Summary Context Statement for NHL Lighthouse Nominations

The lighthouse and lightship appeal to the interests and better instinct of man because they are symbolic of never-ceasing watchfulness, of steadfast endurance in every exposure, of widespread helpfulness. The building and the keeping of the lights is a picturesque and humanitarian work of the nation.[1]

George Putnam, Commissioner of Lighthouses, 1910-1935

History of the Lighthouse Service

The U.S. Lighthouse Establishment was created by the First Congress in 1789 to manage the 12 colonial lighthouses now controlled by the federal government and to oversee construction of new lighthouses. Sandy Hook Lighthouse (designated an NHL in 1964), built in New Jersey in 1764, is the only colonial lighthouse that has survived (Boston Harbor Lighthouse (designated an NHL in 1964), built in 1716, was rebuilt in 1783-1784). Colonial lighthouses were usually constructed of wood or rubble stone. Between 1789 and 1820 about 40 new lighthouses were built by the Lighthouse Establishment, many using brick and cut stone. Of these, only a few have survived, including Portland Head Lighthouse, Maine, built in 1790 and Cape Henry Lighthouse (designated an NHL in 1964), Virginia, built in 1792. From 1820 until 1852, Steven Pleasonton, Fifth Auditor of the Treasury, was responsible for lighthouse construction and repairs. Though Pleasonton routinely returned unspent funds to the Treasury, during his tenure approximately 300 lighthouses were built.

On August 31, 1852, the U.S. Lighthouse Establishment became the U.S. Lighthouse Board, largely as the result of numerous complaints about the state of the U.S. lighthouse system. The nine-member board was composed primarily of Naval and Army engineer officers. The country was divided into 12 new lighthouse districts, each with an inspector responsible for overall construction, maintenance, and purchasing. Over the next five decades several advances in lighthouse construction technology took place, including the development of cast-iron plate lighthouses, exposed screwpile lighthouses, skeleton tower lighthouses, wave-swept interlocking stone lighthouses, iron caisson lighthouses, and breakwater lighthouses.

Included with the legislation creating the U.S. Lighthouse Board were instructions to install a Fresnel lens in each lighthouse to replace the less-effective lamp and reflector systems. The Fresnel lens, developed by Augustin Fresnel, a French physicist, consists of a collection of glass prisms held together in a beehive shape by a brass frame. The light rays are bent by the prisms into one horizontal sheet of light which in a fixed lens shows a steady light and in a revolving lens, produces a flash or characteristic. These lenses were produced in seven standard orders or sizes, numbered one through six. Orders one through three were used in larger coastal lights, while four through six were

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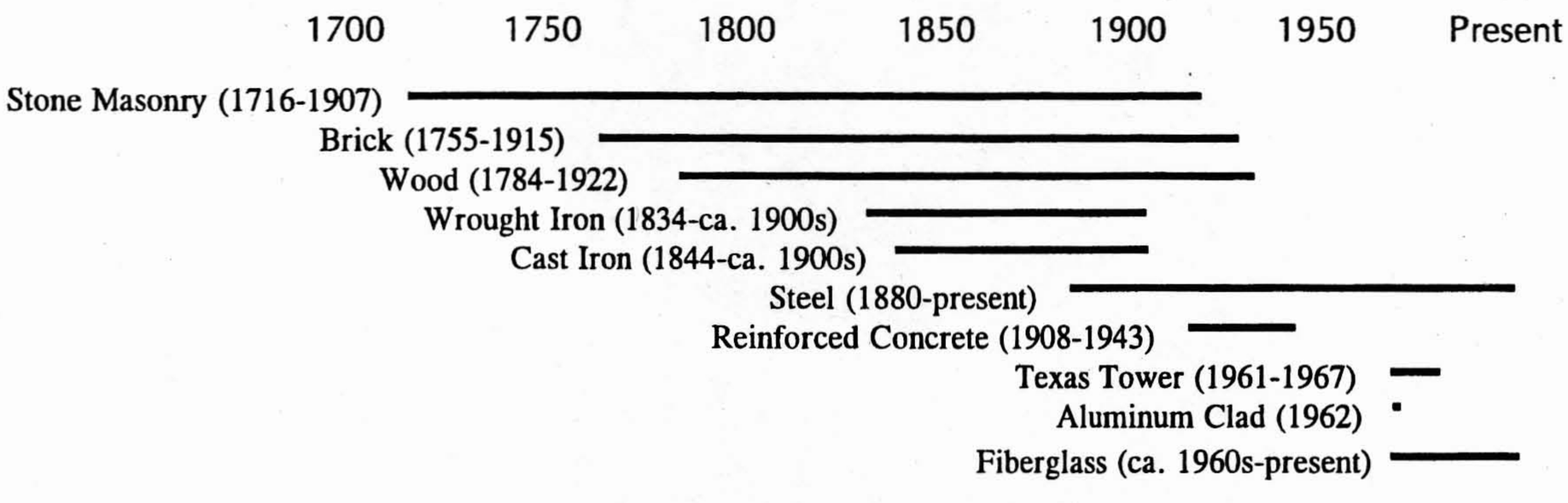
[1]Dennis Noble, *Lighthouses & Keepers: The U.S. Lighthouse Service and Its Legacy* (Annapolis: Naval Institute Press, 1997), p. xi.

used in harbor or bay lights. Later a three-and-a half order lens was developed, which were used most often on the Gulf coast and the Great Lakes. Installation of these new lenses required that many of the existing towers be modified or heightened to accommodate the new optic.

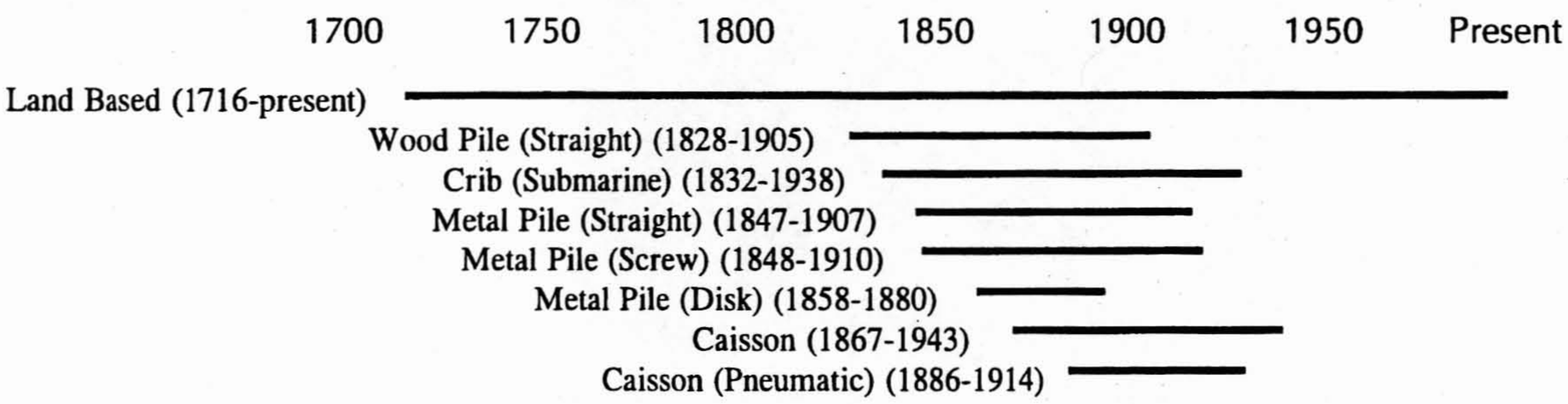
The Lighthouse Board was transferred to the Department of Commerce and Labor on July 1, 1903. On June 17, 1910, the Lighthouse Board became the Bureau of Lighthouses. Just before this transition, reinforced concrete lighthouse towers came into use, particularly along the west coast where earthquakes were common. In 1939 the Bureau was abolished and its functions transferred to the U.S. Coast Guard where the responsibility remains today.

Every Coast Guard-owned lighthouse in the United States is now automated and unmanned, with the sole exception of Boston Lighthouse.[2] With modern automated beacons, the Coast Guard has found it more cost effective to construct and maintain an aid to navigation on a steel structure or buoy, rather than inside the lantern of a traditional lighthouse tower. Thus, in many locations, the traditional lighthouse tower has been found to have little value to the U.S. Coast Guard mission, other than to provide a visual aid to mariners during daylight and good weather. In many cases, outside groups have taken an interest in maintaining and preserving the lighthouses which, because of limited resources, the Coast Guard is unable to

Tower Construction Types—Period of Construction



Tower Foundation Types—Period of Construction



NMI photo

Gurnet Point Lighthouse, believed to be the earliest surviving wooden tower, Plymouth, Massachusetts.

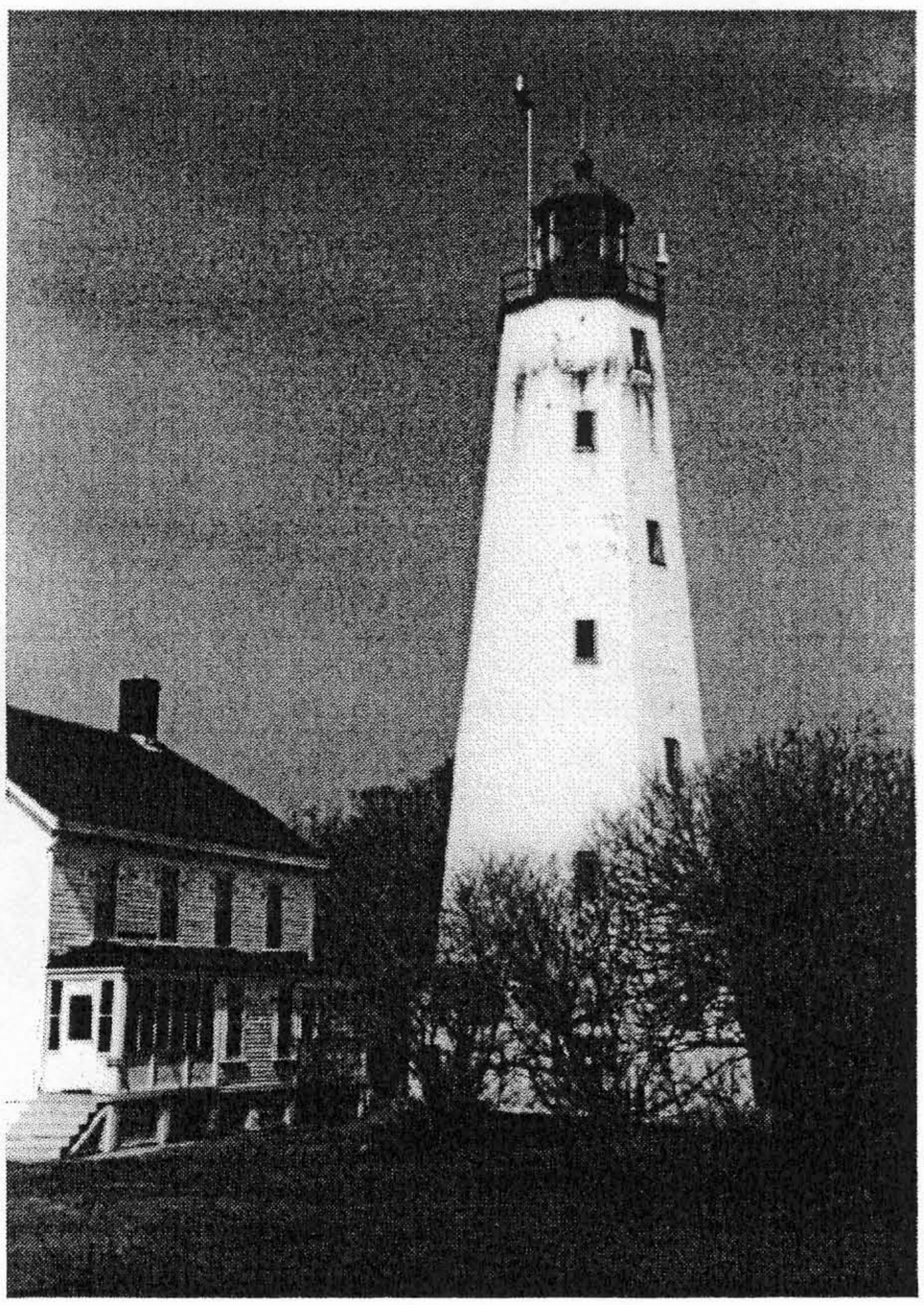
devote the amount of care required to keep up the structures.

Although many towers continue to serve as active aids to navigation, they also serve as museums; national, state, and local parks; inns; research and educational facilities; wildlife preserves; and private residences. Of the approximately 640 surviving towers, approximately 255 are known to be accessible to the public, including 34 in the national park system.

Lighthouse Construction Types

Most lighthouses can be categorized by construction method, shape, building material, or foundation types. A lighthouse can also be classified as terrestrial or aquatic, i.e., onshore or offshore. The majority of today's 640 lighthouses are land based; close to a fourth have foundations built in the water. Lighthouses were built on land, in the water, on islands, on top of ledges and cliffs, on breakwaters and piers, on caissons, and at least five are on fort walls. Some light towers are stand-alone structures, while others are attached or integral to the keeper's quarters or fog signal building. In addition to a light tower, a land-based light station could consist of a keeper's quarters, oil house, fog signal building, workshop, cisterns, privy, landing wharf, boathouse and ways, barn, roads, walks, and fences.

The major construction types for historic lighthouses described below are wooden, masonry, wave-swept, concrete, cast-iron



NMI photo

Sandy Hook Lighthouse, New Jersey, masonry tower and designated NHL.

[2]On the NHL nomination form for lighthouses, we are generally using the year of the station's automation to indicate the end of the period of significance. After automation and dismissal of the keeper, the character of the station changed dramatically.

plate, skeletal, straightpile, screwpile, crib, caisson, and Texas tower. Politics, need, cost, location, and geography of the site, as well as technology available at the time of construction influenced lighthouse designs. Before the mid-19th century, lighthouse construction technology required solid rock or other stable foundation soils; onshore towers sometimes proved inadequate to warn ships off a shoal located offshore. In some locations a lighted buoy or a lightship solved this problem. Riverine and estuarine environments, however, often had unstable muddy and/or sandy bottoms which could not support the heavy masonry towers then in vogue. In areas such as the Chesapeake Bay, Delaware Bay, the Gulf of Mexico, the Mississippi River delta, and the coral reefs of the Florida Keys, the development of newer technology using screwpile,

NMI photo

Cape Henry Light Station, second tower, cast-iron construction, Fort Story, Virginia.

caisson, and skeletal tower lighthouse construction was essential to adequately lighting the marine hazards.

Wooden tower: Most early wooden towers have burned and/or been replaced, however at least 71 wooden towers are still in existence. Prospect Harbor Lighthouse (1891) in Maine is a good example of a stand-alone, conical wooden light tower. Plymouth (Gurnet Point) Lighthouse (1843) in Massachusetts is the earliest surviving wooden tower.

Masonry tower: Masonry towers were constructed of rubblestone, cut stone (dressed stone), brick, or concrete. Masonry is the most popular lighthouse construction material with at least 203 surviving towers constructed of brick and another 123 of stone. The oldest standing masonry light tower in the United States is the 85-foot tall Sandy Hook Lighthouse (1764) in New Jersey built of cut stone. Towers over 150 feet in height are referred to as tall towers. The 208-foot brick Cape Hatteras Lighthouse (1870) in North Carolina is the tallest lighthouse in the United States.

Wave-swept tower: Wave-swept lighthouses were built on low rocks or submarine ledges and constructed of interlocking stones to withstand the fury and power of waves in heavy seas. One of the first wave-swept towers built in the United States was the 114-foot Minot's Ledge Lighthouse (1860) offshore in Massachusetts which replaced a pile-type lighthouse that was destroyed by a storm. It was considered the "most important engineering work" constructed by the Lighthouse Board at the time.

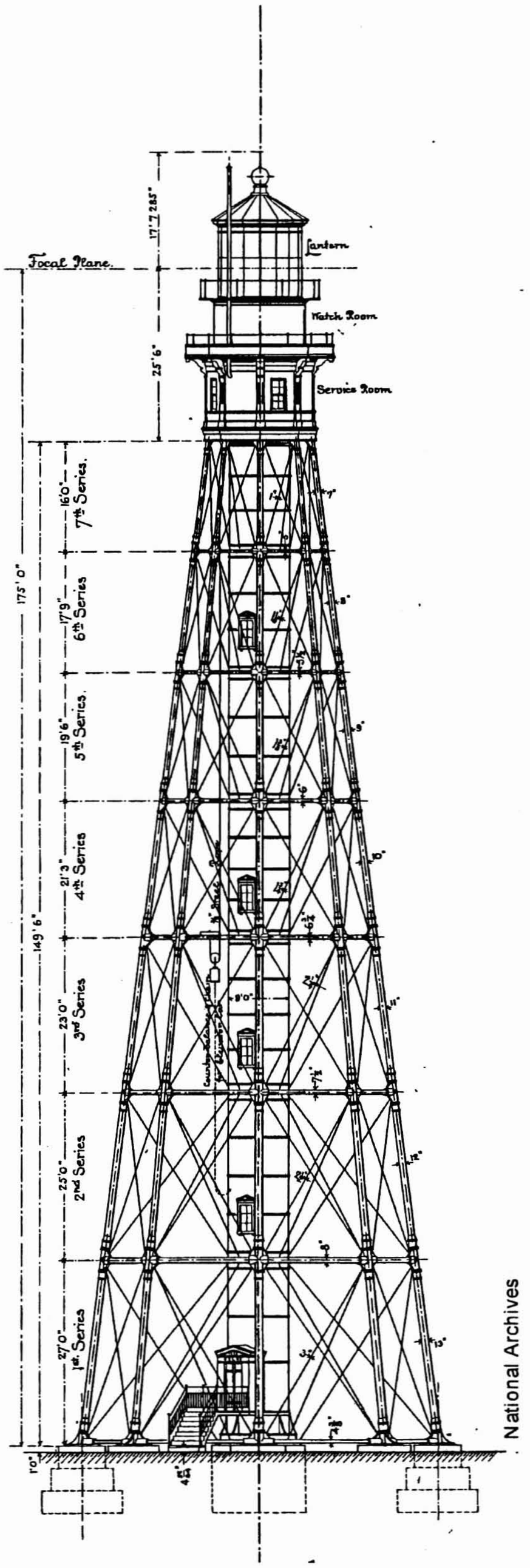
Cast-iron-plate tower: Cast iron was lighter than stone or brick, relatively inexpensive, strong, water-tight, and had a slow rate of deterioration. The second

Cape Henry Lighthouse (1881) in Virginia is the tallest cast-iron-plate tower in the United States at 163 feet. Steel and wrought-iron plate was also sometimes used. This construction type can be dismantled and moved; examples of cast-iron towers which have been relocated include Cape Canaveral Lighthouse, Florida, and Hunting Island Lighthouse, South Carolina.

Skeletal tower: Onshore skeletal towers were built of metal and were typically constructed on concrete foundations. Offshore skeletal towers were also built of metal and typically constructed with straight or screwpile foundations (discussed below). Manitou Island Lighthouse (1861) and Whitefish Point Lighthouse (1861) in Michigan, both built from the same plan, were the earliest onshore skeletal towers built in the United States. Like the cast-iron-plate tower, skeletal towers could also be dismantled and moved. There are at least 130 existing iron lighthouse towers of both the cast-iron plate and skeletal variety with another 56 built of steel.

Straightpile: The pile foundation lighthouse utilized the principal of least resistance. Waves would pass through rather than crash against the foundation. This design of lighthouse structure was used offshore, even in wave-swept locations. The earliest surviving straightpile tubular skeletal tower lighthouse is Sombrero Key Lighthouse (1858) in Florida.

Screwpile: To increase the holding power of the pile, a screw-like flange was fastened to the bottom of the pile and wound like a screw into the substrate. There are two principal screwpile type lighthouses, 1) low spider-like foundations for rivers, bays, and sounds, and 2) tall



Construction drawing for Cape Charles Lighthouse, Virginia, an onshore skeletal tower.

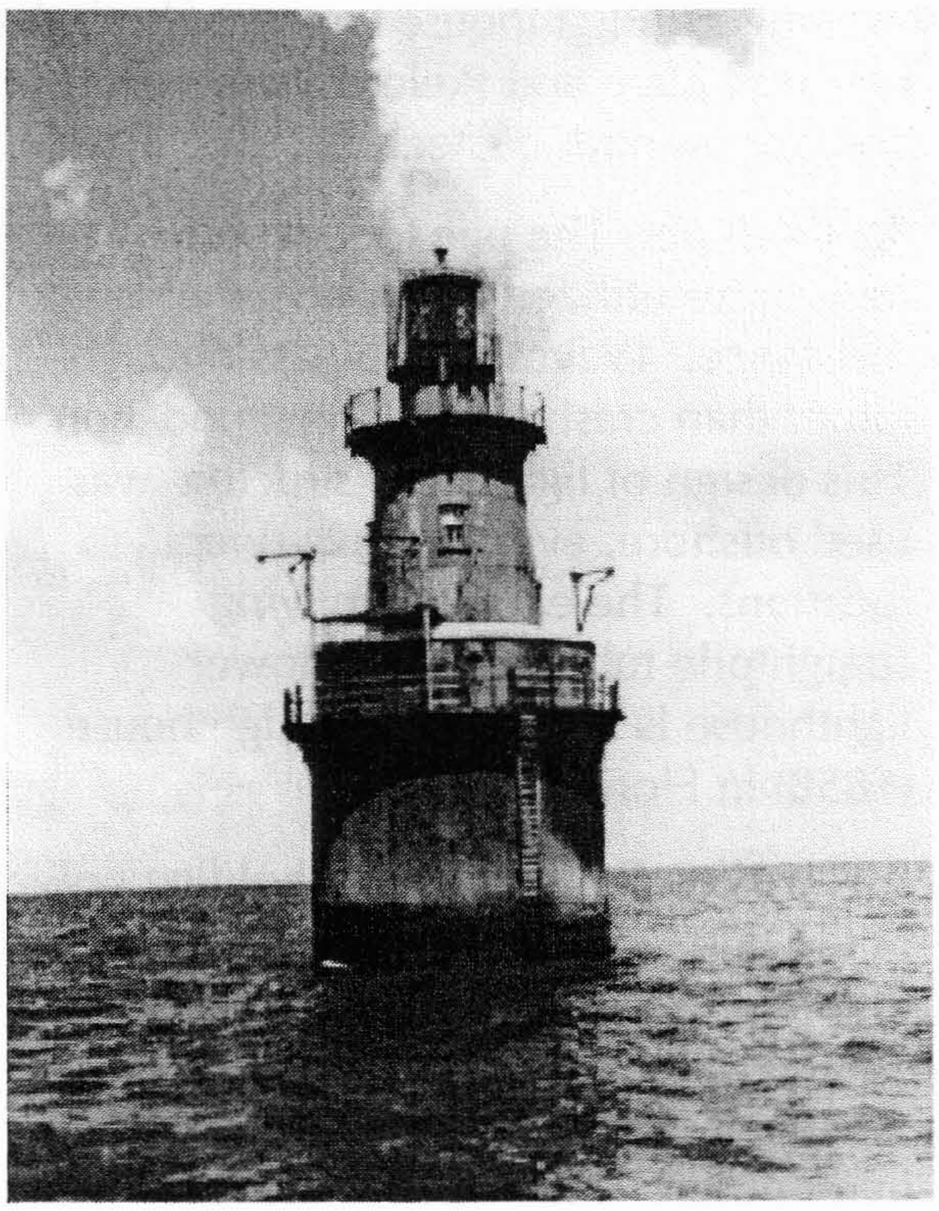
National Archives photo

Thomas Point Shoals Lighthouse with screwpile foundation located in Maryland's Chesapeake Bay; shown here in 1885.

offshore coastal towers. Perhaps as many as 100 spider-like screwpile lighthouses were built throughout the Carolina sounds, the Chesapeake Bay, Delaware Bay, along the Gulf of Mexico, and one even at Maumee Bay (1855) on Lake Erie in Ohio. Thomas Point Shoals Lighthouse (1875) in Maryland is the oldest extant, unmoved, spider-like screwpile lighthouse in the United States. The first of the tall skeletal screwpile coastal towers built in the United States was Carysfort Reef Lighthouse (1852), Florida, which still stands. At least 24 lighthouse towers with pile foundations are known to survive.

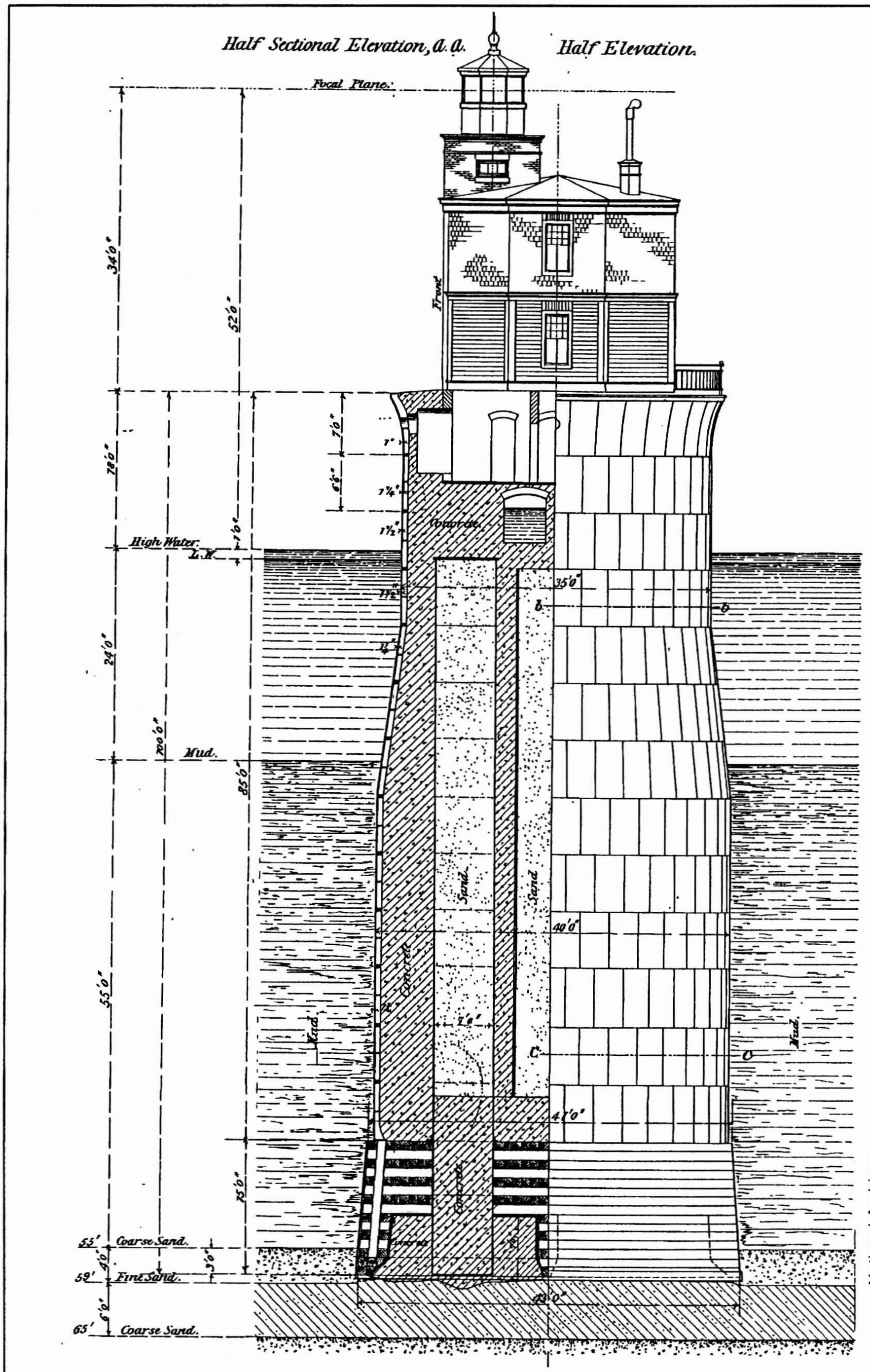
Crib: Wooden cribs, constructed onshore, towed to the site, and then filled with stone to sink them in place were a lighthouse foundation type used extensively in the Great Lakes, usually to replace lightships. Once settled and leveled, the cribs were capped with concrete or some other masonry upon which the lighthouse structure was constructed. Perhaps the two most significant crib foundation lighthouses are the 93-foot Spectacle Reef Lighthouse (1874) on Lake Huron in Michigan, located 10½ miles from the closest land; and the 110-foot Stannard Rock Lighthouse (1882) on Lake Superior in Michigan, located 23 miles from the nearest land. Crib foundations were best suited for hard rock bottoms typically found in the Great Lakes. Thirty-eight lighthouses with crib foundations are known to survive.

Caisson: Caisson foundations were best suited for unconsolidated bottoms composed of sand or mud. The caisson lighthouse type used a large cast-iron cylinder, which was sunk on the bottom and filled with rock and concrete to form a foundation. The caisson foundation was sturdier and better able to withstand heavy stress than the pile foundation lighthouses, so it is not surprising that



USCG photo

Sabine Bank Lighthouse with caisson foundation, located offshore in Texas.



Construction drawing detailing the caisson foundation for Baltimore Lighthouse in Maryland's Chesapeake Bay.

National Archives

caisson lighthouses were built in areas where moving ice was a hazard. The Craighill Channel Lower Front Range Lighthouse (1873) in Maryland, is an early surviving example. Where bottoms were harder, contained rocks, and/or needed greater depth of penetration into the substrate, the pneumatic process was used. The substrate within the caisson was removed and the caisson allowed to sink further into the bottom. Eleven pneumatic caisson lighthouses were built in the United States. The Sabine Bank Lighthouse (1905) in Texas is the most exposed, located 15 miles offshore in the Gulf of Mexico—the only successful caisson south of the Chesapeake Bay. Fifty-nine lighthouses exist today with caisson foundations.

Concrete tower: Concrete towers began to replace brick masonry towers at the beginning of the 20th century; a tower of reinforced concrete was first used in the United States at the 115-foot-tall Point Arena Lighthouse (1908) in California. At least 46 concrete towers exist today.

Texas Tower Type: A relatively recent technological development in lighthouse construction was the Texas tower lighthouse type which replaced exposed lightships offshore. These so-called Texas towers were adaptations modeled on the offshore oil drilling platforms first employed off the Texas coast. The first Texas tower lighthouse type in the United States was the Buzzards Bay Light, located in Buzzards Bay, Massachusetts, and commissioned on November 1, 1961. It has been extinguished and may be dismantled. A total of six Texas tower lighthouses have been constructed.

Makapuu Lighthouse, Hawaii, example of concrete construction.

Lighthouses Previously Designated as NHLs:

- Boston Harbor Light, Massachusetts (designated 1964)
- Cape Henry Light (first tower), Virginia (designated 1964)
- Sandy Hook Light, New Jersey (designated 1964)
- Block Island Southeast Light, Rhode Island (designated 1997)

Current Submissions

Representatives of all the constructions types discussed above will be considered as possible NHL candidates. For the 1998 cycle, we are submitting four nominations for brick lighthouses. When the first Cape Hatteras Lighthouse was heightened to 150 feet in 1854, it was the first of the "tall towers" (150 feet or more in height). That tower was replaced in 1870 with a 208-foot brick tower which is the nation's tallest tower of any construction type. The nation's second tallest brick tower is the 175-foot Ponce de Leon Inlet Lighthouse built in 1887. Ponce de Leon is also one of the nation's best preserved complete light stations, retaining not only its tower, but all three of its keepers dwellings, oil house, and combination woodshed/privies. The Key West Light Station, while not a tall tower, demonstrates the transition between a relatively short brick harbor lighthouse built in 1847 to one which was heightened to be a 86-foot coastal tower in 1894. This heightening represents a simple economic solution of adapting an existing tower to meet the needs of a harbor which had gained importance as its shipping became more significant. Grosse Point Light Station represents a coastal brick tower used on the Great Lakes which has survived unaltered since its period of construction in 1873. A few other early brick towers may be considered for future nominations, as well as examples of other types of masonry towers including rubblestone, waveswept, and concrete towers.