
PLAN NO. 31

CONTRACT DRAWINGS SHEET No. 11

LCBC
Lake Champlain
Bridge
Design + Construction
#
38

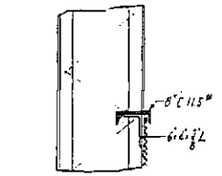


LCBC
Lake Champ. Bridge
Design + Construction
#39

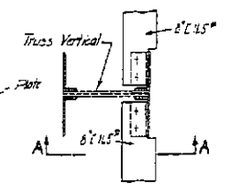


Reinforcing Trusses omitted over floor beams of spans 6, 7 and 8

SECTION B-B

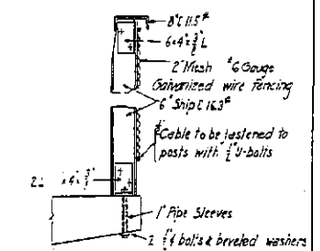


SECTION A-A

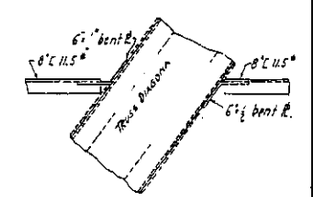


PLAN

DETAIL OF FENCE CONNECTION SPAN 7



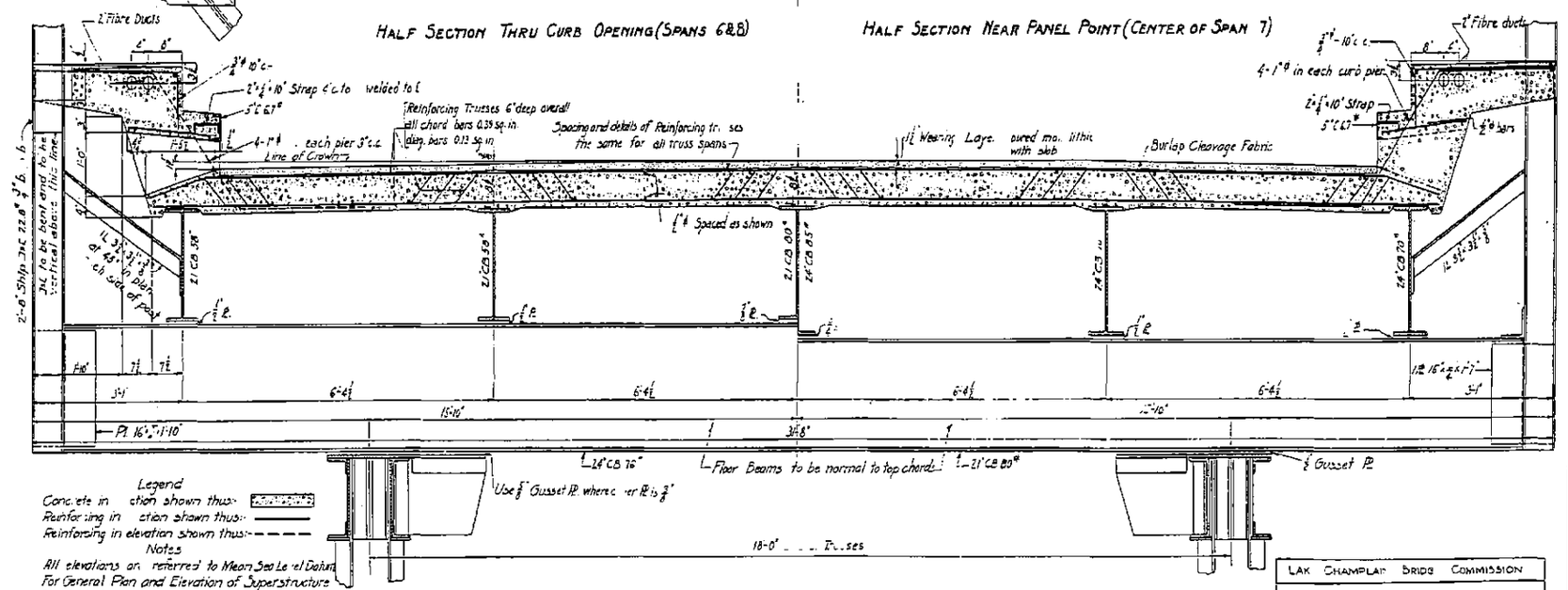
DETAIL OF INTERMEDIATE POST SPAN 7



DETAIL OF RAILING AT DIAGONALS SPAN 7

HALF SECTION THRU CURB OPENING (SPANS 6 & 8)

HALF SECTION NEAR PANEL POINT (CENTER OF SPAN 7)



HALF SECTION THRU CURB OPENING (SPAN 4)

HALF SECTION THRU CURB PIER (SPANS 5 & 9)

Legend
Concrete in section shown thus:
Reinforcing in section shown thus:
Reinforcing in elevation shown thus:

Notes
All elevations are referred to Mean Sea Level Datum
For General Plan and Elevation of Superstructure see Sheet No. 9.
For details of Trusses see Sheets No. 15 to 18 incl.
For other details of Fence see Sheets 10, 11, 12, 14 and 21.
For details of Curb openings, Expansion Joints, Ducts and Pull Boxes see Sheet No. 14.

LAKE CHAMPLAIN BRIDGE COMMISSION	
Mortimer Y. Ferris, Chairman	George E. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Scheff, Treasurer
Mario L. Thomas	William R. Watson

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

FLOOR SECTIONS
TRUSS SPANS

Scale 1/4"=1'-0" March 1928

FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

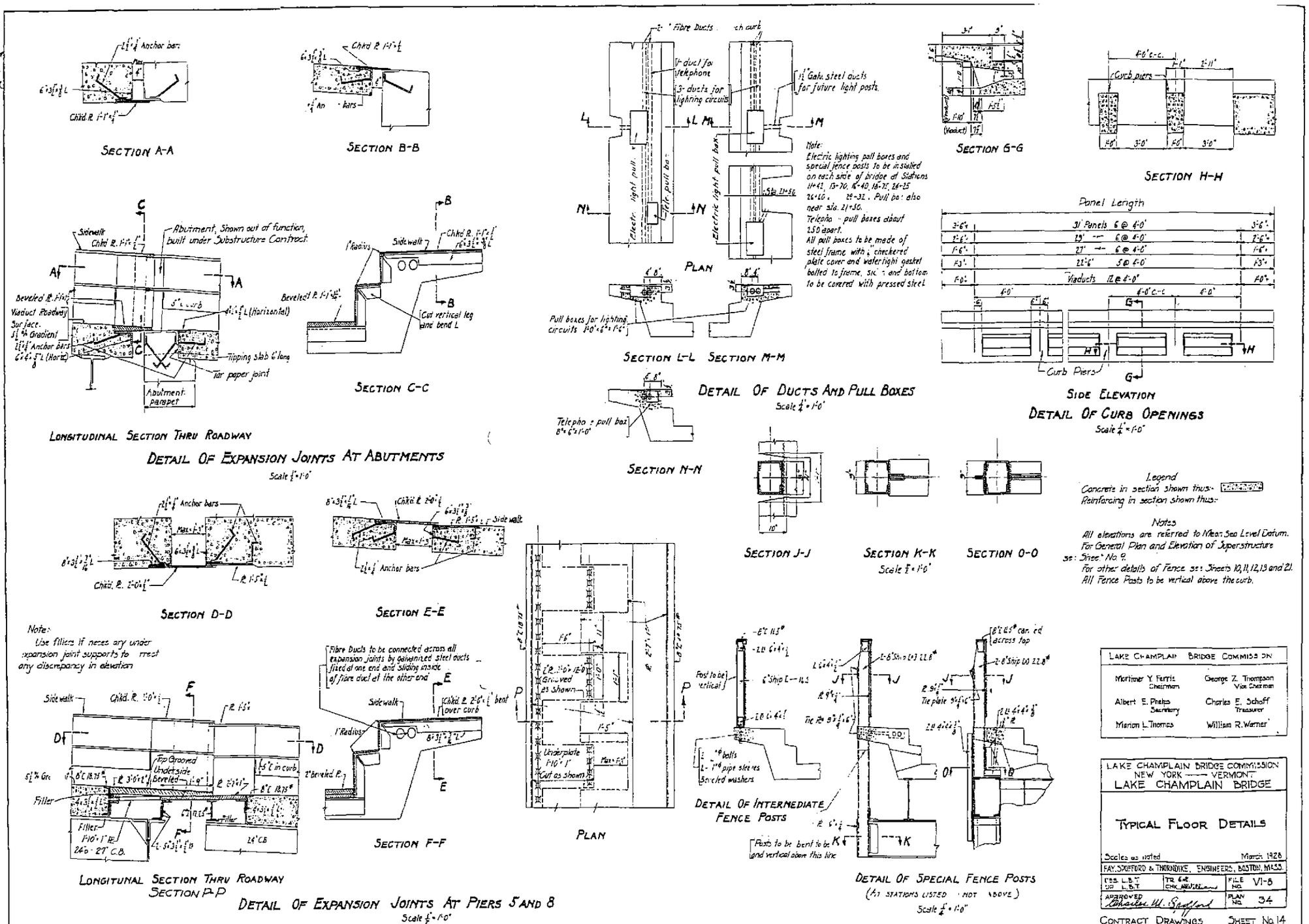
Approved Robert W. Spofford

Plate No. VI-8

Plan No. 33

CONTRACT DRAWINGS SHEET No. 13

LCBC
Lake Champlain Bridge
Design + Construction
#40

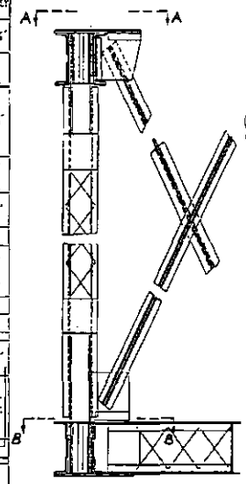


LCBC
Lake Champlain Bridge
Design + Construction
#41

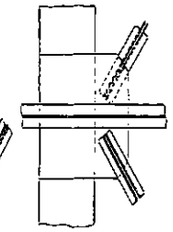
STEEL SCHEDULE

MEMBER	STRESS IN KIPS DEAD	LIVE (INCL. IMP.)	TOTAL	SECTION	AREA GROSS	AREA NET	ASSEMBLY
U_0-U_1			0	4 Pl 6×6×$\frac{3}{8}$ = 18.44; 2 Web Pl 18×$\frac{3}{8}$ = 13.5; 1 Cov. Pl. 26×$\frac{1}{2}$ = 13.0	40.94		
U_1-U_3	-656	-156	-812	2 Pl 6×6×$\frac{3}{8}$ = 11.50; 2 Web Pl 18×$\frac{3}{8}$ = 13.5; 1 Cov. Pl. 26×$\frac{1}{2}$ = 13.0; 2 Bot. Pl. 6×$\frac{3}{8}$ = 9.0	70.22		
U_3-U_4	-1058	-254	-1312	4 Pl 8×6×$\frac{3}{8}$ = 29.76; 4 Web Pl 18×$\frac{3}{8}$ = 45; 1 Cov. Pl. 26×$\frac{1}{2}$ = 13.0; 2 Bot. Pl. 6×$\frac{3}{8}$ = 9.0	106.76		
U_4-U_5	-1076	-258	-1334	4 Pl 8×6×$\frac{3}{8}$ = 29.76; 4 Web Pl 18×$\frac{3}{8}$ = 45; 1 Cov. Pl. 26×$\frac{1}{2}$ = 13.0; 2 Bot. Pl. 6×$\frac{3}{8}$ = 9.0	106.76		
U_5-U_6	-702	-168	-870	2 Pl 6×6×$\frac{3}{8}$ = 11.50; 2 Web Pl 18×$\frac{3}{8}$ = 22.50; 1 Cov. Pl. 26×$\frac{1}{2}$ = 13.0; 2 Bot. L. 6×$\frac{1}{2}$ = 5.6	70.22		
U_6-U_8			0	4 Pl 6×6×$\frac{3}{8}$ = 18.44; 2 Web Pl 18×$\frac{3}{8}$ = 13.50; 1 Cov. Pl. 26×$\frac{1}{2}$ = 13.0	40.94		
L_1-L_3	+348	+84	+432	4 Pl 6×3×$\frac{3}{8}$ = 16.72; 2 Web Pl 18×$\frac{3}{8}$ = 18.0	34.72	28.7	
L_3-L_4	+880	+214	+1102	4 Pl 6×6×$\frac{3}{8}$ = 31.12; 4 Web Pl 18×$\frac{3}{8}$ = 54.0	85.12	70.6	
L_4-L_6	+1111	+263	+1374	4 Pl 6×6×$\frac{3}{8}$ = 31.12; 4 Web Pl 18×$\frac{3}{8}$ = 54.0; 2 Web Pl 5×$\frac{3}{8}$ = 3.75; 2 Web Pl 16×$\frac{3}{8}$ = 24.0	106.87	87.5	
L_6-L_8	+929	+223	+1152	4 Pl 6×6×$\frac{3}{8}$ = 33.76; 4 Web Pl 18×$\frac{3}{8}$ = 54.0	87.76	72.5	
L_8-L_{10}	+385	+93	+478	4 Pl 6×6×$\frac{3}{8}$ = 33.0; 2 Web Pl 18×$\frac{3}{8}$ = 18	37.00	31.0	
U_0-L_1	-535	-132	-667	4 Pl 6×6×$\frac{3}{8}$ = 33.76; 4 Web Pl 16×$\frac{3}{8}$ = 32	65.76		
U_1-L_1	+467	+116	+583	4 Pl 6×6×$\frac{3}{8}$ = 33.44; 2 Web Pl 16×$\frac{7}{16}$ = 22	55.44	37.7	
U_2-L_3	-363	-96	-459	4 Pl 6×6×$\frac{3}{8}$ = 33.44; 2 Web Pl 16×$\frac{3}{8}$ = 16	49.44		
U_3-L_3	+287	+78	+365	4 Pl 6×6×$\frac{3}{8}$ = 33.44; 2 Web Pl 16×$\frac{3}{8}$ = 12	45.44	21.5	
U_4-L_4	-74	-59	-133	4 Pl 5×5×$\frac{3}{8}$ = 12.2; 2 Web Pl 16×$\frac{3}{8}$ = 12	24.2		
U_5-L_4	-59	-51	-101	4 Pl 5×5×$\frac{3}{8}$ = 12.2; 2 Web Pl 16×$\frac{3}{8}$ = 12	24.2		
U_6-L_6	-202	+77	+275	4 Pl 5×5×$\frac{3}{8}$ = 12.2; 2 Web Pl 16×$\frac{3}{8}$ = 12	24.2	18.5	
U_7-L_8	-337	-93	-430	4 Pl 6×6×$\frac{3}{8}$ = 33.44; 2 Web Pl 16×$\frac{3}{8}$ = 16	49.44		
U_8-L_8	+441	+112	+553	4 Pl 6×6×$\frac{3}{8}$ = 33.44; 2 Web Pl 16×$\frac{3}{8}$ = 20	53.44	35.5	
U_8-L_{10}	-384	-101	-485	4 Pl 6×6×$\frac{3}{8}$ = 33.76; 4 Web Pl 16×$\frac{3}{8}$ = 36	69.76		
$U_0'-L_0$ Compression	-45	-11 Min. Comp.	-56	2-12" Ch 30# for all verticals	17.58		
U_1-L_1	0		0	U_2-L_2; U_3-L_3; U_4-L_4 Same	17.58		
U_2-L_3	90	62	+152	2-12" Ch 30#	17.58		
U_4-L_6	90	62	+152	U_6-L_8, U_8-L_{10} Same	17.58		

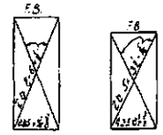
+ Tension
* Compression



SECTION C-C

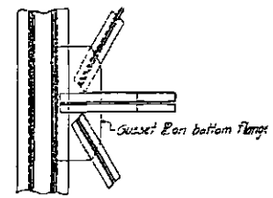


SECTION A-A

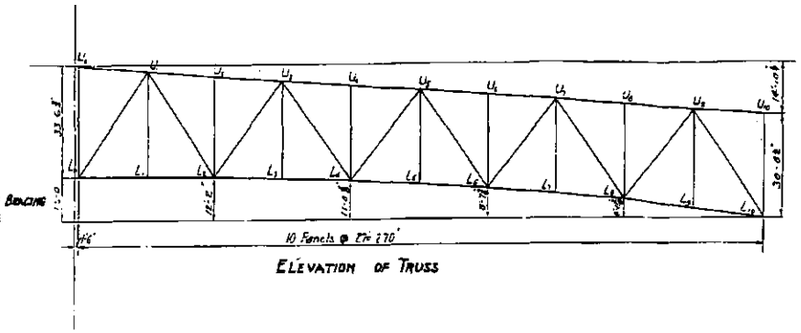


END BRACING
PANELS 0 AND 10

INTERMEDIATE BRACING
PANELS 1-5
Scale 1"=40'



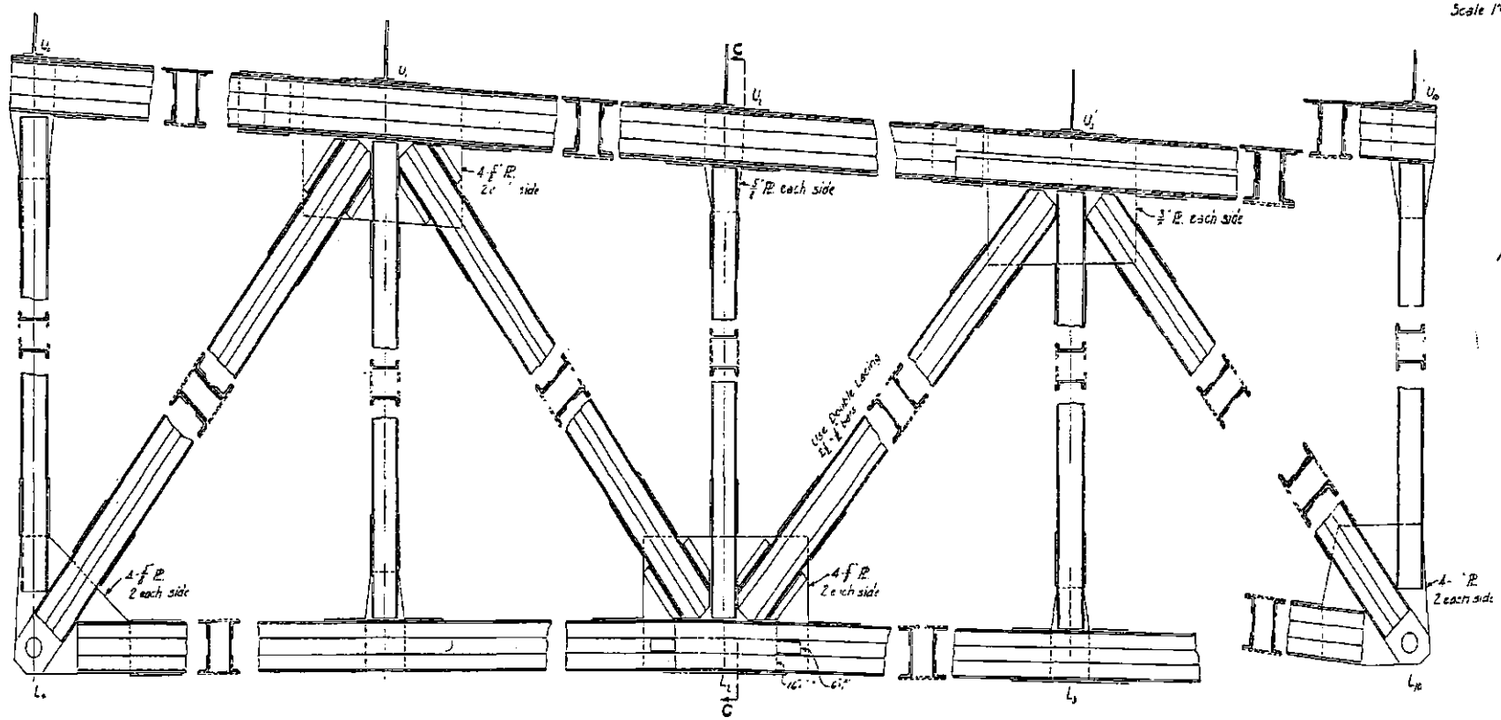
SECTION B-B



ELEVATION OF TRUSS

TOP LATERAL BRACING

BOTTOM LATERAL BRACING
Scale 1"=40'



ELEVATION

Notes
Pl. $\frac{5}{8}$"
Clear distance between web plates of chord members $9\frac{1}{2}$"
Double lacing $2\frac{1}{2}$"×$\frac{1}{2}$" bars for all but verticals.
Single lacing $2\frac{1}{2}$"×$\frac{1}{2}$" bars for verticals.
Tie Plates $\frac{5}{8}$"

For General Plan and Elevation of Superstructure Sheet No 9.
For Floor Sections and Floor Details see Sheets Nos. 13 and 14.
For Bearings see Sheets Nos 19 and 20.

LAKE CHAMPLAIN BRIDGE COMMISSION	
Morris Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Morris L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

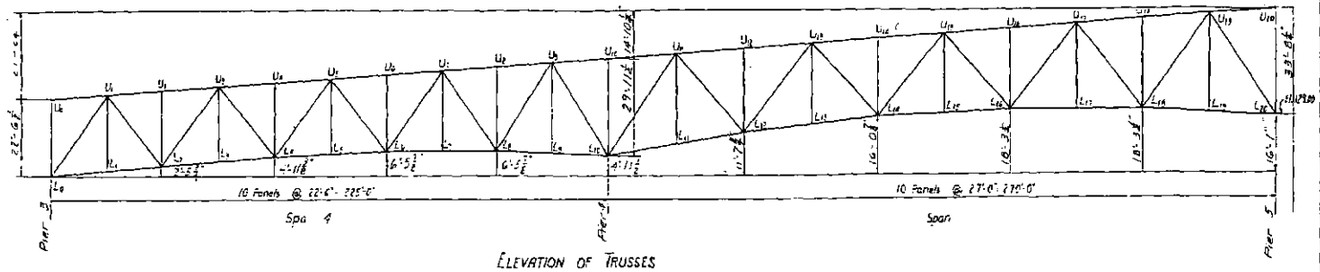
TRUSSES AND BRACING
SPAN 9

Scales 1"=10' except as noted — March 1928
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.
DES. L.B.T. DR. L.B.T. — TR. C.W. CHK. [illegible] — FILE NO. VI-8
APPROVED [illegible] — PLAN NO. 35

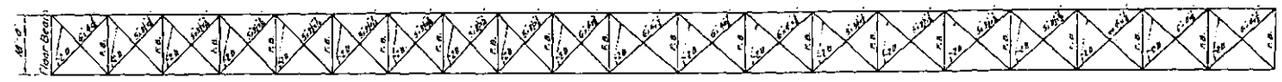
CONTRACT DRAWINGS — SHEET No. 15

LCBC
Lake Champlain Bridge
Design + Construction
#42

Member	Stress in Kips Dead	Live Including Impact	Total	Section	Area Gross	Area Net	Assembly
U_6-U_7				2B-4×4×$\frac{3}{8}$=5.7" 2B-5×3½×$\frac{3}{8}$=6.1" 1Cov.Pl. 20×$\frac{1}{4}$=7.5" 2Web Pl. 15×$\frac{1}{16}$=11.2" 2Bot.Pl. 5×$\frac{3}{8}$=3.75"	34		
U_7-U_8	-288	-127	-415	2B-4×4×$\frac{3}{8}$=5.7 sq.in. 2B-5×3½×$\frac{3}{8}$=6.1 1Cov.Pl. 20×$\frac{1}{4}$=7.5" 2Web Pls. 15×$\frac{1}{16}$=13.1 2Bot.Pl. 5×$\frac{3}{8}$=3.8"	36.2		
U_8-U_9	-320	-172	-492	2B-4×4×$\frac{3}{8}$=5.7" 2B-5×3½×$\frac{3}{8}$=6.1" 1Cov.Pl. 20×$\frac{1}{8}$=3.5" 2Web Pl. 15×$\frac{1}{16}$=15." 2Bot.Pl. 5×$\frac{1}{4}$=5.0"	39.3		
U_9-U_{11}	-91	+88 -143	-3 -234	2B-4×4×$\frac{3}{8}$=5.7" 2B-4×4×$\frac{3}{8}$=7.2" 1Cov.Pl. 20×$\frac{1}{4}$=7.5" 2Web Pl. 15×$\frac{3}{16}$=11.25" 2Bot.Pl. 5×$\frac{3}{8}$=3.8"	35.4		
U_{11}-U_{13}	+344	+1105	+1449	2B-4×4×$\frac{3}{8}$=7.7" 2B-6×4×$\frac{3}{8}$=7.2" 1Cov.Pl. 20×$\frac{1}{4}$=7.5" 2Web Pl. 15×$\frac{3}{16}$=11.25" 2Bot.Pl. 6×$\frac{3}{8}$=4.5"	36.2	75.3	
U_{13}-U_{15}	-863	+196	+1059	2B-6×6×$\frac{1}{2}$=11.5" 2B-6×6×$\frac{3}{8}$=14.22" 4Web Pl. 15×$\frac{1}{16}$ 1Cov.Pl. 24×$\frac{1}{4}$=12.0" 2Bot.Pl. 6×$\frac{3}{8}$=4.5"	80.4	66.7	
U_{15}-U_{17}	+91	+106 -84	+197 +7	4B-6×6×$\frac{3}{8}$=17.44" 2Web Pl. 15×$\frac{3}{16}$=11.25" 1Cov.Pl. 24×$\frac{1}{4}$=12.0" 2Bot.Pl. 6×$\frac{3}{8}$=4.5"	45.2	38.1	
U_{15}-U_{19}	-492	-208	-700	2B-6×6×$\frac{1}{2}$=11.5" 2B-6×6×$\frac{3}{8}$=14.22" 2Web Pl. 15×$\frac{3}{16}$=11.25" 1Cov.Pl. 24×$\frac{1}{4}$=12" 2Bot.Pl. 6×$\frac{3}{8}$=6	56.8		
U_{17}-U_{19}	-683	-230	-913	2B-6×6×$\frac{9}{16}$=15.56" 2B-6×6×$\frac{3}{8}$=16.68" 1Cov.Pl. 24×$\frac{1}{4}$=12 2Web Pl. 15×$\frac{9}{16}$=26.60" 2Bot.Pls. 6×$\frac{3}{8}$=9"	74.0		
U_{17}-U_{21}	-471	-148	-619	2B-6×6×$\frac{3}{8}$=8.72" 2B-6×6×$\frac{3}{8}$=12.86" 2Web Pl. 15×$\frac{3}{16}$=11.25" 1Cov.Pl. 24×$\frac{1}{4}$=12 2Bot.Pl. 6×$\frac{3}{8}$=6"	52.6		
U_{19}-U_{21}				4B-6×6×$\frac{3}{8}$=17.44" 2Web Pl. 15×$\frac{3}{16}$=11.25" 1Cov.Pl. 24×$\frac{1}{4}$=12" 2Bot.Pl. 6×$\frac{3}{8}$=4.5"	45.2		
L_0-L_2	+176	74	+250	4B-5×3½×$\frac{3}{8}$=12.20" 2Web Pl. 15×$\frac{3}{16}$=11.25"	23.5	19.0	
L_2-L_4	-336	+160	+496	4B-5×3½×$\frac{11}{16}$=21.48" 2Web Pl. 15×$\frac{3}{16}$=11.75"	40.2	32.2	
L_4-L_6	+238	+165	+403	4B-5×3½×$\frac{9}{16}$=17.88" 2Pl.-15×$\frac{3}{16}$=16.5"	34.6	28.0	
L_6-L_8	-119	-96	-215	4B-5×3½×$\frac{3}{8}$=12.20" 2Web Pl. 15×$\frac{3}{16}$=11.25"	23.5		
L_8-L_{10}	-394	-342	-736	4B-6×6×$\frac{7}{16}$=[illegible]" 2Web Pl. 15×$\frac{3}{8}$=37.50"	60.6		
L_{10}-L_{12}	-456	-129	-585	4B-6×6×$\frac{11}{16}$=25.6" 2Web Pl. 15×$\frac{3}{16}$=22.[illegible]	48.1		
L_{12}-L_{14}	+235	+154	+389	4B-6×6×$\frac{9}{16}$=16.72" 2Web Pl. 15×$\frac{3}{16}$=12.1"	29.8	24.6	
L_{14}-L_{16}	+625	+217	+842	4B-6×6×$\frac{11}{16}$=31.12" 4Web Pl. 15×$\frac{3}{16}$=23.75"	64.9	54.9	
L_{16}-L_{18}	+617	+199	+816	4B-6×6×$\frac{11}{16}$=31.12 4Web Pl. 15×$\frac{1}{2}$=30"	61.1	51.6	
L_{18}-L_{20}	+251	+77	+328	4B-5×3½×$\frac{9}{16}$=14.12 2Web Pl. 15×$\frac{9}{16}$=13.1	27.2	22.0	
U_1-L_0	+256	-108	+[illegible]	4B-5×3½×$\frac{1}{2}$=16.00 2Pl.-15×$\frac{3}{16}$=16.5	32.5		
U_1-L_2	+154	+81	+235	4B-5×3½×$\frac{3}{8}$=12.2 2Pl.-15×$\frac{3}{8}$=11.25"	23.5	19.0	
U_2-L_2	-70	-67	-137	4B-3½×3½×$\frac{3}{8}$=3.92" 2Pl.-15×$\frac{3}{8}$=11.25"	21.2		
U_2-L_4	-24	+[illegible]	+[illegible]	4B-3½×3½×$\frac{3}{8}$=3.92" 2Pl.-15×$\frac{3}{16}$=11.25"	21.2	16.8	
U_4-L_4	+117	+62	+179	4B-3½×3½×$\frac{3}{8}$=3.92" 2Pl.-15×$\frac{3}{8}$=11.25"	21.2	16.8	
U_4-L_6	-198	-74	-272	4B-5×3½×$\frac{9}{16}$=18.12" 2Pl.-15×$\frac{9}{16}$=13.1"	27.2		
U_5-L_6	+294	+95	+389	4B-5×3½×$\frac{1}{2}$=16.0" 2Pl.-15×$\frac{1}{2}$=15.0"	31.0	25.0	
U_6-L_8	-341	-103	-444	4B-5×3½×$\frac{7}{16}$=15.68" 2Pl.-15×$\frac{9}{16}$=20.62"	40.5		
U_6-L_8	+295	+113	+408	4B-5×3½×$\frac{3}{8}$=19.68 2Pl.-16×$\frac{3}{8}$=20"	39.7	32.2	
U_8-L_{10}	-443	-119	-562	4B-5×3½×$\frac{11}{16}$=21.48" 4Pl.-17×$\frac{9}{16}$=28.75"	51.2		
U_8-L_{10}	-620	-153	-773	4B-6×6×$\frac{3}{8}$=[illegible].76" 4Pl.-18×$\frac{3}{8}$=40.50"	74.3		
U_8-L_{12}	+498	+128	+626	4B-6×6×$\frac{11}{16}$=31.12 2Web Pl. 15×$\frac{3}{8}$=18.75"	49.9	41.5	
U_{12}-L_{12}	-465	-126	-591	4B-6×6×$\frac{1}{2}$=32.76 2Pl.-16×$\frac{11}{16}$=22	55.6		
U_{12}-L_{14}	+232	+99	+431	[illegible] 2Pl.-15×$\frac{3}{8}$=15"	34.0	28.0	
U_{14}-L_{14}	-195	-79	-274	4B-[illegible]=16.0" 2Pl.-15×$\frac{3}{8}$=11.25"	27.2		
U_{14}-L_{16}	+73	+60	+133	4B-3½×3½×$\frac{3}{8}$=9.92" 2Pl.-15×$\frac{3}{8}$=11.25"	21.2	16.8	
U_{14}-L_{16}	[illegible]	+74	+169	[illegible] 4B-3½×3½×$\frac{3}{8}$=3.92" 2Pl.-15×$\frac{3}{8}$=11.25"	21.2	16.8	
U_{16}-L_{16}	-201	-87	-288	4B-[illegible]=16.00" 2Pl.-15×$\frac{3}{8}$=15.00"	31.0		
U_{16}-L_{18}	+325	+110	+435	4B-5×3½×$\frac{9}{16}$=19.68" 2Pl.-15×$\frac{9}{16}$=16.9"	36.6	29.6	
U_{16}-L_{20}	-367	-115.1	-506	4B-6×4×$\frac{1}{2}$=27.76" 2Pl.-15×$\frac{11}{16}$=20.6"	48.4		
U_0-L_0	-[illegible] Wind-[illegible]	-[illegible]	-97	2-12"B-30" same section for all verticals except U_0-L_0	17.6		
U_1-L_1				U_1-L_1, U_2-L_2, U_4-L_4, U_6-L_6, U_8-L_8, U_{10}-L_{10}, U_{12}-L_{12}, U_{14}-L_{14}, U_{16}-L_{16}, U_{18}-L_{18}			
U_3-L_3	-65	-37	-112	U_3-L_3, U_5-L_5, U_7-L_7 Same			
U_5-L_{10}	-[illegible] Wind-[illegible]	-[illegible]	-124	2-15"B-40"	23.6		
U_9-L_{11}	-85	-50	-135	U_{11}-L_{11}, U_{13}-L_{13}, U_{15}-L_{15} Same			
U_{19}-L_{20}	-43	-25 Wind-[illegible]	-68				

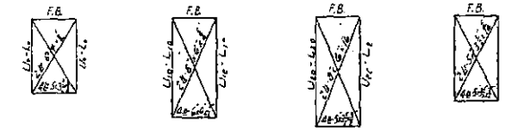


ELEVATION OF TRUSSES

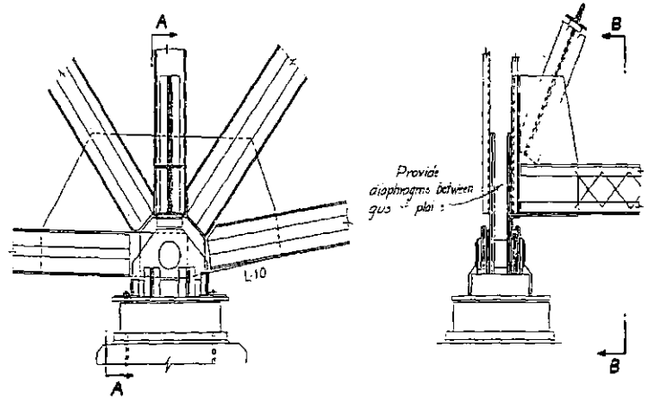


TOP LATERAL BRACING

BOTTOM LATERAL BRACING
Scale 1" = 40'



SWAY BRACING
Scale 1" = 40'



SECTION B-B

SECTION A-A

DETAIL AT PIER 4
Scale 1/4" = 1'-0"

Note:
Details of trusses, bracing and connections similar to span 5 except otherwise shown.
Rivets $\frac{7}{8}$"
Clear distance between web plates of chord members $9\frac{1}{2}$"
Double lacing $2\frac{1}{2}$"×$\frac{1}{2}$" bars for all but verticals.
Single lacing $2\frac{1}{2}$"×$\frac{1}{2}$" bars verticals.
Tie Plates $\frac{7}{8}$"

For General Plan and Elevation of Superstructure see Sheet No. 9.
For Floor Sections and Floor Details see Sheets Nos. 13 and 14.
For Bearings see Sheets Nos. 19 and 20.

LAKE CHAMPLAIN BRIDGE COMMISSION	
Mortimer Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schioff, Treasurer
Max L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

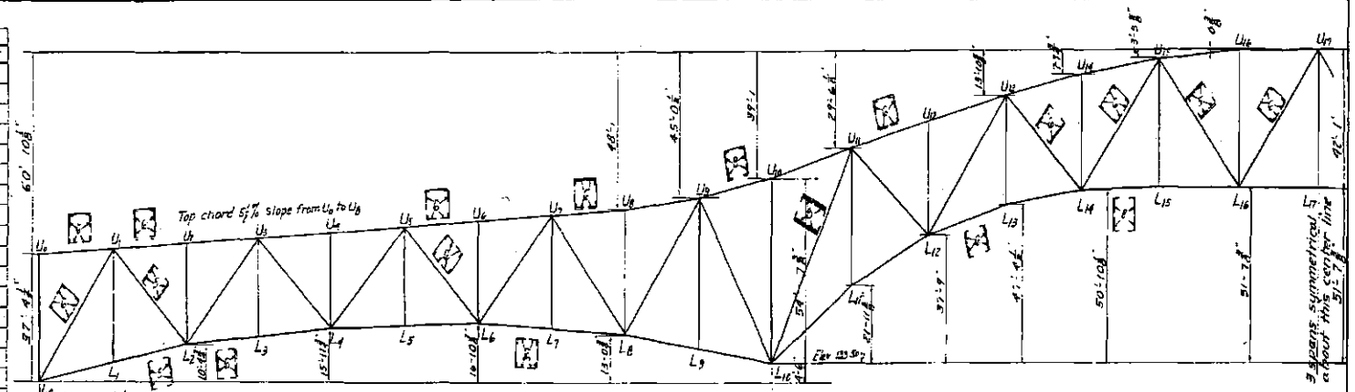
TRUSSES AND BRACING
SPANS 4 AND 5

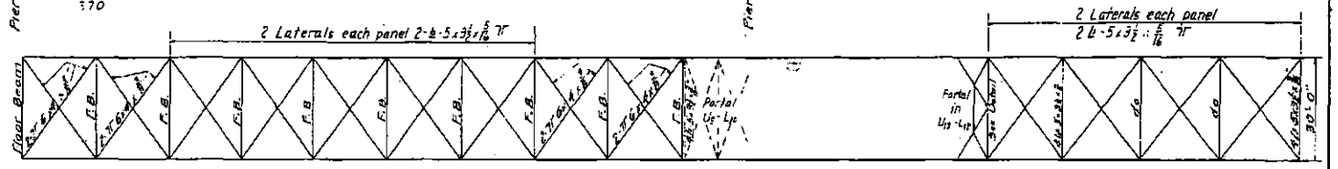
Scales as noted — March 1928
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.
DES. L.B.T. DR. L.B.T. TR. I.W.J. CHK. [illegible]
FILE NO. VI-8
APPROVED [illegible]
PLAN NO. 36

CONTRACT DRAWINGS — SHEET No. 16

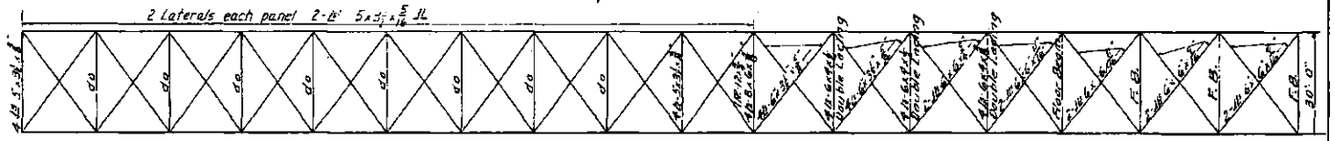
LCBC
Lake Champlain Bridge
Design + Construction
#43

Member	Stresses in Kips: Dead	Live and Impact	Total	Erection	Section		Area: Gross	Net
$U_0 - U_1$					4L-6x4x3/8 = 14.44	2 Web Pl. 20x7/16 = 17.5	35.4	33.5
					1 Cov Pl. 20x3/8 = 7.50			
$U_1 - U_3$	-335	-148	-483	+5/-46	4L-6x4x3/8 = 14.44	2 Web Pl. 20x3/4 = 15.00	42.9	
					1 Cov Pl. 20x3/8 = 7.50	2 Bott Pls 4x3/8 = 6.00		
$U_3 - U_5$	-346	-223	-569	+228	4L-6x4x3/8 = 14.44	2 Web Pl. 20x3/8 = 20.00	47.9	
					1 Cov Pl. 20x3/8 = 7.50	2 Bott Pl. 4x3/8 = 6.00		
$U_5 - U_7$	+29	+147/-178	+176/-149	+526	4L-6x4x3/8 = 14.44	2 Web Pl. 20x7/16 = 17.50	39.4	33.9
Wind Stress			+129/-169		1 Cov Pl. 20x3/8 = 7.50			
$U_7 - U_9$	+595	+169	+764	-802	4L-6x4x3/8 = 23.44	2 Web Pl. 20x1/2 = 20.00	58.4	48.9
$U_8 - U_9$					1 Cov Pl. 20x3/8 = 7.50	2 Bott Pl. 6x3/8 = 7.50		
$U_9 - U_{10}$	+1020	+217	+1237	+904	4L-8x6x1/2 = 27.00	4 Web Pl. 20x5/8 = 50.00	92.0	81.0
$U_{10} - U_{11}$					1 Cov Pl. 20x3/8 = 7.50	2 Bott Pl. 6x3/8 = 7.50		
$U_{11} - U_{13}$	+419	+142	+561	+760	4L-6x4x3/8 = 14.44	2 Web Pl. 20x7/16 = 17.50	44.7	38.3
					1 Cov Pl. 20x3/8 = 7.50	2 Bott Pl. 6x11/16 = 5.25		
$U_{12} - U_{14}$	+319	-191	-510	+297	4L-6x4x3/8 = 14.44	2 Web Pl. 20x7/16 = 17.50	44.7	
$U_{14} - U_{15}$					1 Cov Pl. 20x3/8 = 7.50	2 Bott Pl. 6x11/16 = 5.25		
$U_{13} - U_{15}$	-568	-228	-796	+33	4L-6x4x1/2 = 19.00	2 Web Pl. 20x11/16 = 27.5	65.5	
$U_{15} - U_{17}$					1 Cov Pl. 20x1/2 = 10.00	2 Bott Pl. 6x3/8 = 9.00		
$L_0 - L_2$	+168	+79	+267	+7/-6	4L-5x3½x5/16 = 12.20	2 Web Pl. 20x7/16 = 17.5	29.7	24.9
$L_2 - L_4$	+387	+199	+586	-121	4L-6x4x3/8 = 19.00	2 Web Pl. 20x11/16 = 22.5	46.5	39.7
$L_4 - L_6$	+197	+229	+426	-371	4L-6x4x7/16 = 16.72	2 Web Pl. 20x7/16 = 17.5	34.2	29.0
$L_6 - L_8$	-296	-155	-451	-658	4L-6x4x1/2 = 19.00	2 Web Pl. 20x3/8 = 20.00	39.0	
$L_8 - L_{10}$	-823	-189	-1012	-857	4L-6x6x3/8 = 33.76	4 Web Pl. 20x1/2 = 50.00	83.8	
$L_{10} - L_{11}$	-972	-227	-1199	-1058	4L-8x6x3/8 = 35.76	4 Web Pl. 24x5/8 = 60.00	95.8	
$L_{11} - L_{13}$	-876	-204	-1080	-956	4L-6x6x3/8 = 33.76	4 Web Pl. 24x3/8 = 60.00	93.8	
Wind Stress			-362					
$L_{12} - L_{14}$	-4	+133/-120	+129/-116	-541	4L-6x4x5/8 = 23.44	2 Web Pl. 24x1/2 = 24.00	47.4	41.7
Wind Stress			+82/-75					
$L_{13} - L_{15}$	+4	+150/-117	+154/-113	-523	4L-6x4x5/8 = 23.44	2 Web Pl. 24x1/2 = 24.00	47.4	41.7
Wind Stress			+73/-58					
$L_{14} - L_{16}$	+479	+214	+693	-123	4L-8x6x11/16 = 36.60	2 Web Pl. 24x3/4 = 36.00	72.6	64.1
Wind Stress			+66/-60					
$L_{16} - L_{17}$	+590	+231	+821		4L-8x6x3/8 = 29.76	2 Web Pl. 24x7/8 = 42.0	81.8	72.5
Wind Stress			+630/-840					
$U_1 - L_0$	-308	-129	-437		4L-6x4x5/16 = 21.24	2 Web Pl. 20x1/2 = 20.0	41.2	
$U_1 - L_2$	+200	+106	+306		4L-5x3½x3/8 = 12.20	2 Web Pl. 18x3/8 = 13.50	25.7	21.2
$U_3 - L_2$	80	-89	-169				25.7	
$U_3 - L_4$	-48	+62/-64	+110/-116				25.7	21.2
$U_5 - L_4$	+212	+86	+298				25.7	21.2
$U_5 - L_6$	-308	-99	-407		4L-6x4x1/2 = 19.00	2 Web Pl. 18x1/2 = 18.00	37.0	
$U_7 - L_6$	355	+112	+507		4L-6x4x1/2 = 19.00	2 Web Pl. 18x5/8 = 22.5	41.5	35.0
$U_7 - L_8$	-460	-118	-578		4L-6x6x3/8 = 28.44	2 Web Pl. 20x5/8 = 25.0	53.4	
$U_9 - L_8$	+382	+123	+505		4L-6x4x1/2 = 19.00	2 Web Pl. 20x1/2 = 20.0	39.0	33.0
$U_9 - L_{10}$	-340	-115	-455		4L-6x4x1/2 = 19.00	2 Web Pl. 20x5/8 = 25.0	44.0	
$U_{11} - L_{10}$	-440	-155	-595		4L-8x6x11/16 = 36.60	2 Web Pl. 24x1/2 = 24.0	60.6	
$U_{11} - L_{12}$	+476	+133	+609		4L-8x6x5/16 = 23.72	2 Web Pl. 24x7/16 = 21.0	44.7	38.4
$U_{13} - L_{12}$	-690	-184	-874		4L-6x6x3/8 = 33.76	4 Web Pl. 24x1/2 = 48.0	81.8	
$U_{13} - L_{14}$	+428	+124	+552		4L-6x4x7/8 = 19.00	2 Web Pl. 20x9/16 = 22.5	41.5	35.2
$U_{15} - L_{14}$	-270	-102	-372		4L-6x4x1/2 = 19.00	2 Web Pl. 20x1/2 = 20.0	39.0	
$U_{15} - L_{16}$	+145	+80	+225		4L-5x3½x3/8 = 12.20	2 Web Pl. 18x3/8 = 13.5	25.7	21.2
$U_{17} - L_{16}$	50	+63/-68	+113/-118		4L-6x4x3/8 = 14.44	2 Web Pl. 18x7/16 = 15.75	30.2	
$U_0 - L_0$	36	-52	-88		4L-7x3½x7/16 = 20.00		20.0	
Wind Stress			-82					
$U_1 - L_1$					4L-7x3½x7/16 = 20.00		20.0	
$U_3 - L_3$	$U_5 - L_5$	$U_7 - L_7$	$U_9 - L_9$	$U_{11} - L_{11}$	$U_{14} - L_{14}$ same as $U_1 - L_1$		20.0	
$U_2 - L_2$	76	64	-140		4L 7x3½x7/16 = 20.0		20.0	
$U_4 - L_4$	$U_6 - L_6$	$U_8 - L_8$	same	as $U_2 - L_2$			20.0	
$U_{10} - L_{10}$	Top +55 / Bot -55	-55	+55/-167		2-15" PB @ 33.9# = 19.8		15.8	
$U_{11} - L_{11}$	-200	-42	-242		4L-8x3½x1/2 = 22.0		22.0	
$U_{12} - L_{12}$	122	-66	-188		4L 7x3½x7/16 = 20.0		20.0	
$U_{13} - L_{13}$	$U_{15} - L_{15}$	$U_{17} - L_{17}$	same	as	$U_{12} - L_{12}$		20.0	

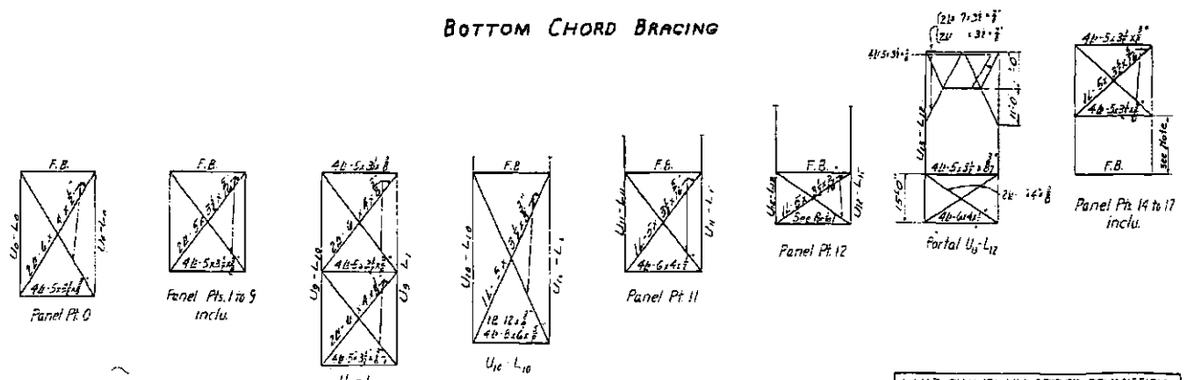




Top Chord Bracing



Bottom Chord Bracing



Sway Bracing

Note.
Chord members to be straight between dimensions given.
When consistent with shipping requirements two pairs of chord members shall with spaced one embedded together.
Plates ⅞"
Dimension out to out of webs of all chord members 1'-8"
Sway Bracing over roadway shall leave a clear headroom of 14½" above crown of roadway

For General Plan and Elevation of Superstructure Sheet No 9.
For Floor Sections and Floor Details Sheets No: 12 and 14.
For Typical Truss Details of Spans 6, 7 and 8 Sheet No. 18.
For Bearings Sheets Nos 19 and 20.

LAKE CHAMPLAIN BRIDGE COMMISSION	
Mortimer M. Ferris, Chairman	George [illegible] Thomas, Chairman
Albert E. Phelps, Secretary	Charles E. Scroff, Treasurer
Mo[illegible] L. Thoma	William R. Wat[illegible]

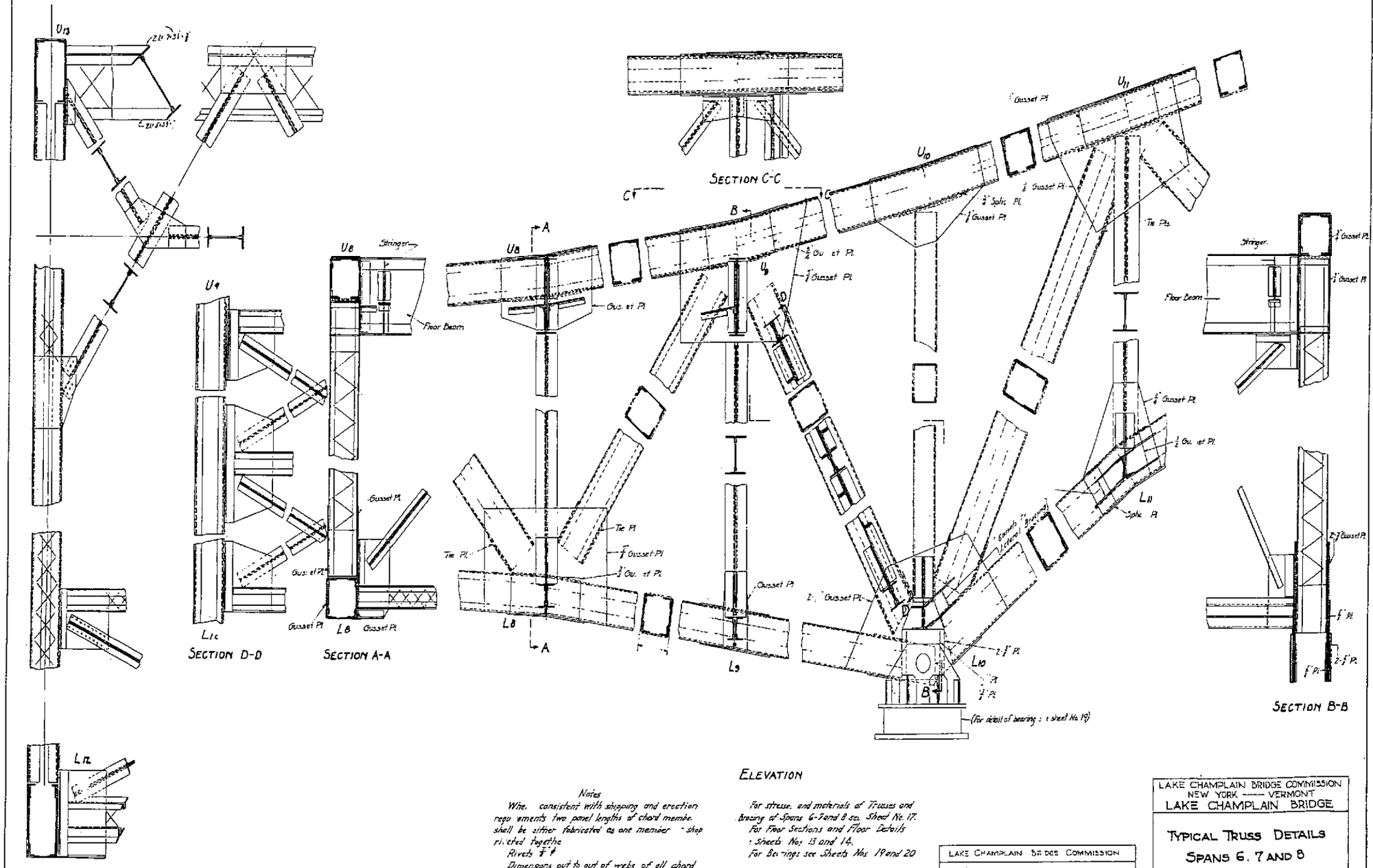
LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

TRUSSES AND BRACING
SPANS 6 7 AND 8

Scale 1" = 40' March 1928
SAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS
DES. RG DR. RG TR. LWH CHK. HHW
DWG. NO. V1-8
APPROVED
DWG. NO. 37

CONTRACT DRAWINGS SHEET No 17

LCBC
Lake Champlain Bridge
Design + Construction
#44



Notes

Wire, consistent with shipping and erection requirements two panel lengths of chord members shall be either fabricated as one member or shop riveted together

Rivets $\frac{7}{8}''\phi$

Dimensions out to out of webs of all chord members 1'-8"

Double lacing $2\frac{1}{2}''\times\frac{1}{2}''$ for all but verticals.

Single lacing $2\frac{1}{2}''\times\frac{1}{2}''$ for verticals.

For stresses and materials of Trusses and Bracing of Spans 6-7 and 8 see Sheet No. 17.

For Floor Sections and Floor Details see Sheets Nos. 13 and 14.

For Bearings see Sheets Nos. 19 and 20

LAKE CHAMPLAIN BRIDGE COMMISSION	
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Albert E. Phelps, Secretary	Charles L. Schoff, Treasurer
Marion L. Thoma	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK —— VERMONT
LAKE CHAMPLAIN BRIDGE

TYPICAL TRUSS DETAILS
SPANS 6, 7 AND 8

Scale $\frac{1}{2}''=1'-0''$ March 1928

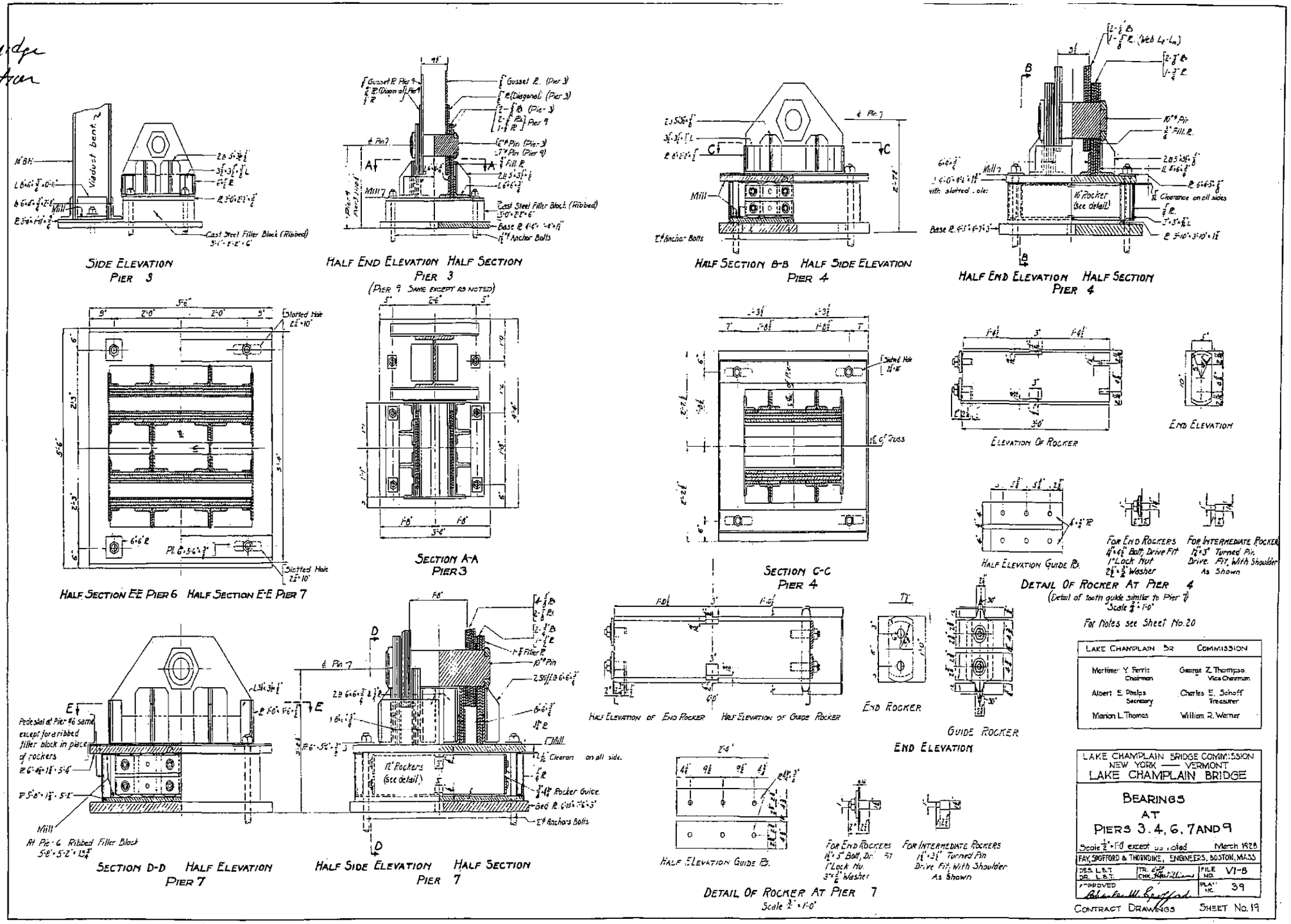
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

DES. RCA. DR. RCA. TR. CAB CHK. [illegible] FILE NO. V1-8

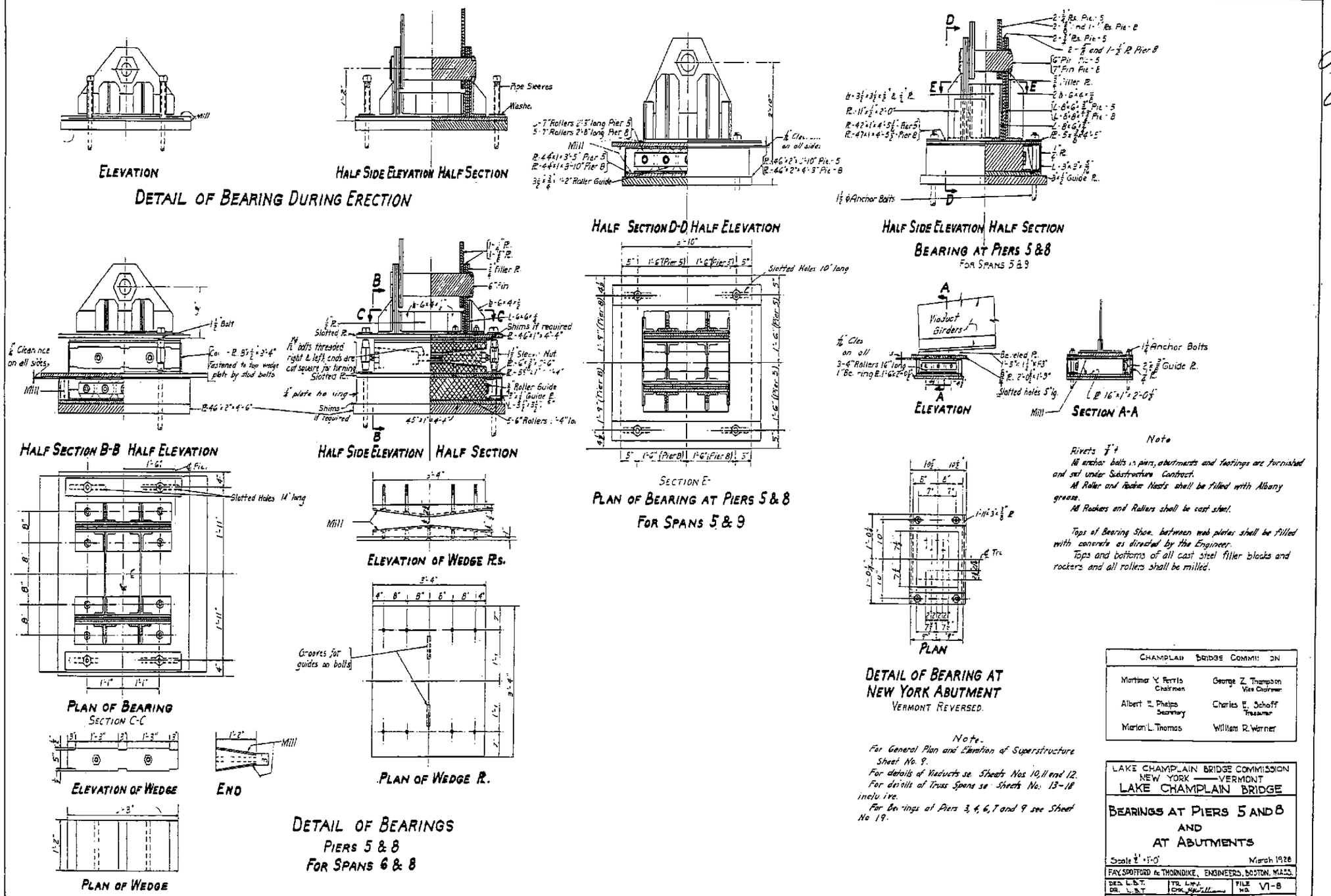
APPROVED [illegible] PLAN NO. 38

CONTRACT DRAWINGS SHEET No. 15

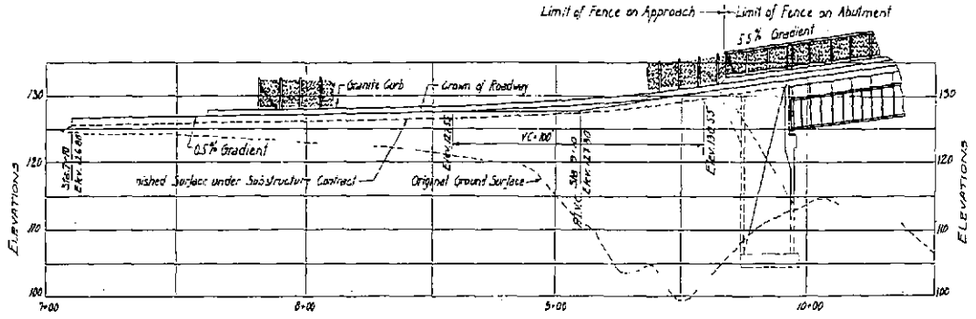
LCBC
Lake Champlain Bridge
Design + Construction
#45



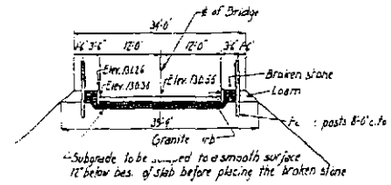
LCBC
Lake Champlain Bridge
Design + Construction
#46



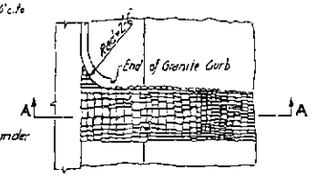
LCBC
Lake Champlain Bridge
Design + Construction
47



PROFILE ON CENTER LINE OF ROADWAY
Horiz. Scale 1" = 40'

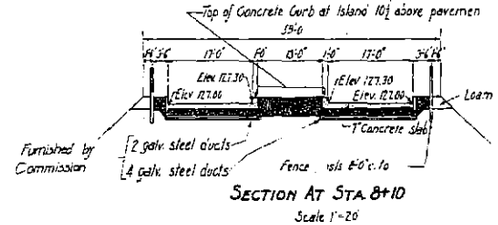


SECTION AT STA. 9+60
Scale 1" =

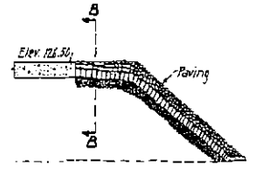


All loam furnished under Substructure Contract.

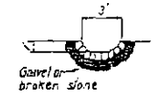
PLAN
SIDE GUTTER
Scale 1/8" = 1'-0"



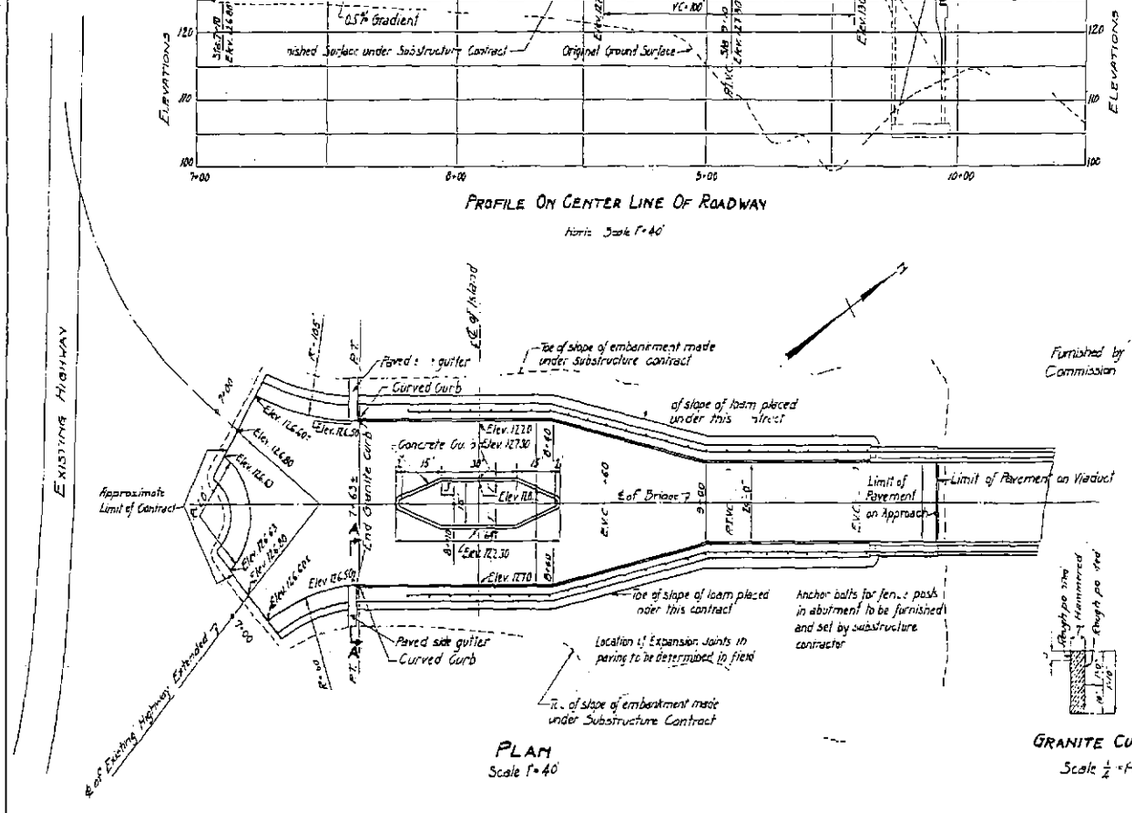
SECTION AT STA. 8+10
Scale 1" = 20'



SECTION A-A
SIDE GUTTER
Scale 1/8" = 1'-0"

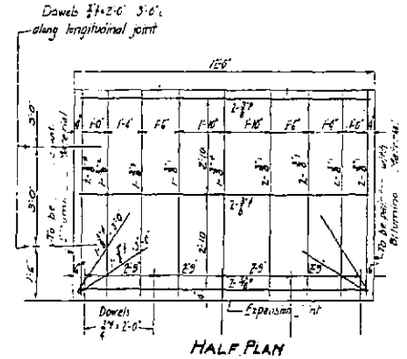


SECTION B-B
Scale 1/8" = 1'-0"



PLAN
Scale 1" = 40'

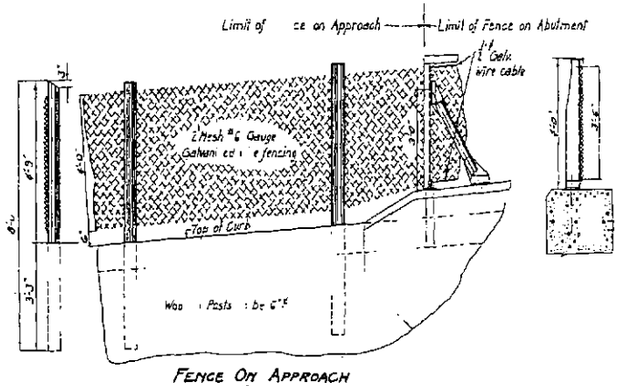
GRANITE CURB
Scale 1/4" = 1'-0"



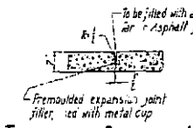
HALF PLAN

Notes

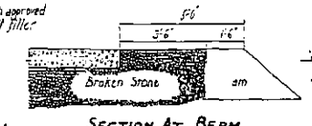
All elevations are referred to Mean Sea Level Datum
For General Plan and Elevation of Superstructure see Sheet No. 3
For details of Expansion Joint at Abutment see Sheet No. 14
For detail of end of concrete roadway slab resting upon Abutment see Sheet No. 3



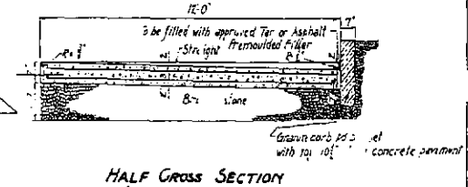
FENCE ON APPROACH
Scale 1/4" = 1'-0"



TRANSVERSE EXPANSION JOINT
Scale 1/4" = 1'-0"



SECTION AT BERM WITHOUT CURB
Scale 1/4" = 1'-0"



HALF CROSS SECTION
24' ROADWAY WITH CURB
Scale 1/4" = 1'-0"

LAKE CHAMPLAIN BRIDGE COMMISSION	
Mortimer Y. Ferris, Chairman	George Z. Thompson, Vice-Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Max L. Thomas	William R. Wame

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

NEW YORK APPROACH
SURFACING AND DETAILS

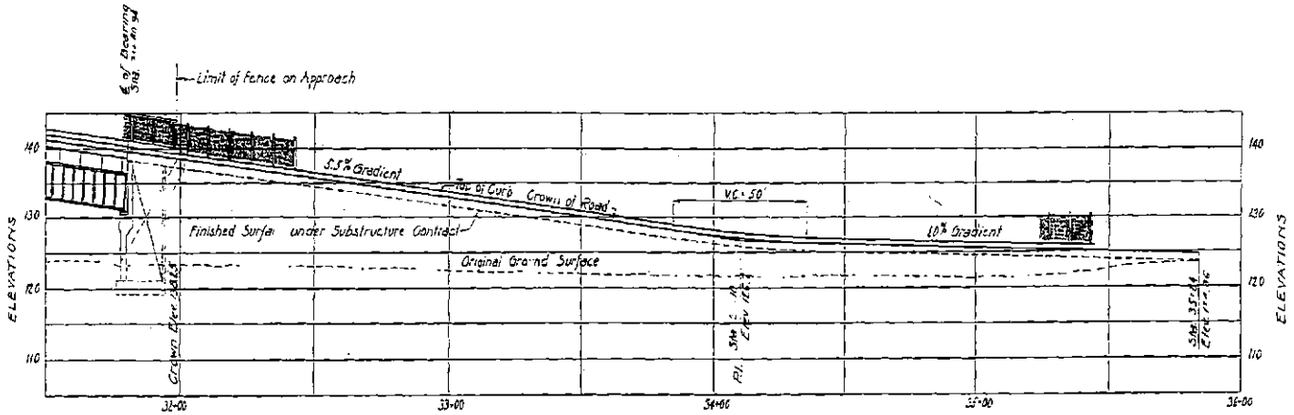
Scales as noted — March 1926

FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

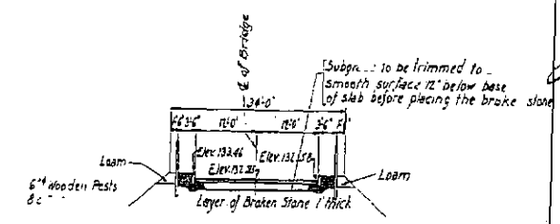
DES. R.C.L. DR. R.C.L.	TR. E.W. CHK. A.D. Williams	FILE NO. VI-B
APPROVED Frederick H. Fay		PLATE NO. 41

CONTRACT DRAWINGS — SHEET No. 21

LCBC
Lake Champlain Bridge
Design + Construction
#48

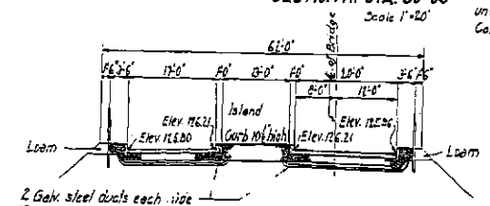


PROFILE ON CENTER LINE OF ROADWAY
Horiz. Scale 1" = 40'

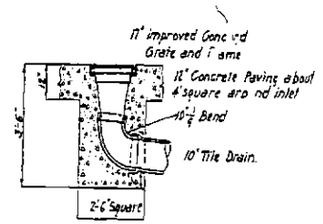


SECTION AT STA. 33+00
Scale 1" = 20'

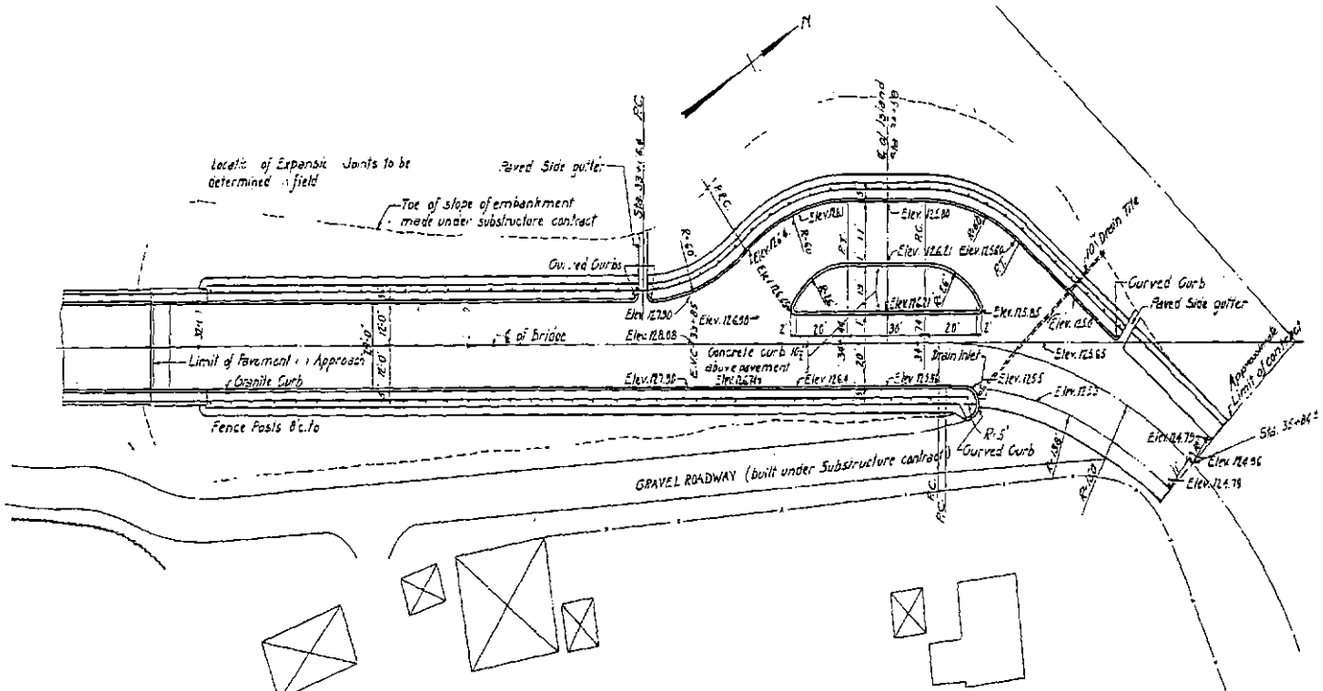
All Loam furnished under Substructure Contract



SECTION AT STA. 34+59
Scale 1" = 20'



DRAIN INLET
Scale ¼" = 1'-0"



PLAN
Scale 1" = 40'

Notes
All elevations are referred to Mean Sea Level Datum
For General Plan and Elevation of Superstructure see Sheet No. 9
For details of Pavement Curb, Side gutter, Fence etc. see Sheet No. 21
For details of Expansion Joint at Abutment see Sheet No. 14
For detail of end of concrete roadway slab resting upon Abutment see Sheet No. 3

LAKE CHAMPLAIN BRIDGE COMMISSION	
Mortimer Y. Ferris, Chairman	George Z. Thompson, Vice Chairman
Albert E. Phelps, Secretary	Charles E. Schoff, Treasurer
Marion L. Thomas	William R. Warner

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

VERMONT APPROACH
SURFACING AND DETAILS

Scale as noted — March 1928

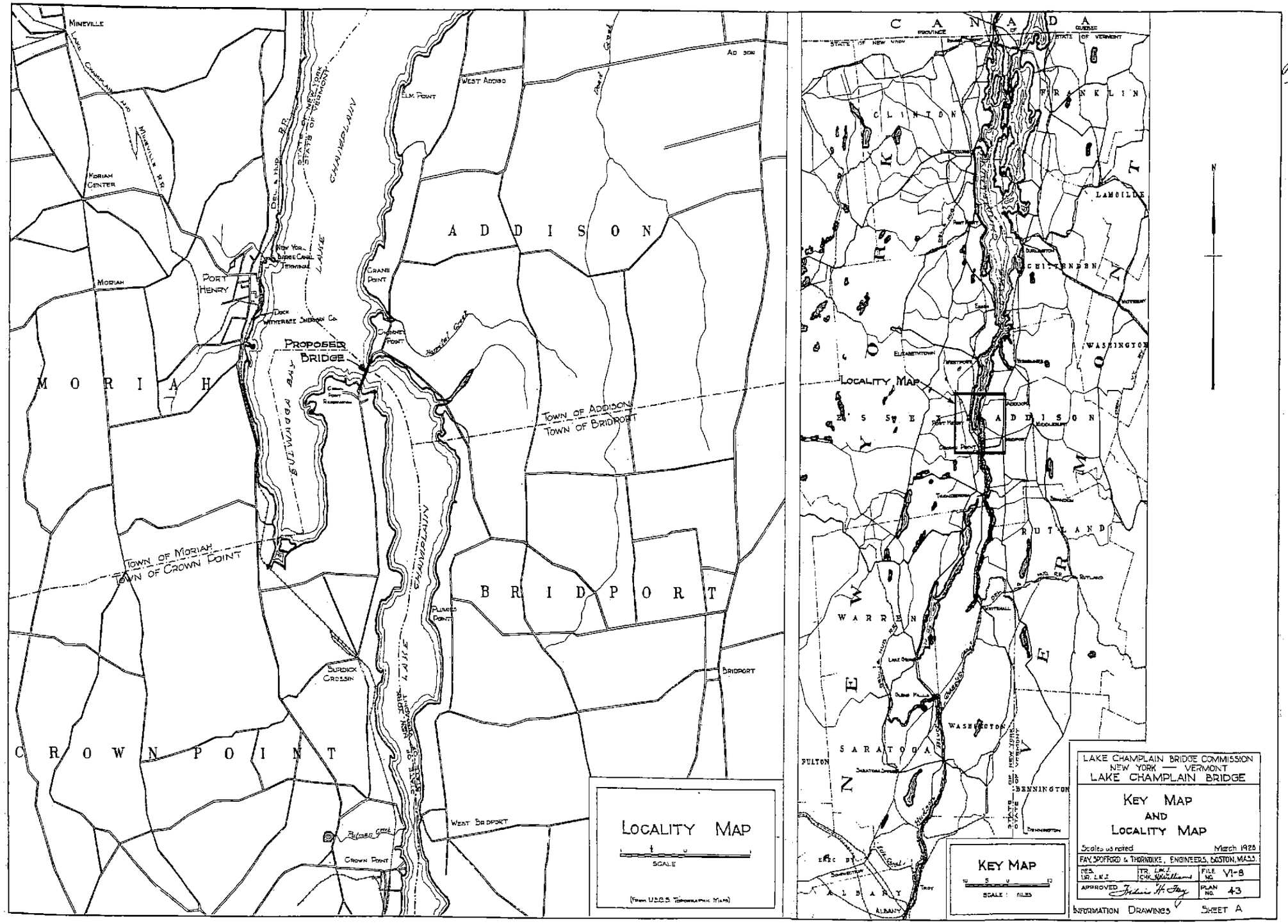
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

DES.	TR.	FILE NO.
DR.	CHK.	VI-8
APPROVED		PLAN NO. 42

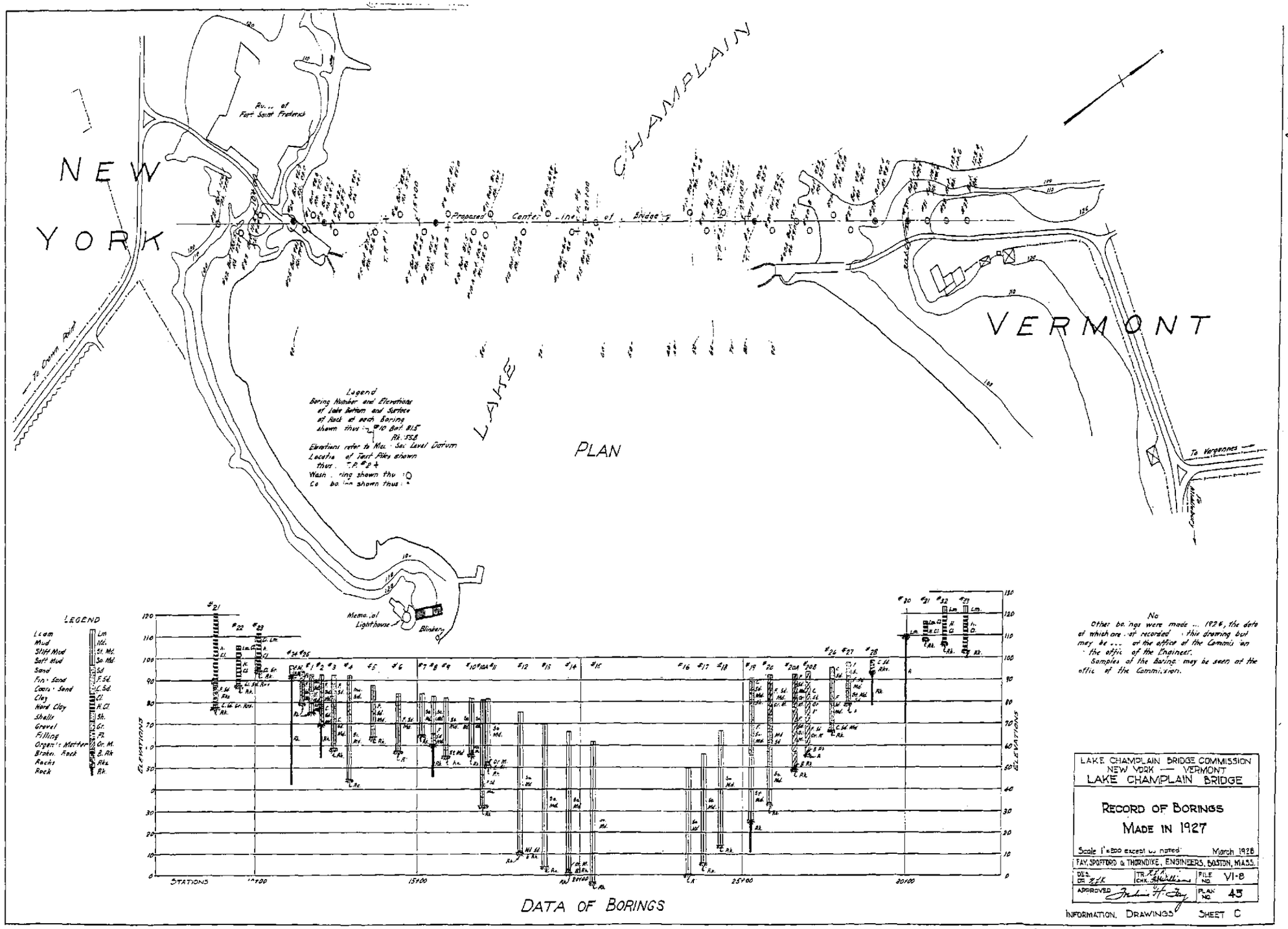
CONTRACT DRAWINGS — SHEET No. 22

LCBC.
Lake Champlain Bridge
Design & Construction

#49



LCBC
Lake Champlain
Bridge
Design &
Construction
#51



No
Other borings were made in 1926, the data of which are not recorded on this drawing but may be seen at the office of the Commission or the office of the Engineer.
Samples of the Borings may be seen at the office of the Commission.

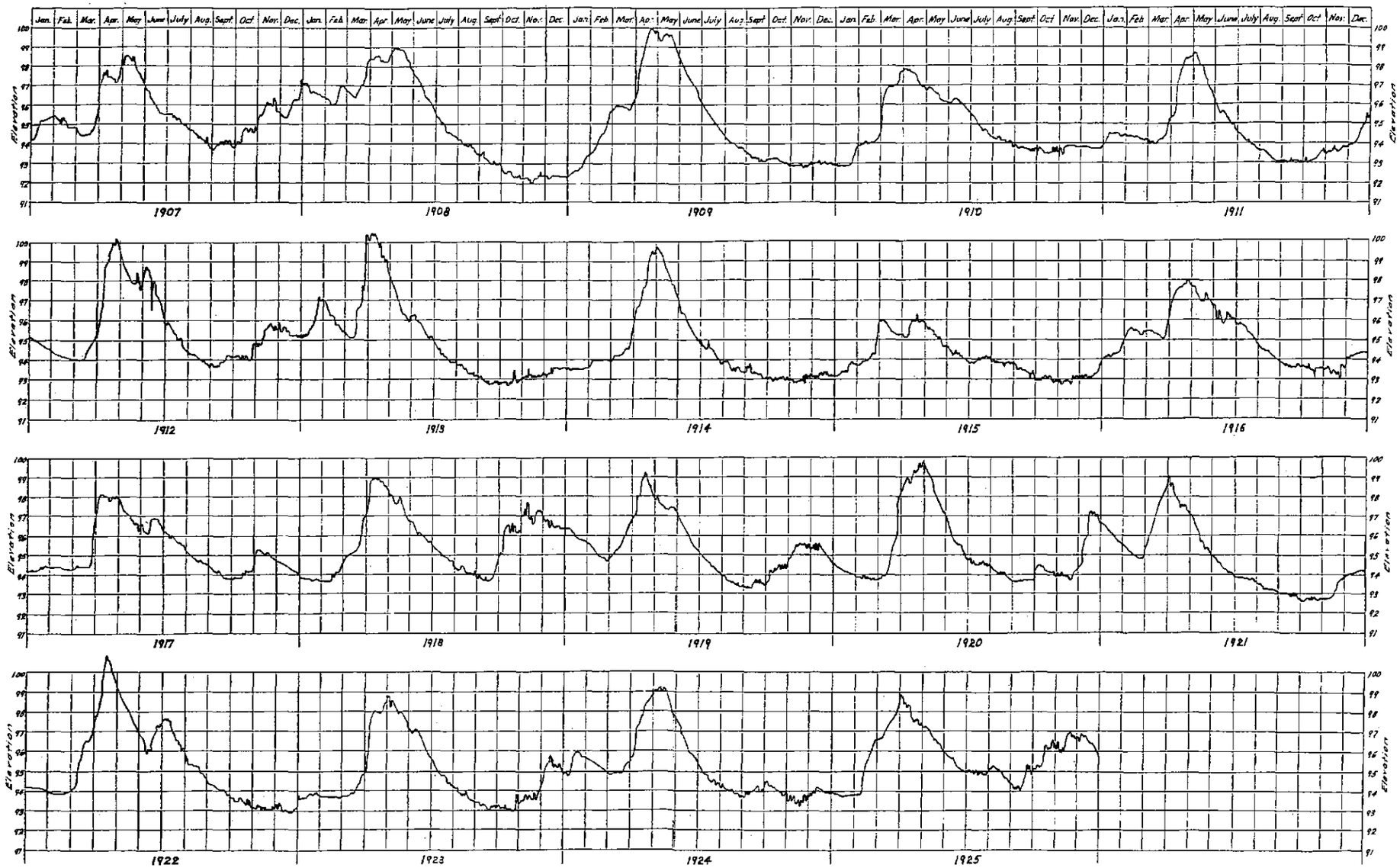
LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

RECORD OF BORINGS
MADE IN 1927

Scale 1" = 200 except as noted March 1928
FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.
DES. DR. R.F.K. TR. R.F.K. CHK. A.W.Williams FILE NO. VI-8
APPROVED Andrew H. Hay PLAN NO. 45

INFORMATION. DRAWINGS SHEET C

LCBC
Lake Champlain Bridge
Design & Construction
#52



Data from Hydrostat of Lake Champlain at Fort Montgomery, New York, furnished by Corps of Engineers, U.S. Army.
All elevations referred to Mean Sea Level Datum

LAKE CHAMPLAIN BRIDGE COMMISSION
NEW YORK — VERMONT
LAKE CHAMPLAIN BRIDGE

HYDROSTAT OF LAKE LEVELS

March 1928

FAY, SPOFFORD & THORNDIKE, ENGINEERS, BOSTON, MASS.

DES. DR. RJK	TR. RJK CHK. RLB HWJ.	FILE NO VI-8
APPROVED Fredric H. Fay		PLAN NO. 4-6

INFORMATION DRAWINGS SHEET D