NPS Form 10-900
(Oct.1990)

OMB No. 1024-0018

943

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

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

1. Name of Property

historic name Brandywine Shoal Light Station

other names/site number Brandywine Shoal Light

2. Location

street & number In lower Delaware Bay, about 8.8 miles WNW of Cape May Point ☐ not for publication

city or town Cape May Point ☒ vicinity

state New Jersey code NJ county Cape May code 009 zip code 08212

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register Criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☒ locally. (☐ See continuation sheet for additional comments.)

Jeffrey Mamik, PE, CAPT, USCG 5/26/2006
Signature of certifying official/Title Date

United States Coast Guard
State or Federal agency and bureau

In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of commenting or other official 8/2/06
Date

Assistant Commissioner Natural & Historic Resources/DSHPO
State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that this property is:

☒ entered in the National Register — Signature of the Keeper: Patrick Andrus — Date of Action: 1/8/2007
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register
☐ removed from the National Register
☐ other (explain): _____

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☐ private
- ☐ public-local
- ☐ public-State
- ☒ public-Federal

Category of Property
(Check only one box)

- ☐ building(s)
- ☐ district
- ☐ site
- ☒ structure
- ☐ object

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

Contributing	Noncontributing	
		buildings
		sites
3		structures
		objects
3	0	Total

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

Light Stations of the United States

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

Transportation
Water-related
Lighthouse

Current Functions
(Enter categories from instructions)

Transportation
Water-related
Lighthouse

7. Description

Architectural Classification
(Enter categories from instructions)

No Style

Materials
(Enter categories from instructions)

foundation Reinforced concrete, sand, and rock
roof Metal
walls Reinforced concrete
other Lantern: Cast iron and Glass

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

8. Statement of Significance

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

- ☒ A Property is associated with events that have made a significant contribution to the broad patterns of our history.
- ☐ B Property is associated with the lives of persons significant in our past.
- ☒ C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- ☐ D Property has yielded, or is likely to yield information important in prehistory or history.

Criteria Considerations
(Mark "X" in all the boxes that apply.)

Property is:

- ☐ A owned by a religious institution or used for religious purposes.
- ☐ B removed from its original location.
- ☐ C a birthplace or a grave.
- ☐ D a cemetery.
- ☐ E a reconstructed building, object, or structure.
- ☐ F a commemorative property.
- ☐ G less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)
Maritime History
Transportation
Architecture
Engineering

Period of Significance
1914 to 1955

Significant Dates
1914

Significant Person
(Complete if Criterion B is marked above)

Cultural Affiliation
N/A

Architect/Builder
U.S. Lighthouse Service; Interstate Construction Company

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

9. Major Bibliographical References

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

Previous documentation on file (NPS):
- ☐ preliminary determination of individual listing (36 CFR 67) has been requested.
- ☐ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Buildings Survey # _____
- ☐ recorded by Historic American Engineering Record # _____

Primary Location of Additional Data
- ☐ State Historic Preservation Office
- ☐ Other State agency
- ☒ Federal agency
- ☐ Local government
- ☐ University
- ☐ Other

Name of repository:

US National Archives; NPS Maritime Heritage Program; USCG Headquarters, Historian's Office, Washington, DC

10. Geographical Data

Acreage of Property Approximately 2.8 acres

UTM References:	Zone	Easting	Northing
1	18	490208	4315033

Verbal Boundary Description
The boundary aligns with the exterior limit of the riprap barrier that surrounds the light station's existing lighthouse and boat basin.

Boundary Justification
The boundary encompasses the extent of the riprap barrier, boat basin, existing lighthouse, and site of the 1850 lighthouse that historically have been part of the Brandywine Shoal Light Station.

11. Form Prepared By

name/title Daniel Koski-Karell, Ph.D., USCG HQ Environmental Management Division, Karmen Bisher, NCSHPO Consultant, and Jennifer Perunko, NPS Maritime Historian

organization U.S. Coast Guard Headquarters (COMDT CG-443) date 26 May 2006

street & number 2100 Second Street SW telephone 202-475-5683

city or town Washington state DC zip code 20593

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps: **USGS map** (7.5 or 15 minute series) indicating the property's location.
Floor plans for basement and first story.

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

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

Property Owner

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

name U.S. Coast Guard Headquarters

street & number 2100 Second Street SW telephone 202-267-1587

city or town Washington state DC zip code 20593

Narrative Description

Brandywine Shoal Light Station is located in lower Delaware Bay, approximately 8.8 miles west-northwest of Cape May Point in Cape May County, New Jersey. It marks Brandywine Shoal, a hazard to navigation near the main shipping channel between the Atlantic Ocean and ports along the Delaware River. The lighthouse standing today was built in 1914. It is the latest of a series of light structures at this location. The existing light station includes three contributing resources, the lighthouse, the light station's protective riprap barrier, and the boat basin. The lighthouse is built atop a reinforced concrete cylindrical caisson pier that is 35 feet in diameter. The pier supports a 45-foot tall reinforced concrete cylindrical tower that includes three stories topped by a cylindrical watch room and lantern. The pier, tower and watch room are painted white. The lantern is painted red. The tower's roof, first story gallery deck and trim, watch room gallery, lantern gallery and the lantern door are also painted red. The riprap barrier is a circular breakwater approximately 60 feet wide and 300 feet in diameter that nearly encompasses the light station's property. Inside it is a lagoon-like area of protected water. The barrier's only opening is the narrow entrance to the light station's boat basin in the lagoon-like protected area. This basin is delineated by a line of wooden pilings that encompass its perimeter. The boat basin includes a dock and a catwalk extending to the lighthouse. Brandywine Light Station is owned by the United States Coast Guard and is closed to the public. It is operated as an automated aid to navigation identified as number 1555 on the regional light list. The only access to this property is by boat.

Contributing resource: Lighthouse

The lighthouse is the most prominent structure at Brandywine Light Station. It was built in 1914 to replace one constructed in 1850. The earlier lighthouse included a superstructure atop a skeletal framework of metal pilings. It has been removed.

The existing lighthouse is accessed by way of a catwalk extending from the boat basin's dock. This catwalk ends at a steel ladder attached to the lighthouse's cylindrical pier. The ladder leads up to the light's main gallery through a trapdoor in the gallery's overhanging deck.

Exterior

The lighthouse sits atop a reinforced concrete cylindrical caisson pier that serves as its foundation. This pier is 35 feet in diameter. Its top is approximately 15 feet above mean low water. The pier's interior is filled with sand, stone and concrete except for the space occupied by storage tanks and the lighthouse's basement. There are eight round port-light openings that pierce the caisson pier just below its top. They are arranged in pairs on the pier's north, east, south and west sides. These port-lights lighted the basement but are presently covered with metal plates. A row of 16 metal brackets surrounds the top of the pier above the port-lights. These brackets support the lighthouse main gallery's overhanging deck.

The main gallery surrounds the light tower. It is 46 feet in diameter and approximately 15 feet above mean low water. The gallery's metal deck extends approximately five feet wide outward from the light tower. A series of cast concrete columns attached to the deck's perimeter support the outer edge of the main gallery's metal roof. The roof's inner edge is attached to the light tower just above the first story. A series of metal stanchions is also attached to the deck's perimeter. A guardrail encircles the gallery. It is made with three horizontal rails tied into the columns and stanchions.

A large bronze bell mounted in a framework sits on the gallery deck's southwestern side. It was placed there as a backup for the compressed air fog signal installed when the lighthouse was built. This bell weighs 3,056 pounds and was cast by William Blake & Co. of Boston, Massachusetts. Its diameter is 4 feet, 7 inches and its height is 3 feet, 4 inches. In addition, a steel 1000-gallon fuel tank is mounted on the north side of the gallery deck.

The lighthouse's cylindrical tower is built of reinforced concrete and sits centered atop the pier. It is 45 feet tall and its surrounding wall is six inches thick. The tower's first story entrance is directly in front of the gallery deck's trapdoor where the ladder is located. This doorway holds a modern metal double-door that has replaced the original cast iron door. The tower first story's perimeter is pierced with six rectangular window openings. These are all sealed on the exterior with covers that contain vents of various sizes.

The tower's second story is pierced with five rectangular windows and the third story has seven rectangular windows. The third story windows are shorter than those of the second. Most of these windows are fitted with vented Plexiglas panels. A row of metal brackets surrounds the tower just above the third story windows. They support the watch room gallery's overhanging deck.

The lighthouse's cylindrical watch room sits centered atop the light tower's third story. Its surrounding wall is pierced with a doorway on the southeast side, as well as three windows. The watch room is surrounded by an open-air gallery that extends approximately 1.5 feet beyond the light tower. A series of metal pipe stanchions around the gallery deck's perimeter supports a guardrail made with three pipe railings. A solar array is mounted on the gallery deck's south side. It provides power for the lighthouse's existing signal light and fog signal. The existing fog signal is a modern device mounted on the gallery's west side.

The lighthouse's lantern is an example of the third order size. It is cylindrical and sits centered atop the watch room. The lantern's glazing is mounted in helical astragals and a full-height doorway pierces it on one side. This doorway provides access from the lantern's interior to the open-air gallery that surrounds it. This gallery has a metal deck. It is enclosed by a metal pipe railing supported by stanchions. The lantern's metal roof is surmounted by a cast iron ventilator ball topped with a brass lightning rod that has a platinum point.

Interior

The entrance to the lighthouse's first story interior pierces the light tower's southeast side. This doorway holds a modern replacement metal double-door. The entrance's original cast iron doors presently rest on the floor in one of the first story rooms.

A spiral stairway housed within a cylindrical stairwell is located in the center of the light tower's first story. It extends from the basement to the watch room. This stairway's central support is a hollow cast iron column extending from the basement floor to the watch room ceiling. The column supports the inner ends of the stairway's cast iron treads, which lack risers, as well as the cast iron landings located on each story. The stair treads and landings are embossed with a diamond pattern. The spiral stairway's outer edge is tied into the staircase's cylindrical concrete wall. A pipe handrail is also attached to the cylindrical wall.

Basement

A door in the central stairwell on the first story provides access to the basement. Inside this doorway there is a cast iron landing. The stairway's center column next to the landing has two small doors attached with hinges and held closed by pins and latches. These doors provide access to the hollow column's interior space, and were used for adjusting the clock works that controlled the light and fog signals. A flight of 17 stairs descends counterclockwise from this stairway landing to the basement. At the foot of the stairs there is a wood panel door with a glass panel at the top. It provides access from the stairwell to the basement.

The basement is circular like the pier that surrounds it. The walls, floor and ceiling are concrete and are painted gray. There are eight large port-light window openings set into the upper portion of the basement wall. They have all been sealed. Three large metal disks on the concrete floor cover the openings to three storage tanks within the caisson pier below the basement. Approximately half of the basement space is divided into a number of smaller rooms. On early plans of the lighthouse, these are labeled wood room, coal room, provision room, oil room and toilet. The other half of the basement space originally served as the fog signal room.

First Story

The walls lining the light tower's first story are covered with beaded board. The ceiling is concrete. Asbestos tiles cover most of the concrete floor. A portion of the floor inside the entry is covered by a metal plate. The first story's circular space is bisected by a partition wall on both sides of the enclosed stairwell. This creates two semi-circular rooms of equal size. The partition wall closest to the entry contains a door to the other room. Each room has three windows. All the first story windows are presently covered with wooden panels that hold vents.

The first story is in poor cosmetic condition, overall. The walls exhibit layers of peeling paint and there are dried paint drips on the walls and floor. Many floor tiles are chipped and broken. Non-functioning modern fluorescent lighting is attached to the ceiling, and various electrical boxes and conduits are attached to the walls.

Second Story

A flight of 14 stairs in the central stairway leads from the first story landing to the second story landing. A doorway in the stairwell wall at the second story landing provides access to the second story's space. This doorway holds a wood-paneled door that appears to be original. Its doorknob is missing. The door's upper half holds a square glass window that allows light to enter the stairwell.

The second story's circular space is divided into two rooms by partition walls that extend from the tower wall to the staircase cylinder. One room is larger than the other. The partition wall has two doorways fitted with six-paneled wooden doors. Most of the second story's outer wall is lined with beaded board that is painted white. The floor is hardwood over concrete and is painted gray. The concrete ceiling is painted white. The second story contains five double-hung windows with wooden sashes and one-over-one lights. The larger room was probably a bedroom. It contains two closets, both with their original six-paneled wooden doors. One closet is located at each end of the partition wall, between the tower's surrounding wall and one of the partition's doorways.

The smaller room appears to have been used as a bath. Its walls are covered with tiles from the baseboard to half-way up the wall, with beaded board above that. A small section of the smaller room's wall is covered with plywood. This appears to close off an opening where there are plumbing pipes or a medicine cabinet had once been mounted.

Third Story

A flight of 14 stairs leads from the second story to the third story landing, where there is a doorway identical to the one on the second story landing. A door provides access to the third story's single room. There are no interior partition walls. This room is lighted with seven double-hung windows with wooden sashes and two-over-two lights. The walls are covered in beaded board and are painted lime green. The concrete floor is covered with hardwood and is painted gray.

The third story room contains a built-in cabinet that extends to the ceiling. It sits against the r oom's surrounding wall, directly opposite the stairwell doorway. This cabinet has a Dutch door that provides access to its upper and lower sections. The lower section has beaded board doors with latch locks at the inside edges and hinges on the outside edges. The upper section is twice the height of the lower section and has similar doors and hardware. The upper section contains three shelves of varying height and is lined in beaded board. There is a decorative wooden cornice where the cabinet's top meets the ceiling.

As with the first and second stories, the third story's ceiling is concrete. However, around the stairwell the ceiling drops approximately 12 inches. The reason for this is unclear, but it may provide additional support for the watch room and lantern above.

Fourth Story (Watch Room)

A flight of 14 stairs leads from the third story landing to the watch room. The stairwell's surrounding concrete wall terminates where it meets the watch room floor. The central cast iron column continues upward to the watch room ceiling. A semi-circular encasement composed of vertical tongue-and-groove wooden boards encloses the head of the stairway in the watch room. This stairway encasement rises from the floor to approximately half the height of the room. A small square opening in the encasement wall provides light to the top portion of the stairs. This encasement's top covering is made with wooden boards that radiate from the center column to the vertical outer side. There is a small, horizontal, hinged hatch door directly above the final stair. It can be raised for easier access to and from the watch room. Originally, there was a second, vertical door mounted at the end of the encasement at the head of the stairs. It closed off the opening between the central column and the encasement's outer edge. When this door and the horizontal hatch door were closed, the stairwell was completely sealed off from the watch room. The stairway encasement also contains a built-in cabinet with shelves. It is accessed from within the watch room.

The watch room's surrounding concrete wall is pierced with three double-hung windows with wooden sashes and two-over two lights. There is also with a doorway leading to the watch room gallery outside. A slanted metal ship's ladder with eight rungs and a pipe handrail rises from the watch room's floor to a rectangular opening in the reinforced concrete ceiling. It leads to the lantern room, above.

Fifth Story (Lantern)

The watch room is surmounted by a cylindrical third order lantern that rests upon a reinforced concrete floor. The lantern room is eight feet, seven inches in diameter. The surrounding wall includes a lower section made with eight cast iron panels that form a parapet wall. Seven of these panels are of equal size. The eighth is made with two half-panels that flank a full-size door providing access to the lantern gallery. The lantern's glazed upper section is composed of helical cast iron astragals that hold diamond-shaped and triangular glass panes. A soffit above the glazing is composed of small cast iron panels. The soffit plates connect with nine triangular-shaped cast iron plates that form the lantern's roof. The roof plates converge to meet at an apex opening where a vent cover is mounted.

The parapet wall inside the lantern is pierced with five vents to regulate airflow. All the vent covers are missing and have been replaced with wire-mesh screens. A series of metal rods, bars, struts and hooks are attached to the wall above the glazing and extend to the ceiling. These formerly supported curtains that were closed during daylight to protect the lantern's original Fresnel lens.

An original cast iron pedestal stands in the middle of the lantern room floor. A modern wood and metal pedestal attached to its top supports the lighthouse's existing optic, a modern VRB-25 marine rotating beacon. This VRB-25 signals a flashing white light that is visible from 338 degrees through west to 151 degrees. A wooden frame between the optic and the lantern's eastern side glazing supports red-colored Plexiglas panels. These create the signal light's red sector, which is visible from 338 degrees through east to 151 degrees. This red sector warns of hazardous shoals between Brandywine Shoal and Cape May.

Contributing resource: Riprap Barrier

The riprap barrier is a massive circular band of large rocks approximately 60 feet wide that rises to about four feet above mean high water. It is approximately 300 feet in diameter. This barrier encloses the lighthouse's location and a lagoon-like area of protected water containing the light station's boat basin. The riprap band is continuous except for an opening on its southwest side. This opening is approximately 50 feet wide provides access from Delaware Bay's open waters to the boat basin. This resource was built during the property's defined Period of Significance and retains historic integrity. It contributes to the property's historic significance.

Contributing resource: Boat Basin

The boat basin is situated in the southern half of the protected lagoon-like area. It is made with a line of wooden pilings that extend from either side of the riprap barrier's opening to delineate a rectangular enclosure approximately 200 feet long by 200 feet wide. There is a rectangular concrete dock with an attached metal ladder at the boat basin's northeast end. A steel catwalk partly supported by wooden pilings extends northward from this dock to the lighthouse's circular concrete pier foundation. At the end of the catwalk, a steel ladder attached to the concrete pier leads up to the lighthouse's main gallery. The boat basin was built during the property's defined Period of Significance and retains historic integrity. It contributes to the property's historic significance.

Changes through time to the light station property:

The first lighthouse on Brandywine Shoals was built in 1827 atop vertical pilings. It was destroyed in 1828. A second lighthouse was built in 1850. It was supported by a skeletal framework of cast iron pilings that were screwed into the shoal's submerged land. This screw-pile light structure was located about 50 feet east of the existing lighthouse, which was built in 1913 to 1914. During the existing lighthouse's construction, the platform supporting the 1850 lighthouse provided extra work space and a storage area for building materials. A wooden catwalk extending from the old lighthouse to the new one was also built at that time. Following completion of the existing lighthouse in 1914, the 1850 lighthouse's superstructure was removed. This left a flat platform sitting atop the skeletal framework foundation built in 1850. Outbuildings standing on this platform remained in use by the light station's personnel. They included an iron oil house and a frame storehouse. A large, two-story storage building was erected atop the old lighthouse platform circa the 1940s. This storage structure was dismantled by 1963. The platform and its 1850 skeletal framework foundation were removed around the same time. Historic photographs suggest access to the lighthouse completed in 1914 involved crossing the earlier lighthouse's platform. The boat basin dock was next to this platform, and a catwalk extended from the platform to the newer lighthouse. Today, both the 1850 screw-pile skeletal framework and the platform it supported are gone. The existing lighthouse is presently accessed by way of a modern steel catwalk extending from the boat basin dock to a steel ladder attached to the lighthouse's concrete pier foundation.

Optics and Illuminants

The 1914 lighthouse's original optic was a third order Fresnel lens. It measured 39-3/8 inches in diameter and was 4 feet, 8 inches in height. This optic was initially lighted with a 55-millimeter, single-tank, incandescent oil-vapor lamp. The *Light List* published in 1921 described the signal light's characteristic as an occulting white light with a red sector that was lit for 27 seconds and eclipsed for three seconds. The oil-vapor lamp was later replaced with an electric lamp. The signal's characteristic in 1941 was two seconds of light followed by a 2-second eclipse, then six seconds of light followed by an eclipse lasting two seconds. At the present time, the lighthouse's optic is a modern VRB-25 marine rotating beacon installed in the late 1990's. Its focal plane is 60 feet above mean low water. This light is powered by batteries recharged by the solar array mounted on the watch room gallery's south side. It signals a white flash every 10 seconds that is visible from northwest through west to southeast, along with a red flash visible from northwest through east to southeast. The light's red sector warns mariners of hazardous shoals between Brandywine Shoal and Cape May.

Fog Signal

The 1850 lighthouse was originally equipped with a bell for its fog signal. This was upgraded in the late nineteenth century with installation of a third class Daboll trumpet. When the 1914 lighthouse was built, the Daboll trumpet and fog bell were relocated to it. The trumpet fog signal was operated by an oil engine and air compressor installed in the basement. The bell was mounted on the 1914 lighthouse's main gallery as a backup in the event the main fog signal could not be operated. It remains there today. By 1940, the lighthouse's Daboll fog signal had been replaced with a more technologically-advanced diaphragm fog horn. Today, Brandywine Shoal Light Station is equipped with a modern automated fog signal mounted on the watch room gallery's west side. It is powered by batteries recharged using the same solar array that recharges the signal light batteries. The existing fog signal sounds a two-second blast every 15 seconds, and is operated from March 15 to December 15.

Narrative Statement of Significance

Summary

Brandywine Shoal Light Station is historically significant for its association with the Federal government's efforts to provide for an integrated system of navigational aids throughout the United States. It is also significant for its role in promoting safe maritime transport in the Delaware Bay region, a major center of maritime commerce in America since colonial times. This light station marks a hazardous shoal just inside the Bay's entrance, and is the first offshore lighthouse that mariners encounter upon entering the Bay from seaward. The light on Brandywine Shoal has aided navigation along the Delaware Bay's principal shipping channel since the middle nineteenth century, and the existing lighthouse has been a prominent landmark since its completion in 1914. The structure standing today is unusual in United States light station engineering. It was the first offshore light in the country where both the caisson-type foundation pier and superstructure are made of reinforced concrete. Most lights of that type have a cast iron caisson. This structure's concrete pier and tower were built more quickly, cost less money, and cost less to maintain than a corresponding cast iron lighthouse. The success of this structure demonstrated the suitability of using reinforced concrete foundations for lighthouse construction in open waters. It convinced the U.S. Bureau of Lighthouses to adopt this design concept. In addition to its historic character, the light on Brandywine Shoal also meets registration requirements outlined in the *Light Stations of the United States* multiple property documentation form. It remains in its original location, and the structure's appearance, character and setting are essentially unchanged from its period of significance. This property also continues to serve its original function as an operating Federal aid to navigation.

Background

Brandywine Shoal Light Station has been an important navigational aid for maritime traffic using ports in the Delaware River and Bay since the nineteenth century. In fulfilling its role to promote safety for shipping, it has made a significant contribution to the development and expansion of the region's maritime transportation and commerce. This has enhanced the important economic impact that maritime trade has had in the region.

This property is a well-preserved example of a distinctive construction technology that had not previously been employed for building offshore lighthouses in the United States. Consequently, it exemplifies the innovative spirit that drove American engineers to advance and improve light station design and construction during the late nineteenth century and early twentieth century.

The existing lighthouse was erected in 1913 to 1914. It was constructed with a reinforced concrete cylindrical caisson foundation pier that is filled with concrete, sand, and rock. It is an example of the structural type generally referred to as "caisson" lighthouses. The first caisson-type lighthouse built in the U.S. was the Craighill Channel Light, erected in Chesapeake Bay in 1873. Caisson-type lighthouses are important in the historical development of lighthouse engineering. They have proven to be ideal for northern areas prone to ice flows because they withstand severe winters much better than screw-pile foundation lighthouses built earlier. Caisson lighthouses constructed from the late nineteenth century to the early twentieth century used cast iron caissons. However, early twentieth century advancements in bridge-building technology inspired the builders of Brandywine Shoal Light to construct its caisson foundation using reinforced concrete instead of iron. This made it the first United States offshore lighthouse built using that innovative design concept.

History of Brandywine Shoal Light Station

Brandywine Shoal is a hazardous area of shallow water in the exposed, open waters of lower Delaware Bay. It has been a serious obstacle to safe navigation since colonial times. Attempts to mark it began early in the nineteenth century. In 1823 the Federal government's General Superintendent of Lighthouses, Stephen Pleasonton, assigned a lightship there. However, the location's exposed character presented problems to keeping the light vessel on station. This led to a light tower with a straight-pile foundation being erected in 1827. Harsh weather and heavy seas destroyed this structure in 1828. Following that, a lightship was again assigned and the shoal continued to be marked in this manner until a new lighthouse was built in 1850.

The lighthouse built in 1850 on Brandywine Shoal was an innovation in lighthouse design. It was unusual in that its foundation was a skeletal metal framework erected using cast iron screw-piles. It was the first lighthouse built in the United States using this foundation type.

A screw-pile is similar to other pilings except that its bottom end is equipped with a helical blade. This makes the pile a large, broad-bladed screw. Instead of being driven directly into the earth like straight-piles, a screw-pile is twisted into bottom sediments or coral in a manner similar to a screw being twisted into a piece of wood. The piling thus becomes securely anchored into the bottom. It can be tied in with other screw-piles using connecting members and braces to create a skeletal framework that provides a strong and stable foundation for supporting a superstructure.

The use of this type of piling for offshore lighthouse foundations was invented by an Englishman named Alexander Mitchell. He built the world's first screw-pile light structure between 1838 and 1841 in England. It was located in Maplin Sound at the mouth of the Thames River.

Responsibility for constructing a lighthouse on Brandywine Shoal in 1850 was assigned to the U.S. Army Bureau of Topographical Engineers. The officer in charge was Major Hartman Bache. He was assisted by Lieutenant George G. Meade (who 13 years later commanded Union forces at the Battle of Gettysburg). The engineers decided to use Alexander Mitchell's screw-pile design, but with modifications. Changes were necessary to address a problem that caused weakness in the skeletal tower lighthouse erected in 1849 on Minots Ledge near Cohasset, Massachusetts. The Minots Ledge Lighthouse's iron pilings vibrated and twisted in heavy seas. It ultimately collapsed in 1851. Bache and Meade adopted a system for cross-bracing the screw-piles to enhance stability, and surrounded the structure with a pile-supported fence. A second barrier made with riprap was installed around the skeletal framework foundation's base to protect it from ice floes.[1]

The U.S. Lighthouse Board was established in the middle 1850s to administer the Federal government's lighthouse system. In the 1860s, the Board adopted a policy to replace light vessels in bays, sounds and rivers with permanent light structures. The Board's engineers concluded that the screw-pile foundation lighthouse type was well suited for areas with ice-free, shallow, slow-moving, sheltered waters. This led to the construction of several lights with screw-pile skeletal foundations in the years following the Civil War.

[1] Minots Ledge Lighthouse, off Cohasset, Massachusetts, stood on iron legs screwed into a wave-swept rock. In April 1851, some 15 months after it was completed, a heavy gale snapped the legs and caused the tower to collapse. Two assistant keepers died in this incident.

The 1850 lighthouse on Brandywine Shoal was erected during the period that the Federal government began to install Fresnel lenses as the optic in American lighthouses. A special Congressional Act was passed to authorize equipping this light station with one of the new optics. Only three lighthouses in the United States had Fresnel lenses in 1851. They were Navesink Light in New Jersey, Sankaty Head Light on Nantucket Island in Massachusetts, and Brandywine Shoal Light Station.

The exposed position of the Brandywine Shoal screw-pile lighthouse required further work to maintain it following its completion. As early as 1854, the *Annual Report of the Light-House Board* discussed steps taken to preserve and protect the structure. The forces of ice floes, currents, and waves led to the installation of additional braces in its skeletal framework foundation. In addition, more riprap had to be delivered to the light station to compensate for the loss of sand, and zinc rings and bands were installed on the skeletal framework's iron piles and braces to protect them from corrosion.[2] An inspection following the severe winter of 1874 noted that one ice-fender pile had broken and that rust had weakened others considerably. Further frequent and extensive reports to the light station were required in following years. This eventually led the Lighthouse Board to explore its options for the property.[3]

By the beginning of the twentieth century, advancements in engineering, construction technology and building materials offered alternative foundation designs that had advantages over the screw-pile type. One concept for building a foundation on submerged land was the caisson construction method. This was first developed in 1845 by an English physician and inventor named Lawrence Potts. It proved to be a successful approach for building bridges and lighthouses.[4] The caisson method involved assembling a hollow cylinder made of cast iron plates onshore, and then towing the assembly to the proposed offshore construction location where it was sunk into position using either a system of weights or a technique that employed a valve for controlled flooding of its interior. After the caisson was leveled, bottom sediments within its perimeter were excavated by pumping or human labor. If workers performed the excavation, the caisson had to be pressurized with compressed air to prevent flooding. The removal of bottom sediments from within the caisson caused it to settle downward until reaching the desired depth below the submerged land's surface. It was then further stabilized by placing protective riprap around its exterior.

Even though caisson lighthouses were more complicated and more expensive to build than screw-pile foundation lights, they were better able to withstand the pressure of moving ice. Because of this advantage, the U.S. Lighthouse Board decided to replace several screw-pile lighthouses in areas prone to ice flows with new ones of the caisson type. This included the light station on Brandywine Shoal in Delaware Bay.

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[2] U.S. Department of the Treasury, Lighthouse Board, *Annual Report of the Light-House Board for the fiscal year ended June 30, 1854* (Washington, D.C.: GPO, 1854).

[3] *Annual Report of the Light-House Board ... 1875*, 37; *Annual Report of the Light-House Board ... 1878*, 28; *Annual Report of the Light-House Board ...1879*, 29; *Annual Report of the Light-House Board ...1880*, 29; *Annual Report of the Light-House Board ... 1900*, 86; *Annual Report of the Light-House Board ... 1901*, 97; and *Annual Report of the Light-House Board ... 1902*, 111.

[4] The first application of caisson technology in the United States used for lighthouse-related work was at Waugoshance Light in Michigan in 1870. A temporary caisson enabled workers to repair the structure's crib foundation with a masonry protection wall. In 1873, the Craighill Channel Lower Front Range Lighthouse in Maryland was built using a permanent caisson.

On 11 March 1911, the U.S. Congress appropriated $75,000 to replace the deteriorating screw-pile lighthouse on Brandywine Shoal with a new one. After conducting a test boring adjacent to the light station, the Lighthouse Bureau's engineers immediately began working on plans for a durable, yet cost-effective structure.[5] The first set of advertisements requesting construction bids were distributed in September 1912. They were printed in *Engineering Record*, *Engineering News*, *American Contractor*, *Press and Inquirer*, and *United States Government Advertiser*, as well as being sent directly to individual contractors.

The advertised design specifications called for a pneumatic caisson foundation 35 feet in diameter and 37.5 feet high, built of one hundred ninety-two 1.25-inch thick cast iron plates, supporting a cast iron superstructure.[6] Several bids were received for furnishing metal work, but none of them proposed to complete the entire structure according to plan. The range of prices submitted for the metal work alone led the Bureau of Lighthouses to believe that the $75,000 budget deterred contractors from bidding on the structure's construction.

The Hennebique Construction Company of New York City submitted a proposal that suggested an alternative to the planned cast iron structure. It specified a structure that could be built for less than the appropriated amount. Although this company had never constructed an offshore lighthouse before, it was experienced in submarine construction using concrete for bridges throughout the United States and abroad. The company's suggested an original design using reinforced concrete based on its own ideas and studies.[7] However, since reinforced concrete had not previously been used for building lighthouses on submarine sites, and because regular standards for its testing and design had not been established, the government declined to accept the Hennebique Company's proposal.[8]

On 15 February 1913, bids were again invited using the same specifications listed in the first advertisement. However, this new solicitation included a provision that due consideration would be given to proposals for a reinforced concrete structure if the bidder furnished detailed plans. Two bids for the complete structure were received. The Phoenix Construction Company proposed to build an iron structure costing $175,000. The other bid was from the Interstate Construction Company of Mobile, Alabama. It proposed to erect a reinforced concrete structure costing $69,850, and included $2,500 for 900 tons of protective riprap.

Although the Bureau of Lighthouses accepted the bid from Interstate Construction Company, the carefully-worded contract revealed skepticism concerning the reinforced concrete plans. It contained a clause stating that the contractor must guarantee the structure for one year after its completion and acceptance by the Federal government.[9]

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[5] U.S. Department of Commerce and Labor, Bureau of Lighthouses, *Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce for the fiscal year ended June 30, 1911* (Washington, D.C.: GPO, 1911), 57; U.S. Lighthouse Service, *Annual Report of the Commissioner of Lighthouses ... 1912*, 62; U.S. Lighthouse Service, *Annual Report of the Commissioner of Lighthouses ... 1913*, 60; U.S. Lighthouse Service, *Annual Report of the Commissioner of Lighthouses ... 1914*, 57; U.S. Lighthouse Service, *Annual Report of the Commissioner of Lighthouses ... 1915*, 53 and 93-94; and T.J. Rout, Lighthouse Inspector, "Building Brandywine Shoal Lighthouse, 22 September 1914, RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

[6] Rout, "Building Brandywine Lighthouse."

[7] JSC to Secretary of Commerce and Labor, 21 December 1912, typed, RG 26, Entry 50, Box 109, Subject File 327-A, National Archives.

[8] In *Technology in Western Civilization: Technology in the Twentieth Century, Volume II*, edited by Melvin Kranzberg and Carroll W. Pursell, Jr., author Melvin M. Rotsch discusses organizations for the improvement and control of reinforced-concrete design that came into existence in America. The American Society of Testing Material was established in 1902, the American Concrete Institute in 1905, and the Portland Cement Association in 1916. He adds that although strict standards had been adopted by the mid-1920s, there were still cases of structural failure.

[9] Rout, "Building Brandywine Lighthouse."

The caisson for the new Brandywine Shoal Lighthouse was constructed on the beach at Lewes, Delaware. Its shell contained 104 cubic yards of concrete and 11,400 pounds of steel reinforcement. The caisson's total weight was approximately 225 tons. The work to build it was completed on 14 May 1913.

This reinforced concrete caisson consisted of circular inner and outer walls each six inches thick that were spaced 3 feet, 4 inches apart. The inner and outer walls were joined together by radial partitions, creating a series of chambers. Every other chamber was sealed at the bottom while the others remained open. A concrete floor reinforced by radial beams was connected to the inner wall at the top. Iron rods lined the foundation's interior walls and bottom.

As onshore work progressed, the contractor began work at the offshore construction site. This included erecting a working platform next to new lighthouse's location, and using the old lighthouse's screw-pile-supported deck to store building materials and facilitate the work. The construction plan called for a load-bearing pile foundation beneath the caisson. This was emplaced using 74 pinewood pilings driven to a depth of 20 feet. The pilings terminated 12 inches above the shoal's submerged terrain to create a level surface.

A tugboat towed the concrete caisson from Lewes to Brandywine Shoal on 6 August 1913. It was carefully floated into position and then sunk to rest upon its pile foundation. Twelve concrete pilings were then run through open chambers between the caisson's inner and outer walls. These were driven 20 feet into the bottom to pin the structure down. Workers then deposited bags of concrete to seal the bottom of the chambers, pumped out water, and poured additional concrete to bond each pile to the caisson. Water within the caisson shell was then pumped out and the space filled with concrete to the top of the radial beams. The space above the radial beams was filled with sand and rock up to the level of the basement floor, except for where the structure's storage tanks and freshwater cistern were placed.[10]

Construction work was hindered by a hurricane that passed through the area on 21 October 1913. The storm caused the Interstate Construction Company's barge, *Hero*, to sink. It was loaded with building materials and a smaller boat.[11] Fortunately the lighthouse's caisson foundation pier was unharmed.

The light station's Assistant Keeper Henry P. Marshall described the loss of the *Hero* in a letter to Lighthouse Inspector T.J. Rout. He stated that the barge "parted her anchor chains and at 7 P.M. drug on the South ice breaker staving a hole in the stern below the water line and drifted to the present sight (sic), about 100 yds. E.N.E from station and sank in a S.W. hurricane."[12] The keeper supplied the light station's boat to two Interstate Construction Company employees who rescued the *Hero*'s captain and deck hand. They were brought to safety at the light station where the keeper cared for them.

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[10] Bowerman, Chief Constructing Engineer to Commissioner, 10 October 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-A, National Archives; Rout, "Building Brandywine Lighthouse."

[11] Sgd. Henry P. Marshall, 2nd A.K. in charge, to Lighthouse Inspector, Sir, 20 October 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-E, National Archives; Sgd. F.W. Bedford to Lighthouse Inspector, Philadelphia, Pa. Sir, 21 October 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-E, National Archives; and Rout to Commissioner, 24 November 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-A, National Archives.

[12] Sgd. Henry P. Marshall, 2nd A.K. in charge, to Lighthouse Inspector, Sir, 20 October 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

The Bureau of Lighthouses had a policy for commending private parties who assisted its employees in rescue work. Based on this, Inspector Rout contacted the Commissioner of Lighthouses with information about the *Hero*'s rescuers. He wrote that "While these men were not employed by the Lighthouse Service, I am of the opinion that their act is worthy an expression of appreciation by the Bureau, the rescue having been performed at great risk and as a voluntary act."[13] However, since the light station's keeper did not actively assist in the rescue, the Acting Commissioner ruled that neither the keeper nor the private parties should be commended.[14]

As 1913 drew to a close and the weather deteriorated with the onset of winter, construction work at Brandywine Shoal was suspended. The caisson foundation pier had been completed by that time, and work had begun on the reinforced concrete superstructure.

Work resumed in May 1914. After the cylindrical light tower and watch room were completed, a new, standard third order lantern was placed on top. It had been built by the Champion Iron Company of Kenton, Ohio. Other work included placing a three-foot thick layer of riprap around the base of the foundation pier.[15] The construction was officially completed in September 1914. The lantern atop the light tower was subsequently equipped with a third order Fresnel lens made by Henry LePaute of Paris. The new lighthouse was officially established in November 1914 when its optic was first lit. It had been built more quickly and at less cost, and would cost less to maintain, than a corresponding cast iron lighthouse. The new light on Brandywine Shoal was the first concrete caisson foundation lighthouse built on submerged land in the U.S.

In 1916 the Lighthouse Service proposed the installation of storm shutters on the lighthouse's windows. A 1927 photograph documents this addition. These shutters do not appear in later photos, showing that their use was discontinued. Other improvements to the light station included emplacing additional riprap. The Lighthouse Service recommended that more riprap be deposited around the caisson foundation pier as early as 1915, and frequently thereafter. On 18 July 1929, Brandywine Shoal Light Station was selected to receive the first 7-10 watt radio beacon installed in its administrative district. A "Recommendation for Repairing Aids to Navigation" in 1939 advised the installation of an LSR 319 radiophone to provide two-way communication between this isolated station and shore. Brandywine Shoal Light Station's importance contributed to its retaining resident keepers later than another other Delaware Bay lighthouse.[16] In 1974 it became the last in Delaware Bay to be automated. The lighthouse today has changed little from its original 1914 appearance. The limited changes that have been made consist largely of technological up-grades to its optic and fog signal.

Today, this landmark and historically significant light station remains an active Delaware Bay aid to navigation. It is presently equipped with a modern VRB-25 marine beacon and a modern fog signal powered with batteries recharged using the solar array mounted atop the light tower. The light's original third order Fresnel lens has been loaned by the U.S. Coast Guard to the Tuckerton Seaport maritime museum at Tuckerton in Ocean County, New Jersey. It may be seen there today.

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[13] Rout to Commissioner, 29 October 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

[14] Corway, Acting Commissioner to Bureau of Lighthouses, 7 November 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

[15] Bowerman, Chief Constructing Engineer to Commissioner, 26 November 1913, typed, RG 26, Entry 50, Box 109, Subject File 327-A, National Archives.

[16] Jim Gowdy, *Guiding Lights of the Delaware River and Bay* (Mitzpah: Jim Gowdy, 1990), 67.

Primary Sources

Bedford, Sgd. F.W., to Lighthouse Inspector, Philadelphia, Pa. Sir, 21 October 1913. Typed. RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

Bowerman, Chief Constructing Engineer to Commissioner, 10 October 1913. Typed. RG 26, Entry 50, Box 109, Subject File 327-A, National Archives.

Bowerman, Chief Constructing Engineer to Commissioner, 26 November 1913. Typed. RG 26, Entry 50, Box 109, Subject File 327-A, National Archives.

Corway, Acting Commissioner to Bureau of Lighthouses, 7 November 1913. Typed. RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

JSC to Secretary of Commerce and Labor, 21 December 1912. Typed. RG 26, Entry 50, Box 109, Subject File 327-A, National Archives.

Marshall, Sgd. Henry P., 2nd A.K. in charge, to Lighthouse Inspector, Sir, 20 October 1913. Typed. RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

Rout, T.J., Lighthouse Inspector. "Building Brandywine Shoal Lighthouse." Photocopy. RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

Rout to Commissioner, 29 October 1913. Typed. RG 26, Entry 50, Box 109, Subject File 327-E, National Archives.

Rout to Commissioner, 24 November 1913. Typed. RG 26, Entry 50, Box 109, Subject File 327-A, National Archives.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board to the Secretary of the Treasury for the fiscal year ended June 30, 1854.* Washington, D.C.: GPO, 1854.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board to the Secretary of the Treasury for the fiscal year ended June 30, 1875.* Washington, D.C.: GPO, 1875.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board to the Secretary of the Treasury for the fiscal year ended June 30, 1878.* Washington, D.C.: GPO, 1878.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board to the Secretary of the Treasury for the fiscal year ended June 30, 1879.* Washington, D.C.: GPO, 1879.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board to the Secretary of the Treasury for the fiscal year ended June 30, 1880.* Washington, D.C.: GPO, 1880.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board for the fiscal year ended June 30, 1900.* Washington, D.C.: GPO, 1900.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board for the fiscal year ended June 30, 1901.* Washington, D.C.: GPO, 1901.

U.S. Department of the Treasury. Lighthouse Board. *Annual Report of the Light-House Board for the fiscal year ended June 30, 1902.* Washington, D.C.: GPO, 1902.

U.S. Department of Commerce and Labor. Bureau of Lighthouses. *Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce and Labor for the fiscal year ended June 30, 1911.* Washington, D.C.: GPO, 1911.

U.S. Department of Commerce and Labor. Bureau of Lighthouses. *Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce and Labor for the fiscal year ended June 30, 1912.* Washington, D.C.: GPO, 1912.

U.S. Department of Commerce and Labor. Bureau of Lighthouses. *Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce and Labor for the fiscal year ended June 30, 1913.* Washington, D.C.: GPO, 1913.

U.S. Department of Commerce. Bureau of Lighthouses. *Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce for the fiscal year ended June 30, 1914.* Washington, D.C.: GPO, 1914.

U.S. Department of Commerce. Bureau of Lighthouses. *Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce for the fiscal year ended June 30, 1915.* Washington, D.C.: GPO, 1915.

Secondary Sources

Gowdy, Jim. *Guiding Lights of the Delaware River and Bay.* Mitzpah: Jim Gowdy, 1990.

Kranzberg, Melvin and Carroll W. Pursell, Jr., eds. *Technology in Western Civilization: Technology in the Twentieth Century,* Volume 2. London: Oxford University Press, 1967.

NPS Form 10-900-A
(8-86)

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

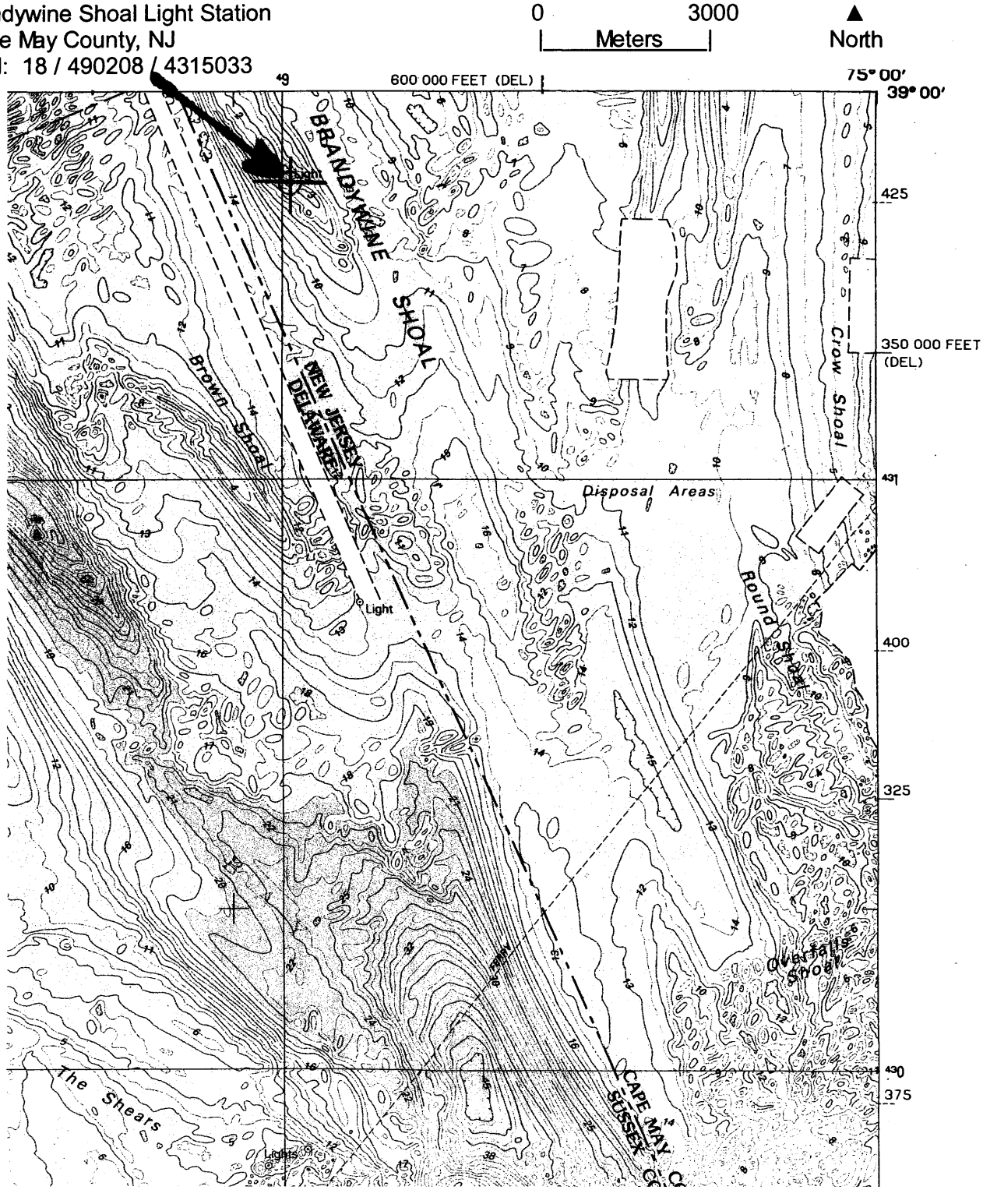
National Register of Historic Places Continuation Sheet

Brandywine Shoal Light Station
Cape May County, NJ
(Light Stations of the United States Multiple Property Listing)

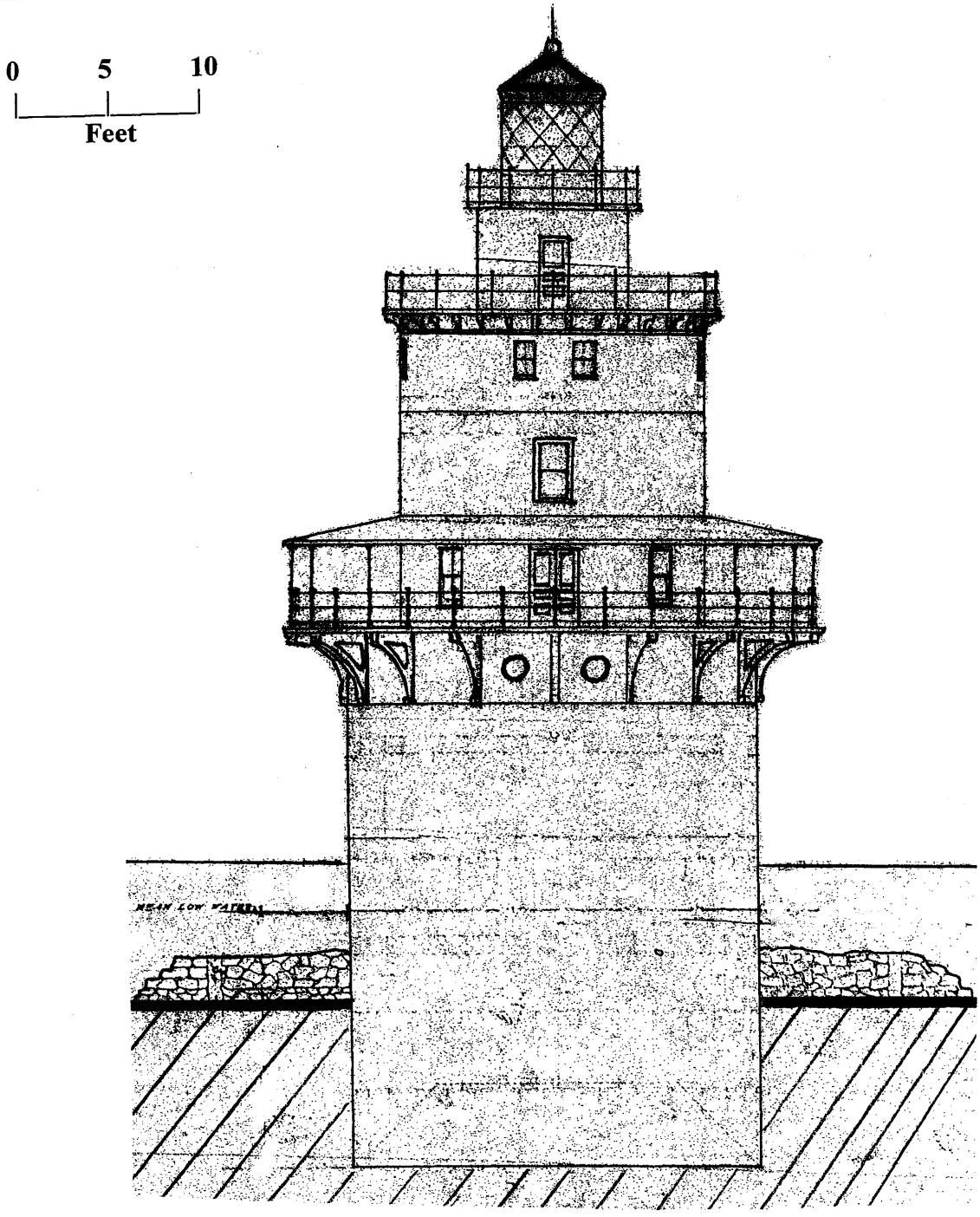
LOCATION MAP

This is a portion of the "Seaford, Delaware-Maryland-New Jersey" 30 X 60 minute quadrangle metric topographic-bathymetric map, scale 1:100,000 (U.S. Geological Survey/National Ocean Service 1984).

Brandywine Shoal Light Station
Cape May County, NJ
UTM: 18 / 490208 / 4315033



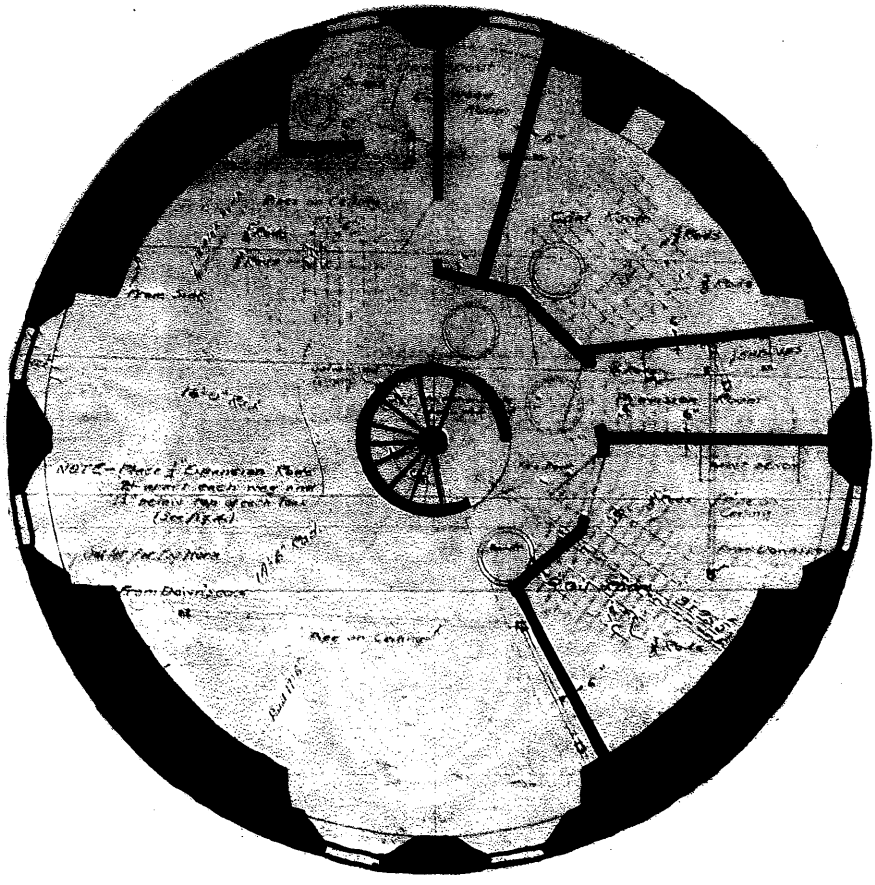
ELEVATION DRAWING



FLOOR PLAN - BASEMENT

0 5 10 ▲ North

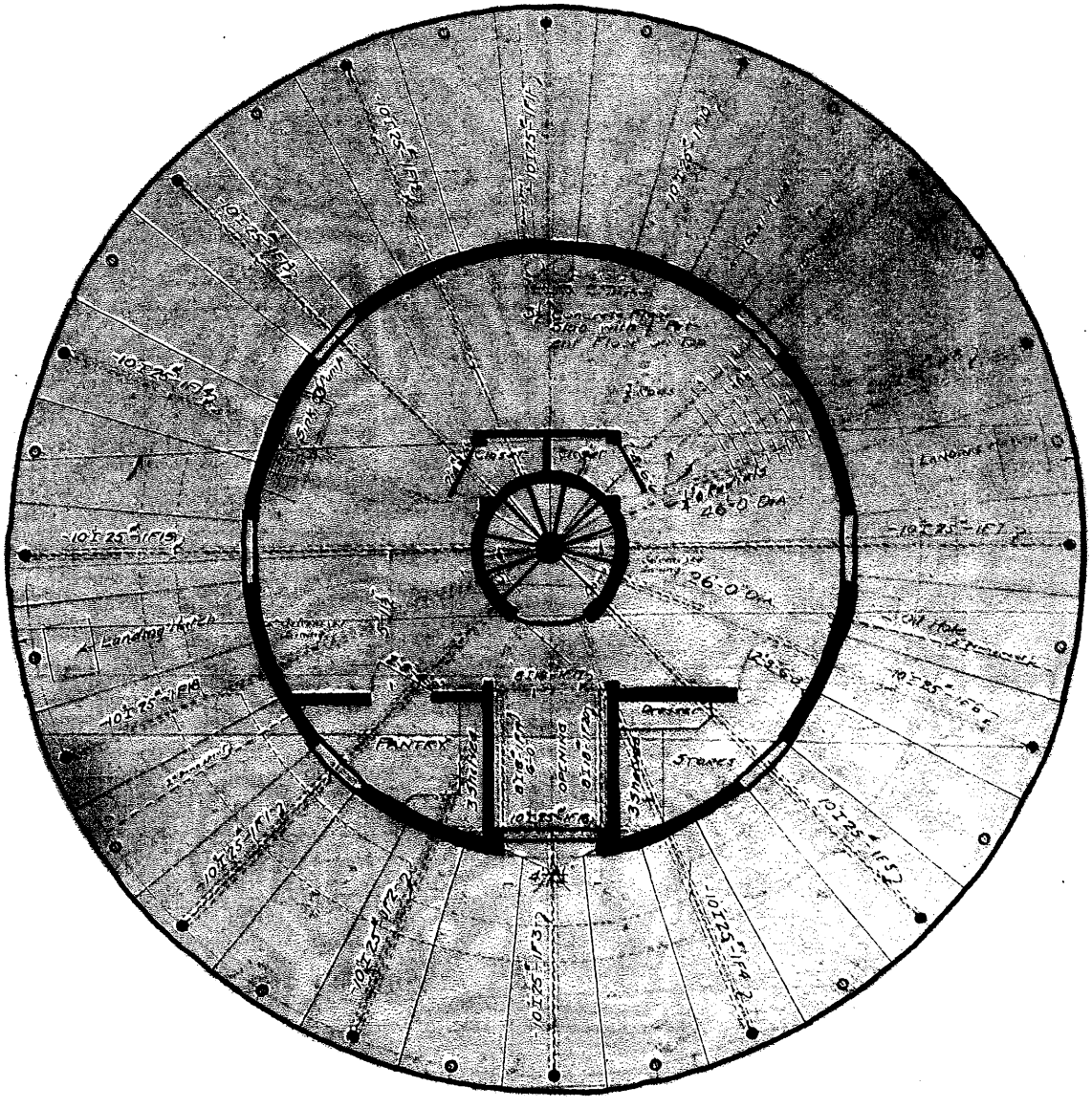
Feet



FLOOR PLAN - FIRST STORY

0 5 10 ▲ North

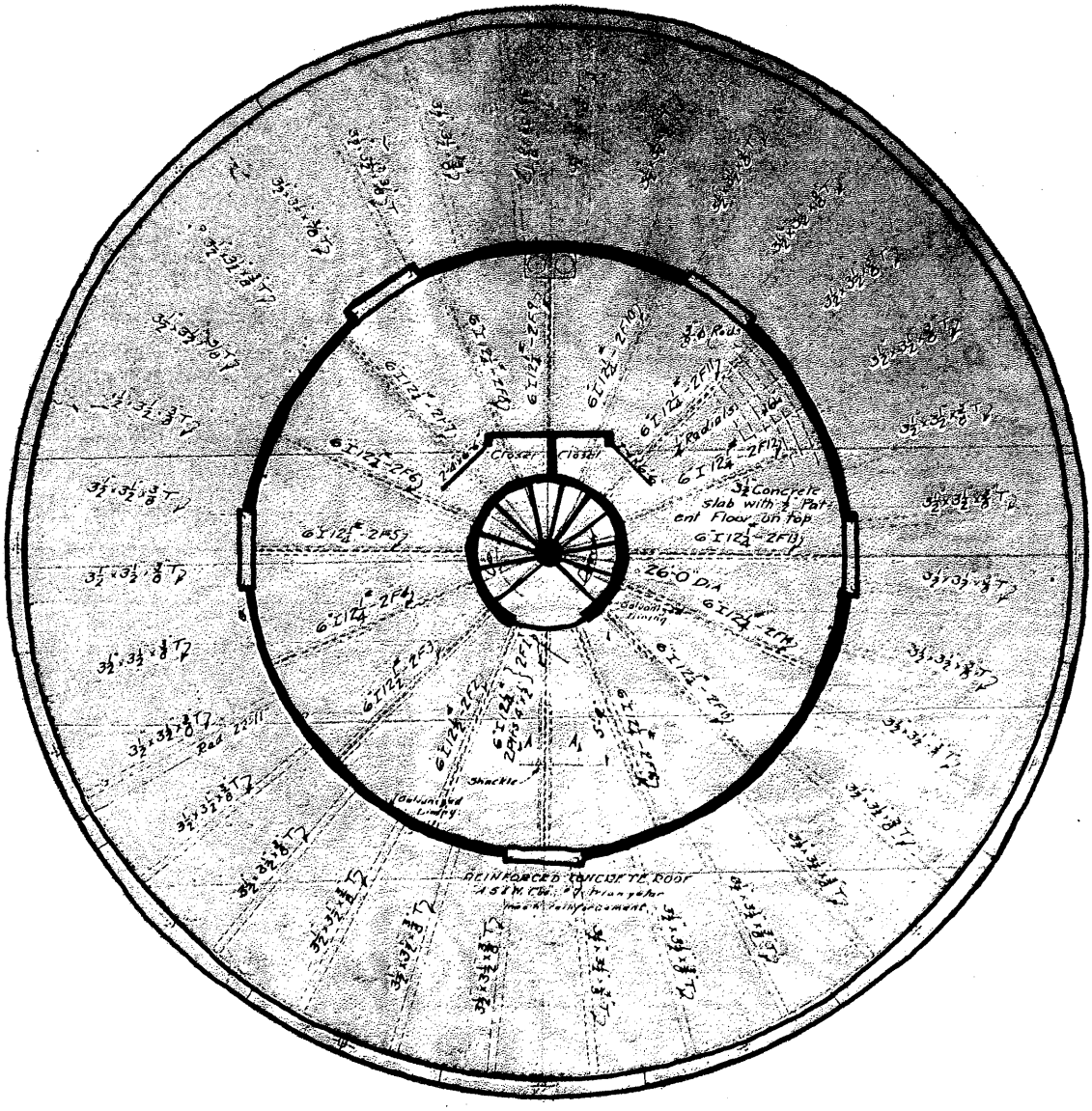
Feet



FLOOR PLAN - SECOND STORY

0 5 10
Feet

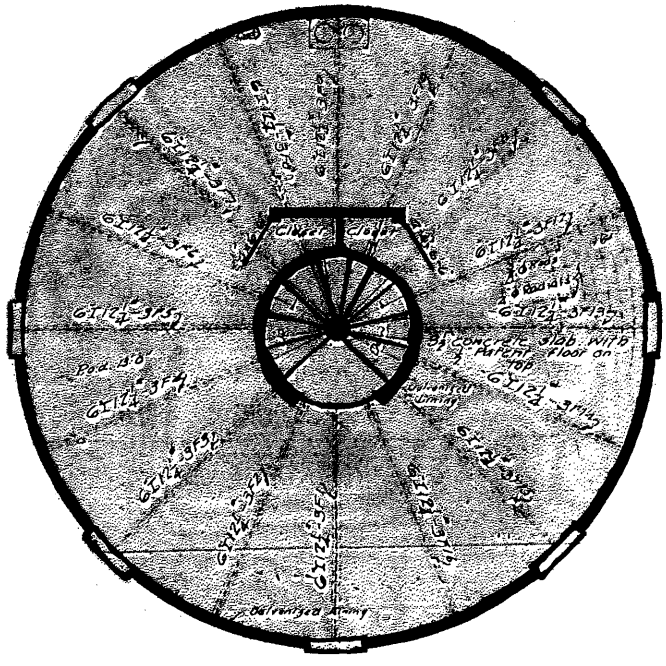
North



FLOOR PLAN - THIRD STORY

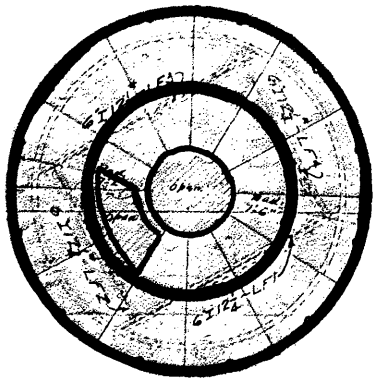
0 5 10 ▲ North

Feet



FLOOR PLANS - FOURTH STORY (WATCH ROOM) AND FIFTH STORY (LANTERN)

FIFTH STORY (LANTERN)



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Feet

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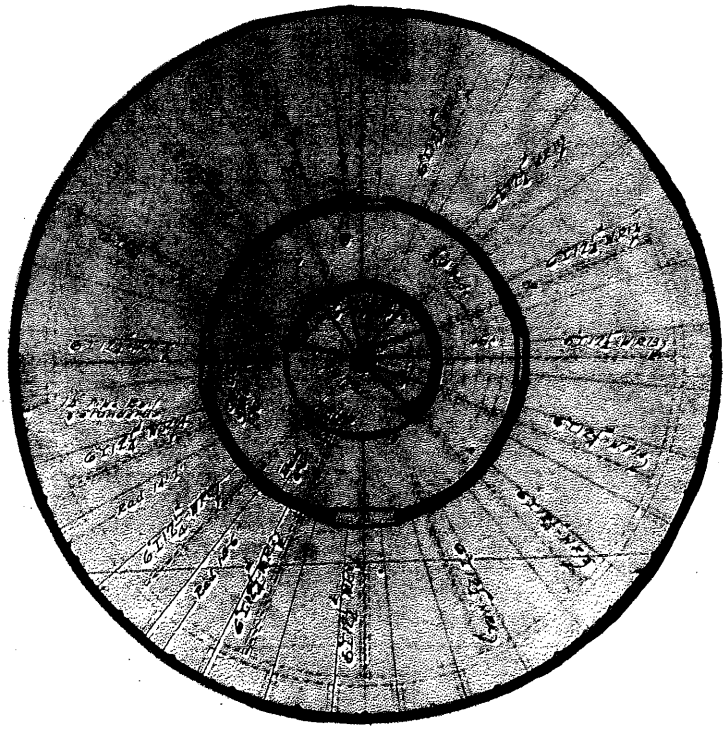
FOURTH STORY (WATCH ROOM)



LIST OF PHOTOGRAPHS

Name of property: Brandywine Shoal Light Station
County and state: Cape May County, New Jersey

Contemporary Photographs (# 1 to # 5)

Name of photographer: Jennifer Perunko
Date of photographs: 11 May 2004
Location of original negatives: Maritime Heritage Program, National Park Service, Washington, DC.

1. View of lighthouse, looking northeast.

2. First story southwest side, looking west; fog signal bell on main gallery.

3. Second story interior, bedroom closet and doorway to bathroom.

4. Fourth story watch room, cast iron center support and weight well, and head of staircase.

5. Second story interior, doorway to central staircase.

Historical photographs (# 6 and # 7)

Name of photographer: Unknown
Date of photographs: 1914 and 1952
Location of original negatives: U.S. Coast Guard Historian's Office, U. S. Coast Guard Headquarters, Washington, DC.

6. View of new lighthouse from old lighthouse platform, looking north. Photo taken 31 October 1914.

7. View of light station, looking south. Large rectangular structure at left sits atop the platform supported by the screw-pile skeletal framework foundation built in 1850. Photo taken 1952.