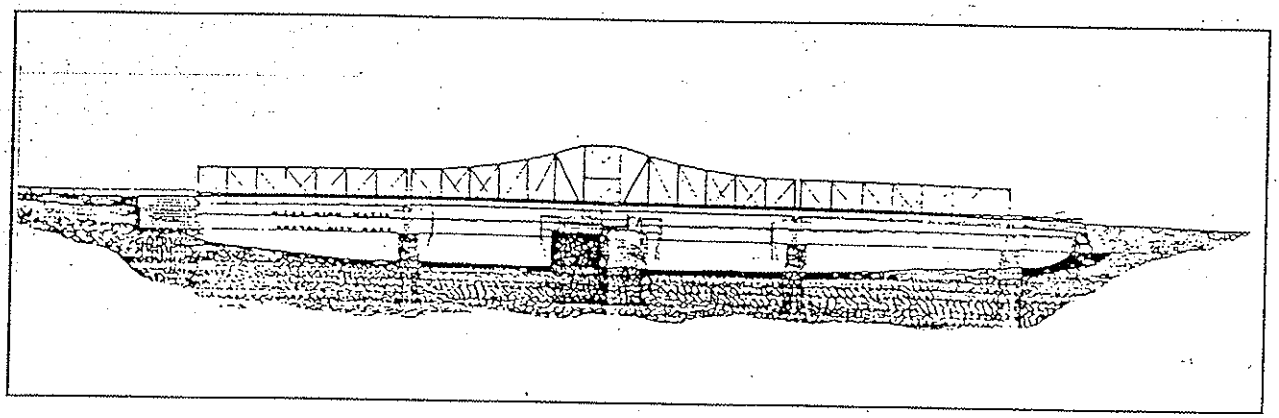
HISTORIC PRESERVATION PLAN

FOR THE

OLD NORTHERN AVENUE BRIDGE
BOSTON, MASSACHUSETTS



HISTORIC PRESERVATION PLAN

FOR THE

OLD NORTHERN AVENUE BRIDGE
BOSTON, MASSACHUSETTS

By
Jane Carolan
Consultant in History and Architectural History
42 Middle Street
Newburyport, MA 01950

For

Fay Spofford Thorndike, Inc.
5 Burlington Woods
Burlington, MA 01803

and

Public Works Department
Boston, MA

August, 1998

TABLE OF CONTENTS

LIST OF FIGURES

I. INTRODUCTION

As part of a mitigation plan for the construction of the new Northern Avenue Bridge, known as the Evelyn Moakley Bridge (adjacent to the old Northern Avenue Bridge) and the preservation and reuse of the old Northern Avenue Bridge, the Massachusetts Historical Commission has requested that a Preservation Plan be undertaken to fully explore all the preservation options - from No Action to Demolition - available for the old bridge.

The Northern Avenue Bridge, constructed in 1905-1908, has recently been taken out of service and is presently in the closed position. Due to a Coast Guard Regulation requiring a sixteen-foot clearance for the channel of Fort Point Channel, the current closed position is blocking navigation in Fort Point Channel.

The Preservation Plan contains a history of the bridge, outlines its significant historic features and provides an analysis, from a Historic Preservation viewpoint, of alternative actions for the bridge.

II. HISTORY AND HISTORIC ENGINEERING DESCRIPTIONS

The Northern Avenue Bridge carries Northern Avenue over Fort Point Channel and connects Atlantic Avenue in Boston and Fan Pier in South Boston (Fig. 1). Throughout the nineteenth and early twentieth centuries Fort Point Channel, originally a tidal creek, was incrementally filled and developed into a manmade channel connected to Boston Harbor. As the City of Boston grew and industry and shipping developed in South Boston, it was necessary to have quick and direct access by bridge across the channel.

Since 1805, at least fourteen bridges have been constructed over this waterway at different times. The channel is presently crossed by seven bridges, which in their totality form a rich compendium of nineteenth and twentieth century bridge technology, particularly in the field of drawbridge construction.

Extant bridges include the Broadway Bridge, piers from 1874-1875, spans, 1902, swing span, 1914 (HAER NO. MA-129); the New York, New Haven and Hartford Railroad Fort Point Channel Rolling Lift Bridge (Scherzer Rolling Lift Bridge), 1899, (HAER NO. MA-35); the Summer Street Bridge, 1899-1900, rebuilt 1996, (HAER NO. MA-41); the Northern Avenue Bridge, 1908, rebuilt 1934, (HAER NO. MA-37); Congress Street Bridge, 1930, (HAER NO. MA-38); the Y-Connector, 1984; and the Dorchester Avenue Bridge 1892; rebuilt 1948 (Carolan 1995: 11-12).

(The following description of the Northern Avenue Bridge is based on the Northern Avenue Bridge Historic Engineering Record Documentation (HAER) No. MA-37, 1989, McGinley Hart & Associates, Inc. For a more complete description of the bridge see Appendix).

The Northern Avenue Bridge was constructed in 1905-1908 by the City of Boston's Engineering Department (Fig. 2). Unlike other locations in Fort Point Channel, where bridges were built, torn down, and rebuilt, the Northern Avenue Bridge is the first and only bridge at its location. It occupies a prominent site at the juncture of Fort Point Channel and Boston Harbor. The bridge was built "as part of a general upgrading of vehicular, railroad and pedestrian service to the South Boston wharfs and warehouses which were expanded at a rapid rate (McGinley Hart & Associates, Inc. 1989: 4). It was designed by William Jackson, City Engineer. The piers and abutments were built by the W.H. Ellis Company and the superstructure by the New England Structural Company, Everett, MA. The Northern Avenue Bridge is comparable in design to the North Washington Street Charlestown Bridge (1896-9), also constructed by Boston City Engineers.

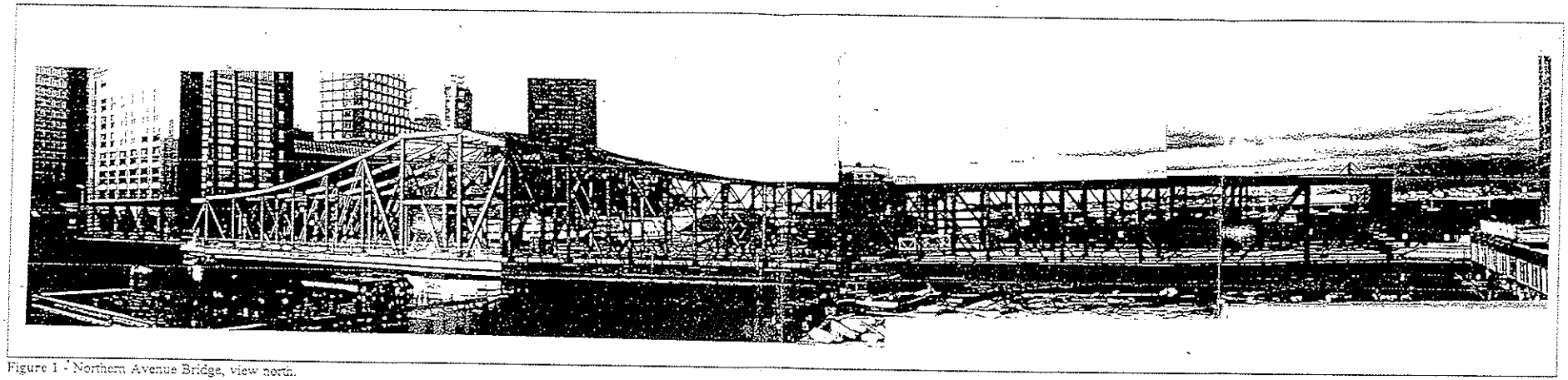


Figure 1 - Northern Avenue Bridge, view north.

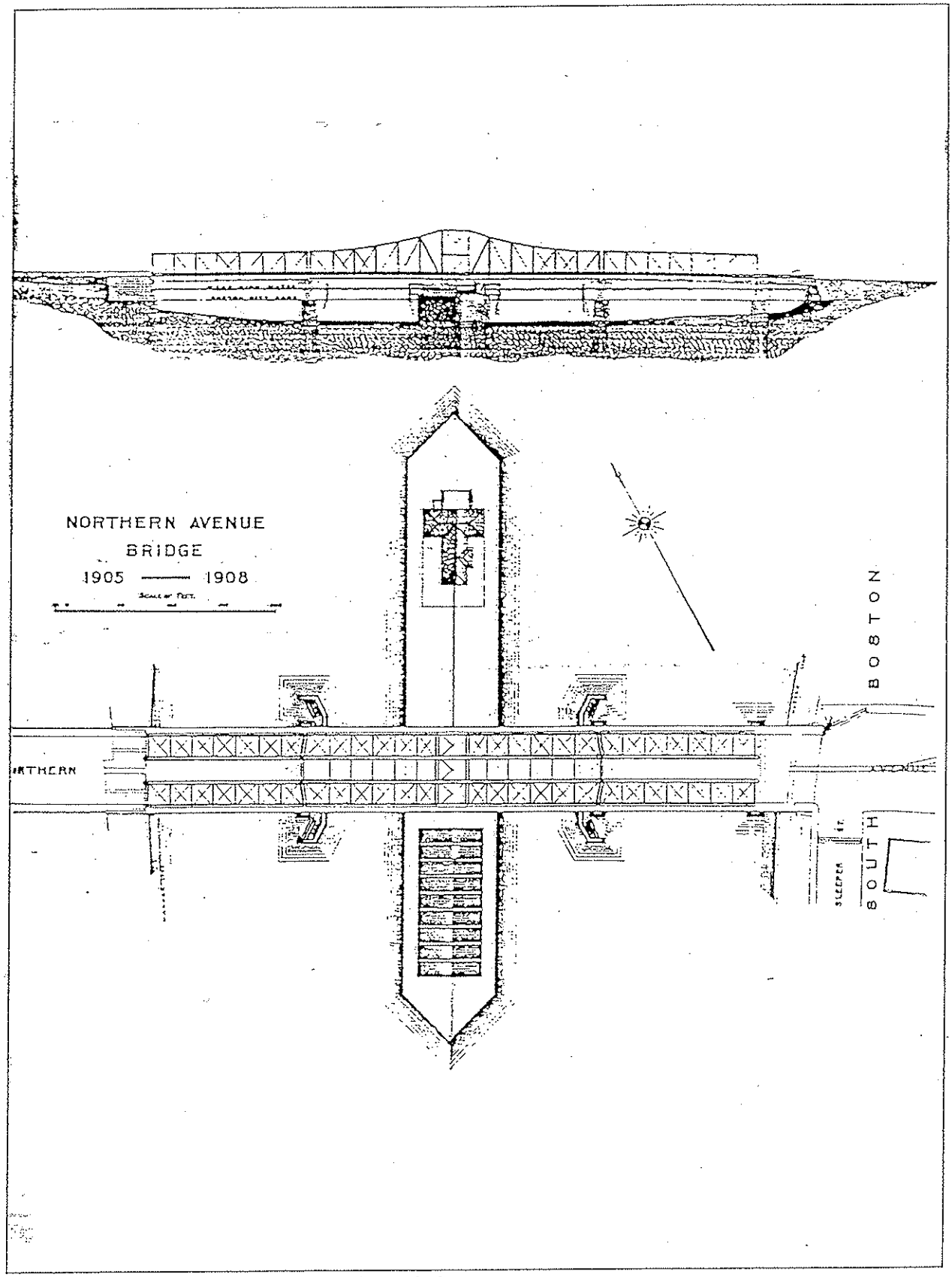


Figure 2 - Northern Avenue Bridge elevation and plan.

The Northern Avenue Bridge is a 643-foot long, triple-barreled swing bridge with three Pratt-type truss spans and a riveted steel frame. (The Pratt truss, patented in 1844, is a widely used truss-type. It was developed in Boston by T. Willis, a Boston City Assistant Engineer.) The approach spans are through truss spans with four pin connected trusses with vertical end posts (Fig. 3). The 238-foot long draw span is a pinned through truss with five sloped upper chords in cantilever arms and a flat topped single span tower. Spans one and two, both about 150-feet long, contain three roadways and two cantilevered pedestrian walkways. Span three is a deck plate girder consisting of six girders each about 55-feet long, which was used to carry a freight-railway track.

The bridge rests on granite block piers and abutments which are supported by concrete foundations and friction piles. The channel piers on the shore sides are similar in design and size to those of the Summer Street Bridge, which also spans Fort Point Channel. The granite piers within the channel are curved in an arc similar to the ends of the swing span. The center draw pier, approximately 69- feet in diameter is a massive concrete and granite structure supporting the span operating equipment which is set in a three-foot thick concrete turntable pit. The wooden draw fender pier (Fig. 4), 593-feet long "... was the largest ever built by the city at the time of its construction (McGinley Hart & Associates, Inc. 1989: 4)."

The original operating equipment is a rim-bearing turntable track (the draw rests on fifty-six steel wheels running between steel-faced tracks) which was operated by a rack and pinon drive system run by compressed air. The compressors and eight original tanks of compressed air, were all housed in the Tender's House and powered by direct current electric motors.

The bridge was operated by a Draw Tender, from the Tender's House with the assistant of additional Tender's on the bridge operating safety gates and manually operating bearing blocks through levers that would level the draw span as it was closed and allow the gates to open. The compressed air system could open the bridge in only two minutes while manually cranking the bridge open took about twenty minutes.

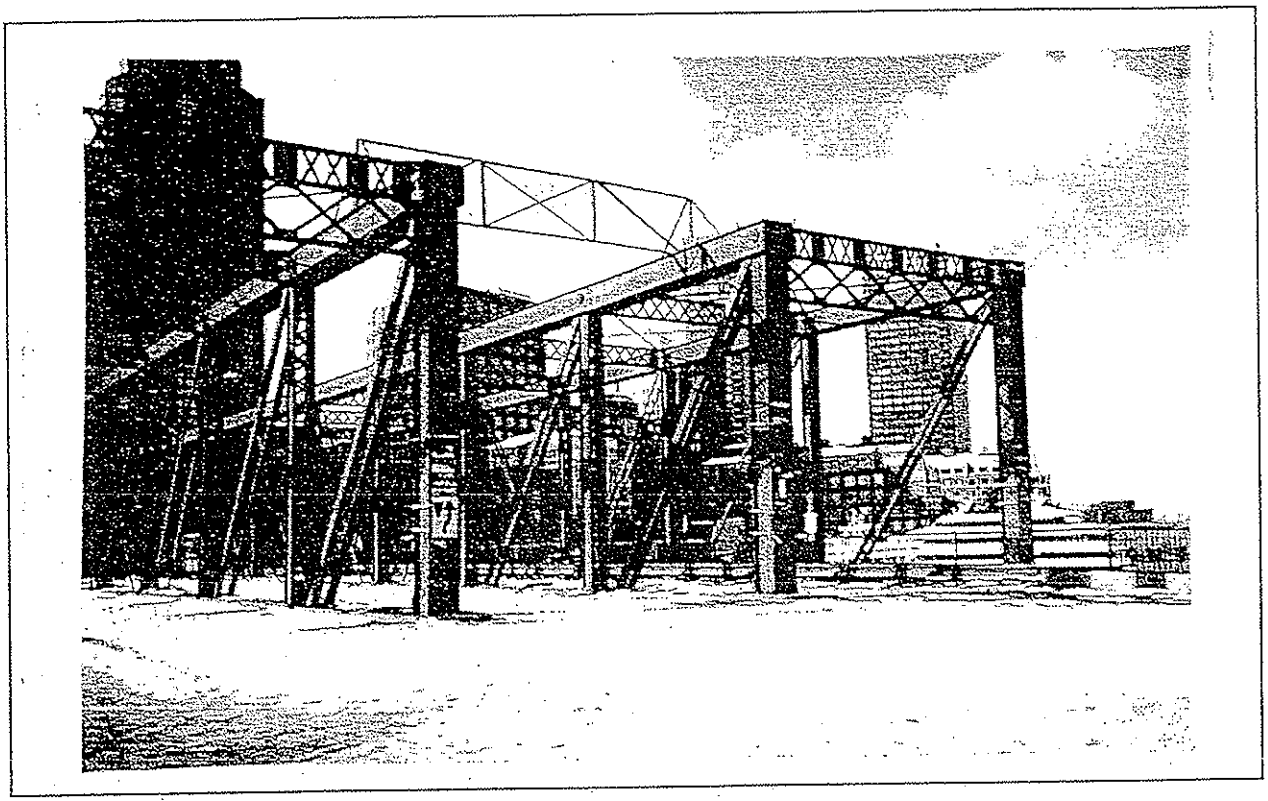


Figure 4 - View of through trusses.

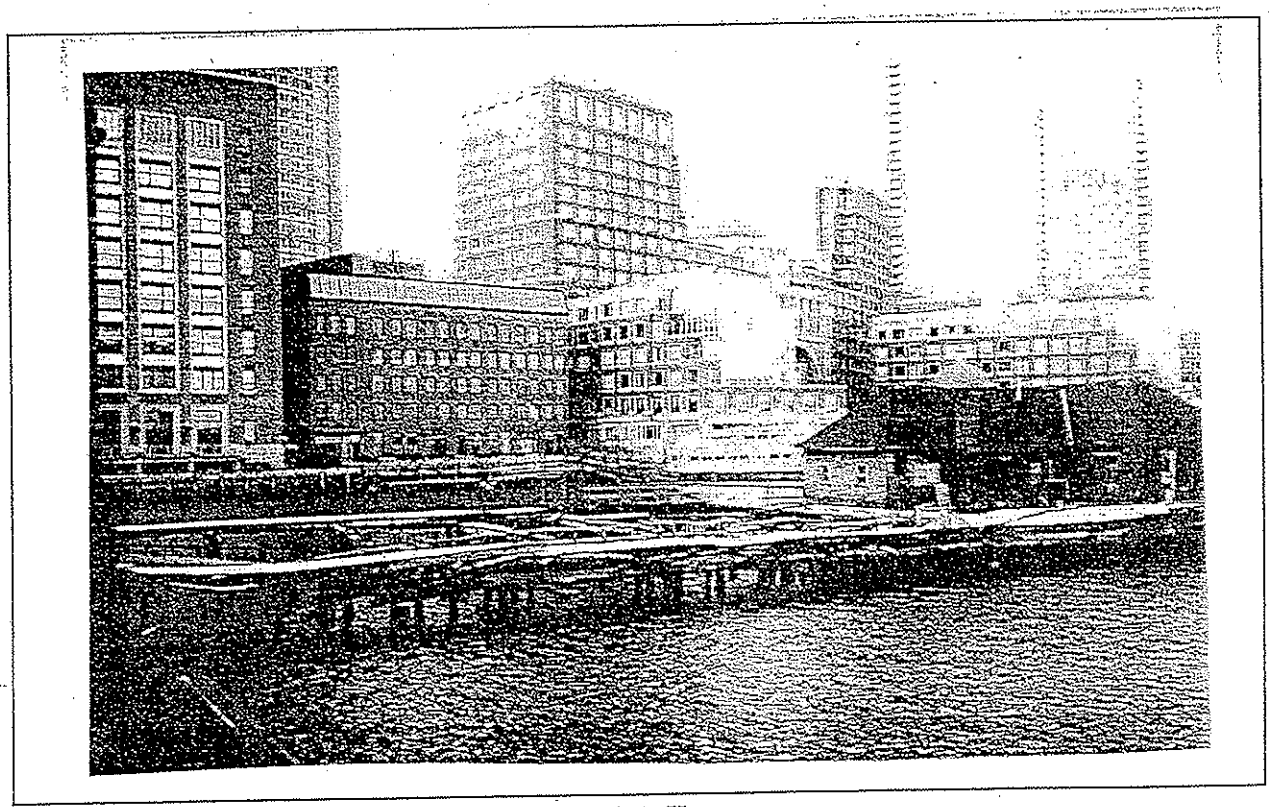


Figure 3 - View showing part of fender and Draw Tender's House.

Set at the northern most end of the large center fender is the Draw Tender's House (Figs. 5 and 6). It is a one story, cross-gabled, wood-framed structure. It is sheathed in wood shingles and has an asphalt shingle roof. Windows are symmetrically arranged. In the north end of the building they are 6/2 with simple wood surrounds. In the south end they are small, 1/1 and have simple wood surrounds. Doors are large, double wood, with panels below and 4 glass panes above. A wooden utility shed has been added to the west side of the north elevation. Perhaps the most distinctive feature of the Tender's House is its almost residential like, gabled, entrance porch on the east elevation which is sheathed in wood shingles and has arched openings.

Since the bridge's completion it has undergone a number of repairs and alterations. Around 1912, a fireboat house and public landing pier were constructed on the north side of the South Boston approach spans. In ca. 1918 the Union Railway finally laid track over the bridge; these were abandoned in 1970. In 1924 the first rubber paving tiles used in Boston were laid. These were subsequently replaced by later repaving. In 1930-1 new compressed air tanks were installed and the draw pier masonry and concrete repaired. In 1934-6 the draw pier, foundation and draw superstructure were completely rebuilt with minor modifications. The end lifts were also repaired and a new air compressor installed leaving the original compressor as a backup. In 1957 approach span three was redecked. In 1974-5 the approach and draw spans were redecked. In 1986 the approach span deck bracing was repaired and a new draw span compressor was installed to replace the 1934 compressor. Currently, the bridge, Tender's House and fender system are in very poor condition. In 1997 the bridge was taken out of service and is currently in the closed position.

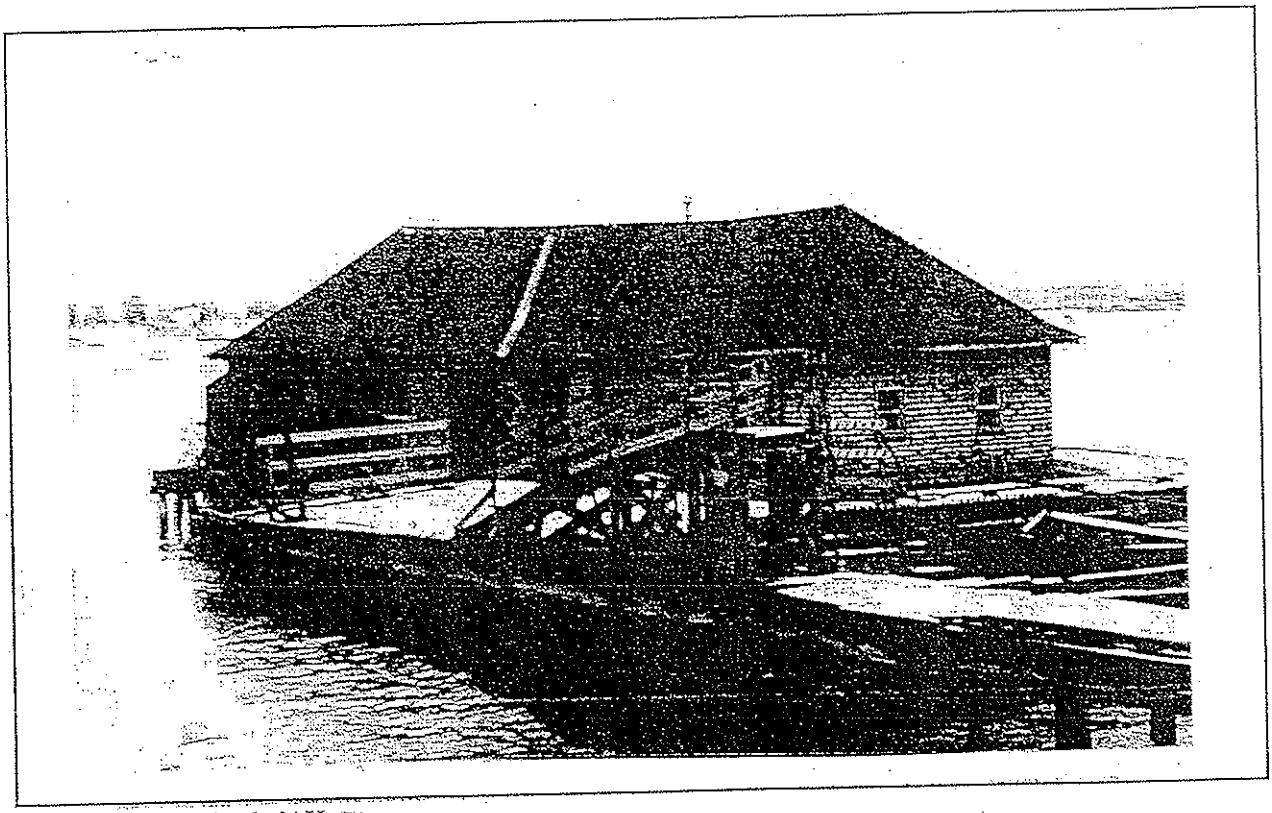


Figure 6 - Draw Tender's House

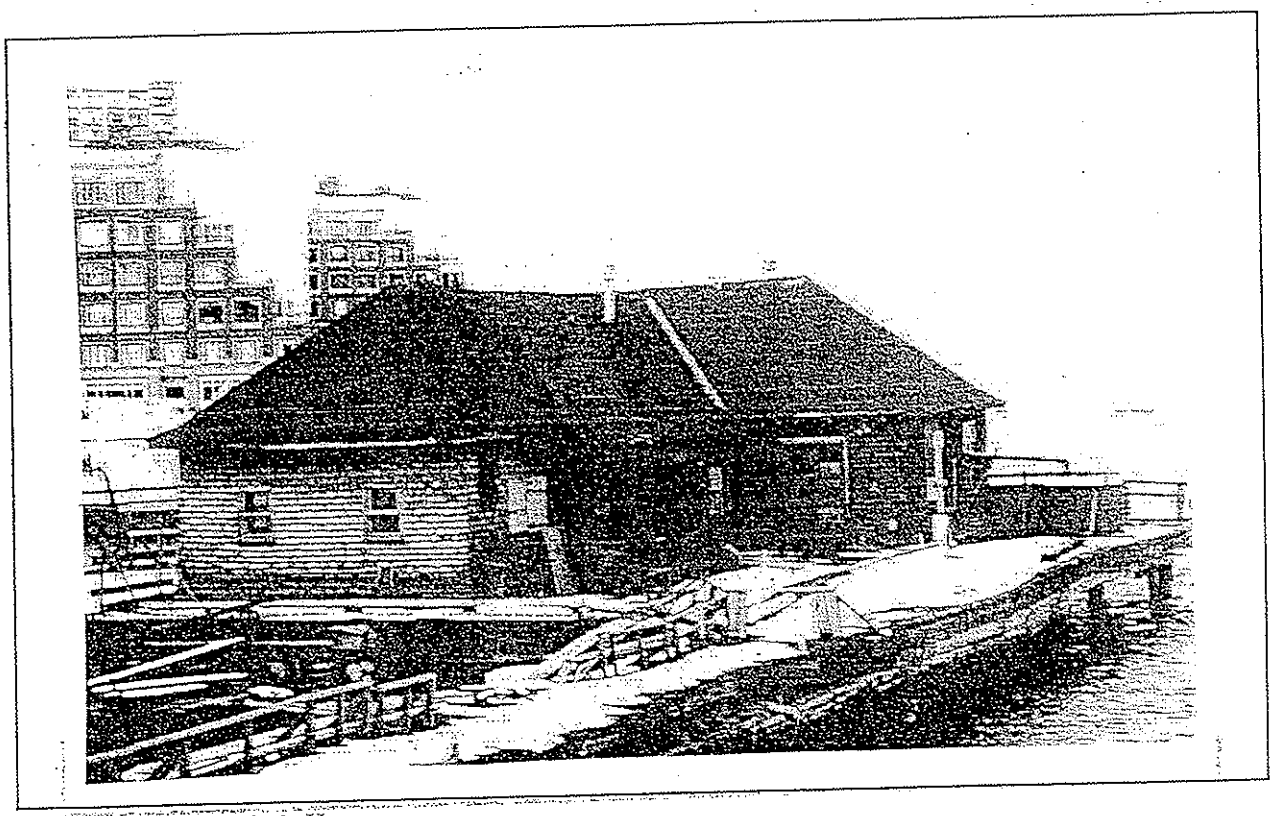


Figure 5 - Draw Tender's House

III. HISTORIC SIGNIFICANCE AND CHARACTER DEFINING QUALITIES

A. Historic Significance

The Massachusetts Historical Commission has determined the Northern Avenue Bridge to be eligible for inclusion on the National Register of Historic Places and it is listed on the State Register of Historic Places. Additionally, the bridge is within the Fort Point Channel Historic District which is potentially eligible for inclusion on the State and National Registers of Historic Places.
The Northern Avenue Bridge is significant for the following reasons:

1. The Northern Avenue Bridge and the North Washington Street Bridge (Boston-Charlestown) are the only two triple-barreled swing bridges in the Massachusetts Highway Department Inventory.
2. The bridge is one of eight remaining rim-bearing swing bridges in the Massachusetts Highway Department Bridge Data Base. The other bridges are the Rocks Village Bridge (Haverhill); The Pow Wow River Bridge (Amesbury); the Berkley-Deighton Bridge; Fairhaven-New Bedford Bridge; North Washington Street Bridge (Boston-Charlestown); Kernwood Avenue Bridge (Beverly-Salem); and the Dartmouth-Gulford Bridge.
3. The bridge's original compressed air tanks, one original compressor and its original steam pump, all operated under direct current, are extant.
4. The bridge is one of the few triple-use bridges that contained railroad tracks in the center barrel, horse drawn and auto/truck access on the outer barrels and pedestrian on its cantilevered sidewalks.
5. The original Tender's House is intact.
6. The bridge is an integral part of Fort Point Channel and its collection of four other historic bridges.
7. The bridge is an integral part of the proposed Fort Point Channel Historic District.
8. The bridge is a visual and distinctive landmark in Boston Harbor, seen from Boston Harbor and from downtown Boston, particularly from Rowe's Wharf.
9. The bridge is historically associated with the development of commerce and trade in Boston and South Boston and with the development of South Boston.
10. It is a component of the Public Realm Plan of the Boston Redevelopment Authority.

B. Character Defining Qualities

The Northern Avenue Bridge has specific qualities that make it a unique and historic bridge.

1. It is a triple-barreled swing bridge.
2. It is a rim bearing swing bridge.
3. Because it is a through-truss, the bridge's engineering is dramatically experienced by walking through the bridge.

4. The original 1908 Tender's House is intact as well as the original compressed air tanks and compressors that are housed in the Tender's House.
5. The large center fender supporting the Tender's House is a distinctive element of Fort Point Channel.
6. It is a triple use bridge serving railroad freight down the center barrel, cars and trucks on the outer barrels and pedestrians on its cantilevered sidewalks.
7. The bridge can be seen from a number of locations in and around Boston Harbor.
8. Along with the Tobin Bridge, the Northern Avenue Bridge frames Boston Harbor on its north and south ends.

IV. SUMMARY OF EXISTING HISTORIC AND ENGINEERING STUDIES

There have been a number of studies specifically complied on the Northern Avenue Bridge. The following is a list of historic and engineering reports and studies.

Historic American Engineering Record. HAER No. MA-37, STV/Seelye Stevenson Value and Knecht, Boston, MA. & McGinley Hart & Associates, Boston, MA, August 1989.

Northern Avenue Bridge Study, for the Boston Redevelopment Authority, Todd Lee/Clark/Rozas Associates, Inc., Boston, MA, May 1988.

Northern Avenue Bridge Inspection, Underwater Inspection and Condition Assessment, for Seelye, Stevenson Value & Knecht, Boston, MA, Nucci Vine Associates, Inc., Newburyport, MA, July 1992.

Old Northern Avenue Bridge, Re-Use Study for the Preservation Plan, Draft Report, Boston Redevelopment Authority, June 1995.

Physical Change and Programming in and Around Fort Point Channel, A Report of the Fort Point Channel Project, Greater Boston Chamber of Commerce, 1988.

Fort Point Channel Plan Progress Report, the City of Boston, the Fort Point Citizens Advisory Committee and the Boston Redevelopment Authority, 1989.

National Register Nomination Form for the Fort Point Channel Historic District, Architectural Conservation Trust, 1987.

Fort Point Channel HAER Documentation, No. MA-130, for the Central Artery//Tunnel Project, Jane Carolan for Maguire/Harris, 1996.

Inventory of Historic Resources, Central Artery/Third Harbor Tunnel Agency Review Draft, McGinley Hart & Associates, Inc., Massachusetts Department of Public Works, Boston, 1989.

Massachusetts Department of Public Works Bridge Inventory, Stephen J. Roper, 1984.
Bridge Row, The Drawbridges of Fort Point Channel, unpublished typescript , Peter Stott, 1987.

V. HISTORIC PRESERVATION LEGISLATION

The Secretary of the Interior is responsible for establishing professional standards and providing advice on the preservation of cultural resources listed in or eligible for listing in the National Register of Historic Places. In response to this task, the Secretary of the Interior's Standards for Historic Preservation Projects were completed in 1976. These standards provide the guidelines to responsibly protect and maintain historic structures. In 1992, the standards were rewritten to better address the changing needs of historic preservation. Today the Secretary's Standards are organized into four sets of guidelines for Preservation, Rehabilitation, Restoration and Reconstruction.

Preservation standards require retention of the greatest amount of historic fabric, features and details as they have evolved over time.

> Preservation is defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project (The Secretary of the Interior's Standards for the Treatment of Historic Properties 1996:18).

1. Identify, retain and preserve historic materials and features.
2. Stabilize and protect deteriorated historic features and materials as a preliminary measure.
3. Maintain Historic features and materials.
4. Repair (Stabilize, consolidate and conserve) historic features and materials.
5. Limited replacement in kind of extensively deteriorated portions of historic features.
6. Accessibility Considerations/Health and safety Considerations/Environmental considerations and Energy Efficiency.

Rehabilitation standards acknowledge the need to alter or add to a structure to meet continuing needs or new uses.

> Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values (The Secretary of the Interior's Standards for the Treatment of Historic Properties 1996: 48).

1. Identify, retain and preserve historic materials and features.
2. Protect and Maintain Historic Features and Materials.
3. Repair Historic Features and Materials.

4. Replace deteriorated historic materials and features.
5. Design for the Replacement of Missing Historic Features.
6. Alterations/Additions for the New Use.
7. Accessibility Considerations/Health and safety Considerations/Environmental considerations and Energy Efficiency.

Restoration allows the structure to be restored to a particular period of time by retaining features from that period and removing others.

> Restoration is defined as the act or process of accurately depicting the form, features and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project (The Secretary of the Interior's Standards for the Treatment of Historic Properties 1996: 90).

1. Identify, Retain and Preserve Materials and Features from the Restoration Period.
2. Protect and Maintain Materials and features from the Restoration Period.
3. Repair Features and Materials from the Restoration Period.
4. Replace Extensively deteriorated Feature from the Restoration Period.
5. Remove Existing Features from Other Historic Periods.
6. Re-create missing features from the Restoration Period.
7. Accessibility Considerations/Health and safety Considerations/Environmental considerations and Energy Efficiency.

Reconstruction recreates a vanished object with new materials. This process is usually used for interpretative purposes.

> Reconstruction is defined as the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location (The Secretary of the Interior's Standards for the Treatment of Historic Properties 1996: 128).

1. Research and Document historical significance.
2. Investigate archaeological resources.
3. Identify, protect and preserve extant historic features.
4. reconstruct non-surviving landscapes.
5. Interpret the reconstructed landscape.
6. Accessibility Considerations/Health and safety Considerations/Environmental considerations and Energy Efficiency.

VI. PRESERVATION OPTIONS

A number of preservation options have been proposed for the Northern Avenue Bridge. It is currently out of service and fixed in the closed position. The bridge is open to pedestrians; Jersey barriers restrict vehicular access. There is currently no access to the Tender's House. Based on the Secretary of Interior's Standards, the City of Boston has the option of Preservation, Rehabilitation, Restoration, Reconstruction or Demolition of the Northern Avenue Bridge. This report recommends that any action taken is under the guidelines of Preservation and Rehabilitation. These two processes will insure stabilization and long term maintenance of the bridge with the option of incorporating new features on the existing bridge.

A. No Action

No action would result in the bridge staying in the closed position with access available to pedestrians. There is no public access to the Tender's House with the bridge in the closed position. The United States Coast Guard mandates a sixteen-foot navigational clearance for the channel in Fort Point Channel. The Northern Avenue Bridge provides only a seven foot clearance in the channel, therefore, the bridge is blocking navigation in Fort Point Channel under the current Coast Guard regulations. Due to the federally dictated sixteen-foot clearance status, it is unacceptable for the bridge to remain in the closed position and therefore No Action is an unacceptable alternative. Furthermore, No Action would result in no maintenance and further deterioration of the bridge.

B. Stabilize and Mothball in Open Position

Stabilizing the bridge guarantees that the bridge will remain for years to come, and that its unique engineering features and contribution to the historic aspect of Boston Harbor will survive and be recognized. The open position would also satisfy the Coast Guard requirement of a sixteen-foot clearance for the navigation channel of Fort Point Channel. With a ramp, elevator or steps leading from the open span, the Tender's House would be accessible to the public with the bridge in the open position. This alternative would also maintain the view from the Evelyn Moakley Bridge just south of the Northern Avenue Bridge. Keeping the bridge in the open position would, however, make the bridge unsuitable for pedestrian access for the full length of the bridge. Additional piers would need to be constructed and the bridge would require long-term maintenance.

C. Stabilize in Open Position and Construct Pedestrian Bridge Over Waterway (See Cost Estimate Alternative 1, 2, 2A)

Stabilizing the bridge guarantees that the bridge will remain for years to come, and that its unique engineering features and contribution to the historic aspect of Boston Harbor will survive and be recognized. The open position would also satisfy the Coast Guard requirement of a sixteen-foot clearance for the navigation channel of Fort Point Channel.

A Pedestrian Bridge would continue the pedestrian link between Boston and South Boston and enable people to continue to use this popular route and also fully experience the pleasure of walking the length of the bridge and enjoying its engineering aesthetic by walking through a through-truss span. With a ramp, elevator or steps leading from the open span, the Tender's House would be accessible to the public with the bridge in the open position. This alternative would also maintain the view from the Evelyn Moakley Bridge just south of the Northern Avenue Bridge.

The new pedestrian bridge should be designed in a way that clearly differentiates it from the original bridge through use of material, color and detailing. The new pedestrian bridge should clearly not appear to be a part of the old bridge. The character of the old bridge should be readily identifiable after the new bridge is constructed.

D. Demolition and Construction of a New Pedestrian Bridge; 4 Alternatives

Action proposed under this Alternative consists of demolishing the entire bridge and Tender's House. Demolition of the Northern Avenue Bridge and its Tender's House would result in the loss of a significant historic engineering structure in the City of Boston. The public would no longer be able to experience the engineering of the bridge. Construction of a new pedestrian bridge within the right-of-way of the existing Northern Avenue Bridge would have no beneficial action for the existing bridge. Each ALTERNATIVE is discussed below.

1. ***Alternative 4A***: Fix bridge to open position, remove fixed end spans and provide a new pedestrian link **(See Cost Estimate Alternative 4A)**.

This Alternative would result in a major loss of historic context for the Northern Avenue Bridge and leave the remaining swing span and Tender's House as "interesting objects." Standards for Preservation, as defined by the National Park Service state that:

> The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided (The Secretary of the Interior's Standards for the Treatment of Historic Properties 1996:19).

Demolition of significant pieces of the bridge would result in lose of historic context and integrity. Integrity is defined as a property's historic identity, which is characterized by location, design, setting, materials, workmanship, feeling and association. Demolition would result in a loss of design, setting, feeling and association. The very features that define the bridge and contribute to its historic significance would be destroyed leaving only fragments of whole.

2. *Alternative 4B*: Demolish bridge, restore Tender's House and build a new pedestrian link **(See Cost Estimate Alternative 4B).**

Alternative 4B leaves only the Tender's House linked to the shoreline by a new pedestrian bridge. This Alternative would result in a major loss of historic context for the Northern Avenue Bridge and leave the remaining swing span and Tender's House as "interesting objects." Standards for Preservation, as defined by the National Park Service state that:

> The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided (The Secretary of the Interior's Standards for the Treatment of Historic Properties 1996:19).

Demolition of significant pieces of the bridge would result in lose of historic context and integrity. Integrity is defined as a property's historic identity, which is characterized by location, design, setting, materials, workmanship, feeling and association. Demolition would result in a loss of design, setting, feeling and association. The very features that define the bridge and contribute to its historic significance would be destroyed leaving only fragments of whole.

3. *Alternative 4C*: Demolish bridge, Tender's House and build a new pedestrian link **(See cost Estimate Alternative 4C).**

Demolition of the Northern Avenue Bridge and its Tender's House would result in the loss of a significant historic engineering structure in the City of Boston. The public would no longer be able to experience the engineering of the bridge

4. *Alternative 4D*: Demolish bridge and Tender's House/Mitigation Options.

Demolition of the Northern Avenue Bridge and its Tender's House would result in the loss of a significant historic engineering structure in the City of Boston. To mitigate the impact of proposed demolition the following options should be considered:

a. A Historic American Engineering Record (HAER) Documentation should be completed. Through a written history and photographs, HAER Documentations record the history of endangered engineering structures. The City of Boston completed a HAER recordation of the Northern Avenue Bridge in 1989.

b. Through advertisements in publications such as the *Boston Globe, National Trust for Historic Preservation* and other appropriate journals, the Northern Avenue Bridge should be made available for disassembly and removal.

c. The Northern Avenue Bridge's technological history and its place in Boston's history should be preserved. Using actual pieces of the bridge, such as machinery, trusses and/ or railings and gates, in addition to written and photographic material, an exhibit, installation, or popular publication should be produced in conjunction with the Children's Museum at Fort Point Channel or another appropriate agency or institution.

d. Using bridge railings, gates, machinery and other artifacts, portions of the land approaches at either end of the former bridge could be used as sites to interpret the Northern Avenue Bridge.

e. Gates and railings from the former bridge should be incorporated into the plans for the proposed new pedestrian bridge.

REFERENCES CITED

McGinley Hart & Associates, Inc. Historic American Engineering Record, HAER No. MA-37, STV/Seelye Stevenson Value and Knecht, Boston, MA,. August 1989.

Boston Redevelopment Authority. Old Northern Avenue Bridge, Re-Use Study for the Preservation Plan, Draft Report, June 1995.

Greater Boston Chamber of Commerce. Physical Change and Programming in and Around Fort Point Channel, A Report of the Fort Point Channel Project, 1988.

The City of Boston, the Fort Point Citizens Advisory Committee and the Boston Redevelopment Authority. Fort Point Channel Plan Progress Report, 1989.

Architectural Conservation Trust. National Register Nomination Form for the Fort Point Channel Historic District, 1987.

Carolan, Jane. Fort Point Channel HAER Documentation, No. MA-130, for the Central Artery//Tunnel Project, Maguire/Harris, 1996.

McGinley Hart & Associates, Inc. Inventory of Historic Resources, Central Artery/Third Harbor Tunnel, Agency Review Draft, Massachusetts Department of Public Works, Boston, 1989.

Stephen J. Roper, Bridge Inventory Form, Massachusetts Department of Public Works, 1984.

Stott, Pete. Bridge Row, The Drawbridges of Fort Point Channel, unpublished typescript, 1987.

Appendix

Construction and Alterations

The entire history of the Northern Avenue Swing Bridge, including its original construction, rebuilding, repairs and maintenance are well documented in the collections of the Boston Public Works Department Bridge Division, as well as the Annual Reports of the earlier City Engineer's Department, Bridge and Ferry Division, and other photographic collections such as those of the Boston Public Library, the Bostonian Society, and the archives of the Boston Herald. The original and existing conditions of both the site and the bridge are documented by the drawings and photographs accompanying the following text. Additional photos and drawings appear in published sources cited in the bibliography.

The Northern Avenue Swing Bridge, the first crossing at this site, was preceded by earlier structures at the other four bridge crossings along Fort Point Channel, the nearest of which is the Congress Street Bascule Bridge. Northern Avenue's compressed-air movable bridge was built according to the design precedent (and with some interchangeable parts) of the North Washington Street Charlestown Bridge which was constructed under the direction of the city engineers in 1896-9 across the entrance to the Charles River at the North End of the city. The Northern Avenue Swing Bridge, a triple-barrelled swing bridge with a Pratt-type truss and two similar approach spans, was constructed in 1905-8 as part of a general upgrading of vehicular, railroad and pedestrian service to the South Boston wharfs and warehouses which were expanding at a rapid rate. [5]

The existing swing bridge has undergone several repairs and alterations as follows:

1918 (ca.) - Track laid over bridge by Union Railway, as originally planned.

1930-1 - Draw pier concrete and masonry repaired; new compressed air tanks.

1934-6 - Bridge draw pier, foundation, and draw superstructure rebuilt with minor modifications; new air compressor installed (original retained as backup). End lifts repaired.[6]

1957 - Redecking of approach span 3.

1970 - Railroad track abandoned.

1974-5 - Approach and draw spans redecked.

1986-9 - Approach span deck bracing repairs; new draw span compressor installed to replace 1934 compressor; original compressor functioning as backup.

General maintenance over the years has included painting and miscellaneous minor repairs such as installation of steel patch plates; machinery, gate and railing repairs; and grouting of the mortar joints in the granite piers.[7]

Key Individuals

The bridge was designed by the City Engineer, William Jackson, based on his earlier design of the Charlestown Bridge (1896-9) for which John E. Cheney was Assistant Engineer. The widely utilized Pratt truss used in the bridge's construction was originally patented in 1844 by Boston Assistant City Engineer, T. Willis Pratt. The W. H. Ellis Co. built the masonry piers and abutments and the New England Structural Company of Everett, Massachusetts built the superstucture which was completed in 1908. In 1930, W.H. Ellis & Son Co. repaired the draw fender and fender guards, while A.G. Tomasello & Son Co. repaired the drawbridge masonry pier. In 1931, Rideout Chandler & Joyce installed eight new compressed air tanks, piping and valves. The major work of the 1934-5 rebuilding was performed by M.F. Gaddis, under the direction of J.R. Worcester & Co., Consulting Engineers; new steelwork was fabricated by the Lehigh Structural Steel Co. In 1936 the end lifts were repaired by the Boston Bridge Works. Other Boston Public Works Department engineers worked on bridge alterations in the succeeding years, including John J. McCall, Division Engineer, who superintended the 1957 repairs. More recent repairs have been done under the direction of Universal Engineering Corporation, and most recently STV/Seelye Stevenson, Value and Knecht, Lawrence J. McCluskey, P.E., Senior Vice-President. In the past decade Balfour Engineering Co. Inc. and recently their mechanic, Dave Rowell, have executed repairs and provided mechanical services to keep the bridge in operating condition.[8]

Construction Techniques - Technical Description

Foundations - The granite masonry piers were built on concrete footings which rest on wood pilings below the river bed. The westerly abutment on the Boston side is a composite masonry structure, consisting of a front pier on a Portland Cement concrete foundation supported by piles and five lines of longitudinal piers which extend back to the face of the old dock wall and support steel I-Beams which carry concrete arches. The easterly abutment on the South Boston side was constructed over the site of a granite seawall built in 1878; the mass of large granite blocks was consolidated with concrete since its removal for the driving of piles was not possible. The two channel piers which support the draw ends are curved on the draw-side face to approximate the arc of the end of the draw span swing which rests upon it when the draw is closed. The center draw pier has a circular concrete foundation resting on wood piles; the concrete of this and other piers was formed by splined plank caissons. The draw fender pier, comprised of oak wood piles braced and partially decked with hard pine, was the largest ever built by the city at the time of its construction. The pier measured from the center of the bridge 290 feet downstream, 215 feet upstream, and 88 feet across. The extension of the triangular ends, 44 feet measured along the center line, made the total length of the draw fender pier 593 feet.

Superstructure - The Northern Avenue Swing Bridge employs a riveted steel frame on both the approach and the draw spans. The active leaf of the bridge is a triple-barrelled pinned through-truss swing bridge with a flat-topped single-panel tower. Approach spans 1 and 2 are similar through-truss spans each with four pin-connected trusses about 150 feet

long, spaced at 22 foot-eight inches on center. These support three roadways and two outboard cantilevered sidewalks. Span 3, which formerly carried a freight-railway track transversely across the bridge near the South Boston abutment, is a deck plate girder span made up of six plate girders at fourteen feet-nine inches on center with an average length of 55 feet. The approach span floor paving, resting on six-inch hard pine plank covered with waterproofing and sand, originally consisted of six-inch granite blocks laid with pitch and pebble joints. Sidewalks were originally of four inches of asphalt laid on four-inch thick plank.

The 283 feet long by 80 feet wide draw span, a Pratt-type truss with five sloped upper chords in cantilever arms, is visually continuous to the top of the tower. The steel truss towers provide lateral stability to the swing bridge. Each opposing leaf acts as the other's counterweight upon opening, with the truss towers resting on a turntable. The draw span of the bridge was built in an open position, supported by its wood-pile fender pier, and closed upon completion of the truss and machinery assembly. When closed, the swing bridge ends are supported on sliding blocks, after the lowering of the end lifts. The draw span roadway was five-inch hard pine plank sheathed with spruce plank, and sidewalks were of two-inch hard pine.

Repairs and Alterations - A fireboat house and public landing pier were added to the north side of the South Boston approach span circa 1912. This auxiliary structure, visible in older views, disappeared within the last decade when it collapsed into the Channel. The two side spans were built originally to accommodate vehicular traffic, and the center span was constructed to accommodate a freight railway spur as well. The tracks were added ten years after the initial construction ca.1918, and removed in 1970. In 1924, the Boston Public Works Commissioner, J.A. Rourke nailed down the first rubber paving tile in Boston on the Northern Avenue Bridge, but this innovative technology apparently disappeared with the wood planks in later repavings. In 1931 Rideout, Chandler and Joyce installed eight new compressed air tanks, new piping and valves in the Tenders' House.

The proximity of salt-water to the draw turntable pit led to its deterioration and eventual reconstruction in 1934-5. On January 26, 1934 one of the links connecting the upper chord of one of the center trusses to the draw span tower failed and the adjacent links also parted. Because of the possibility of a complete collapse, a comprehensive engineering survey was made and it was determined that it would be necessary to entirely dismantle the draw, rebuild the draw pit from grade up and rebuild the drawspan superstructure. At that time the draw span was completely dissassembled in order to rebuild the draw pit with reinforced concrete along the lines of the original design. The draw was then completely rebuilt in its original form with replacement of deteriorated members and some repairs using welded, rather than riveted construction techniques. J.R. Worcester & Company, Consulting Engineers, superintended the rebuilding which was done by M.F. Gaddis, Contractor. This work on the bridge was carried on as a W.P.A. Project which provided federal funding for the rebuilding. The structure was rebuilt using the old floor beams, truss posts and minor members of the drawspan, and included repairing the fixed spans and redecking of the entire structure. New steelwork of the superstructure, fabricated by the Lehigh Structural Steel Company of Allentown, Pennsylvania, very nearly

duplicated the original design as there are no apparent visual differences before and after rebuilding. The original roadway gates remain with some later repairs.

The wood decking of the draw span, covered with rubber tile pavement in 1924 said to be "the first in Boston", has since been replaced with open steel grate decking; the granite block paving of the approach spans has likewise been superseded by asphalt pavement. The wood fender piers and Draw Tenders' house have deteriorated in intervening years, although they retain much of their original form. Recent repairs have included replacement of the 1934 Pennsylvania Compressor with an A. C. powered Joy compressor in 1989, although the original Union Steam Pump, made in Battle Creek Michigan in 1908, still operates under D.C. power with a rectifier, as a backup. The bridge is presently in a somewhat deteriorated state, and requires constant repairs; its inventory rating (type 3S2) of 30 tons has been reduced to (type 3S2) 15 tons.[8]

Description and Operation

The three-barrell bridge has a steel superstructure which rests on granite block piers and abutments; these in turn are supported by the concrete foundations and friction piles. The Northern Avenue Swing Bridge consists of three spans: the two approach spans are fixed, paved-deck, steel through-girders averaging 145 feet, each carrying steel stringers. The center draw span is a double-leaf, open-deck steel rim-bearing swing bridge which is 283 feet in length from end to end. The deck width is eighty feet (out to out) and now consists of two vehicular lanes in each barrell and two cantilevered sidewalks projecting outboard. The approach spans are paired, pinned Pratt through trusses with vertical end posts. There is no upper lateral bracing between the two inner lines of trusses. The center draw span has lateral bracing among all four Pratt truss lines. The center tower, 46 feet high measured from the bridge deck, carries the weight of the two independent 125 feet 2 inch swing spans to eight points on a circular drum, 40 feet in diameter. The draw weighs about 1,300 tons and rests on fifty-six steel wheels running between steel-faced tracks. The total length of the bridge is 643 feet from abutment to abutment. The minimum horizontal clearance through each of the two channel ways of the draw is 75 feet between fenders; the vertical clearance is 7 feet from mean high water to bottom of steel, and unlimited when the bridge is open.

The bridge is operated by a draw tender to allow the passage of boats, with assistant tenders manning the gates and end lift blocks. The original operating mechanism (rebuilt in similar form in 1934-5) consists of a rim-bearing turntable track and wheels with a rack-and-pinion drive system powered by compressed air. The concrete turntable pit contains the forty foot diameter drum which turns on fifty-six steel wheels running on tracks supported by granite blocks. The operating mechanism consists of a system of donkey engines driving turntable rack-and-pinion gears and plunger-actuated lever-action end lifts, all driven by compressed-air. The compressors in the Tenders' House on the fender pier are powered by direct current electric motors; the compressed air is stored in eight tanks located in an adjoining room. A manual drive system was designed for use in operating both the revolving mechanism and the end lifts, in the event of electrical failure.

Historical Significance

a. Engineering Significance

The primary significance of the Northern Avenue Swing Bridge is its engineering design. It is the only movable bridge still operating on a compressed air system; one of only two triple-barreled swing bridges in the MDPW bridge inventory list, where it is listed as one of nine remaining rim-bearing swing bridges. The original Tenders' House survives with its compressed air tanks and one original compressor intact. A former double-track freight railway ran down the center barrel, making it one of very few multi-purpose bridges designed for horsedrawn and automotive vehicles, trains and pedestrians. It is a prominent structure as seen from Boston Harbor and the ferry landing at nearby Rowe's Wharf on the downtown Boston dockside. The bridge is an integral part of the proposed Fort Point Channel Historic District and a visual landmark on the Boston waterfront.

b. Cultural Significance

The bridge has secondary historical associations with the development of South Boston, since the construction of this bridge influenced the progress of commercial construction activity on the South Boston waterfront. Northern Avenue's construction was an integral part of the promotion of the area by the Commonwealth which resulted in the building of the Commonwealth and Fish Piers in 1913.

c. Architectural Significance

The design of the bridge and the principles involved in its original construction and operation are significant features. The bridge has less importance from an architectural than from an engineering standpoint; however, the original approach span trusses remain intact and the draw span retains its original graceful appearance visually. The Tenders' House is a good example of the shingle style which enhances the waterfront character of the area. The bridge is a familiar landmark to Boston Harbor and automobile traffic, and visible from other nearby landmark bridges as well.

Contextual Information

The Northern Avenue Swing Bridge was built according to the design precedent (and with some interchangeable parts) of the North Washington Street Charlestown Bridge which was constructed under the direction of the City Engineers in 1896-9. Some of the operating machinery of the draw span for the Northern Avenue Bridge was identical to that of the Charlestown Bridge when originally constructed. Most notable was the gearing, made according to Holyoke Machinery Company Patterns, which was noted on drawing number 3715 in February of 1908 as "interchangeable with the Charlestown Bridge". Recent interviews with bridge tenders, mechanics and engineers reveal that these gears from the Charlestown Bridge were actually used to repair the Northern Avenue Swing Bridge. These were subsequently replaced when they were in turn destroyed by a tugboat which was being used to close the bridge which had jammed. One original D.C.

receiver tanks had a combined capacity of 1500 cubic feet. A four inch pipe main carried the air to the draw span center, directly under the operator's stand; from there the air is delivered at 200 pounds pressure to the end lifts, and at 70 pounds to the donkey engines which turn the draw.

The draw is opened by two 6 1/4 inch by 10 inch double-cylinder engines with drive trains attached to the draw; the final pinion of each train acts on a rack attached to the track on the draw pier. These two sets of turning apparatus can operate independently and rotate the draw if one is out of service. The eight end lifts, one at each free end of the four truss lines, are each actuated by a piston in a 16 inch diameter cylinder. The plunger rod actuates a lever using a cast-iron block on the stone pier as a fulcrum. This mechanism raises the free end of the truss approximately five inches to allow bearing blocks to be slid beneath it. The four blocks at each end of the bridge are connected to a shaft operated by a lever from the roadway deck by the gateman. The truss ends are then lowered half an inch onto the bearing blocks, the end lifts released, gates opened, and traffic passes onto the draw. The operator's stand is located at the center of the draw span between the two roadways, where both street traffic and navigation can be observed. Compressed-air power requires about two minutes to fully open the draw while the manual drive requires about twenty minutes.

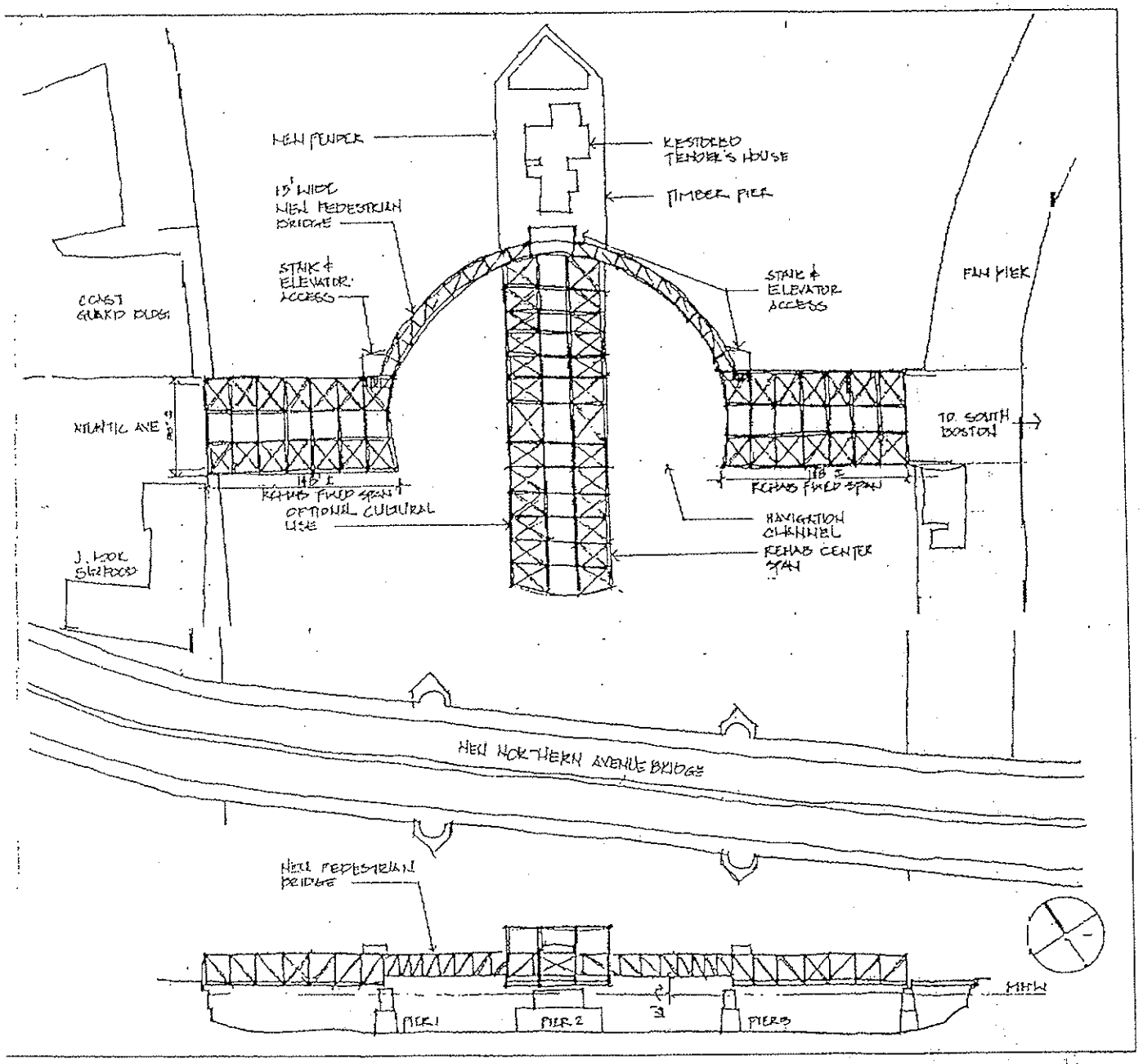
Cost Estimates for Preservation Options

COST COMPARISON
REHABILITATION / REPLACEMENT OF THE OLD NORTHERN AVENUE BRIDGE
JANUARY 29, 1998

ITEM	ALTERNATE 1	ALTERNATE 2	ALTERNATE 2A	ALTERNATE 3	ALTERNATE 4	ALTERNATE 4A	ALTERNATE 4B	ALTERNATE 4C
BILITATE TRUSS CENTER SPAN	$800,000	$800,000	$800,000	$800,000	-	$600,000	-	-
BOTH END SPANS	$640,000	$640,000	$640,000	$640,000	-	-	-	-
R/MODIFY PIERS	$200,000	$200,000	$200,000	$250,000	$250,000	$300,000	$300,000	$350,000
VE SUPERSTRUCTURE CENTER SPAN	-	-	-	-	$450,000	-	$450,000	$450,000
BOTH END SPANS	-	-	-	-	$400,000	$400,000	$400,000	$400,000
VE EXISTING TIMBER PIER	-	-	-	$400,000	$400,000	-	-	$400,000
FENDER SYSTEM	$1,700,000	$1,700,000	$1,700,000	$1,100,000	$800,000	$1,700,000	$1,700,000	$1,100,000
ER PIER/WALKWAY	$1,070,000	$1,070,000	$1,070,000	-	-	$1,070,000	$2,100,000	-
SUPPORTS FOR ENDS OF EC CENTER SPAN	$100,000	$100,000	$100,000	-	-	$100,000	-	-
PEDESTRIAN BRIDGE - TRUSS*	$500,000	$310,000	$700,000	-	$1,700,000	-	-	-
PEDESTRIAN BRIDGE - GIRDER	-	-	-	-	-	$2,000,000	$2,600,000	$3,700,000
KING EXISTING BRIDGE	-	-	-	$300,000	-	-	-	-
ESTRIAN ACCESS ELEVATORS AND STAIRS**	$300,000	$300,000	-	-	-	-	-	-
INECTION TO NEW NORTHERN NUE BRIDGE	-	-	-	-	-	$420,000	-	-
SUBTOTAL	$5,310,000	$5,120,000	$5,210,000	$3,490,000	$4,000,000	$6,790,000	$7,550,000	$6,400,000
20% CONTINGENCIES	$1,060,000	$1,020,000	$1,040,000	$700,000	$800,000	$1,350,000	$1,510,000	$1,280,000
TOTAL W/O PAINTING	$6,370,000	$6,140,000	$6,250,000	$4,190,000	$4,800,000	$8,140,000	$9,060,000	$7,680,000

COST COMPARISON
REHABILITATION / REPLACEMENT OF THE OLD NORTHERN AVENUE BRIDGE
JANUARY 29, 1998

ITEM	ALTERNATE 1	ALTERNATE 2	ALTERNATE 2A	ALTERNATE 3	ALTERNATE 4	ALTERNATE 4A	ALTERNATE 4B	ALTERNATE 4C
DELEADING AND PAINTING								
CENTER SPAN	$2,700,000	$2,700,000	$2,700,000	$2,700,000	-	$2,700,000	-	-
BOTH END SPANS	$2,400,000	$2,400,000	$2,400,000	$2,400,000	-	-	-	-
SUBTOTAL	$5,100,000	$5,100,000	$5,100,000	$5,100,000	$0	$2,700,000	$0	$0
20% CONTINGENCIES	$1,020,000	$1,020,000	$1,020,000	$1,020,000	$0	$540,000	$0	$0
TOTAL W/ PAINTING	$12,490,000	$12,260,000	$12,370,000	$10,310,000	$4,800,000	$11,390,000	$9,060,000	$7,680,000
SUBSTITUTIONS								
*NEW PEDESTRIAN BRIDGE - GIRDER	$660,000	$420,000	$860,000	-	$860,000			
**RAMP	$200,000	$200,000						



FAY, SPOFFORD & THORNDIKE, INC.

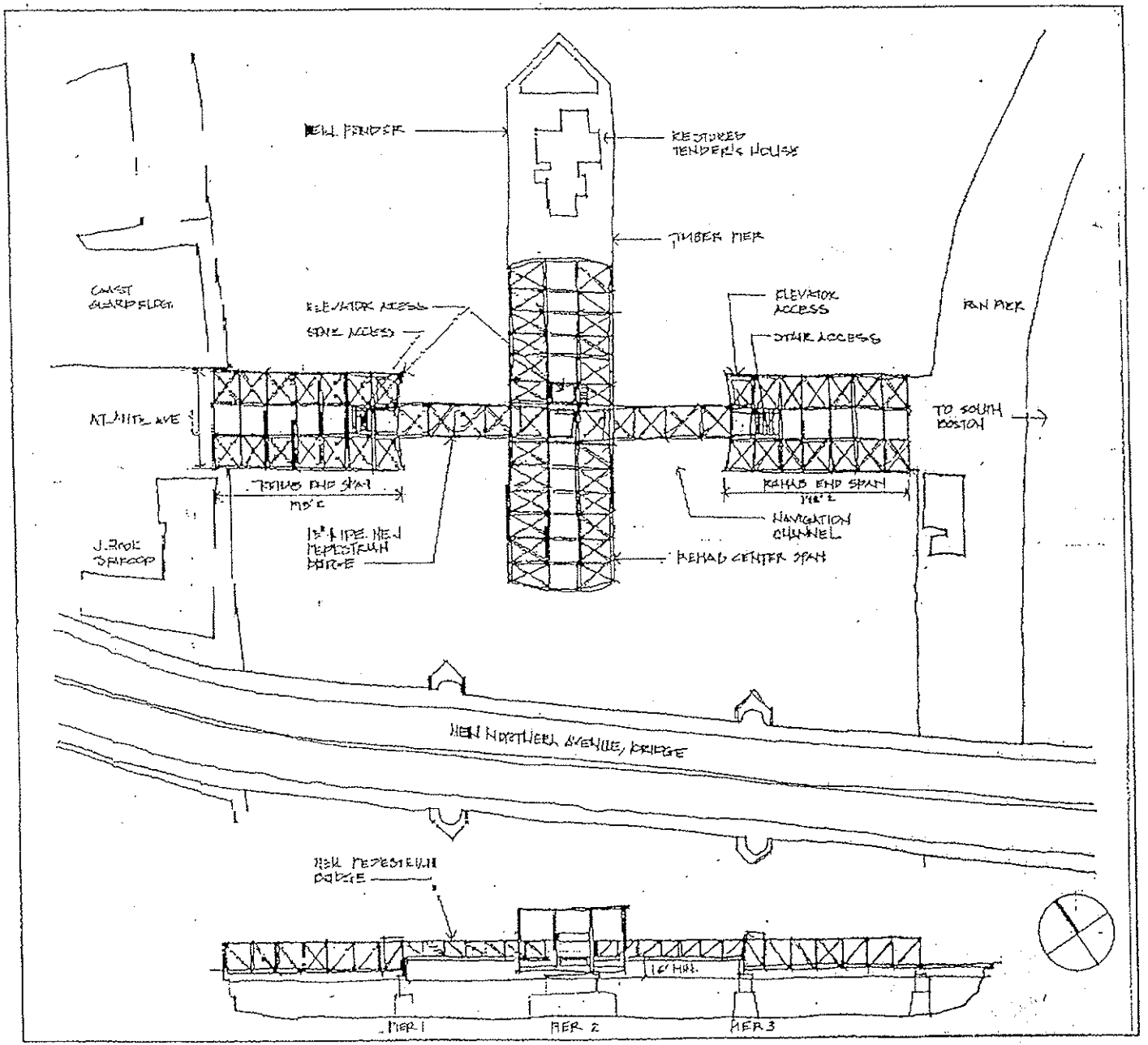
SCHWARTZ/SILVER ARCHITECTS, INC.

ALTERNATIVE 1

F x bridge to open position and provide a new pedestrian link.

- New curved pedestrian link.
- Elevators for ADA access.
- Possible to achieve ADA access with ramps at fixed span.
- Possible development of center span with cultural or commercial use.
- New fenders for piers 1, 2, & 3.
- Timber pier and walkways for Tender's House.

City of Boston
NORTHERN AVENUE BRIDGE
January 27, 1998



FAY, SPOFFORD & THORNDIKE, INC

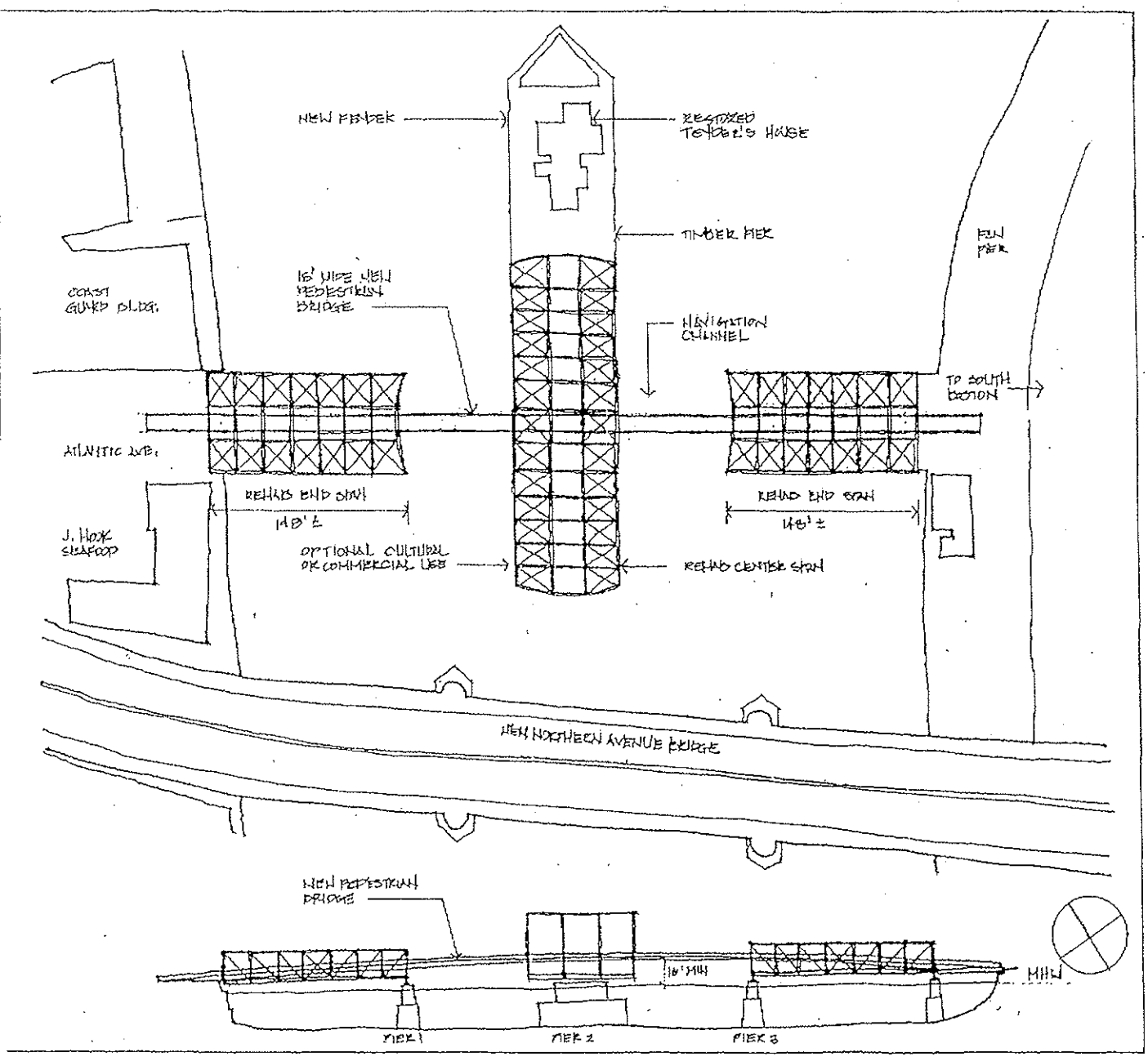
SCHWARTZ/SILVER ARCHITECTS, INC.

ALTERNATIVE 2

Fix bridge to open position and provide a new pedestrian link.

- Elevators for ADA access.
- Possible to achieve ADA access with ramps.
- Possible development of center span.
- New pedestrian link through center span.
- Center span can be accessed at second level.
- New fenders for piers 1, 2, & 3.
- Timber pier and walkways for Tender's House.

City of Boston
NORTHERN AVENUE BRIDGE
January 27, 1998



FAY, SPOFFORD & THORNDIKE, INC.

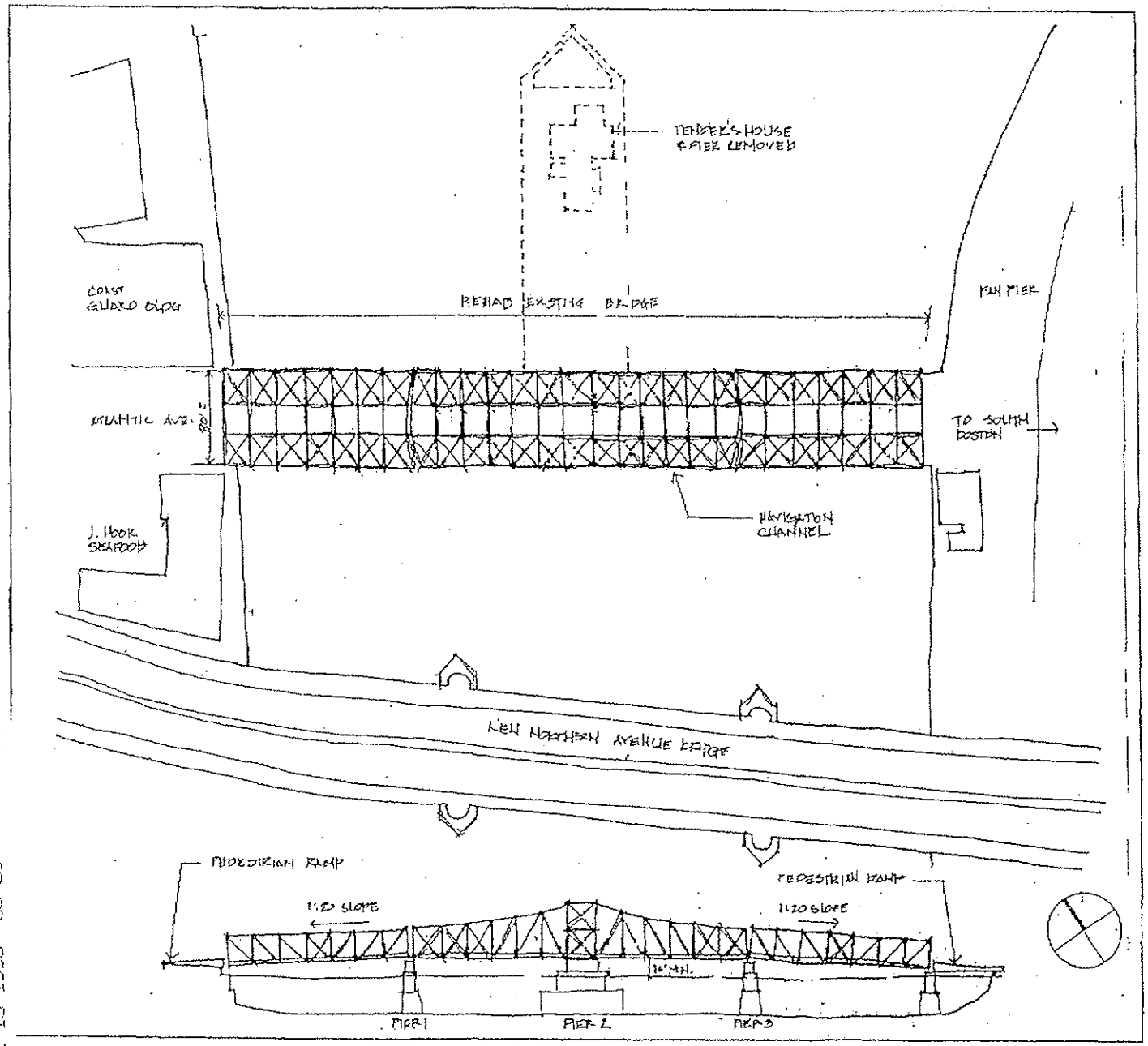
SCHWARTZ/SILVER ARCHITECTS, INC.

ALTERNATIVE 2A

Fix bridge to open position and provide a new pedestrian link.

- Possible to achieve ADA access to center span with ramps and elevator.
- Possible development of center span.
- New pedestrian link through center span.
- Center span can be accessed at second level.
- New fenders for piers 1, 2, & 3.
- Timber pier and walkways for Tender's House.

City of Boston
NORTHERN AVENUE BRIDGE
January 29, 1998



FAY, SPOFFORD & THORNDIKE, INC.

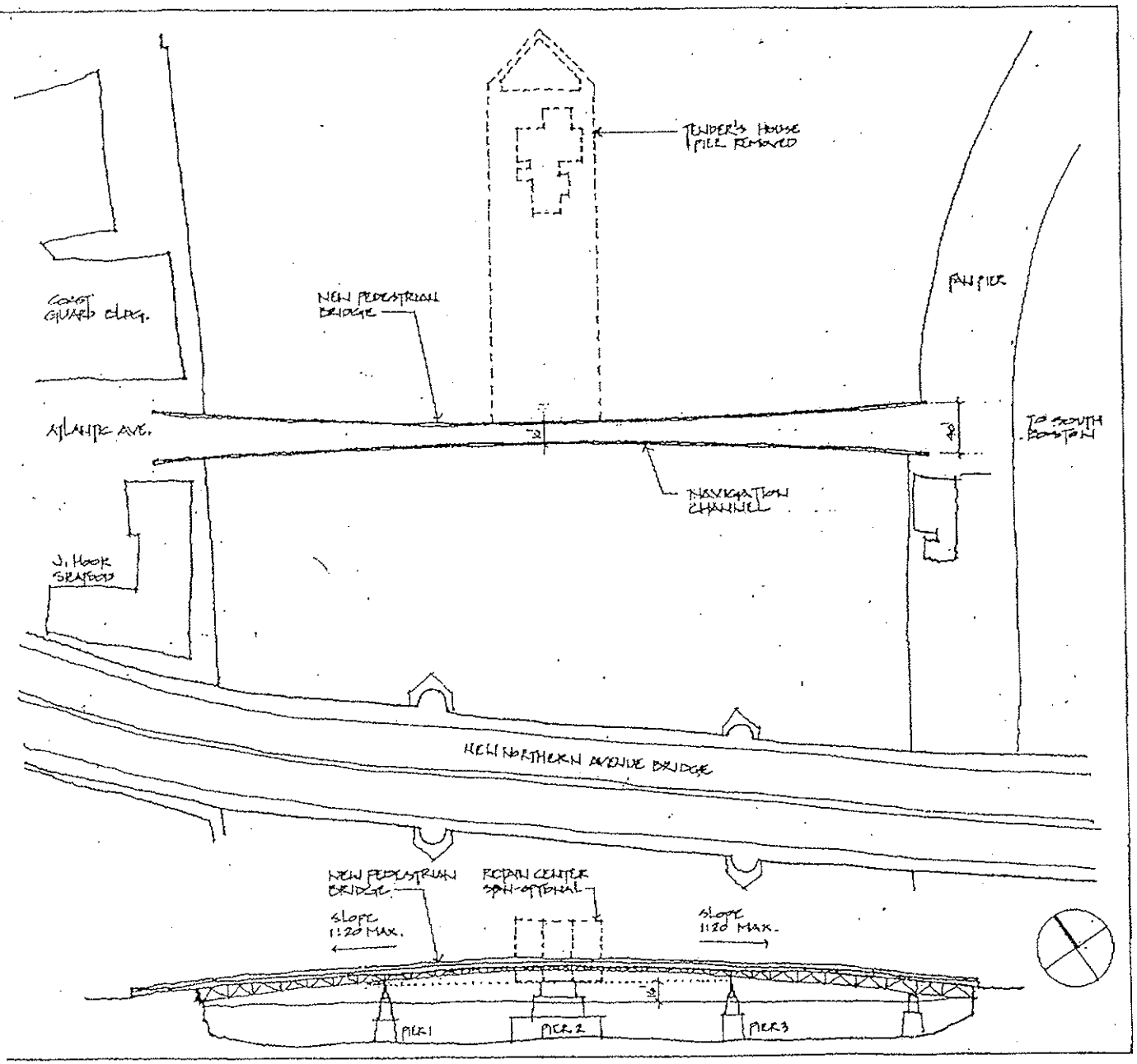
SCHWARTZ/SILVER ARCHITECTS, INC.

ALTERNATIVE 3

Raise center span in closed posi and tilt up fix spans at 1/20 slope

- 1/20 slope required 40' past fixed spans at each end.
- Character of bridge is altered.
- Some rebuilding of fixed spans required.
- Pedestrian ramps at ends of truss spans.
- New fenders for piers 1, 2, & 3.
- Tender's House and pier removed

City of Boston
NORTHERN AVENUE BRIDGE
January 27, 1998



AY, SPOFFORD & THORNDIKE, INC.

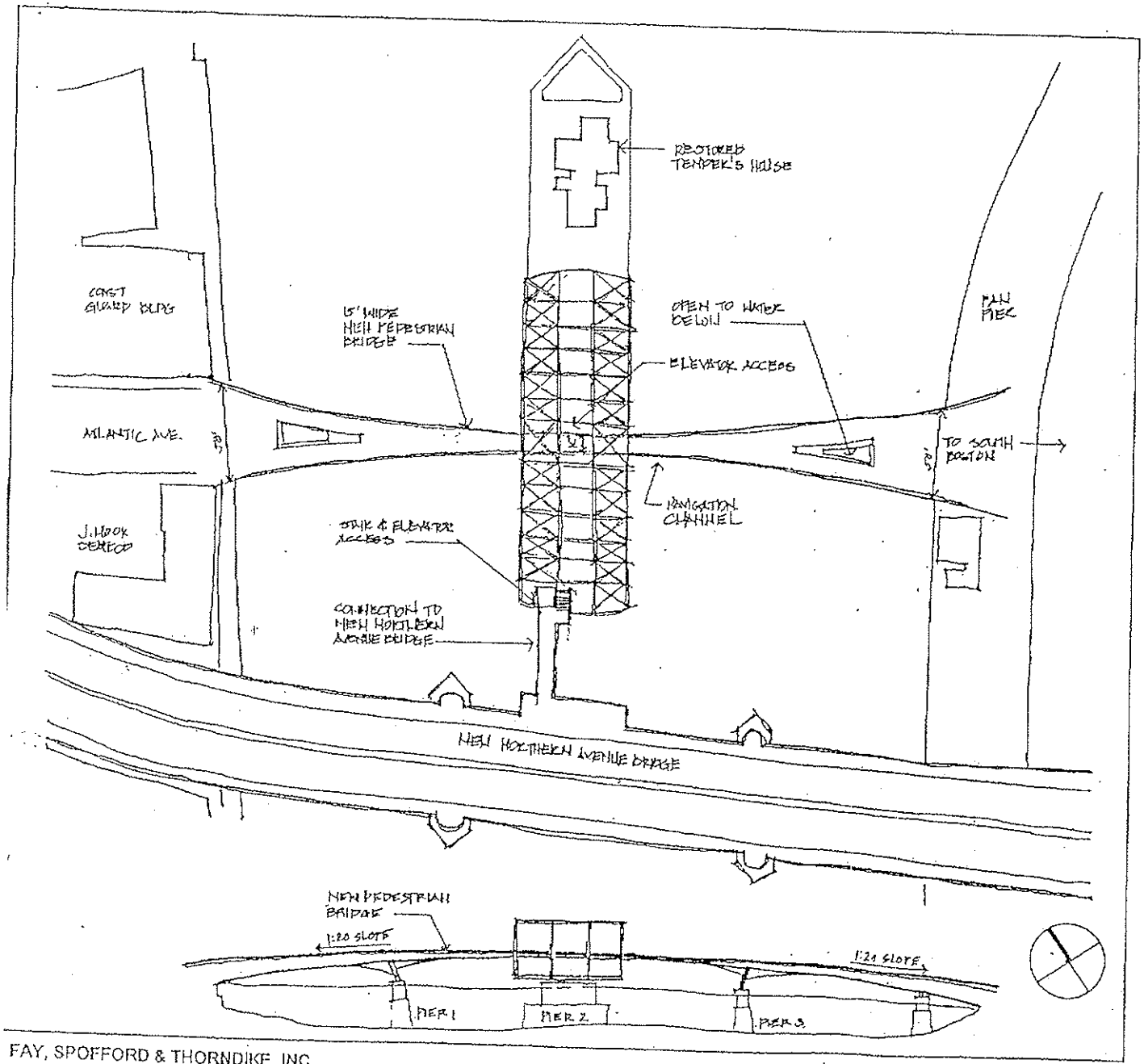
SCHWARTZ/SILVER ARCHITECTS, INC.

ALTERNATIVE 4

Demolish bridge and build new pedestrian link.

- New pedestrian link is free to establis a unique character.
- Removal of bridge may be politically difficult.
- No real opportunity for development.
- New fenders at piers 1, 2, & 3.
- Tender's House and pier removed.

City of Boston
NORTHERN AVENUE BRIDGE
January 27, 1998



ALTERNATIVE 4A

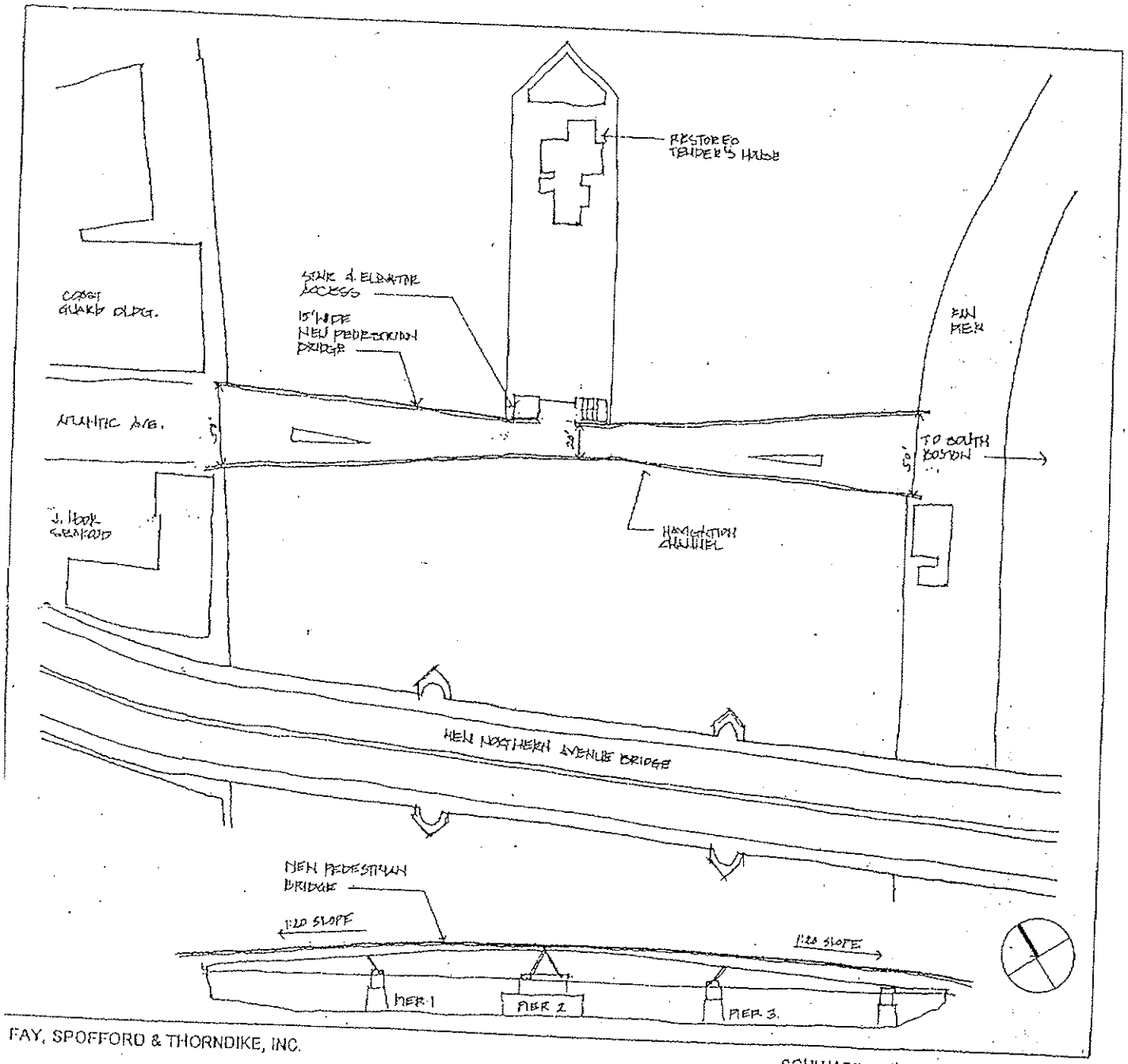
Fix bridge to open position, remov fixed end spans, and provide a ne pedestrian link.

- Elevators for ADA access to center span (by developer).
- Possible to achieve ADA access wit ramps to center span if provided by Boston Public Works Department.
- Possible development of center span.
- New pedestrian link through center span.
- Center span can be accessed at second level.

FAY, SPOFFORD & THORNDIKE, INC.

SCHWARTZ/SILVER ARCHITECTS, INC.

City of Boston
NORTHERN AVENUE BRIDGE
January 27, 1998



FAY, SPOFFORD & THORNDIKE, INC.

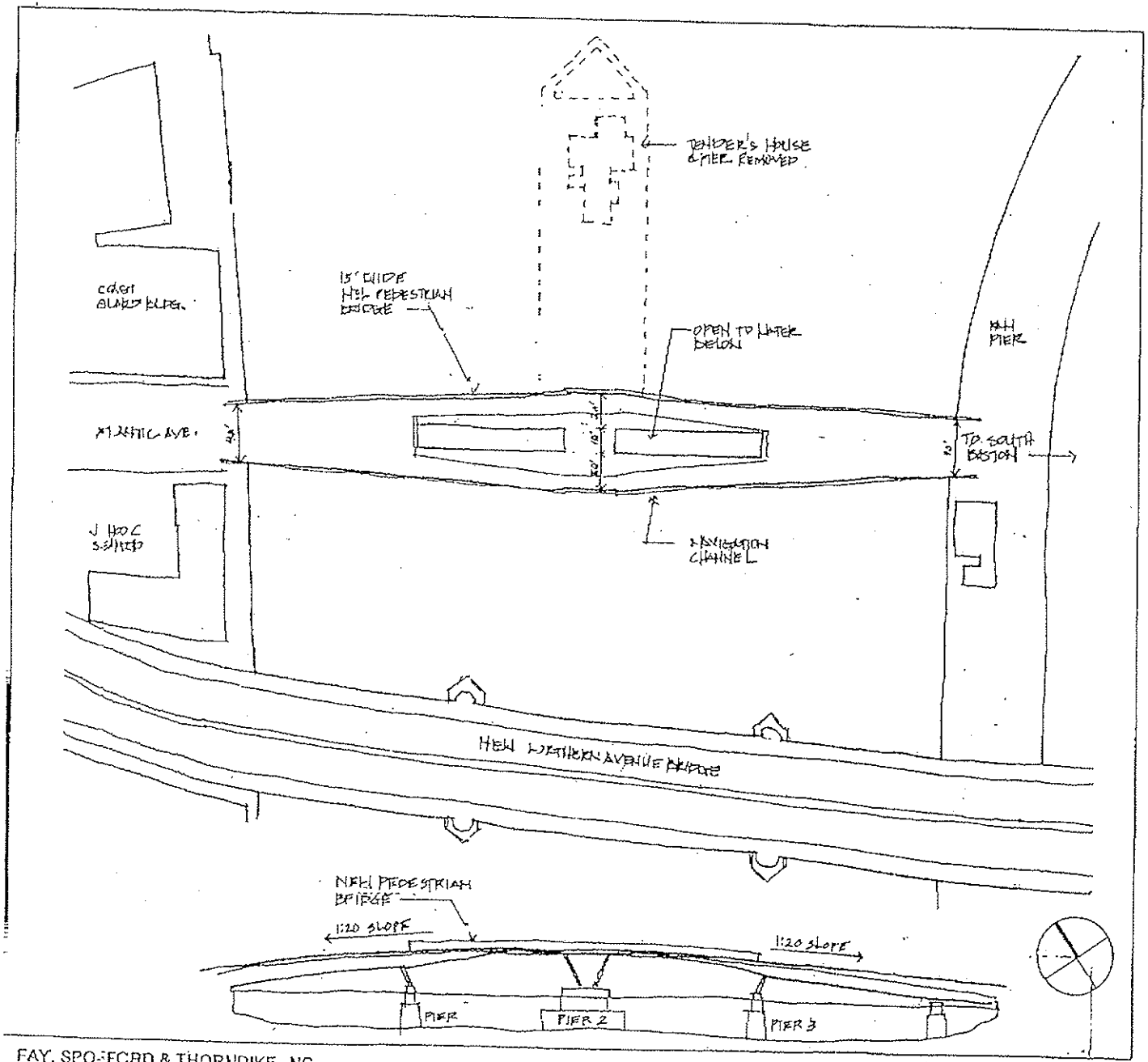
SCHWARTZ/SILVER ARCHITECTS, INC.

ALTERNATIVE 4B

Demolish bridge, restore Tender's House and build a new pedestrian link.

- New pedestrian link is free to establish a unique character.
- Removal of bridge may be politically difficult.
- No real oppoitunity for development.
- ADA access to Tender's House possible with elevator.

City of Boston
NORTHERN AVENUE BRIDGE
January 27, 1998



FAY, SPOFFORD & THORNDIKE, INC.

SCHWARTZ/SILVER ARCHITECTS, INC.

ALTERNATIVE 4C

Demolish bridge, Tender's Hou and build a new pedestrian link

- New pedestrian link is free to est a unique character
- Removal of bridge may be politic difficult.
- No real opportunity for developm

City of Boston
NORTHERN AVENUE BRIDGE
January 27, 1998