Society for Industrial Archeology · New England Chapters

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Newsletter Numbering Errors

Currently the Newsletter is being published twice a year; in the Spring and Fall. Each year has been given a sequential volume number, and the two issues each year are numbered 1 (Spring) and 2 (Fall). There have been errors made in the volume numbers for the Fall 2007 and the Spring 2008 issues. The **Fall 2007 should be Volume 28, Number 2** (it is marked Volume 29, Number 2), and the **Spring 2008 issue should be Volume 29, Number 1** (it is marked Volume 30, Number 1).

Notice

The Northern New England Chapter
Spring Study Tour
will be conducted on Saturday, June 6, 2009
with visits to the Kearsarge Peg Mill
and Livermore Logging Town
See Details on Page 3

NNEC-SIA President's Report

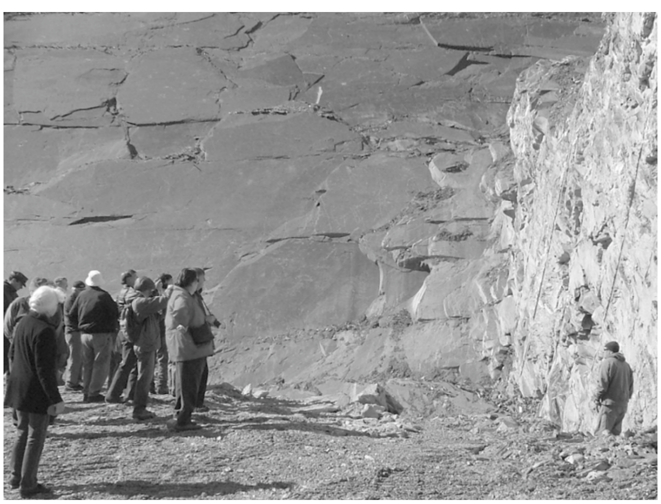
This winter I spent time looking over past issues of the New England SIA Newletters from the very first one in 1980, the same year the NNEC was organized. The SNEC was founded a few years earlier. These past issues have been kept by Dennis Howe over the years and has made it possible to compile a list of industrial archeological sites the Northern New England Chapter has visited over the years. Once complete, this list will be published in a future newsletter. However, there are some missing issues of newsletters that could help complete the site list. If any members still have these missing issues and care to part with them due to downsizing, moving, etc. they will be added to the current collection. They are as follows:

1980 – Vol. 1 - #2 (Fall)
1981 - Vol. 2 - #1 (Spring)
1983 - Vol. ? - # 1 & 2
1984 - Vol. 4 - #2
1987 - Vol. 7 - #2
1996 - Vol. 16 - #2
2000 - Vol. 20 - #1 & 2
2001 - Vol. 21 - #1
2002 - Vol. 22 - #2
2003 - Vol. 23 - #1
2004 - Vol. 24 - #2
2005 - Vol. 26 - #1

Please email or call me at ykforestry@yahoo.com or 603-714-4052 if you would like to donate these issues to complete the collection.

One upcoming important date to put in your fall calendar is the National Fall Tour hosted by Dennis Howe. It will take place in Rosendale, NY, and the Hudson River Valley from October 13-16, 2009. More information concerning tours and events can be found on the National SIA website, www.sia-web.org. The Northern New England Chapter spring tour and meeting will be in Bartlett, NH, on June 6th and will include a visit to the last remaining peg mill in North America.

David Coughlin
President, Northern New England Chapter



NNEC members view the Poultney, Vermont, Greenstone Slate Company quarry.

A Report:

NNEC-SIA Fall 2008 Tour and Meeting

The NNEC fall tour and meeting was held on Saturday, October 17, 2008, at the Slate Valley Museum in Granville, N.Y., just over the Vermont border. The museum had expanded this year and opened a new visitor/interpretive center. An exhibit entitled "Heavy Lifting" had recently been installed and featured a 1951 Mack truck used in the slate industry. We watched a short movie on the history of the local slate industry which began in 1840 just one year after the discovery of slate in the area. The location of the slate is a valley running 24 miles long and six miles wide along the New York and Vermont border.

Many of the earliest workers in the slate industry came from Wales. These men were experienced miners and had the knowledge and expertise required for successful mining. In time, as more quarries opened, immigrants came from Italy, Ireland, and other Eastern European countries. At its peak, approximately a century ago, there were 350 quarries in the region owned by 100 different owners and corporations. In 2008, there were still 100 quarries open, producing slate for 35 business entities.

The museum exhibits contain many items of interest to the visitor. Mining equipment, tools, hardware, etc. are there to see. There is a large amount of information concerning the social life of the mining communities. Worker strikes and labor problems are covered along with detailing the strife between the various ethnic groups. Mary Lou Willits, executive director of the museum, talked briefly about the local slate industry and answered all questions we had. She mentioned that for insurance reasons, it's becoming more difficult for the museum to host quarry tours. So fellow SIA members, plan a visit someday soon.

Our tour of the Greenstone Slate Company quarry in Poultney, Vermont, was very informative. The company began operation between 1878-1886 and has been in business for over 120 years. There were two shutdowns during this time: during the

Continued on Page 4

Mark Your Calendar! Plan to Attend!

The Northern New England Chapter Spring Study Tour

To be conducted on Saturday, June 6, 2009, Beginning at 10:00 am
with visits to the Kearsarge Peg Mill, in Bartlett, NH,
and Livermore Logging Town Archeological Site

Kearsarge Peg Mill, Bartlett, New Hampshire

The Kearsarge Peg Mill is the last operating shoe peg mill in the Western Hemisphere. The company was founded shortly after the Civil War. In addition to shoe pegs, it made, at certain times in it's existence other wood products such as toothpicks, bobbins, tongue depressors, etc. The mill operates today with much of the equipment that was installed after a fire in 1910. Much of the equipment is "home made" by company mechanics who were solving a given problem It would appear that Rube Goldberg was alive and well in Bartlett. The mill today, using much of the vintage machinery, still produces shoe pegs but they've devised other uses for them. The building that houses The Common Man Restaurant in Plymouth was also a shoe peg mill and part of the same company that operated in Bartlett. We'll have a tour guided by the present owner, Paul Soares. It will be a unique experience.

Directions to the mill: The mill is on Kearsarge Street in Bartlett. Kearsrage St. crosses the Bear Notch Road a couple of hundred yards south of Rt. 302 in the center of Bartlett. Also in Bartlett is the round-house built by the P&O RR.

Livermore

Livermore was a logging town, abandoned in the 1920s. It's logging railroad, The Sawyer River Railroad, was built in 1877. As many as 300 people lived in the town, which had a store, a mansion built by the owners of the town, a school, several homes, a charcoal kiln, a large mill, a power house, a dam, railroad tracks, a wagon road, etc. The remains of the mill and power are quite large; the company safe is still in the foundation of the company store, and additional foundations survive. Remnants of a CCC camp are nearby as are surviving railroad buildings on Rt. 302.

Our guide will be Dr. Peter Crane, Program Director, Mt. Washington Observatory. Peter wrote his doctoral dissertation on Livermore, and knows a great deal about the town. We couldn't have a better guide. Livermore is just a short distance west of Bartlett, of Rt. 302.

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depression for two years and for six years during WW2 due to a shortage of experienced workers. The current economic conditions would be expected to also cause production reductions.

The quarry we visited produces green, gray, and black slate but not red. Their red slate comes from a quarry in New York state, one of five the Greenstone company owns, together employing 80 workers in October 2008. On our tour, slate was being sawed and splitted into roofing shingles. The quarry was running 12 hours a day during the weekdays and on Saturday mornings until noon. At current mining rates this quarry will run out of slate in 20-25 years. The land has a fine view of Vermont and will eventually be sold and developed for luxury country homes. Even today, the land value exceeds the value of the slate under it.

This slate was formed 650 million years ago and was once above the granite in the Adirondacks and Green Mountains. As those mountain ranges uplifted, the slate eroded, exposing the granite underneath. Slate Valley was at a lower elevation between the mountains and the slate was never eroded away.

The process of mining, cutting, splitting, and trimming slate produces large volumes of waste material like most quarrying. In the past, only 10% of the mined slate ended up on roofs. Now the figure is closer to 20%. A considerable volume of the quarry slate cannot be used due to defects and fault lines. The useable sections are sawn into blocks one to two feet thick. The workers then slice off the roof slates in the traditional manner, using a chisel and a few blows from a mallet. The roof slates that are sliced off have a thickness of between three-eighths and three-quarters of an inch. The width of the roof slates varies greatly around the world. In Europe, cathedral roofs from the Middle Ages may have two-inch-thick slate that last 500 years. Thin, imported, one-quarter inch roof slates used in US housing developments may not even last 20 years. Greenstone slate roofs are guaranteed to last 100 years, with their thicker slates lasting 200 years or more. Normally the copper fasteners need to be replaced before the slate on the roofs with a 100+ year lifespan. In Europe during the Middle Ages, sheep's teeth were used as the fasteners.

The final two steps in the manufacturing of slate roofing shingles are trimming and punching holes for the fasteners. The slate shingles are trimmed by hand using a couple of 120-year-old trimming machines. They are operated by experienced employees to produce shingles with a minimum of waste. An automatic trimming machine has been purchased but the faster speed results in more waste. Two holes are then punched through the slate for the fasteners. If slate thickness exceeds three-eighths of an inch, a two-headed drill press is utilized to drill the two holes. Punching holes is the preferred method since less slate is broken when punching the holes. The shingles are 12 inches long, and when installed, only 4 inches are exposed to the elements. Shingle width is generally 7-8 inches.

The Greenstone Slate Company sells the majority of their slate roofing for expensive residental housing and for University buildings. Any structure desiring such a roof needs to be engineered with additional structural strength to withstand the weight of roofing slates.

After the quarry tour, we returned to the Slate Museum for further viewing and the fall meeting. David Dunning, a recent and active member of both NE chapters, was nominated for second vice-president and accepted. A short explanation of how our chapter will slowly move towards email notification of dues and meetings/tours was the next topic. Those without email will still have the information mailed to them. Dennis Howe and Bill Burt, president of the Southern NE Chapter, discussed both chapters having a joint website similar to the joint newsletter. David Starbuck, longtime newsletter editor, informed us that more submissions are coming in for the newsletter and we may need one more issue per year or more pages per issue. It was decided to stay with two issues per year for now. Dennis Howe who arranged the Slate Valley tour informed us he is planning a mid-Hudson Valley Study Tour of the Rosendale Cement Industry and other sites from October 13-16, 2009.

David Coughlin
President, Northern New England Chapter

Corrections to the Newsletter Fall 2008 (Volume 29, Number 2), Page 5, article:
Power Sources for the Granite Industry

Diagram 1,(below) was left out and the three mentions of Diagram 1 in the text (listed below) were changed to Table 1:
"Diagram 1 summarizes the power sources, prime movers, power converters, power transmission, and secondary movers for tools and machinery used in the granite industry."
" Table I lists examples of tools and machines of the granite industry and shows how they fit into Diagram 1."
"One machine that is not represented by Diagram 1 is the early steam-driven, track-mounted channeling machine with an integral steam boiler that powered an array of chisels."

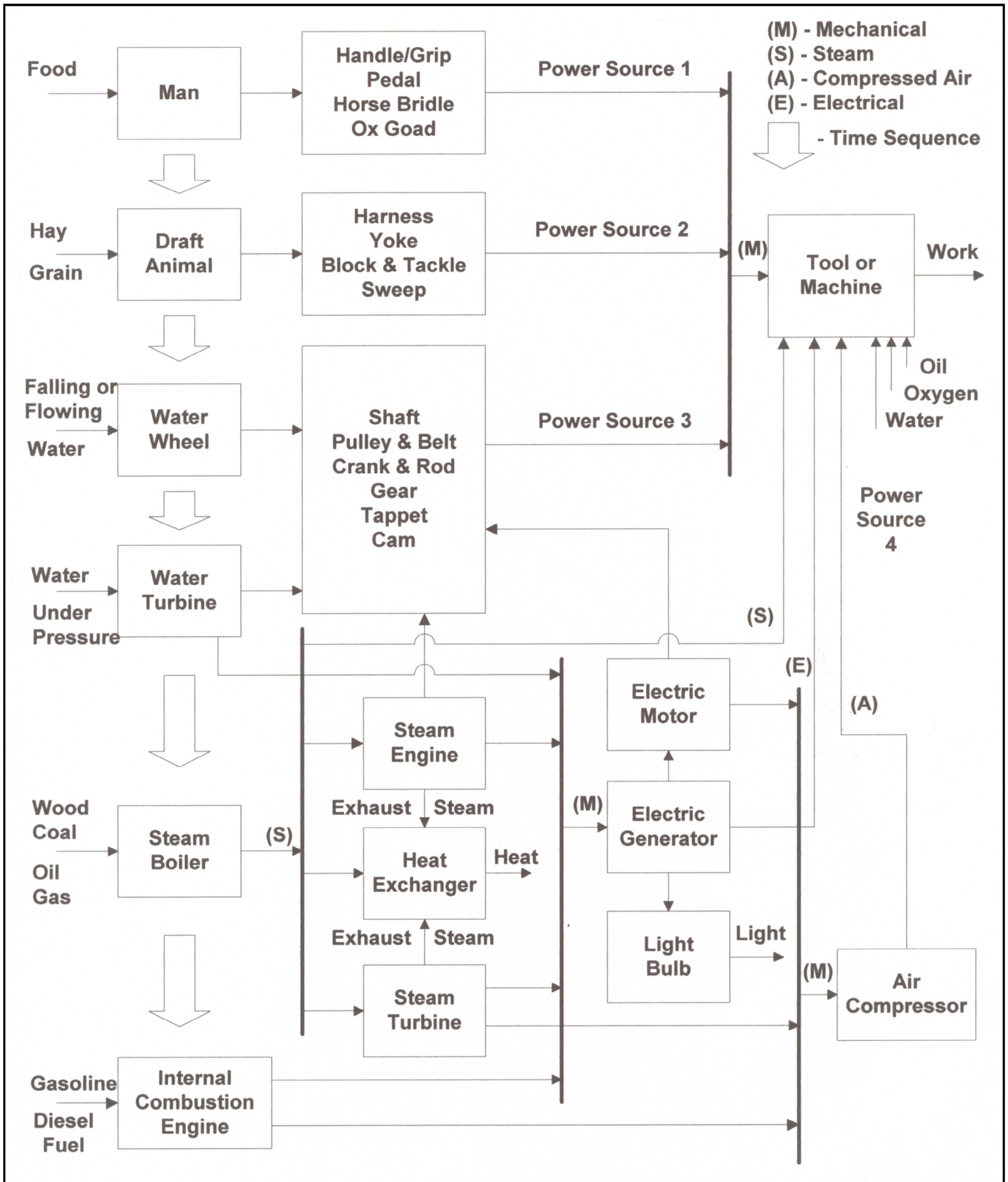


Diagram I - Power Sources for the Granite Industry

Nuclear Power Research and Development in Connecticut:

Combustion Engineering's Kreisinger Development Laboratory in Windsor, Connecticut

Building # 3, Combustion Engineering's Kreisinger Development Laboratory (KDL), was located at Windsor, Connecticut. During the last half of the 20th century significant experimental activity in fossil and nuclear energy production was performed at this site. The scientific work led to the corporation's establishment of a Nuclear Power Division. The laboratory, fabrication shops and its personnel produced concepts, prototype components and systems for nuclear and fossil fuel steam plants.

Site work for the laboratory began in the mid 1950s with the Atomic Energy Commission's (AEC) contracts directing research, development and manufacturing of nuclear fuel for the United States Navy. These contracts included construction, testing and operation of a naval test reactor, the S1C. The description S1C means: S=submarine, 1=First generation core, C=Combustion Engineering contractor. Buildings 1, 2, 3, 5, 6 and 6A were built for the design, fabrication and testing of fuel element subassemblies for submarines.

Building # 3 was designed in 1956 and originally designated the Fuel Fabrication Building. Its function was to manufacture the S1C reactor core. This was a prototype nuclear reactor designed for the United States Navy to provide electric power and propulsion for submarines. The building housed a comprehensive metals fabrication shop, distinctive tooling and welding equipment. The processes carried out in this dedicated nuclear manufacturing facility required analytical laboratories, instrumentation maintenance shops, a full range of utilities, controlled air flow and radiation shielding. Other requirements included wastewater drainage to a "hot" treatment facility, containment vaults for radioactive materials and sensor instrumentation features not required in conventional factory buildings.

A second reactor core, the S2C, was produced in building # 3 for the *USS Tullibee* (SSN-597), an advanced experimental fast-attack nuclear submarine that was used to test defensive and offensive features. The *Tullibee* had an unusual propulsion plant; a turbo-electric drive, rather than a steam turbine. At the time this drive made it the quietest submarine in the fleet. The hull was built by Electric Boat in Groton, Connecticut, and she was commissioned in 1960.

Changes in the contract with the Navy in 1961 and business decisions by C-E management to focus on commercial nuclear power curtailed the need for submarine reactor work. The S1C reactor was then used for training reactor operating personnel and sited centrally within the C-E campus on a government controlled parcel of 10.6 acres. The S1C Nuclear Power Training Unit (NPTU) also supported Navy's nuclear fleet by testing new equipment. Over 14,000 Naval operators trained at the S1C facility from 1959 to 1993. After expiration of the Navy's original contract with C-E, Knolls Atomic Power Laboratory (KAPL) took over operation of the S1C. Knolls shut down the facility and completed clean-up of the site in October of 2006.

When the Fuel Fabrication Building was no longer required for submarine reactor work, the building was renamed the Kreisinger Development Laboratory (KDL) to honor Dr. Henry Kreisinger, a distinguished expert in powdered coal combustion who was a prominent scientist at C-E from 1920 until the mid-1940s. The laboratory's mission shifted from fabricating nuclear fuel elements to becoming a research facility for fossil fuel projects. An office wing was built in 1962 to house scientists and engineers who were transferred from C-E's Chattanooga research facility.

Background and Organization of Combustion Engineering

At the beginnings of commercial nuclear power generation, Combustion Engineering was ideally positioned to perform development and fabrication of reactors. Their experience in designing steam plants provided the technical background and skills necessary for designing and building large pressure vessels. Acquisition of reactor vessel know-how dated back to the organization of one of its predecessor companies, the Heine Boiler Company, in 1882. In addition to developing technology from within, the company focused on acquiring businesses that were related to the production of energy, primarily from coal. Its initial success was related to fulfilling market needs by developing a cost-effective railroad engine superheater in 1912. In an engine equipped with a superheater, the steam passed through a heat exchanger which raised the temperature of the steam on its way to the cylinders. The higher temperature steam significantly contributed to engine efficiency. The company prospered with this invention during a period of rapid growth in railroading. By 1917 the company was also producing superheaters for stationary engines. Over the next thirty years the company acquired or merged with businesses that complimented its core business. Consolidation with companies that produced pulverizers, grates, boilers and coal handling equipment contributed to Combustion Engineering's ability to supply completely integrated solid fuel combustion systems.

During World War II government policies required the company to concentrate on production rather than research and development. War production included manufacturing about 5000 steam generator plants for Liberty ships. Starting in 1946 with the advent of nuclear power and subsequent efforts to utilize it for commercial purposes, Combustion Engineering studied the feasibility of nuclear power generation as a business venture. Because of its production technology in manufacturing large welded pressure vessels, the company was positioned to become a major supplier of nuclear power plant components.

Nuclear Energy and Combustion Engineering

Between 1947 and 1951, C-E was in the preliminary development stage of its nuclear components business. In 1951, the U.S. Navy ordered the first sodium cooled reactor vessel and steam generator for a submarine from C-E. The prototype components were shipped in 1953 to Milton, N.Y., where they were installed in a land-based power plant for testing purposes. The second set of improved components were shipped later to New London, Conn., and placed into the hull of the *Seawolf*, SSN-75, the world's second nuclear submarine. In July 1955, the *Seawolf* was launched. About the same time, the *Seawolf's* land-based prototype plant in Milton was put to civilian use when its electric power went into transmission lines serving homes, farms and industries of upper New York State.

In the early days of nuclear power generation C-E understated its commercial nuclear capabilities. Typically, utilities bought steam generators from a manufacturer like C-E and the electric generating equipment from Westinghouse or General Electric. However, the utilities, uneasy about their lack of nuclear energy experience, turned to the two suppliers who were offering complete turnkey plants, General Electric and Westinghouse.

Up to this time, C-E's design and fabrication of components were distributed to the various existing divisions and departments as special assignments. C-E entered the nuclear power field when its management decided to continue serving its traditional market, the electric utilities industry. Early in 1953, nuclear energy projects were consolidated within a Nuclear Power Division as a separate entity. In 1954, the company announced plans to construct, at its Chattanooga, Tennessee plant, a new building that would have the most advanced facilities available for the manufacture of nuclear power equipment. The facilities, first in the country to be created especially for the manufacture of heavy nuclear components, placed C-E in a position to design and manufacture complete nuclear power plants from "boiler to turbine." The new capability required doubling of the technical staff in 1954.

After developing its expertise as a nuclear subcontractor for a number of years, C-E became the third major Atomic Energy Commission contractor to enter the naval reactor development program. In 1955, the AEC awarded Combustion a contract for the design and development of a reactor suitable for installation in a small submarine. In terms of AEC and Navy recognition this contract for the SRS (Submarine Reactor Small) recognized C-E within the same category as Westinghouse and General Electric. An important difference, however, was that C-E was the first of the three to undertake design and construction of a Naval reactor using its own integrated engineering and manufacturing facilities. The submarine that incorporated C-E's first nuclear steam supply system was the *SSN Tullibee*, the first nuclear-powered "hunter-killer" submarine designed to find and destroy enemy submarines.

Also in 1955, a contract to design and build a reactor vessel for the first commercial sodium fast breeder reactor in the world was awarded to C-E. Completed and delivered to the Enrico Fermi plant thirty miles southwest of Detroit in 1958, this vessel was considered the most complex ever built.

The heaviest single component for America's first full-scale commercial power plant was shipped from Chattanooga on September 25th 1956. The vessel, a huge steel containment for the nuclear reactor, weighed 235 tons and was destined for the nuclear power plant at Shippingport, Pennsylvania. The station, operated by the Duquesne Light Company for the AEC, was scheduled to go in service in 1947 with an initial net electrical output of 60,000 kilowatts. The vessel was unique in point of safety factors, size, weight, and close tolerances. It was two years in the making and had steel walls 8-1/2 inches thick. It stood three stories high, had an inside diameter of nine feet and required precise tolerances never before achieved in equipment of this size.

During the 1950s, C-E supplied the Navy with 141 major components, including two reactor vessels for the *SSN Triton*, the first to circumnavigate the globe completely submerged, and six reactor vessels for the aircraft carrier *Enterprise.*

The Kreisinger Laboratory at Windsor, Connecticut

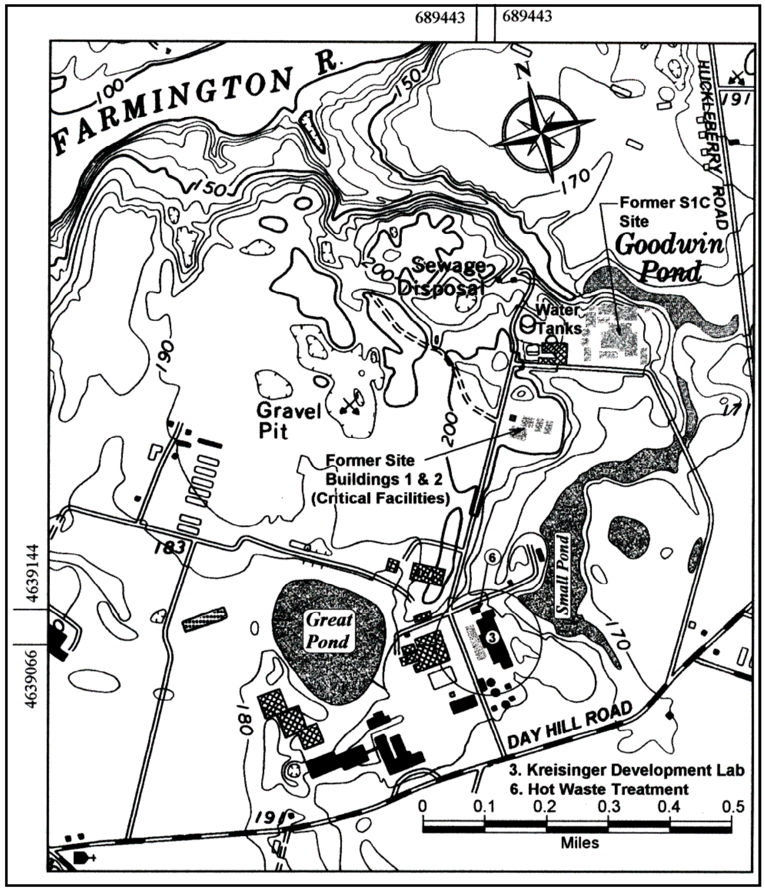
The Corporation decided to concentrate its nuclear activities at a Nuclear Engineering and Development Center. The purchase of a 580-acre site in Windsor, Conn., was announced in December 1955. The tract would be the headquarters for the facility and consisted of a large engineering and administration building, a critical experiment facility for studying the physics and nuclear characteristics of reactor cores, a "hot" laboratory, and a fuel element fabrication plant, plus all necessary related metallurgical chemical and physical testing laboratories.

Designed by the engineering firm of Stone & Webster, work on the site commenced immediately and on July 16, 1956, little more than six months from the time construction began, the first nuclear chain reactions were achieved in Building # 1, the Critical Experiment Facility. The Nuclear Engineering center, including the Fuel Fabrication Building, was fully completed and occupied the following spring.

Also in July, Combustion won an AEC contract to construct a prototype nuclear power plant which would duplicate the reactor C-E was developing to power the *Tullibee*. Set up in a steel replica of the submarine hull on the Windsor site, its purpose would be to allow C-E instructors to train Naval submarine crews in the operation and maintenance of the power plant. In addition to the prototype contract, C-E also received an order to build reactor cores for the Submarine Fleet Program of the U. S. Navy at the Windsor site.

When C-E's contract with the Navy was concluded, the Fuel Fabrication Building was turned over to C-E. Under the Navy's aegis the facility had been used for fabricating reactors for the Navy. It contained an extensive metal working shop capable of forming, machining, cutting and welding steel

Oblique Aerial View of Kreisinger Development Laboratory, 1963 and a variety of exotic alloys to form reactor components. The facility's Building # 3 was renamed the Kreisinger Development Laboratory, (KDL). The machinery was then used to form components used in fossil fueled pilot plants and experimental boilers. Additionally, Kreisinger housed an integrated analytical services lab, fuels research lab and photography lab. A large open bay, almost 19,000 square feet in area, could enclose full and sub-scale pilot plant operations with capabilities for instrumentation, modeling, high pressure testing and analysis. Two mezzanines allowed access to upper portions of pilot plants and experimental boilers. Numerous significant patented and proprietary improvements in fossil fuel utilization were developed by the scientists, engineers and technicians who worked at Kreisinger Development Laboratory.



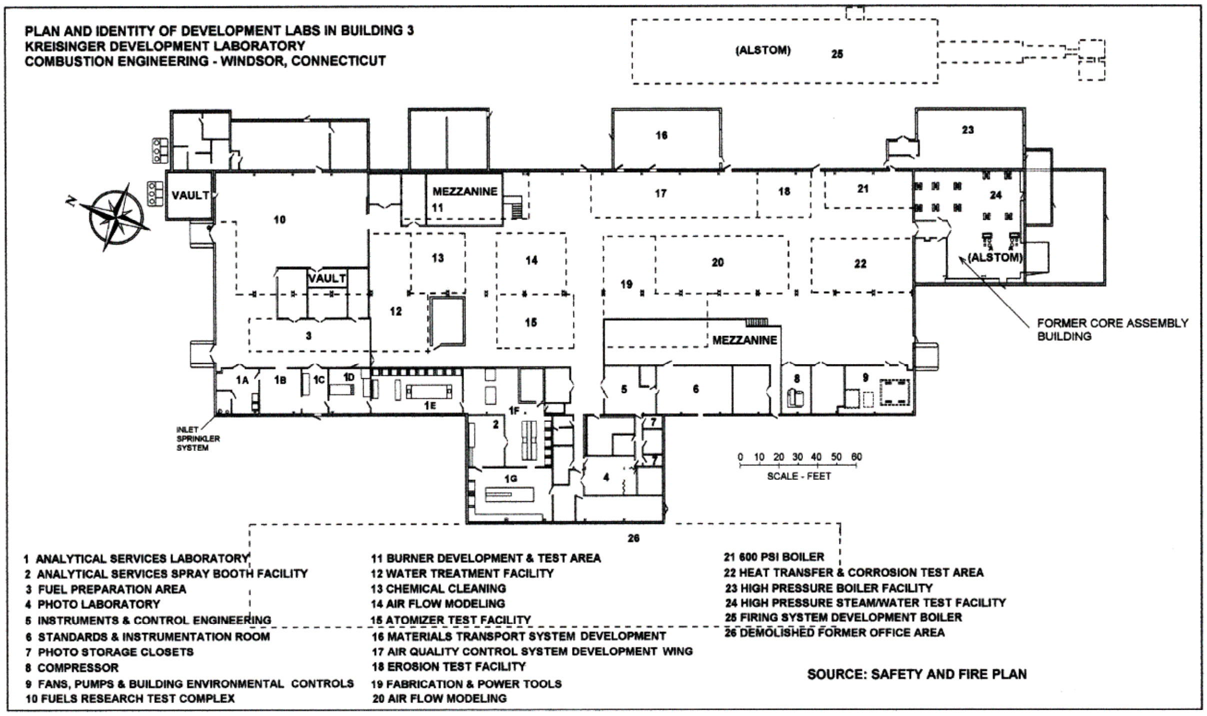
Location Map – Combustion Engineering, Inc.
USGS Quadrangle – Windsor Locks, Connecticut

In a move to expand its business into all phases of nuclear power, especially the commercial applications, C-E acquired the General Nuclear Engineering Corporation of Dunedin, Florida, in 1959. Dr. Walter H. Zinn, General Nuclear's president and founder, was elected a vice president of C-E and placed in charge of all the company's nuclear power activities. General Nuclear completed a merger with C-E on September 4, 1964.

Dr. Zinn was considered to be the father of the commercial power reactor. He assisted the renowned Enrico Fermi during the building of the first nuclear pile. Zinn was present at Stagg field in Chicago when the first sustained chain reaction was achieved on December 2, 1942. As the first director of Argonne National Laboratory he personally contributed to the design and development of a number of nuclear reactors. Included was Experimental Breeder Reactor No. 1, also known as "Zinn's Infernal Pile," which produced the first electricity from nuclear energy in 1951. Zinn also first demonstrated the breeding of nuclear fuel in the reactor EBRN No. 2.

C-E continued to supply nuclear components to other manufacturers. As utilities gained experience in nuclear power generation they returned to their traditional method of purchasing steam generators from one manufacturer, turbines from another. C-E began to market complete nuclear steam supply systems.

In l966, C-E received its first contract for an integrated commercial nuclear steam supply system. This was a 780-Mw unit for the Palisades plant of Consumers Power Company in Michigan. It was quickly followed that same year by a contract from the Omaha Public Power District and by five more in 1967. By then C-E was firmly established as one of the major suppliers of nuclear steam generating equipment. Reflecting these new capabilities, in 1970 it adopted a new corporate symbol, a red-and-black C-E in block form designed to enhance and unify the corporate image. This early exposure allowed C-E to undertake design and evaluation studies for the AEC of large reactors for central station power production and small reactors for special applications. The capability extended to the design of reactor fuel elements and development of fuel element fabrication processes. As a result the company was awarded the contract to provide the reactor vessel for the



Layout of Kreisinger Development Laboratory at Combustion Engineering, c. 1975

Shippingport Station, the world's first commercial sized nuclear electric generating station.

The 1960's was an era of growth for Combustion. Not only did C-E become the world's leading manufacturer of nuclear reactor vessels but its fossil-fueled steam generators continued to grow in capacity, temperature and pressure. In 1963, a major management change took place. Arthur J. Santry, Jr. became president and chief executive officer. Santry believed that C-E's growth depended on diversification. C-E was to expand into those areas related to its core technology. A decision announced in July1964 indicated that C-E intended to maintain its position in the conventional steam-generating field, and additionally the company would become a major supplier to the nuclear power-generation field.

The C-E unit was generally credited with a superior design, resulting in a higher megawatt yield of its nuclear reactors. C-E reactors typically performed about 10% higher than that of comparable Westinghouse plants. The higher efficiency was produced with a computer-based system called the Core Operating Limit Supervisory System (COLSS) which controlled about 300 in-core neutron detectors with a patented algorithm to permit higher power densities.

In the 1970s negative public opinion adversely affected nuclear power generation. The nuclear accident at Three Mile Island in Pennsylvania on March 28, 1979 resulted in an almost complete cessation of nuclear construction in the US. Besides the negative media attention other factors that affected the industry were the availability of cheap natural gas and a move away from domestic manufacturing and toward importation of consumer products. Federal policies encouraged the use of natural gas and coal for electric generation.

C-E was acquired by Asea Brown Boveri (ABB) in 1990. ABB, a major supplier of electrical generating equipment, was formed from the merger between Asea AB of Sweden and BBC Brown Boveri Ltd. of Baden, Switzerland in 1988. C-E's boiler and fossil fuel businesses were split off and purchased by ALSTOM in 2000, and the nuclear business was purchased by Westinghouse Electric Company, also in 2000. The commercial nuclear power businesses of Westinghouse were acquired by British Nuclear Fuels plc. in 2000.

Robert C. Stewart
Historical Technologies

Groton Bridge

(Thames River Movable Bridge, Amtrak Structure No. MB 124.09), Groton and New London, Connecticut

Introduction

The National Railroad Passenger Corporation (Amtrak) is replacing the original movable bascule span of the Groton Bridge (a/k/a Thames River Bridge) with a vertical lift span. The Groton Bridge is a multiple-span, moveable draw bridge carrying the Amtrak's Boston, MA—Washington, DC Northeast Corridor (NEC) electrified passenger rail line across the Thames River between Groton and New London, CT. It is designated by Amtrak as the Thames River Moveable Bridge, MB 124.09 (129.04 miles east of Grand Central Terminal, New York City, NY).

The bridge was determined eligible for listing in the National Register of Historic Places in 1977. The bridge is historically significant as a link in the New York, New Haven, & Hartford Railroad system (the New Haven) and as a then state-of-the art engineering solution to the problem of creating a dependable rail line while accommodating heavy marine traffic (Artemel 1983). In accordance with Section 106 of the National Historic Preservation Act of 1966, Amtrak and the FRA consulted with the Connecticut State Historic Preservation Officer (SHPO) regarding the potential effects of the project on the historic bridge. The consultation resulted in a Memorandum of Agreement (MOA) that included stipulations designed to minimize or mitigate the adverse effect of the project. PAL assisted Amtrak in fulfilling their obligations for mitigation of project impacts to the historic resource, including transmittal of a copy of the 1983 Historic American Engineering Record (HAER) documentation to the Connecticut Historical Commission, surveying the bridge for items for salvage including the original bronze builder's plaque, preparing a Connecticut State-Level Photographic documentation, completing a National Register of Historic Places evaluation, and preparation of this article for the SIA New England Chapters Newsletter.

Description

As originally constructed in 1919 the Groton Bridge incorporated five double-track through truss spans consisting of pairs of Parker-type Pratt truss fixed approach spans flanking a 212 ft long moveable Warren through truss Strauss heel trunnion bascule draw span (Figures 1 and 2). The bascule span opened up at an angle, pivoting at its west end. In 2008, the bascule draw span was replaced by a vertical lift span that is

Figure 1: *View of Groton Bridge with its original bascule span in open position, looking west. The abutment for the earlier New London Draw Bridge is visible to the left of the structure (PAL Photo).*

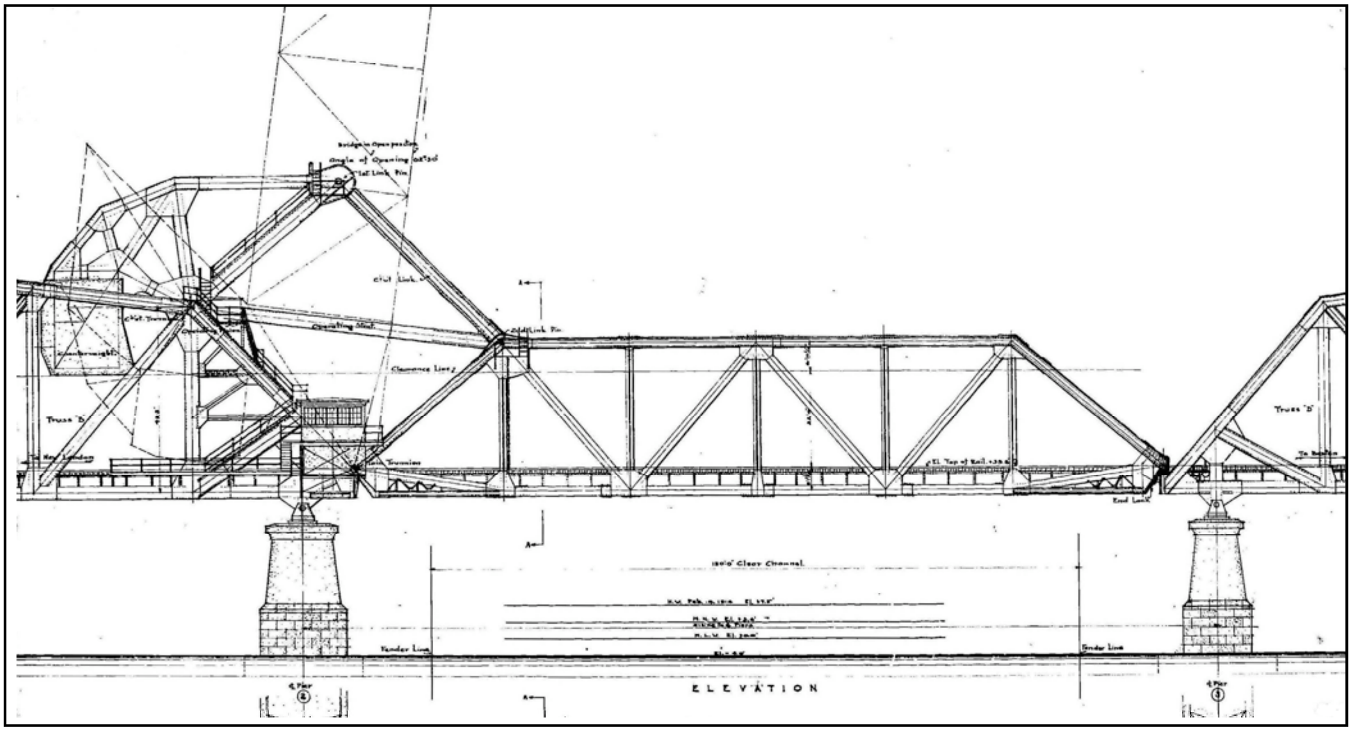


Figure 2: Elevation of the Strauss trunnion bascule span, Groton Bridge (Strauss Bascule Bridge Company, Strauss Trunnion Bascule Bridge over Thames River at New London, Conn. *General Drawing, Sheet No. 1, June 14, 1916. On file, Amtrak Engineering Archives, Philadelphia, PA).*

raised horizontally by cables from tall flanking towers resting on altered piers.

The Groton Bridge is 1,394 feet long between the faces of the river bank abutments. The granite and concrete abutments and piers extend upstream beyond the steel superstructure as they were built to potentially accommodate extra tracks (never installed). From west to east, the current bridge consists of two original Parker (Pratt with polygonal top chord) through truss approach spans, 185 feet and 330 feet long, respectively; the new vertical lift span and towers; and two more Parker truss approach spans, each 330 feet long. Structural members carrying live loads are made of structural silicon steel. The bridge is 32 feet wide on truss centerlines. The trusses are constructed of riveted, built-up, structural steel members, with the bottom chord of floorbeam and stringer construction. The Parker truss adjacent to the draw span opening is asymmetrical in profile, with taller, steeper portal posts at the east end to accommodate the former bascule span mechanism. The original bascule draw span was a 212 ft long riveted Warren through truss with vertical substruts. The bascule span was connected to a 4 million lb overhead concrete counterweight by a system of elevated structural steel links and struts located above and west of the span. The concrete counterweight was clad in sheet steel, and was specially designed with an offset center of gravity by incorporation of intentional voids and areas of concrete made heavier through the addition of steel rivet punchings.

The bridge drive machinery was located in a house at the east end of the fixed span to the west, between the trusses. The electric drive motors consisted of four 82 hp, 44-volt, 3-phase, 60 cycle A.C. units geared together in pairs, with an equalizer assembly between the final reduction gears. One auxiliary 40-horse-power motor was also located in the machinery house. Each motor was equipped with a solenoid-actuated brake for regular use, with a pneumatic emergency brake located on each operating strut. The bridge was locked in the down position by lock linkage, with associated motor drive and gear trains located below track level at the toe of the bridge, with a bevel gear set for manual operation. Mitre rails were located at both the heel and toe of the bridge with rail alignment guides to insure perfect alignment of the tracks. Sliding rail locks driven by electric motors and linkages were also at both ends of the bridge. The electrical switchgear and controls were located in the operator's house and the lower level of the machinery house. The original two-level operator's house was adjacent to the northbound track at the west end of the draw span on the south side of the bridge.

Prior to the replacement of the draw span in 2008, the Groton Bridge had been altered twice by Amtrak. In 1983, original drive machinery, electrical equipment, and the bridge control panel for bridge operation were replaced and the control house was removed from the south side of the bridge and replaced with a new structure on the north side the bridge (Artemel 1983:4–5). The electrification of the New Haven- Boston portion of the Northeast Corridor in the 1990s required the addition of catenary support structures to the interior of the bridge spans and to either end of the bascule span.

History

The New York, New Haven, & Hartford Railroad

The Groton Bridge was built by the New Haven as part of an extensive construction program to improve its Shore Line rail route between Boston and New York City. The New Haven and the Shore Line route evolved in parallel as the product of mergers among five connecting railroads that operated in association to provide transportation between the two cities: the Boston & Providence (completed 1835); the New York, Providence & Boston between Providence and Stonington, Connecticut (1837); the New York & New Haven (1849); the Shore Line Railroad between New Haven and New London (1852); and the New London & Stonington (1858). The route was not entirely by rail, however, because ferry crossings of the Connecticut and Thames rivers were still required (Adams et al. 1998).

The New Haven formed in 1872–1873 when the New York & New Haven, Shore Line, New London & Stonington, and the New Haven & Hartford railroads merged. The new company obtained control over the entire route between New York and Boston in 1892 and 1893, when it took over the New York, Providence & Boston and the Boston & Providence. These acquisitions made the New Haven, which controlled 644 miles of track, the largest railroad system in New England and its New York Division between New Haven and New York City (the Shore Line) became one of the busiest rail corridors in the United States. It was during this period of corporate expansion that an all-rail connection between New York and Boston was finally achieved, when the first Groton Bridge over the Thames River (a/k/a New London Draw Bridge, used hereafter) was constructed by the New Haven in 1889 (Figure 3) (Adams et al. 1998; Artemel 1983:2–4). This bridge was replaced with the current Groton Bridge in 1919 after problems developed in the bridge piers, as discussed below.

After reaching a pinnacle of geographic and financial expansion in the 1920s, and experiencing a brief resurgence during World War II, the New Haven's fortunes decline markedly. The railroad underwent a series of mergers and reorganizations that finally culminated in the 1971 designation of the Shore Line route between New York and Boston as Amtrak's "Northeast Corridor."

The 40 years between 1890 and 1930 represented the golden era for train travel on the New Haven and the period of its greatest technological and engineering accomplishments. This era was one of intensive construction by the New Haven, as the company worked to secure its regional dominance by upgrading facilities and improving speed and safety along the line. Significant projects included the expansion of the Shore Line between New Haven and Woodlawn into a four-track corridor, new switch and automatic block signal systems, purchases of new locomotives and passenger rolling stock, and, most notably, the electrification project between New York and New Haven completed in 1914 (Cornwall 1987:74–75; PAL 2001:24; Roth and Clouette 1990).

The New Haven's enlarged rail corridor and heavier locomotives and rolling stock made moveable bridges along the Shore Line an essential focus of improvement and represented a sizable engineering challenge, both in terms of scale and technical

Figure 3: *Post card view of the New London Draw Bridge (Courtesy of the Dodd Research Center, UConn Libraries).*

requirements. The New Haven had a total of 15 movable bridges on the route: nine bascule bridges, five swing bridges, and one vertical lift bridge. Of these, ten were in Connecticut and were built between 1891 and 1919, including swing bridges at Shaw's Cove (pin-connected Pratt through truss, 1891), Norwalk River (Warren deck truss, 1896), and the Mystic River (Warren through truss, 1919); Scherzer rolling-lift bascules at the Pequonnock River (through girder, 1902), Mianus River (deck-girder, 1904), Housatonic River (Warren through-truss, 1905), Saugatuck River (deck-girder, 1905), Niantic River (through-girder, 1907), and Connecticut River (Warren through-truss, 1907); and a Strauss heel trunnion bascule at the Groton Bridge, which is the longest bascule span in Connecticut and the only bascule of its type. The longest river crossing is the 1,585 feet-long, ten-span Connecticut River Bridge at Old Saybrook, Connecticut (Artemel 1983:2–4; Clouette 2004:49–70; PAL 2001).

Construction of the Groton Bridge

The completion of the new Groton Bridge in 1919 was the first successful solution to a problem that had challenged engineers for more than 60 years. The Thames River at this location is more than 1,300 ft wide and up to 50 ft deep, with a suitable bottom for pier foundations not found until depths of more than 100 feet. A railroad bridge at the location had been discussed as early as 1856 but was not built until 1889. This predecessor to the Groton Bridge was the New London Draw Bridge, a double-track, through-truss swing bridge more than 1,400 ft long with a draw span of 503 ft – the longest in the world at the time of construction. Unfortunately, the piers of this bridge were constructed on pilings driven into deposits of silt and clay, rather than a lower stratum of gravel and bedrock. This system failed and the structure began to move and the piers to settle about 1905. Weight restrictions were imposed, but by 1908 pier settlement had progressed to such an extent that traffic was restricted to a single gantleted track (Artemel 1983:5; Rollins 1920:85).

The new Groton Bridge adapted to the challenges presented by the site and reflected changing preferences in movable bridge design. The structure was designed by the New Haven Engineer's Office, under the supervision of Edward Gagel, chief engineer; I.D. Waterman, construction engineer; and W.H. Moore; bridge engineer. Noted bridge engineers Gustav Lindenthal and Ralph Modjeski were also associated with the project as consulting engineers (Artemel 1983:5).

The site chosen for the new bridge was 186 ft upstream of the old, a location that arose out of conflicting requirements. Heavy traffic on the route did not permit closure of the old bridge. The new structure needed to be near the old location to prevent excessive curvature on the new approach track alignment, but engineers did not wish to construct the new bridge so close to the old that the old piers might be further destabilized. Because boat passage had to be maintained and the new bridge location was within the radius of the swing bridge's opening; the sequence of erection was carefully programmed to permit the continued operation of the old swing span (Engineering and Contracting n.d.:57).

After some debate between Holbrook, Cabot & Rollins, the contractors for the substructure, and New Haven engineers, rectangular open crib caissons were chosen for the pier foundations. These were sunk and excavated to the level of the gravel and bedrock below the channel. This was the method preferred by the New Haven, which thought it necessary to assure the stability of the new structure. The work on the foundations was begun in April of 1916 and finished in August of 1917. The piers were designed to accommodate four tracks but only two were ever needed (Artemel 1983:2–4; Engineering News 1917:420).

The prominent construction and engineering firms American Bridge Company and Strauss Bascule Bridge Company were selected for the work on the superstructure, which was competed in 1919 (Artemel 1983:2–4). Joseph Strauss founded the Strauss Bascule Bridge Company (later Strauss Engineering Corporation) in 1904 after leaving the office of Ralph Modjeski, where he served principal assistant engineer and designed numerous movable spans in Chicago. Strauss and his company held patents on a number of bascule types, including variations on the vertical overhead counterweight type, the underneath counterweight, and the heel trunnion. He would later become the chief engineer of the Golden Gate Bridge project (American Society of Civil Engineers n.d.).

Movable Span Technology

The Strauss heel trunnion bascule draw span was state-of-the art technology for movable bridges at the time of its application in the Groton Bridge. Swing bridges, where the movable span rotates on a pivot pier (exemplified by the New London Draw Bridge), were the first movable railway bridges employed in the United States and were constructed by the New Haven and other railroads well into the twentieth century. Swing bridge types were often preferred over bascule and lift bridges if the waterway was wide enough to allow for clearance on either side. This type of bridge requires less power to open and close, but involves more structure and therefore more weight (Artemel 1983:2–4).

The modern bascule and lift bridge types were not developed until after 1890, when the electric motor and methods for counter-balancing large spans had fully developed. These movable bridge types, particularly the bascule, hold several advantages over the swing bridge that would have been appealing to engineers of the Groton Bridge. Bascule spans offer a lighter superstructure – an important factor in the choice of spans at the Thames River, where pier stability was of the utmost concern. Both bascules and lift bridges are suited to locations with limited channel clearances. However, bascules can be opened and closed more quickly than a swing span, a trait advantageous for busy railroad applications (Artemel 1983:2–6). Finally, bascule spans are readily expanded by the addition of new leaves and lift mechanisms, which supported the New Haven's plans for two additional tracks at the crossing (Hool and Kinne 1943:4). At the time of the Groton Bridge's construction, there were numerous patent-holders for bascule spans, whose design particularities chiefly resided in variations upon the use of a trunnion (the pivot or axle on which the bascule span pivots) or a rolling lift mechanism and in the location of the counterweight or its connection to the bascule span. Accepted and commonly used bascules available to the Groton Bridge engineers included the Scherzer and Rall rolling lift types and the simple trunnion, of which the Strauss heel trunnion was a sub-type (Hoole & Kinne 1943:15–25). In a heel trunnion bascule, the counterweight is supported on a separate rigid structure that is connected to the bascule via pivoting links and a second trunnion for the counterweight (Koglin 2003:40). The Strauss heel trunnion bascule was developed about the same time as the Scherzer rolling lift and was first constructed in 1905. In addition to the general advantages provided by bascules, the Strauss heel trunnion also allows for longer spans than other bascules by making the movement of the counterweight independent of that of the bascule leaf and situating the counterweight above the bridge deck, an important consideration in low-level crossings (Artemel 1983:2–4; Koglin 2003:41).

Groton Bridge Replacement Project

In 2008, the bascule span and associated steelwork links, struts, and counterweight, which had become deteriorated over 90 years of use, were replaced by a vertical lift span as part of the Northeast Corridor Improvement Project (NECIP). This new structure represents the third generation of movable span technology to be applied at the Thames River crossing. Planning for replacement of the moveable span began in 1994. The $72 million project was a major engineering endeavor incorporating physical and logistical challenges including removal of steel structures and a concrete counterweight over a busy active railroad line with 25,000 Volt overhead catenary over open water. The new bridge was designed by Howard, Needles, Tammen & Bergendoff (HNTB) of Kansas City, MO. Construction management was provided by Washington Group International (WGI), of Rocky Hill, CT. The general contractor was Cianbro Corporation, of Pittsfield, ME who also provided marine equipment and cranes.

Substructure construction began in November 2005 and included driving eight, 36-inch diameter pipe piles to support the new concrete sections of the lift tower piers. The marine sediments proved as challenging as they had during construction of the early Thames River swing bridge in 1889, and the Judy Co. of Kansas City, MO, grouted a 40 inch thick layer of marine sand with fine concrete powder for six months to stabilize the riverbed.

Superstructure work began in August 2007. The lift towers were fabricated at Oregon Iron Works, Clackamas, OR, and shipped in pieces by rail. The new lift span was fabricated by G & G Steel, Russelville, AL, trucked to the site in pieces, and assembled by Cianbro. Dismantling the original 4 million lb concrete counterweight and the structural steel arms, links and struts took several weeks and the heavy components were removed by large cranes on floating barges moved by tugboats in a carefully choreographed operation. All steel was recycled. The project culminated in a narrow four-day closure window for Northeast Corridor trains while the old bascule span was removed and the new lift span was installed (Figure 4). The new lift span was operational on June 26, 2008, and the entire project is slated for completion at the end of 2008.

The new lift span consists of a 188 ft long, 1,780,000 lb fabricated steel Warren through truss with vertical substruts and prominent gusset plates (Figures 5 and 6). The span is flanked by two 230 ft tall structural steel lift towers resting on wide concrete additions to the original piers. Each tower occupies an 18 ft by 40 ft rectangular footprint and consists of four, 4 ft x 6.5 ft steel columns with lateral "X" braces. The lift span's rectangular concrete counterweights travel vertically on guides located within the towers, and are suspended from cables that ride over a pair of sheave wheels in sheet metal housings at the top of each tower. The lift drive motors are located in a rectangular, shed-

Figure 4: *A view of the bascule span in mid-lift, while a tug aligns the barge beneath the structure (PAL photo).*

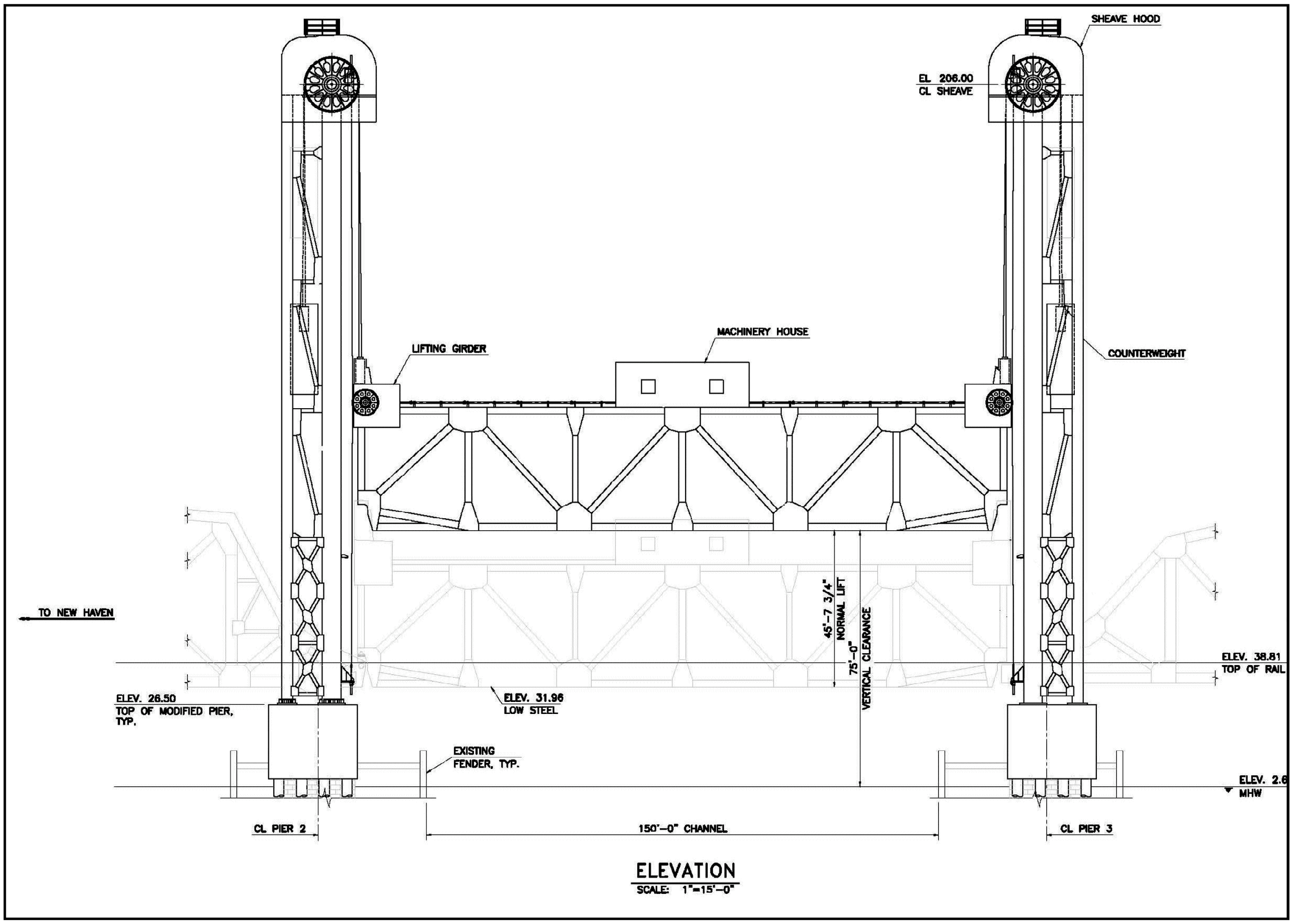


Figure 5: *Elevation of the new lift span, Groton Bridge (Howard, Needles, Tammen & Bergendoff (HNTB),* Groton Connecticut, Bridge 124.09 Over Thames River, Replacement of Movable Span. *General Machinery Layout, Sheet No. 133, September 15, 2005. On file, Amtrak Engineering Archives, Philadelphia, PA).*

roofed machinery house located on the top chord of the lift span. The machinery house contains new motors, reduction gears, and brakes, with horizontal driveshafts extending east and west to sets of 90 degree beveled reduction drive gears at the ends of the lift span. The operator's house was reused and new control equipment installed.

The replacement of the original Groton Bridge bascule draw span with the new vertical lift span removed resulted in dramatic alteration of the bridge' appearance and operation. The new lift span is easier to maintain and will improve operational reliability for the railroad, however, replacement of the bascule span removed the most technologically significant portion of the bridge and rendered it ineligible for listing in the National Register of Historic Places.

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Figure 6: *A view of Groton Bridge with the new lift span installed, looking west (PAL Photo).*

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Connecticut Route 17A Culvert, Portland, Connecticut

Figure 1

Introduction

The Connecticut Department of Transportation (ConnDOT) is preparing to undertake replacement of an approximately 120-foot-long masonry culvert carrying an unnamed stream under Route 17A (Main Street) in Portland, Connecticut. The west end of the culvert has partially collapsed, causing settlement of the sidewalk adjacent to the roadway. The State Historic Preservation Office (SHPO) reviewed the project and determined that the Route 17A culvert possesses potential historic association with the Civilian Conservation Corps and/or the Work Programs Administration. The culvert is also unusual for its incorporation of locally quarried brownstone blocks and pegmatite minerals, both geological products that contributed to the economy of the Portland area. PAL assisted ConnDOT in fulfilling the CT SHPO's request for digital photographs of the culvert, a professional assessment of its history and construction, and preparation of this article for the SIA New England Chapters Newsletter.

Description

Location and Setting

The culvert is located in western Portland, CT, on Main Street (Connecticut State Route 17A), approximately 1.1 miles northeast of the Route 17-66 intersection in downtown Middletown. It is located approximately 1/10th of a mile northeast of the Main Street/William Street intersection, in a residential area of well-preserved eighteenth-century to mid-twentieth century homes. The streetscape is distinctive, with wide grass verges on the west side of Main Street separating the curb from the paved pedestrian sidewalks, with houses set back from the sidewalks. Notable historic residences are located on all sides of the culvert, and include, clockwise from the northeast quadrant, 503 Main Street, a ca. 1930s Dutch Colonial Revival style dwelling; 497 Main Street, the 1753 Moses Wilcox House; 496 Main Street, the ca. 1812 Augustin Overton House; and, 506 Main Street, a large Queen Anne residence. 492 Main Street, the c.

1715 Nathaniel White House is located immediately south of 496, and belongs to the Portland Historical Society.

Structure

Although only the first few feet of the culvert interior are visible at either end, the entire length of the structure appears to be a rectangular tunnel, approximately 2 to 2-1/2 feet wide, and approximately 3 feet high, and constructed of massive split stone slabs laid across two parallel vertical walls of smaller split rectangular stones, with a floor lined with similar small stone blocks.

The east end of the culvert is located approximately 50 feet east of the east edge of Main Street, and is hidden in the landscaped garden of a private residence. The stream in this garden has been channeled between stone walls and flows west over a series of man-made cascades until reaching the culvert. The mouth of the culvert is unconventional, consisting of a rectangular, stone-lined opening in the ground, with the water falling vertically into a chamber rather than simply flowing into an opening in a vertical wall. The chamber measures approximately 2-1/2 ft north-south, approximately 3 feet wide east-west and approximately 3 feet deep. The north, east, and south side walls are constructed of split tabular Portland "brownstone" sandstone blocks, and the floor of the chamber is lined with similar stones. The single visible stone forming the roof is a flat split slab of grey metamorphic schist. The water flows west from the chamber into the stone-lined rectangular tunnel.

The west end of the culvert is located approximately 20 feet west of the west edge of Main Street, at the west edge of the asphalt-paved sidewalk. The west end of the culvert is a more conventional structure consisting of a sidewalk parapet atop a vertical stone block headwall (Figures 1 and 2). The stream exits at the north end of the west face of the headwall and runs downhill to the west in a wooded gully between two residential yards. The headwall below the parapet extends beyond its ends approximately two feet to the north and approximately 10 feet to the south. The headwall is approximately 5 feet high on the south side at its

Figure 2

Figure 3

highest point above the steam bed. It is constructed of roughly 18 inch long, 5 inch thick, horizontally-laid random ashlar tabular split blocks of Portland brownstone, a few of which exhibit stone cutters facing patterns on their outer faces. The wall appears to have originally been dry-laid, and the irregular joints have been more recently crudely mortared. The top course of the wall below the concrete parapet is made of longer, thicker brownstone slabs approximately 6 to 8 inches thick. Some exhibit quarrying marks, and the largest one, over the culvert mouth, is 6 feet, 6 inches long and includes two, 2-inch-diameter quarry drill marks, 2 feet-10 inches apart on center. The side walls of the rectangular culvert tunnel are constructed of mortared brownstone blocks. The west end of the culvert structure is in deteriorated condition due to erosion scour and undermining. The north corner and a section of adjacent interior wall have detached and slid to the east into the mouth of the tunnel, and several of the heavy roof slabs have slid off the top of the north tunnel wall and dropped into the culvert (Figure 3).

The concrete parapet is 19-1/2 feet long, 1-1/2 feet thick, and rises 3-1/2 feet above the top of the stone block headwall. It is smooth on the west side, and has an articulated surface on the east side facing Main Street. The east side consists of a 1-foot-high concrete base and a 3-inch-high concrete cap with a 1 foot-4 inch high panel between them. The panel is studded with roughly football-sized pieces of bright white Portland District quartz-feldspar-mica pegmatite mine waste rock (Figures 4 and 5).

The Route 17A culvert is in poor condition. The west end of the culvert is in a deteriorated condition due to erosion and scour that has undermined the structure. The once dry-laid walls have been recently mortared. Despite these condition problems, the structure retains its original integrity of materials and design, especially in its character-defining concrete parapet.

History

Portland, Connecticut

Portland was originally part of the early towns of Middletown and East Hampton. It was set off from these towns in 1714 as East Middletown, incorporated as Chatham in 1767, again as Conway in 1841, and renamed Portland shortly thereafter.

From the early days, the history of Portland was tied to the brownstone cliffs that front the eastern bank of the Connecticut River. Eighteenth-century inhabitants used the loose rock and stone at the base of the cliffs for foundations, walls, and grave stones. The first person to settle the area was an English stonecutter named James Stancliff who started to quarry the stone for foundations and headstones. A second stone mason, Thomas Johnson, also started to work the brownstone. Town residents were allowed to obtain stone from the quarry for their own use as long as they paid a levy and hauled it away. Stancliff's and Johnson's businesses were inherited by their sons and as the carving of headstones became more elaborate and commercialized the two companies merged (Guinness 2002).

During the early history of the quarries, the owners/operators were involved in all aspects of working with the stone, including quarrying, cutting and dressing. In 1788 the quarries were purchased by Shaler and Hall who developed the first commercial operation. The new owners focused on stone quarrying, leading to the emergence of a merchant class for cutting and dressing. As demand for brownstone increased partnerships arose, merged, and split. By the 1880s, there were three major companies: Middlesex Quarry Company, Brainerd, and Shaler and Hall. The demand for brownstone required the expansion of the quarries to the point where the town cemetery was threatened and relocated, a large expense taken on by the quarry firms (Guinness 2002).

In 1884, the Connecticut Steam Brown Stone Company was established. The company, located on river frontage adjacent to the quarries, cut, dressed, and shaped the quarried products on site for commercial use. By the 1890s brownstone quarrying began to decline and Brainerd and Shaler and Hall merged. In 1906 they purchased the Middlesex Quarry Company. Full-time, active quarrying ceased in the 1920s and in 1936 a spring freshet from the Connecticut River flooded the

Figure 4

Figure 5

quarries. Efforts to pump out the quarries were abandoned after flooding from the New England Hurricane of 1938. Little quarrying was done until 1993 when the Portland Brownstone Quarries, Inc. was established to supply architectural restoration projects (Guinness 2002).

In 2000, the Portland Brownstone Quarries were designated a National Historic Landmark.

Works Progress Administration

The Works Progress Administration (W.P.A.) was established in May 1935 as a central organ of control for the relief projects supported by the United States Government. Taking over responsibility for the work relief programs of the Federal Emergency Relief Administration (F.E.R.A.), which went out of existence at the end of 1935, it became the major agency in efforts to provide work assistance for the unemployed during the later depression years. An independent agency at first, on July 1, 1939, the WPA became part of the new Federal Works Agency and its title was changed to Work Projects Administration. It was abolished on June 30, 1943, and finally liquidated a year later.

A key component of Roosevelt's New Deal was the Emergency Conservation Work (ECW) Act, more commonly known as the Civilian Conservation Corps (CCC). This program was the most popular experiment of the New Deal, engaging over three million young men. The Corps was divided into nine regions with Connecticut being in Region 1. In 1935 Camp Buck was established on Great Hill Road in the Meshomasic State Forest outside of Portland, Connecticut (Anonymous 2008b)

In Connecticut, Senator Matthew A. Daly was appointed State Administrator on June 8, 1935. Offices were opened in New Haven, with later district offices in several other cities. F.E.R.A. projects, workers and officials were quickly transferred to W.P.A. and additional new programs were developed rapidly; by November over 15,000 persons were on the rolls, and by the end of March 1936, 28,671 persons were at work on 963 different projects in Connecticut.

A review of the Town Annual Reports reveals that the federal assistance programs were very active in Portland. Many of the historic houses in Portland were recorded under a WPA program. Beginning in 1934, federal monies were expended in Portland through the C.W.A. and F.E.R.A programs for roadway and sidewalks, although there is no breakout of expenditures. In 1935 over $2,000 of F.E.R.A. money was spend on sidewalks on Main Street. In 1936 the W.P.A became the main federal program and at the end of 1937 the Annual Report states that over 4 miles of roadway, almost 5 miles of sidewalk, and a half mile of curb had been installed. Main Street had side walks from Silver Street north to Gildersleeve. The W.P.A program continued in Portland until June 30, 1941 when the overall economic condition of the country was such that the program was dissolved. The Town Annual Report also notes that there were no applications for CCC work.

Rte 17A Culvert

A review of ConnDOT and Town of Portland records failed to produce any documentary evidence regarding the culvert, save for a 1934 Right of Way map for Route 15 that depicts the structure (Connecticut State Highway Department 1934). The Portland Historical Society provided a series of email communications between the society's members from 2006 when the issue of replacing the culvert was first proposed. Based on the field review, the culvert predates the WPA-era concrete parapet. The construction of the culvert from assembled pieces of brownstone most likely dates to the mid to late 1800s. The massiveness of the structure, including the large tabular pieces that span the abutments suggests that the culvert was constructed so as to handle heavy loads. Evidence also exits to support an assumption that the material used to build the culvert was collected from waste piles. Isolated pieces show evidence of drilling and facial dressing.

It is most likely during the period of sidewalk construction during the 1930's that the concrete parapet was erected on top of the existing culvert that carries Main Street (Route 17A) over the unnamed stream. However, a 1920s photograph of the area showing the sidewalk and a series of wooden posts where the parapet is now located, suggests an earlier date for the sidewalks. A 1938 historic photograph depicts the parapet. Anecdotal evidence offered by the emails between Historical Society members suggests that the parapet was in fact a WPA project:

> "WPA project would put up walls like what's in place incorporating native stones from the old quarries. (WPA's goal was to give work to as many people as possible)…the culvert…was either the first or among the first jobs that the youth corps, established in Portland under the WPA during the early years of Roosevelt, built. That may account for the rough way the stones are laid, they were just practicing" (R. McDougall, Portland Historical Society 2006).

Construction Materials Geology

This culvert, although its type name suggests a humble structure, is significant for its functional and expressive use of local economic geological materials. Portland sits just west of the divide between the distinctive reddish sedimentary rocks of the Connecticut River Valley Lowland and the crystalline metamorphic rocks of the Central New England Upland to the east. At Portland, mining and quarrying operations within these two major New England rock units made important historic contributions to New England economic geology. The Portland "brownstone" quarries are well known as the primary source of the brown sedimentary stone that became a ubiquitous Victorian-era U.S. building material and contributed to the era's later characterization by American urban historian Lewis Mumford as the "Brown Decades." Less well known is the Portland Pegmatite District just to the east, a 14-mile long area including the Bolton Schist and Maronas Granite Gneiss and Monson Gneiss that was a major source of mica and feldspar, particularly during World War II. Pegmatites are coarse, whitish rocks characterized by large irregular masses of quartz and feldspar with large sheets of mica. The Portland pegmatite mines were also a notable source of semi-precious gems including beryl (Cameron et al. 1954:19-22).

Like most building stone quarries, the Portland brownstone quarries generated large quantities of waste rock, disposal of which typically became a nuisance. In quarry towns, waste rock was typically marketed locally at a discount and was extensively incorporated in building foundations, retaining walls, etc. The tabular shape, consistent size, and quarrying and dressing marks exhibited by the brownstone blocks in the culvert walls, roof, floor, and west headwall all suggest that it was built out of "recycled" brownstone cutting waste. The schist roof slabs are undoubtedly local schist, which like the sandstone, cleaves in a tabular fashion. More unusual is the use of small pegmatite mining waste quartz-feldspar boulders in the Main Street face of the parapet wall. This stone was apparently chosen to provide some simple variation to the wall, giving it a rough, but distinctive decorative appearance. It is not clear where the pegmatite rock in the culvert came from. The two nearest pegmatite operations, the Hale-Walker prospect and the large Strickland-Kramer Mines, were located approximately two miles northeast of the culvert. A sister structure located just north on Route 17A also includes pegmatite stones in its face, as well as several spikes of the rock cast into the top of the parapet (Cameron et al. 1954:324, 333).

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NATIONAL TRUST FOR HISTORIC PRESERVATION
Names Memorial Bridge, Portsmouth, New Hampshire to Kittery, Maine, to Its 2009 List of America's 11 Most Endangered Historic Places®

Washington, D.C. (April 28, 2009) – Today, the National Trust for Historic Preservation named Memorial Bridge, linking Portsmouth, New Hampshire, and Kittery, Maine, to its 2009 list of America's 11 Most Endangered Historic Places®. This annual list highlights important examples of the nation's architectural, cultural and natural heritage that are at risk of destruction or irreparable damage.

For more than 85 years, Memorial Bridge, the first major "vertical lift" bridge in the eastern US, has been a sturdy and dramatic landmark, spanning the Piscataqua River and connecting the historic coastal towns of Portsmouth, New Hampshire, and Kittery, Maine. At its 1923 dedication as the official state memorial to World War I servicemen, the bridge had the longest lift span in the country (297 feet), making it the prototype for later metal truss bridges. Unlike a drawbridge, which swings open and upward like a gate, a vertical-lift bridge hoists a single section straight up, allowing boats to pass underneath. For generations, the bridge has carried automobiles along coastal Route 1, and its wood-floored walkways still provide the only pedestrian and cycling link between two communities steeped in history. In 2007, the states of Maine and New Hampshire agreed that Memorial Bridge should be fully rehabilitated. When estimates came back $15 million over budget, the two states disagreed on how to pay for proposed repairs and are now studying their options, including destruction and replacement of Memorial Bridge, a solution that could be far more costly.

"An engineering marvel and a landmark of transportation history, Memorial Bridge, the oldest operational lift bridge in the eastern United States, represents a key link in the great Eastern coastal route," said Richard Moe, president of the National Trust for Historic Preservation. "Because federal and state-funded infrastructure projects across the nation have been identified as a priority by the Obama administration, we now have an opportunity to reshape bridge preservation practices in the United States. Memorial Bridge is the poster child for all we stand to lose by erasing these cultural and engineering landmarks."

With its dramatic 200-foot twin towers, Memorial Bridge is one of three highway bridges spanning the Piscataqua River between New Hampshire and Maine. The bridge plays a critical role in the local economy linking historic downtown Portsmouth and the recently revitalized Kittery Foreside neighborhood.

Our nation's historic bridges are being destroyed at the alarming rate of one every two or three days. Lack of maintenance and a knee-jerk preference for replacement often counters the directive of Congress that historic bridges be preserved whenever possible. Bridges that cross state lines are especially vulnerable.

Although owned jointly by both states, Memorial Bridge is operated by New Hampshire, which placed the bridge at the top of the state Department of Transportation's "Red List," of bridges needing repair. At a public meeting in Portsmouth in November, 2008, New Hampshire officials revealed that two bids had been submitted for bridge rehabilitation, both substantially higher than pre-bid estimates. The Maine Department of Transportation was unwilling to proceed with the rehabilitation at the higher price.

A broad coalition of seacoast area preservation, business, green, and veterans' organizations supports the recent proposal by NH DOT that both states seek competitive infrastructure stimulus funds to completely rehabilitate the Memorial Bridge. Maine DOT, however, has not yet concurred.

The 2009 list of America's 11 Most Endangered Historic Places was made possible, in part, by a grant from HistoryTM. Local preservation groups across the nation submitted nominations for this year's list; the nomination for Memorial Bridge was submitted by the Portsmouth Historical Society.

The public is invited to learn more about what they can do to support these and hundreds of other endangered sites, experience first-hand accounts of these places, and share stories and photos of their own at www.PreservationNation.org/11Most.

To download high resolution images of this year's 11 Most Endangered Historic Places, visit http://press.nationaltrust.org/

The 2009 list of America's 11 Most Endangered Historic Places (in alphabetical order):

Ames Shovel Shops, Easton, Mass.— In southeastern Massachusetts, the Ames Shovel Shops complex, an intact 19th-century industrial village that resembles a picture-perfect New England college campus, is threatened by a plan to demolish several of the site's historic buildings and radically alter others to pave the way for new mixed-use development.

Cast-Iron Architecture of Galveston, Texas— The assemblage of late-19th-century Greek Revival and Italianate buildings with elaborate cast-iron storefronts in Galveston's 12-block Strand/Mechanic National Historic Landmark District is one of the largest collections of historic commercial buildings in the country. Unfortunately, the widespread flooding caused by Hurricane Ike in September 2008 caused extensive damage, leaving the district fighting to survive.

Century Plaza Hotel, Los Angeles, Calif.— Opened in 1966, the 19-story curved hotel, designed by renowned architect Minoru Yamasaki, who would later design New York's World Trade Center twin towers, has been a prominent Los Angeles landmark for more than four decades. Despite a $36 million facelift just over a year ago, the hotel's new owners now intend to raze the building and replace it with two 600-foot, "environmentally sensitive" towers.

Dorchester Academy, Midway, Ga.— Founded in 1868 as a school for freed slaves, Dorchester Academy started humbly in a one-room schoolhouse and later gained prominence as a center for voter registration drives during the civil rights movement. The academy's last remaining building, a handsome 1934 Greek Revival dormitory, is deteriorating and structurally compromised.

Human Services Center, Yankton, S.D.— Founded in 1879 as the South Dakota Hospital for the Insane and once regarded as a model institution of its kind, this campus comprises a collection of neoclassical, Art Deco and Italianate buildings that have stood vacant for years. Despite the site's potential for innovative reuse and appropriate redevelopment, the State is moving forward with plans to demolish 11 historic buildings on the Yankton campus.

Lâna'i City, Hawai'i— One of Hawaii's eight main islands, Lâna'i, known as the "Pineapple Isle," has lush tropical beaches, breathtaking natural beauty, lavish resorts and one attraction none of the other islands can claim: an intact plantation town. Lâna'i City, built by pineapple baron James Dole in the 1920s, features plantation-style homes, a laundromat, jail, courthouse and police station, and is now threatened by a large-scale commercial development calling for the destruction or significant alteration of 15-20 historic buildings.

The Manhattan Project's Enola Gay Hangar, Wendover Airfield, Utah— The hangar that housed the Enola Gay, the B-29 Superfortress that dropped the world's first atomic bomb on Hiroshima, Japan, on August 6, 1945, is, along with other Manhattan Project sites, in a critical state of disrepair.

Memorial Bridge, Portsmouth, N.H. to Kittery, Maine— For more than 85 years, Memorial Bridge, the first major lift bridge in the eastern US, has been a sturdy and dramatic landmark, spanning the Piscataqua River and connecting two coastal towns steeped in history. But like so many others in the nation, the bridge has suffered from tight budgets and postponed maintenance. The states of Maine and New Hampshire have not yet agreed on a plan to save Memorial Bridge and are now considering their options, including its removal – a move that would be costly and in direct opposition to the desires of local residents in two communities.

Miami Marine Stadium, Virginia Key, Fla.— Completed in 1963, Miami Marine Stadium is both a South Florida landmark and an icon of modern design. Built entirely of poured concrete and featuring a dramatically cantilevered folded-plate roof, the stadium is a sentimental favorite of many Miami residents. After sustaining damage during Hurricane Andrew in 1992, the stadium, a prime target for developers, closed and has since suffered from years of deterioration, vandalism and neglect.

Mount Taylor, near Grants, N.M.— Located in the southwestern corner of New Mexico's San Mateo Mountains, midway between Albuquerque and Gallup, Mount Taylor, with an elevation of nearly 12,000 feet, is startlingly beautiful and a sacred place for as many as 30 Native American tribes. Currently, the mountain is under threat from exploration and proposals for uranium mining, which, if allowed to proceed, would have a devastating impact on this cherished historic place.

Unity Temple, Oak Park, Ill.— Frank Lloyd Wright's Unity Temple, designed for a Unitarian congregation in Oak Park, is widely acknowledged as a masterpiece of 20th-century architecture. Completed in 1908, the cubist, flat-roofed structure is also one of the earliest public buildings to feature exposed concrete, one of Wright's signature design elements. Years of water infiltration have compromised the structure, prompting a multi-million-dollar rescue effort that the current congregation cannot afford.

America's 11 Most Endangered Historic Places has identified more than 200 threatened one-of-a-kind historic treasures since 1988. Whether these sites are urban districts or rural landscapes, Native American landmarks or 20th-century sports arenas, entire communities or single buildings, the list spotlights historic places across America that are threatened by neglect, insufficient funds, inappropriate development or insensitive public policy. The designation has been a powerful tool for raising awareness and rallying resources to save endangered sites from every region of the country. At times, that attention has garnered public support to quickly rescue a treasured landmark; while in other instances, it has been the impetus of a long battle to save an important piece of our history. Learn more at www.PreservationNation.org/11Most.

The National Trust for Historic Preservation (www.PreservationNation.org) is a non-profit membership organization bringing people together to protect, enhance and enjoy the places that matter to them. By saving the places where great moments from history – and the important moments of everyday life – took place, the National Trust for Historic Preservation helps revitalize neighborhoods and communities, spark economic development and promote environmental sustainability. With headquarters in Washington, DC, nine regional and field offices, 29 historic sites, and partner organizations in all 50 states, the National Trust for Historic Preservation provides leadership, education, advocacy and resources to a national network of people, organizations and local communities committed to saving places, connecting us to our history and collectively shaping the future of America's stories.

BOOK REVIEW

The Coming of the Train: The Hoosac Tunnel & Wilmington and Deerfield River Railroads and The Industries They Served,
Volume I, 1870 to 1910;
© 2008 by Brian A. Donelson

384 pages, illus & maps, index, glossary of terms, bibliography
8 by 10-inches, 80-lb, glossy paper
ISBN 987-0-0920099-0-1, NJD Publishing, 43 Potter Road, Rowe, MA 01367
$49.95 plus $5 S&H per order
or call (914) 967-7541, 11 AM - 10 PM, for free shipping

The title is somewhat misleading. Yes, it's about a little-known, short-line railroad, The Hoosac Tunnel & Wilmington Railroad (HT&W RR) that ran 24 miles between Hoosac Tunnel, Mass., and Wilmington, Vt., along the winding Deerfield River. But it's much more than that. It's also about all the villages and communities along the way between the Hoosac Tunnel and Wilmington, and beyond to Searsburg and Somerset. It's about how the coming of the railroad impacted these villages, what industries were there before the railroad reached them, and what others developed as the result of the railroad. It's all about people, dreams, and industry.

The original, narrow 3-foot gauge railroad was built through some of the most beautiful and difficult terrain in New England. It survived floods, landslides, wrecks, bankruptcy, track relocations, poor management, old equipment, and a shortage of customers for 86 years.

The book opens with the construction of the Hoosac Tunnel in a description of the Deerfield River Valley in the 1870s, introducing the businessmen and industrialists who made the significant changes to the upper Deerfield. Chapters trace the construction of the HT&W from Hoosac Tunnel to Monroe, Bridge, thence to Readsboro, Wilmington, and finally "Off to the Woods," as Chapter XIII is titled - the Deerfield River RR connection to Somerset and points north.

The book is profusely illustrated with many 19th-century annotated maps, hundreds of archival photos of every industry along the way, including logging, mining, tunnels, dams, mills of every description, bridges, hotels, lime kilns, railroad accidents, freight and railroad depots, plus all manner of correspondence, receipts, stock certificates, and railroad schedules: 349 photos, 35 sketches, 45 maps, including plot plans for the industries at Readsboro and Mountain Mills and track plans for the HT& W. Most are original and never before published. There also are 44 reference tables and scanned documents, a glossary, Appendix, and index of maps, tables, and text with over 700 entries. If anything is missing I'd have to say a chronology of events, due to the complex nature of keeping track (no pun intended) of dates and events at the various places along the way. A lot of work and expense went into The Coming of the Train and the result shows it.

Volume one covers the period 1870 to 1910; volume two will resume the story from 1910, presumably to 1954, when the railroad was discontinued. "I think it's important for people to have a feeling how the community they live in came to be the way it is," Donelson said. "Hard-working people built these towns and made it possible for us to live here today. I don't think people give enough credit to those who came before us." Well said!

The book is 8 by 10 inches by 1 inch thick. Text appears to be 12-point Swiss, short paragraphs, full justification with very little hyphenation, so it's an easy, uncomplicated, interesting, and highly instructional read. And it's a great IA guide book for the field also, come this summer. The illustrations and maps alone make this a 'book-to-have.' See also a review by Mike Eldred, editor of The Deerfield Valley News, Vol. 18 Issue 48, Nov 26 - Dec 3, 2008 at www.dvalnews.com/features.php?features/features2.html.

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MEMBERSHIP INFORMATION

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