

HISTORIC STRUCTURES REPORT
for
GRAND HAVEN SOUTH PIER
ENTRANCE AND INNER LIGHTS
Grand Haven (Ottawa County), Michigan



Prepared for:

Grand Haven Lighthouse Conservancy
and
City of Grand Haven
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FINAL REPORT
September 8, 2015

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PART I – INTRODUCTION

A) EXECUTIVE SUMMARY

The Historic Structures Report (HSR) is a planning tool used to document the history, current conditions and use, and guide the preservation of an historic site or building. The purpose of this Historic Structures Report is to define the historic character of the Grand Haven South Pier Entrance Light and Inner Light located on the south pier at the mouth of the Grand River at Lake Michigan in the City of Grand Haven, Michigan; document current existing conditions at this present date of time; and to guide the future use, restoration and rehabilitation of these structures.

The pier, owned and maintained by the United States Army Corps of Engineers, and the elevated catwalk structure, owned and maintained by the City of Grand Haven, are not included in this report other than a general discussion as they relate to the significance of the lights.

The City of Grand Haven increased in importance as a shipping port on Lake Michigan in the 1800s and in 1839 the United States Congress authorized the construction of the first lighthouse a short distance from the mouth of the Grand River. In subsequent years additional aids to navigation and piers extending from the north and south sides of the river were constructed to improve the safety of the harbor. The present day range light system took shape in the early 1900s with the extension of the south pier, the placement of a navigation light on the Fog Signal Building to serve as the Entrance Light, the construction and eventual relocation of the cylindrical tower to serve as the Inner Light, and construction of the elevated catwalk. This range light system allows for the proper alignment for vessels entering the Grand River channel and is one of only two remaining range light systems with a catwalk on the Great Lakes.

The National Historic Lighthouse Preservation Act of 2000, an amendment to the National Historic Preservation act of 1966, established a mechanism for the disposal of federally owned historic light stations through transfer of ownership to qualified entities such as state and local government units and non-profit organizations. Recognized as significant historical maritime assets and community landmarks, ownership of the Entrance and Inner Lights was transferred to the City of Grand Haven, Michigan in early 2013. The City of Grand Haven, in conjunction with the non-profit Grand Haven Lighthouse Conservancy, intends to promote public awareness and appreciation of the community's lighthouse heritage through the restoration, rehabilitation and interpretation of the Grand Haven South Pier Entrance and Inner Lights.

The Historic Structures Report shall be reviewed and approved by the United States Department of the Interior, National Park Service in accordance with the National Historical Lighthouse Preservation Act and Section 106 of the National Historic Preservation Act. This report will serve as an amendment to the Master Plan included in the application prepared by the City of Grand Haven to obtain the South Pier Entrance and Inner Lights from the U.S. Coast Guard. The National Park Service is permanently involved with properties transferred through this act and shall consult with the State Historic Preservation Office of Michigan prior to any further amendments to the Master Plan.

Sanders & Czapski Associates, PLLC of Marquette, Michigan, was retained by the Grand Haven Lighthouse Conservancy and the City of Grand Haven, Michigan in February 2013 to prepare this Historic Structures Report. On site research and documentation of the two lighthouse structures was conducted in April 2013 along with meetings with Mr. David Karpin of the Grand Haven Lighthouse Conservancy. The Grand Haven Lighthouse Conservancy

contributed the historic research, chronology of events, historic photographs and drawings that are included in this report.

This project was independently financed by the Grand Haven Lighthouse Conservancy and the City of Grand Haven. The statements, findings, conclusions and recommendations are those of the Grand Haven Lighthouse Conservancy as well as Sanders & Czapski Associates, PLLC.

The public can help fund the restoration and preservation of Michigan's lighthouses by purchasing a lighthouse vehicle license plate. Further information about this program is available by contacting a local Secretary of State office or the State of Michigan website www.michigan.gov. Additional information about the Grand Haven Pier Lights and how to help fund the preservation efforts may be found at www.GHLIGHTHOUSE.com.



View of North and South Piers, Grand Haven, Michigan, October 2008. Photo credit: Aerial Photography, John L. Wagner, East Lansing, Michigan.



View of North and South Piers, Grand Haven, Michigan, July 2011. Photo credit: Aerial Photography, John L. Wagner, East Lansing, Michigan.

B) ADMINISTRATIVE DATA

The Grand Haven South Pier Entrance and Inner Lights are located on a lengthy pier that extends approximately 1,515 feet into Lake Michigan on the south side of the mouth of the Grand River in the City of Grand Haven, Ottawa County, Michigan. The land along the base of the pier is owned by the State of Michigan and is known as Grand Haven State Park, a very popular tourist destination. The pier, under ownership of the United States Army Corps of Engineers, is accessible to the public, providing a walkway directly to both light structures. The location of the Entrance Light is longitude 43° 03' 24.88" N and Latitude 86° 15' 21.38" W. The location of the Inner Light is longitude 43° 03' 25.99" N and Latitude 86° 15' 13.74" W.

The Entrance Light and Inner Light along with the elevated catwalk structure are now under the ownership of the City of Grand Haven, Michigan. The City of Grand Haven along with the Tri-Cities Historical Museum and the non-profit Grand Haven Lighthouse Conservancy are dedicated to the rehabilitation and public interpretation of these structures.

The "Pier and Revetments at Grand Haven, Michigan" is listed on the U. S. Department of the Interior National Register of Historic Places, listing #95001161, listed on October 23, 1995. The Site ID is #P3559, Record No. 423573. The Period of Significance is listed as 1857 to 1935 with 1857, 1867 and 1916 identified as Significant Dates. The Historic Use is identified as "Transportation / Water Related". Current Use is identified as "Recreation and Culture / Outdoor Recreation" and "Transportation / Water Related".

Because the original nomination included only the "Piers and Revetments," the nomination was amended in 2009 and approved on August 9, 2010 to include the inner and outer pierhead lights and the catwalk. The Period of Significance for these structures is identified as 1907 to 1959, with significant dates of 1907 and 1922.

The work covered by this Historic Structures Report includes the following:

- South Pier Entrance Light, originally constructed in 1875 as a Fog Signal Building and then modified in 1907 to serve as a front range light.
- South Pier Inner Light, a cylindrical metal tower constructed in 1905 and then relocated in 1907 to serve as a rear range light.

The pier and the elevated catwalk structure, constructed in 1922, are not included in this report other than a general description of their condition and their relationship with the two light structures.

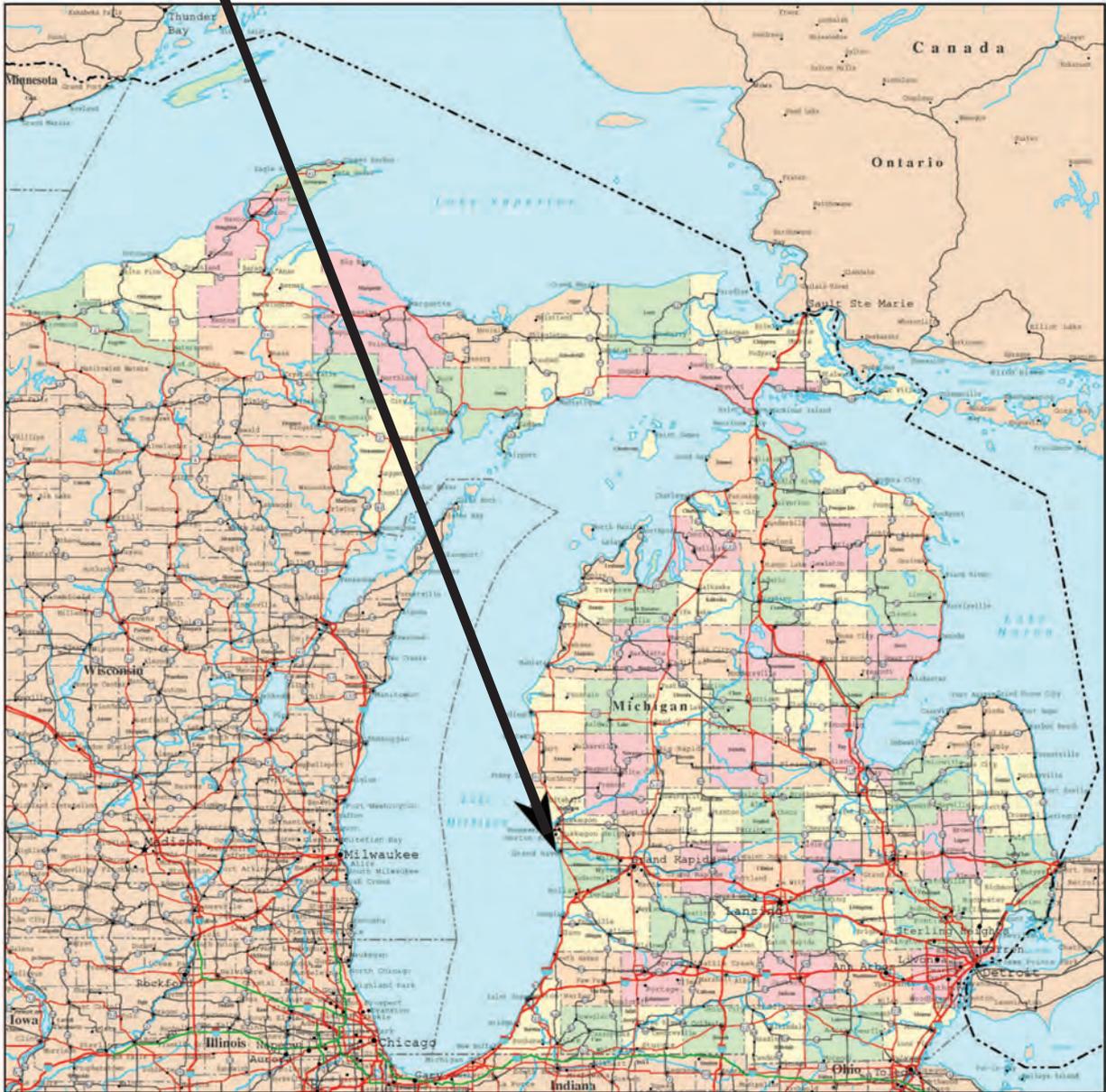
Sanders and Czapski Associates, PLLC gratefully acknowledges the assistance of the following individuals:

- Mr. David Karpin, President, Grand Haven Lighthouse Conservancy
- Mr. Patrick McGinnis, City Manager, City of Grand Haven, Michigan
- Ms. Marci Cisneros, Executive Director, Grand Haven Area Convention and Visitor's Bureau.
- Ms. Joyce Rhodes, Park Manager, Grand Haven State Park
- Mr. Tom O'Brien, U. S. Army Corps of Engineers, Grand Haven, Michigan

These individuals assisted with accommodations, site access, field assistance and furnishing information and documentation.

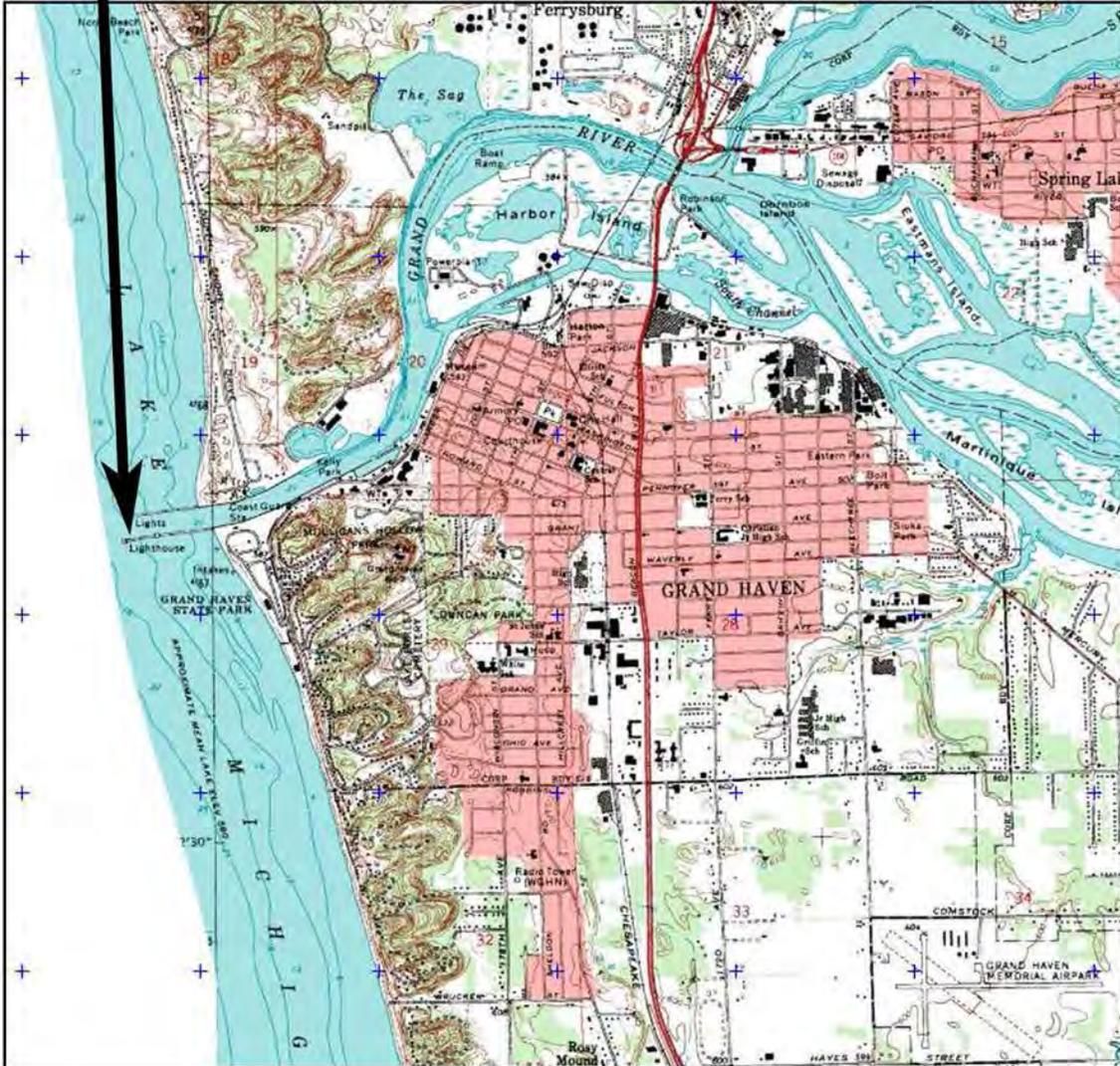
Copies of the final Historic Structures Report will be kept at the offices of the City of Grand Haven; the Tri-Cities Historical Museum; the Grand Haven Lighthouse Conservancy; the State Historic Preservation Office / Michigan State Housing Development Authority, Lansing, Michigan; and Sanders and Czapski Associates, PLLC, Marquette, Michigan.

GRAND HAVEN LIGHTHOUSE PROJECT LOCATION



LOCATION MAP

GRAND HAVEN SOUTH PIER ENTRANCE AND INNER LIGHTS



NORTH

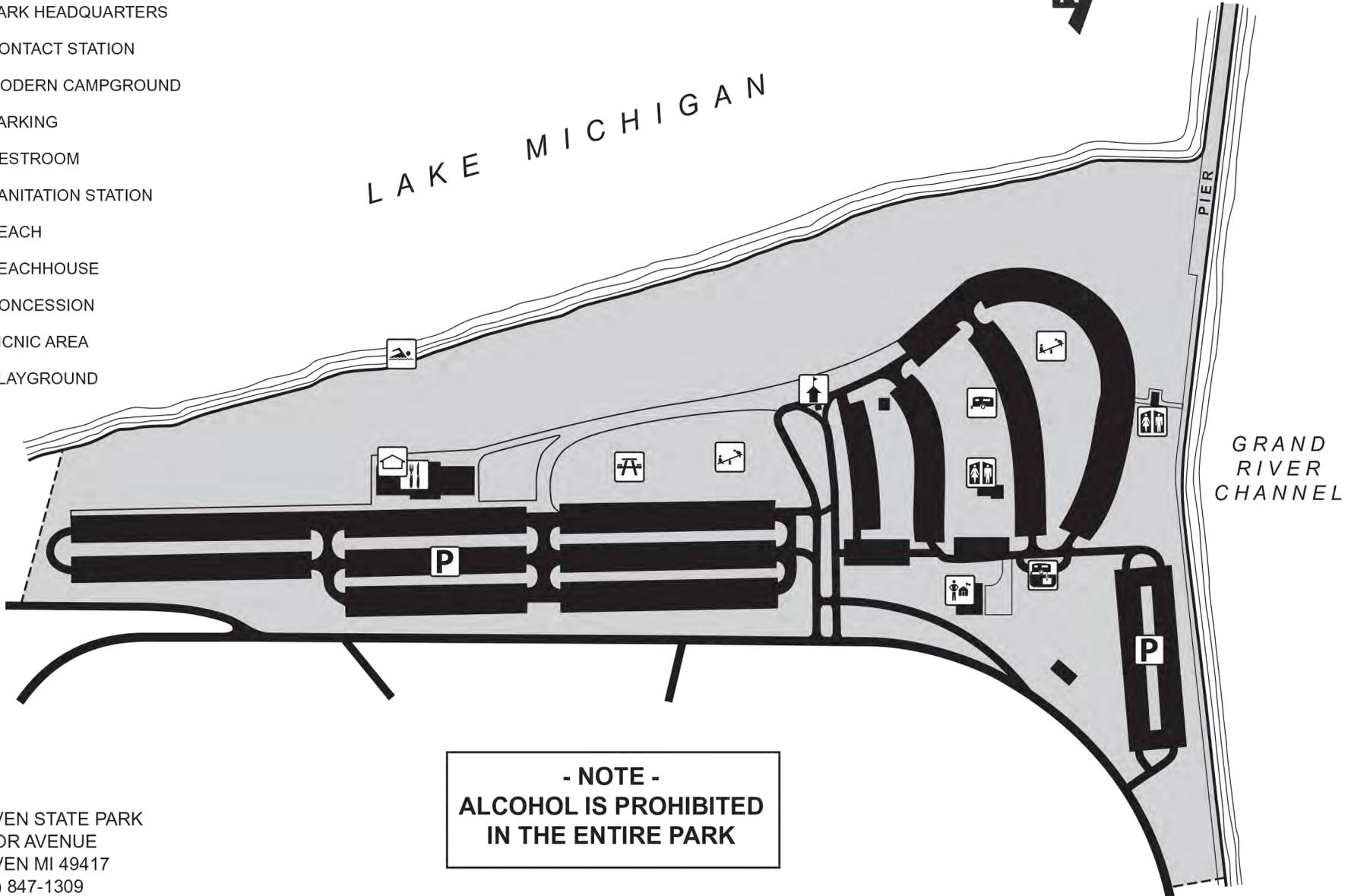


GRAND HAVEN, MICHIGAN

Grand Haven State Park

LEGEND

-  PAVED ROAD
-  AREA BOUNDARY
-  STATE PARK LAND
-  PARK HEADQUARTERS
-  CONTACT STATION
-  MODERN CAMPGROUND
-  PARKING
-  RESTROOM
-  SANITATION STATION
-  BEACH
-  BEACHHOUSE
-  CONCESSION
-  PICNIC AREA
-  PLAYGROUND



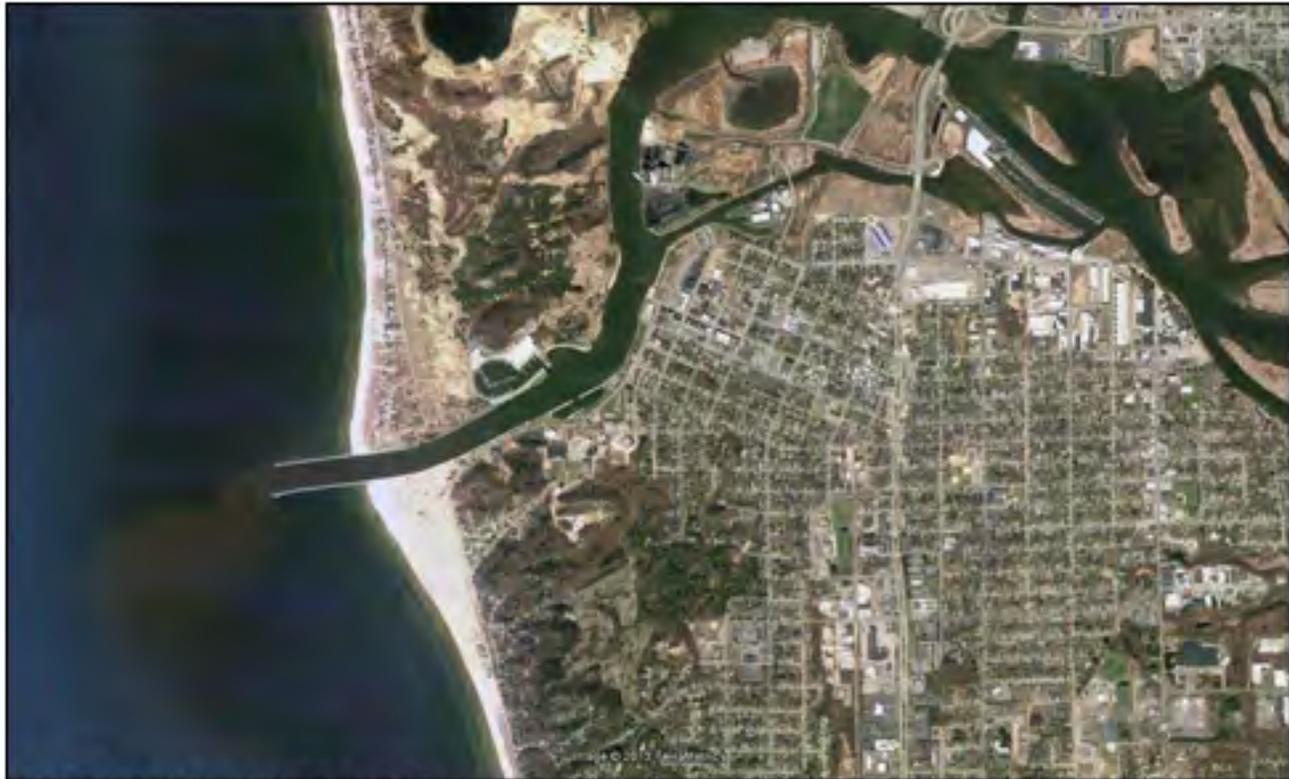
**- NOTE -
ALCOHOL IS PROHIBITED
IN THE ENTIRE PARK**

GRAND HAVEN STATE PARK
1001 HARBOR AVENUE
GRAND HAVEN MI 49417
Phone: (616) 847-1309

AERIAL VIEW OF GRAND HAVEN PIERS



VIEW #1 - NORTH AND SOUTH PIERS



VIEW #2 - CITY OF GRAND HAVEN AND GRAND RIVER

PART II – DEVELOPMENTAL HISTORY

A) HISTORICAL BACKGROUND AND CONTEXT

This section of the report has been written by BMC David C. Karpin, USCG, Ret., of the Grand Haven Lighthouse Conservancy and edited for this report. Additional developmental history is found in the National Register Nomination and Amendment found in Appendices E and F.

GENERAL

The U. S. Lighthouse Establishment was authorized by the United States Congress in 1789 to manage a small number of lighthouses constructed on the eastern coast of the United States and to oversee construction of new lighthouses. As development and maritime activity increased along ocean seaports and the Great Lakes in the 1800s the demand for maritime safety greatly increased and the U. S. Lighthouse Establishment became the U. S. Lighthouse Board in 1852 with twelve lighthouse districts. The original twelve districts were increased to sixteen districts in 1886, undoubtedly as construction of new lighthouses and lightstations increased throughout the country. There was quite an advancement in lighthouse construction technology during the mid to late 1800s including skeletal, screwpile and iron towers as well as lights constructed on piers and breakwaters. In 1910 the U. S. Lighthouse Board became the U. S. Bureau of Lighthouses and the number of districts was increased to nineteen. In 1939 the U. S. Bureau of Lighthouses was abolished along with the U. S. Life Saving Service and their functions were combined into a single agency, the newly formed U. S. Coast Guard. The U. S. Coast Guard embarked on a program to automate lighthouses at the end of World War II, and as a result, personnel and maintenance programs were drastically cut, if not eliminated entirely at some locations. With further increases in navigation technology in the late twentieth century, the U. S. Coast Guard began declaring many lighthouses and light stations as surplus property, making them available to state and local governments, private individuals, and other organizations, beginning a new period in lighthouse history.

GRAND HAVEN

European exploration of Lake Michigan and the peninsulas began in 1673 using readily available bark canoes. The first European style wooden boat to visit this port was the 45 ton British sloop, “Felicity”, which anchored in the Grand River on October 31, 1776 and transited the Great Lakes during this period. Shortly thereafter and for the next fifty years, the Grand River, known as Gabagouache, was frequented by explorers and traders. Early settlements of the Grand Haven area are traced to 1827 with the establishment of a trading post a short distance up the Grand River. In October 1826 the schooner “Andrew” failed to negotiate the harbor entrance and was driven ashore at the mouth of the Grand River, becoming one of the first locally recorded commercial wrecks. Further development and growth of the community may be attributed to the fact that the mouth of the Grand River provided one of the best natural harbors in that region of Lake Michigan. By the 1840s an increase in maritime traffic, growth of sawmills and other commerce, and an increase in population prompted improvements to the Grand River Harbor, however, a major development in the railroad industry played an even more important role. In 1855 the Detroit, Grand Haven and Milwaukee Railroad was formed by combining two competing railroads, the Oakland and Ottawa Railroad with the Detroit and Pontiac Railroad. Rather than develop a railroad route around the southern end of Lake Michigan and through the rapidly growing city of Chicago, the newly formed railroad company proposed and developed direct rail ferry service from Grand Haven to Milwaukee, Wisconsin with rail and ferry traffic beginning in 1858. This important event dramatically increased

maritime traffic in Grand Haven, prompting the continued development and growth of the harbor and lighthouse improvements.

THE FIRST GRAND HAVEN LIGHTHOUSE

Grand Haven's first lighthouse was built in 1839 on the "Lighthouse Acre" purchased by the U. S. government from John Wright of Chicago in 1838. This structure survived only a few years and was destroyed by the encroaching lake during a severe storm in December of 1852. Realizing that this site was too vulnerable, plans were made to construct a replacement lighthouse on a higher, inland site on a bluff overlooking the entrance to the Grand River from Lake Michigan. This bluff is visible in the modern day photograph following this section. This new lighthouse, consisting of a cylindrical stone tower connected to a one and one-half story keepers dwelling, began operation in 1855. Early photographs of this lighthouse are seen in Appendix A. On May 10, 1856, a rotating light equipped with modern technology at the time, a Fresnel lens purchased for \$4,000, and displaying a characteristic of making an apparent bright flash every one and one-half minutes, regulated by clockwork, was placed in the tower. This 4th Order Fresnel lens was capable of reflecting light visible for over twenty miles on a clear night. Although the focal plane of this light was approximately 70 feet above Lake Michigan due to its location on the bluff, the light tower was raised an additional four feet in 1868 and its original lantern was replaced with a new lantern. The ultimate destiny of the original lantern is not known, however, it may have been the lantern installed on the short wood tower constructed on the end of the South Pier in 1871, as seen in historic photo 4. Further investigation is necessary.

The lighthouse on the bluff continued to function as a navigation light until 1907 when the lantern was removed and relocated to the west end of the Fog Signal Building, now positioned at the far west end of the South Pier. The building continued to serve as a dwelling for the light station keepers and in 1910 the light tower was demolished and the dwelling renovated and expanded. Declared as surplus property by the U. S. Coast Guard in the mid-1950s, the dwelling was sold to a private owner. It remains in use today as a private dwelling known as 900 Harbor Drive.

THE SOUTH PIER AND REVETMENTS

The construction of various revetments along the north and south banks of the Grand River and piers extending into Lake Michigan began in the mid-1800s to protect the shipping channel and harbor. In the 1850s the Detroit and Milwaukee Railroad had constructed a pier of considerable length extending into Lake Michigan on the south side of the river, however, this pier was repeatedly damaged and eventually replaced. The U. S. Army Corps of Engineers began work on the piers as they exist today in 1866 with construction of the first segment in 1867-1868 extending approximately 287 feet into Lake Michigan. Subsequent extensions of the South Pier occurred in 1868-1869 with the addition of 109 feet; 1882-1884 with the addition of 348 feet; 1884-1885 with the addition of 652 feet*; and the final extension of 119 feet in 1893-1894, resulting in a total length of 1,515 feet as it exists today. A diagrammatic sketch of the evolution and growth of the South Pier follows this section. Development of the North Pier began in 1875 and continued through the 1890s with improvements occurring through the 1960s. Although this is a simplified description of the construction and development of the South Pier, U. S. Army Corps of Engineers records, as well the Construction Schedules identified in the National Register Nomination describe the extensive repairs and reconstruction of the North and South Piers and Revetments from the 1850s to the 1980s. Drawings of the various construction methods used on the different sections of the South Pier are found in Appendix B, indicating the

original wood piling, cribbing and plank construction. More modern improvements, which have encapsulated the original structure, have included the installation of steel sheet piling and capping with concrete to form the new pier surface or superstructure.

*A discrepancy was discovered between the National Register Nomination that listed the overall length of the pier as 1,495 feet with the 1884-1885 extension as 632 feet and U. S. Army Corps of Engineers maps. This discrepancy was discussed with U.S. Army Corps of Engineers, Grand Haven Office personnel Tom O'Brian in November 2013. The length of this extension was confirmed from U. S. Army Corps of Engineers records as 652 feet.

THE SOUTH PIER LIGHTS AND OTHER AIDS TO NAVIGATION

As the South Pier extended into Lake Michigan in 1867-1868, the first "beacon light" was installed at the end of the pier in 1871 along with an elevated wood catwalk. It is presumed that this "beacon light" may have utilized the original lantern that was removed from the lighthouse on the bluff in 1868. Further documentation is necessary.

A new Fog Signal Building was constructed near the end of the 396 foot long pier in 1875 to serve as a warning to mariners in low visibility weather conditions. Utilizing a coal-fired boiler and steam-powered siren, it emitted a five-second blast followed by a thirty-five second quiet interval. The original Fog Signal Building remains today as the South Pier Entrance Light.

When the South Pier was lengthened during the period of 1882-1894, the beacon light and the Fog Signal Building were subsequently moved to the new far west end of the pier and the wood catwalk extended. In 1902 the fog signal equipment was changed to a compressed air system powered by oil-fired engines and a compressed air siren type fog signal. In 1904 the last developments leading to the present day range light system began to occur on the South Pier. Ten years earlier the pier was constructed to its maximum length of 1,515 feet. In 1904-1905 a new fifty-two foot tall cylindrical light tower was constructed by the American Bridge Company west of the Fog Signal Building near the west end of the South Pier to replace the original beacon light. The rotating 4th Order Fresnel Lens beacon light was removed from the lighthouse on the bluff and installed in this new light tower. Also in 1907 the Fog Signal Building was modified to include the installation of a lantern and lantern deck on its west end. A 6th Order Lens was installed in the lantern. It is believed that the lantern removed from the 1855 Bluff Lighthouse in 1868 was used on the pier beacon light built in 18771 and then used again in 1907 as the lantern on the Entrance Light.

In 1907 the cylindrical light tower was relocated approximately 600 feet to the east of its initial location at the west end of the South Pier, becoming the "inner" light for the present day range light system. One historic photo, Photo 6, shows an octagonal lantern on top of the tower, different from the cylindrical lantern with "diamond" shaped windows seen in earlier photos and in existence today. Further investigation on this is necessary. The original lantern may have been temporarily removed, possibly for maintenance and then replaced. The original 4th Order Fresnel Lens was electrified in 1918 and was replaced in the 1970s with an acrylic beacon. The present day light is a VLB Marine LED Beacon. The 4th Order Fresnel Lens is now located in the Tri-Cities Historical Museum in Grand Haven.

The Fog Signal Building, now also functioning as the "outer light" at the west end of the South Pier, underwent significant changes in 1922 when a substantial concrete structure was constructed at the west end of the pier and the original wood frame Fog Signal Building was placed on top of this new structure, presumably to provide protection of the more fragile wood

frame building from the lake and to elevate the light. Corrugated metal siding was also installed at this time on the exterior of the wood frame structure. The heavily reinforced concrete base, now forming the first floor of the “outer light”, included porthole style windows and a unique “bow” design facing the open lake, much like the bow of a ship. Other building modifications completed in 1922 included the removal of small square windows on the north and south wall and replacing with larger rectangular windows. All windows are now removed from the building. The 6th Order Lens was removed in 1977 and is on loan to the Netherlands Museum in Holland, Michigan. It is presumed that this light was also electrified in 1918. The present day navigation light is a red, Marine Rotating Beacon.

As modifications were made to the outer light in 1922, a major change was also in motion on the pier with the removal of the elevated wood catwalk and the construction of the present day metal catwalk that extended from the shore to the Inner Light and ultimately to the Outer Light. This catwalk provided a walking surface elevated above the pier and lake surfaces for accessing the lights in poor weather and high sea conditions. With automation of the lights in 1969 the frequency of use of the catwalk undoubtedly diminished and it was allowed to deteriorate. In the mid 1980s the U. S. Coast Guard scheduled the catwalk to be demolished. Recognizing the importance of this structure as part of the pier lights, a local group known as the “Save the Catwalk Committee” was organized and raised public awareness as well as funds for preservation. Instead of demolition, the catwalk was declared as surplus property by the government and ownership was transferred to the City of Grand Haven in 1987. Rehabilitation of the catwalk was completed along with the installation of electric lights along its entire length in 1988. In 2004 a twenty-five year lease was signed with the U. S. Army Corps of Engineers allowing the city “passive use” of the north and south piers and for operation and maintenance of the elevated catwalk.

As use and care of the entrance and inner lights by the U. S. Coast Guard continued to decline, both structures were also declared as surplus property in 2008. Under the National Historic Lighthouse Preservation Act of 2000 the City of Grand Haven applied for ownership in 2010 and ownership of both lights was transferred to the city in 2013. The Grand Haven Lighthouse Conservancy, a non-profit organization dedicated to preservation, interpretation and public awareness, was formed in 2009. The City of Grand Haven, along with the Grand Haven Lighthouse Conservancy, is now responsible for the care, maintenance, preservation and public awareness of the lights.

The range light system established in 1907 continues in use today, with the U. S. Coast Guard responsible for the navigational aids that guide mariners safely into the Grand River and Grand Haven port. Frequently photographed during all seasons and an important tourist attraction on Lake Michigan, the South Pier Lights are distinguished by their bright red color and lighted catwalk that is visible for miles at night. The Grand Haven South Pier Entrance and Inner Lights and catwalk structure are an important landmark in the City of Grand Haven, providing testament to the city’s maritime history.

The “Piers and Revetments at Grand Haven, Michigan” were listed on the National Register of Historic Places in October, 1995, Reference #95001161. Recognizing that the Entrance and Inner Lights and Elevated Walkway were not specifically included in the National Register Listing, the nomination was amended and approved in May, 2009 to include these three structures.



View of South Pier, Entrance light, Inner Light and Catwalk, Grand Haven, Michigan, July 2011. Photo credit: Aerial Photography, John L. Wagner, East Lansing, Michigan.



View of South Pier, Inner Light, Entrance Light and Catwalk illuminated at dusk, Grand Haven, Michigan, July 2007. Photo credit: Lake Superior Photo, Marquette, Michigan.



Year Station Established	1839	Year Station Discontinued	_____
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Also known as: _____

Rebuilt: 1905

Auto: 1969

Position	Last Name	First Name	I	Born	Died	Start			End			Comment
						D	M	Year	D	M	Year	
Kpr.	Merritt	Nehemiah				29	8	1839	7	6	1847	Rsgd.
Kpr.	Haucland	William				7	6	1847	27	7	1849	Rsgd.
Kpr.	Torrey	George				27	7	1849	15	4	1853	Rsgd.
Kpr.	Vanderberg	Peter				15	4	1853	4	5	1858	Rsgd.
Kpr.	Gray	Jedediah				4	5	1858	3	4	1861	Rmvd.
1st Asst.	Walsh	M.				16	1	1861	18	2	1861	Rsgd.
1st Asst.	Squian	H.				18	2	1861	6	9	1861	Rmvd.
Kpr.	Belger	J.				23	6	1861	10	8	1861	Rmvd.
Kpr.	Miller	H.				10	8	1861	14	5	1875	Rsgd.
1st Asst.	Miller	James				6	9	1861	17	5	1862	Rsgd.
1st Asst.	Miller	George				17	5	1862	12	9	1872	Rmvd.
1st Asst.	Miller	Mrs. Harry				3	10	1872	1	9	1875	Rmvd.
Act. Kpr.	Smith	Harry				14	5	1875	29	9	1875	Perm. Appt.
Act. 1st Asst.	Hopkins	Munroe				1	9	1875	19	4	1876	Rsgd.
Kpr.	Smith	Harry				29	9	1875	20	4	1883	Rsgd.
Act. 2nd Asst.	Clark	J.	C.			19	1	1876	19	4	1876	Prmtd.
Act. 1st Asst.	Clark	J.	C.			19	4	1876	6	6	1876	Rsgd.
Act. 1st Asst.	Bon	Lewis Jr.	W.			6	6	1876	16	11	1876	Perm. Appt.
Act. 2nd Asst.	Kirkhoff	Bernard				11	7	1876	16	11	1876	Perm. Appt.
1st Asst.	Bon	Lewis Jr.	W.			16	11	1876	16	1	1877	Rsgd.
2nd Asst.	Kirkhoff	Bernard				16	11	1876	1	2	1877	Rsgd.
Act. 1st Asst.	Faltenz	Enno				16	1	1877	20	9	1877	Perm. Appt.
Act. 2nd Asst.	Van Hoef	Andrew				1	2	1877	21	6	1877	Rsgd.
Act. 2nd Asst.	Smith	Christopher				21	6	1877	20	9	1877	Perm. Appt.
1st Asst.	Faltenz	Enno				20	9	1877	1	4	1879	Rsgd.
2nd Asst.	Smith	Christopher				20	9	1877	22	4	1881	Prmtd.
Act. 1st Asst.	Andres	William				1	4	1879	10	1	1880	Rsgd.
Act. 1st Asst.	Bon	Lewis Jr.	W.			10	1	1880	1	7	1880	Perm. Appt.
1st Asst.	Bon	Lewis Jr.	W.			1	7	1880	22	4	1881	Rsgd.
Act. 1st Asst.	Smith	Christopher				22	4	1881	22	7	1881	Perm. Appt.
2nd Asst.	Smith	Andre				27	5	1881	1	3	1883	Rmvd.
1st Asst.	Smith	Christopher				22	7	1881	1	3	1883	Rmvd.
Act. 2nd Asst.	Manz	William				14	3	1883	9	5	1883	Rsgd.
Act. 1st Asst.	Sperry	Charles				14	3	1883	30	4	1883	Rsgd.
Kpr.	Davidson	Emanuel		1822	1911	20	4	1883	26	3	1900	Rsgd.
Act. 1st Asst.	Davidson	Lesander				30	4	1883	23	11	1883	Rsgd.
Act. 2nd Asst.	Shatt	Frank				9	5	1883	25	7	1883	Rsgd.
Act. 2nd Asst.	Robinson	Williamson				25	7	1883	23	11	1883	Rsgd.
Act. 2nd Asst.	Barden	Alfred				23	11	1883	4	2	1884	Rsgd.
Act. 1st Asst.	Hovey	Charles	R.			23	11	1883	21	8	1884	Perm. Appt.
Act. 2nd Asst.	Hovey	Frederick				4	2	1884	21	8	1884	Perm. Appt.
1st Asst.	Hovey	Charles	R.			21	8	1884	5	10	1885	Rsgd.
2nd Asst.	Hovey	Frederick				21	8	1884	17	5	1886	Rmvd.
Act. 1st Asst.	Satterlee	John				5	10	1885	5	10	1885	Declined
Act. 1st Asst.	Joyce	John	F.			5	12	1885	10	9	1886	Perm. Appt.
Act. 2nd Asst.	Fraga	Frank				26	5	1886	10	9	1886	Perm. Appt.
2nd Asst.	Fraga	Frank				10	9	1886	11	7	1892	Prmtd.
1st Asst.	Joyce	John	F.			10	9	1886	28	6	1892	Rmvd.
2nd Asst.	Bon	Lewis	W.			11	7	1892	30	6	1896	Rsgd.
1st Asst.	Fraga	Frank				11	7	1892	1	4	1900	Prmtd.
2nd Asst.	Douglas	Joseph				20	7	1896	31	5	1902	Prmtd.
1st Asst.	Boshka	Charles		1869	1925	1	4	1900	31	5	1902	Trsf. , Prmtd.
Kpr.	Fraga	Frank				1	4	1900	17	9	1911	Rsgd.
1st Asst.	Douglas	Joseph				1	6	1902	30	4	1909	Rsgd.
2nd Asst.	Grenell	Charles	S.			1	6	1902	30	6	1909	Trsf. , Prmtd.
1st Asst.	Ball	John	G.			1	5	1909	26	6	1909	Rsgd.
Act. 2nd Asst.	Lenenga	Oliver				28	7	1909	28	7	1909	Declined
Act. 2nd Asst.	Grenell	Dale				29	7	1909	29	7	1909	Declined
2nd Asst.	Beard	Ferdinand	A.			1	8	1909	28	2	1911	Trsf. , Prmtd.
1st Asst.	Berg	William	C.	1885		1	8	1909			1917	Trsf.
2nd Asst.	Dennis	Charles				1	3	1911	6	9	1911	Rsgd.
2nd Asst.	Poor	Benjamin	B.			3	10	1911	15	12	1917	Rsgd. Start date unsure
Act. 2nd Asst.	Fisher	Peter				6	9	1911	6	9	1911	Declined
Act. 2nd Asst.	Mc Gue	Edwin	E.			6	9	1911	3	10	1911	Rsgd.
Kpr.	Kilgore	Joseph		1868	1920	27	10	1911	11	2	1920	Died
1st Asst.	Paris	John	R.	1890		1	7	1918			1940	End date unsure
Kpr.	Bavry	Charles		1872	1927			1922	30	6	1926	Trsf.
2nd Asst.	Nufus	Carl	K.					1922			1922	Dates unsure
Kpr.	Engberg	Nels		1884		1	6	1926			1940	End date unsure
2nd Asst.	Sauers	David	M.	1887	1956			1939	27	7	1943	Trsf. Prmtd. Start date unsure

B) CHRONOLOGY OF DEVELOPMENT AND USE

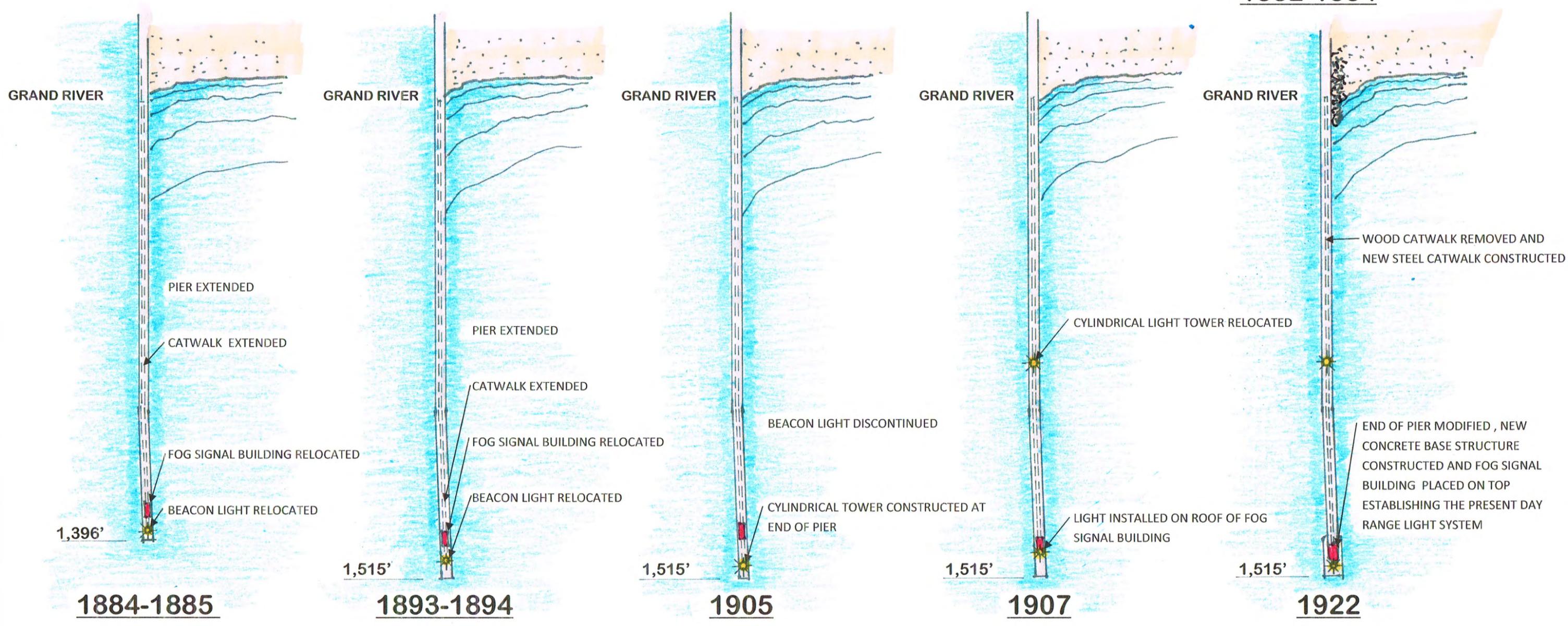
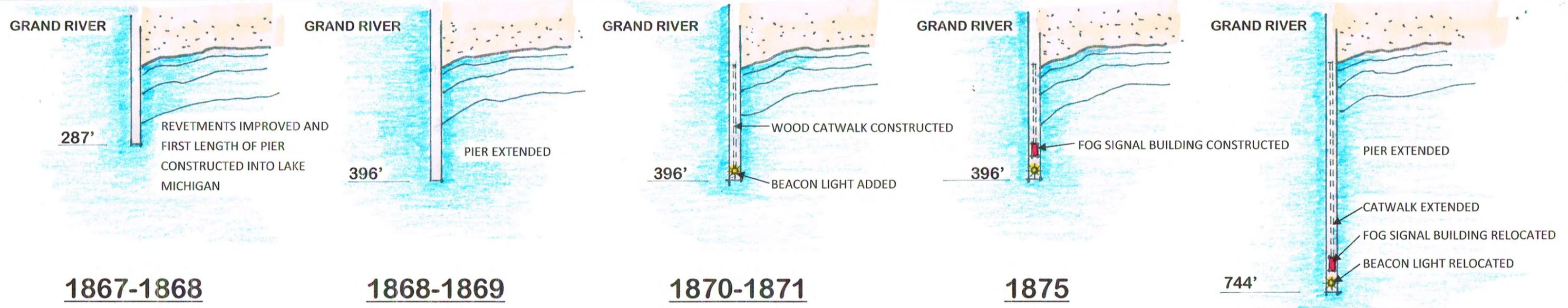
- 1827 Early settlements established along the Grand River from Grand Haven.
- 1838 Increase in maritime traffic prompts the U. S. Congress to authorize purchase of a small piece of land and construction of a lighthouse at the mouth of the Grand River.
- 1852 The first lighthouse was destroyed during a December storm.
- 1855 The Detroit, Grand Haven and Milwaukee Railroad was established with Grand Haven selected as the terminus on the east shore of Lake Michigan. This increased the importance of Grand Haven as a port with extensive rail ferry service to Milwaukee.
- 1855 A second lighthouse with a keepers dwelling was constructed on a higher bluff overlooking the mouth of the Grand River.
- 1856 A rotating 4th Order Fresnel lens was installed in the new lighthouse.
- 1857-1858 Construction began on revetments along the banks of the Grand River and a short pier at the south bank of the river to control erosion, shifting sand and reduce silt build-up in the channel.
- 1867-1868 The U. S. Army Corps of Engineers began construction of the first permanent section of the South Pier which extended 287 feet into Lake Michigan. This was the beginning of a long period of construction and improvements to the piers and revetments.
- 1868 The lantern on the lighthouse on the bluff was removed, the tower height was increased by four feet and a new lantern was installed.
- 1868-1869 The South Pier was extended by 109 feet, now bringing its total length to 396 feet.
- 1870 The Lighthouse Board requested \$8,000 to install a wooden tower and bell with 1,200 feet of elevated walkway, which was approved and installed the following year.
- 1871 A "Beacon Light", was installed at the end of the South Pier along with an elevated wood catwalk. It is presumed that this lantern was the original lantern recently removed from the lighthouse on the bluff.
- 1875 A Fog Signal Building was constructed at the end of the South Pier. The coal fired boiler and steam powered siren produced a 5 second blast followed by a 35 second quiet interval.

- 1882-1884 The South Pier was extended by 348 feet, now bringing its total length to 744 feet. The Fog Signal Building and beacon light were relocated to the new west end of the pier and the wood catwalk extended. A flash panel was added to the Fresnel lens and the rotation speed adjusted, altering its characteristics.
- 1884-1885 The South Pier was extended by 652 feet, now bringing its total length to 1,396 feet. The Fog Signal Building and beacon light were again relocated to the new west end of the pier and the wood catwalk extended.
- 1893-1894 The South Pier was extended by 119 feet. This was the final extension of the pier, bringing its final total length to 1,515 feet as it exists today.
- 1895 The Fog Signal Building and beacon light were relocated to the new west end of the pier and the wood catwalk extended. The Fog Signal was replaced with steam sirens in duplicate. They consumed 28 tons of coal annually.
- 1897 Construction of the North Pier was completed.
- 1904 A new 52 foot tall cylindrical metal tower was constructed on the South Pier west of the Fog Signal Building at the end of the pier.
- 1905 The rotating 4th Order Fresnel's Lens was removed from the lighthouse on the bluff and installed in the new cylindrical light tower. At this time the lantern on the lighthouse on the bluff was also removed and that lighthouse ceased to function as a navigation aid and began use only as a dwelling for U. S. Lighthouse Service personnel.
- Fog horn replaced with air compressor equipment powered by oil engines and a compressed air fog signal. This emitted a 3 second blast followed by a 37 second quiet interval.
- 1907 The 52 foot tall cylindrical metal tower was relocated from its initial location to its present day position approximately 600 feet to the east to serve as the "inner light" for the range light system that continues in use today.
- 1907 The roof structure of the Fog Signal Building was modified on its west end to include the construction of a lantern deck and placement of a lantern. This lantern was the one removed from the lighthouse on the bluff. The Fog Signal Building entered a new phase serving as the "outer" or "entrance light" for the range light system now in place on the South Pier, as well as continuing in use as a fog signal. A 6th Order lens was installed as the optic.
- 1918 The lights were electrified. The inner light was painted red to match the light color.
- 1921-1922 The west end of the South Pier was reconstructed and a heavily reinforced concrete structure was built as a new base, or lower level, for the Fog Signal Building and the wood frame Fog Signal Building / Entrance Light structure was placed on top of this concrete base, now making it a two story structure. The wood catwalk structure was demolished at this time and a new metal catwalk

structure was constructed. These changes during this period represent the last major physical changes and established the range light system as it exists today.

- 1927 A radio beacon was installed in the Entrance Light, identified as “go” on 316 KHz.
- 1940 A Type “F” air diaphone fog horn was installed. Its characteristic was a first blast 1.5 seconds long, followed by a 2 second silent period, a second blast 1.5 seconds long, followed by a 25 second silent period.
- 1950-1960 Extensive repairs and improvements were made to the South Pier, North Pier and revetments along the banks of the Grand River.
- 1956 The original lighthouse constructed on the bluff was sold by the U. S. Government as surplus property. The former lighthouse was purchased and converted to use as a private dwelling.
- 1969 Lights were automated and the diaphone fog signal was replaced with an “FA-232” electric fog signal.
- 1977 The 6th Order Fresnel Lens was removed and transferred to the Netherlands Museum in Holland, Michigan.
- 1984 A boardwalk was constructed connecting the downtown district of Grand Haven with the South Pier.
- 1986 The U. S. Coast Guard schedules the demolition of the elevated metal catwalk over concerns of public safety and maintenance.
- 1987-1988 A local preservation group was formed, raising funds for rehabilitation and lighting. New lighting was installed along the entire length of the catwalk. Declared surplus property by the U. S. Government, ownership of the catwalk was transferred to the City of Grand Haven. The catwalk was first illuminated in 1988. Fog horn replaced with air compressor equipment powered by oil engines and a compressed air fog signal. This emitted a 3 second blast followed by a 37 second quiet interval.
- 1995 Recognizing their historical importance, the “Piers and Revetments at Grand Haven, Michigan” were listed on the U. S. Department of the Interior’s National Register of Historic Places.
- 2004 The City of Grand Haven enters into a twenty-five year lease with the U. S. Army Corps of Engineers allowing the city “passive use” of the South Pier for operation and maintenance of the catwalk.
- 2008 The Entrance and Inner Lights were declared surplus property by the U. S. Government.
- 2009 The Grand Haven Lighthouse Conservancy was formed to assist the City of Grand Haven and guide the preservation of the Entrance and Inner Lights and catwalk.

- 2009 The U.S. Department of the Interior's National Register of Historic Places listing was amended to include the "Entrance and Inner Lights and Elevated Walkway" located on the South Pier.
- 2009-2010 Under the National Historic Lighthouse Preservation Act of 2000 the City of Grand Haven applies for ownership of the Entrance and Inner Lights.
- 2013 Ownership of the Entrance and Inner Lights was transferred to the City of Grand Haven.
- 2013-2014 Work on the Lights resumes with the removal of lead base paint, painting and lantern glass replacement.



PROGRESSION OF DEVELOPMENT OF THE SOUTH PIER AT GRAND HAVEN, MICHIGAN

PART III – EXISTING CONDITIONS / PHYSICAL DESCRIPTIONS

Documentation of the existing conditions at the Grand Haven South Pier Entrance and Inner Lights was performed by Mr. Ken Czapski, AIA, a registered architect in Michigan, during a site visit on April 19 – 22, 2013. This section includes a general assessment of the pier, elevated catwalk and the entrance and inner light structures.

A) ELEVATED CATWALK AND SOUTH PIER

The Grand Haven Entrance and Inner Lights, as seen in Photo III-A-1, are located on a pier constructed on the south side of the mouth of the Grand River where it flows into Lake Michigan on Michigan’s west coast. Known as the South Pier, this structure, along with the pier on the north side of the river mouth, is owned and maintained by the U. S. Army Corps of Engineers. The North Pier, which has a navigational light at the west end is shown in Photo III-A-2. The inclusion of the South Pier in this report is for informational purposes only as it is the “site” and approach to both lights; an in depth analysis of the pier is not included.



Photo III-A-1



Photo III-A-2

The South Pier extends approximately 1,515 feet from the sand beach shoreline on the south face of the pier, which marks the beginning of the Grand Haven State Park, a popular 48 acre park, as seen in Photo III-A-3 and terminates at the Outer Light structure, as seen in Photo III-A-4. The pier, which was built in segments, began with the construction of a series of shoreline revetments in 1857 – 1858 along the south bank of the Grand River. Construction of the present day 1,515 foot long pier progressed as follows:

1867 – 1868	287 foot long segment constructed;
1868 – 1869	109 foot long segment added;
1882 – 1884	348 foot long segment added;
1883 – 1885	652 foot long segment added;
1893 – 1894	<u>119 foot long segment added.</u>
	1,515 feet total



Photo III-A-3

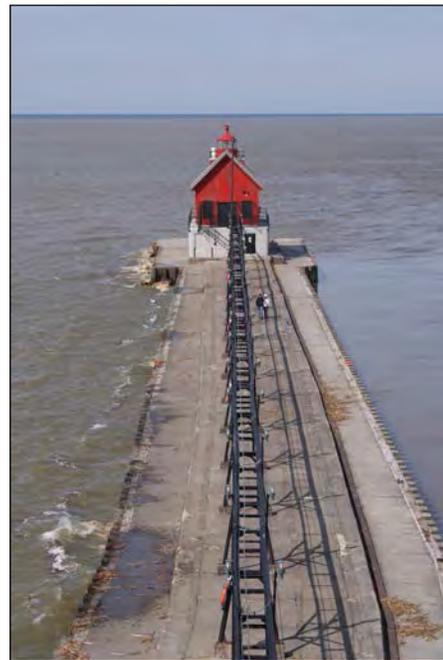


Photo III-A-4

The 37 foot wide pier surface, or superstructure, was modified and repaired many times from 1916 through the 1960s. The last segment of the pier that surrounds the Entrance Light was constructed with a width of 51 feet – 6 inches. The eastern terminus of the pier now joins a public walkway along the Grand River that connects with public parking areas within the Grand Haven State Park. Photos III-A-5, III-A-6, III-A-7, and III-A-8 show various views of the approach to the pier. A continuous metal railing serves as a barrier at the river along this walkway and a small concrete ramp provides access onto the pier. The public parking areas, as seen in Photos III-A-9 and III-A-10, provide convenient parking a reasonable distance from the pier. A motor vehicle permit is required for entry to these parking areas, however, pedestrians are free to enter the site at various points. While there are no restroom facilities on the pier there are a number of public facilities near the parking lot area conveniently located for visitors. Permanent facilities are shown in Photos III-A-11 and III-A-12. Portable toilets, Photo III-A-13, are occasionally placed for seasonal use, but are not normally available.



Photo III-A-5



Photo III-A-6



Photo III-A-7



Photo III-A-8



Photo III-A-9



Photo III-A-10



Photo III-A-11



Photo III-A-12



Photo III-A-13

Public access to the pier is unrestricted and it is an extremely popular destination for fishermen, tourists, bicyclists, park visitors and sightseers. An unprotected pier extending into the lake is often a dangerous place and signage at the terminus of the pier states that the pier “is not designed for public access” and that dangers and hazards are present as seen in Photos III-A-14, III-A-15 and III-A-16. The metal railing along the public walkway along the river’s edge abruptly ends at the small ramp at the beginning of the pier leaving the pier surface unprotected from the water’s edge. Refer to Photo III-A-17.



Photo III-A-14



Photo III-A-15

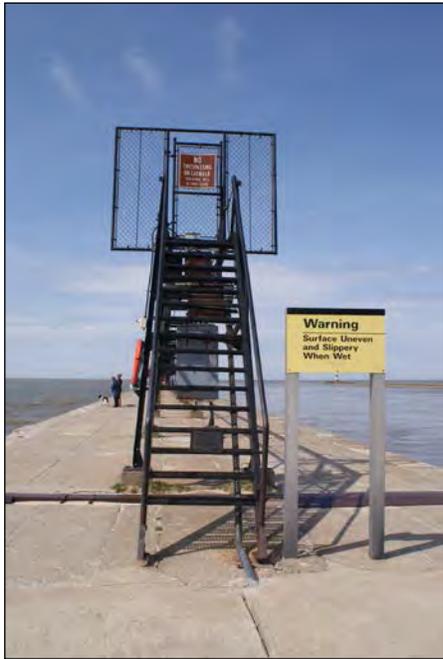


Photo III-A-16



Photo III-A-17

The traffic surface of the pier is concrete which is in fair condition, however, there are many areas of deterioration and many potential tripping hazards as seen in Photos III-A-18, III-A-19 and III-A-20. The elevation of the walking surfaces changes a number of times along its length and width with steps and sloped ramp surfaces providing the transition between levels. Refer to Photos III-A-21 and III-A-22. Although there are areas of concern, the pier in general, provides a barrier free accessible, albeit somewhat dangerous, walkway from the State Park parking lot to the Entrance and Inner Light structures.



Photo III-A-18



Photo III-A-19



Photo III-A-20



Photo III-A-21



Photo III-A-22

The Inner Light, placed approximately halfway along the length of the pier, is situated upon an eight sided concrete base, Photo III-A-23, that is 2'-8" above the main pier deck surface. Access around the structure's base is maintained at the main pier deck surface as seen in Photo III-A-24. At the Entrance Light, located at the far western end, there is a 1'-1" step up from the main pier deck surface to the walkway at the entry to the structure, as seen in Photo III-A-25. Further discussion of these areas are found in the respective sections describing the existing conditions of the Entrance and Inner Lights.



Photo III-A-23



Photo III-A-24

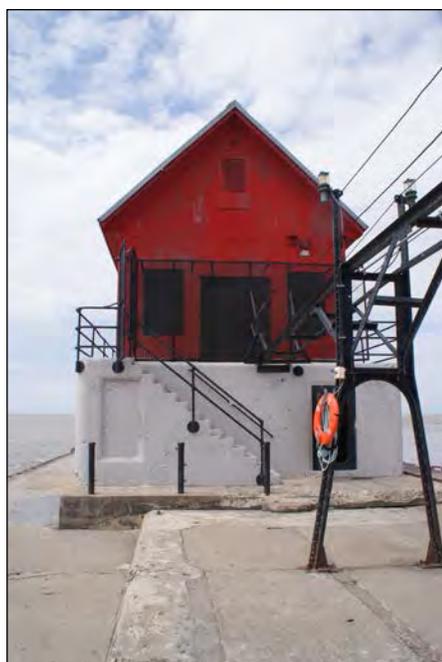


Photo III-A-25

The elevated catwalk structure is a unique element of the Grand Haven South Pier, and with the addition of lighting in 1988, greatly contributes to the aesthetics and structural rhythm of the Entrance and Inner Lights. Because of the dangers in accessing the Lights, there was a need to construct an elevated walkway above the pier deck surface. A wooden catwalk structure was constructed on the pier in 1871 and extended through time. The present day metal catwalk structure, constructed in 1922 and replacing the wood catwalk, consists of a series of sixty stanchions that begin at the east end of the pier, Photo III-A-26, and terminate at the Entrance Light structure at the western end. These stanchions provide the main supports for the continuous walkway that is approximately 11'-6" above the pier deck surface. The walkway provided access to an upper level entry door at the Inner Light and then makes a short dogleg around that structure as seen in Photo III-A-27. Various views of the catwalk are shown in Photos III-A-28, III-A-29, III-A-30 and III-A-31.

A small plaque, as seen in Photo III-A-32, is mounted to the catwalk stair located at the east end. This plaque is dedicated to the memory of Edward J. Zenko, (1916-1987) a Grand Haven citizen and businessman who lead the effort to save and preserve the catwalk structure upon learning of the U. S. Coast Guards plan to demolish the structure in 1987 for safety reasons. Mr. Zenko established the "Save the Catwalk Committee" which raised funds to remove the deteriorated wood planking at the walkway level, repair and reinforce damaged structural supports and install new lighting along its length. The rehabilitation project was completed and the catwalk structure was illuminated for the first time in November 1988. Mr. Zenko unfortunately died in December 1987 prior to the completion of the project, however his leadership efforts are recognized.

The metal stanchions consist of angles that bear upon small raised concrete piers as seen in Photo III-A-33. There is localized damage at the lower portions of some of the stanchions including bent and damaged members and some rusting, as seen in Photos III-A-34 and III-A-35, along with some damaged and spalling concrete at the raised support piers. These areas appear to be minor and the overall integrity of the catwalk appears sound, however, further evaluation and monitoring is recommended. The walking deck surface of the catwalk was removed in 1988 for safety reasons and to raise funds by salvaging the wood planks for donors. Presently the catwalk serves only as a support structure for the lighting system, Photo III-A-36, electrical panels, Photo III-A-37 and some public safety equipment, Photo III-A-38.



Photo III-A-26



Photo III-A-27



Photo III-A-28



Photo III-A-29



Photo III-A-30



Photo III-A-31



Photo III-A-32



Photo III-A-33



Photo III-A-34



Photo III-A-35



Photo III-A-36



Photo III-A-37

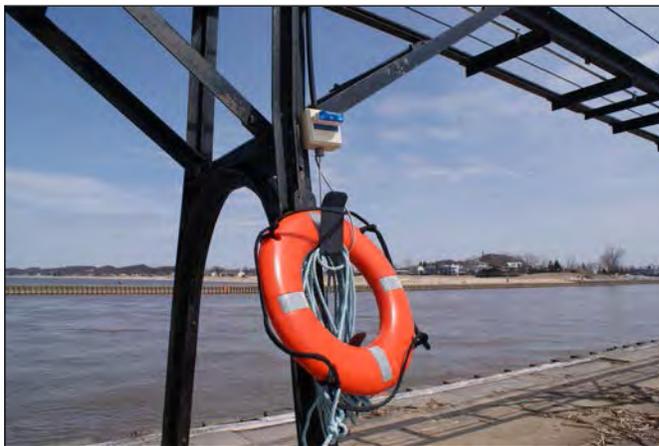


Photo III-A-38

The elevated catwalk is entered by a stairway at its eastern end as seen in previous Photo III-A-16. A security fence and gate, Photo III-A-39, along with signage is present to keep the public off the catwalk. It is now only accessed for lighting maintenance purposes by authorized city personnel.

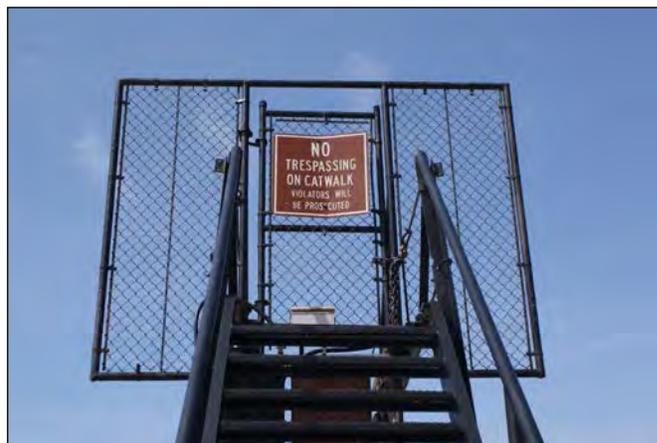


Photo III-A-39

B) ENTRANCE LIGHT

The Grand Haven South Pier Entrance Light has gone through numerous changes from its original construction in 1875 as a Fog Signal Building to its present design as the light marking the entrance to the Grand River. The last significant change to this structure occurred in 1922 when the substantial concrete base was constructed and the original wood frame building was placed on top. Refer to Photos III-B-1 and III-B-2. In addition to these changes the building was relocated several times as the South Pier was extended in length. Historic photos in Appendix A show the evolution and changes of the building over time.

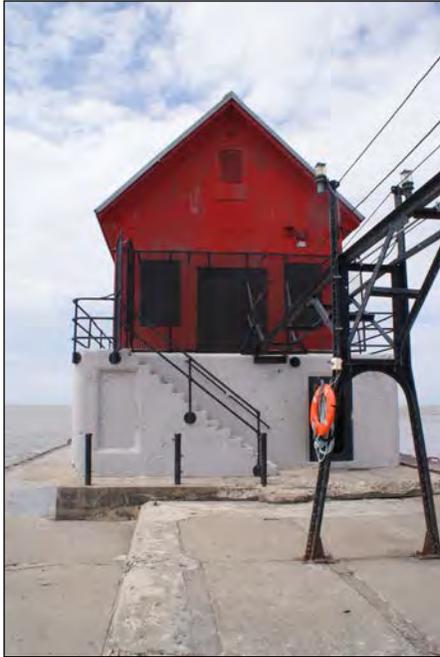


Photo III-B-1



Photo III-B-2

STRUCTURAL SYSTEM ANALYSIS

The Entrance Light is a simple metal clad wood frame building with a gable roof, constructed on top of a reinforced concrete structure that now forms the first floor of the building. The concrete structure has a nautical design with porthole style windows, a watertight steel door and a unique pointed “bow” facing the lake to divert water and ice away from the building.

The main floor of the building, at the pier deck level, is a concrete floor slab. Original building drawings indicate this slab to be a 2 inch poured concrete topping over 4 inch hollow clay tile installed over a rather substantial 7 foot thick concrete base that is tied into a series of concrete beams that are poured on the pier superstructure. The floor slab at this level is in good condition. The upper floor, or the floor level of the original wood frame Fog Signal Building, is also a concrete floor slab. Existing conditions indicate some substantial deviations from the original building drawings. Existing conditions are noted as an 8½ inch thick concrete slab poured directly over the 10 inch thick structural slab, forming a floor structure approximately 1'-7" overall thickness resulting in a floor to floor dimension of 9'-2½" versus the 10'-6" dimension noted on the original drawings. The structural slab of this upper floor also includes a series of concrete beams that measure 1'-6" wide by 1'-0" deep. A general view of the interior space is

seen in Photo III-B-3 showing the concrete beams, columns and underside of the structural slab that forms the finished ceiling. One concrete beam near the entrance door is damaged and has a large vertical crack. Two supplementary wood columns, 3 ½" x 5 ½" in size, have been installed to provide support as seen in Photo III-B-4. The floor / ceiling slab, beams and columns otherwise are all in good condition with some minor areas of spalling on the interior.



Photo III-B-3



Photo III-B-4

Exterior concrete surfaces are, in general, in fair condition although there are many areas where severe spalling has occurred which has exposed the reinforcing steel. Refer to Photos III-B-5 and III-B-6. Additional information is found in the Exterior Conditions and Analysis section.



Photo III-B-5



Photo III-B-6

The upper floor level of the building transitions to the original 1875 wood frame structure placed upon the concrete base. The original wood floor structure was removed at this time and there is now the exposed concrete floor slab, which is in good condition. Walls of the building are wood frame with 2" x 5 1/2" and 3 5/8" x 5 1/2" wood studs at various spacing. Stud walls are covered on the exterior face with horizontal and diagonal wood sheathing 1 3/4" thick. A general interior view of the main room is seen in Photo III-B-7. Although the studs and sheathing are in reasonably good condition supplementary 6" wide steel beams have been installed in the stud space as reinforcing. These beams are seen in Photos III-B-8 and III-B-9. The date of the installation of this reinforcing steel is not known. Supplementary steel has also been added below the lantern. A framework of 4" x 4" x 5/16" steel angle columns extends from the concrete floor, Photo III-B-10, up to the underside of the lantern floor, Photos III-B-11 and III-B-12. The date of the installation of this reinforcing steel is not known, however, it is in good condition.



Photo III-B-7



Photo III-B-8



Photo III-B-9



Photo III-B-10



Photo III-B-11



Photo III-B-12

From the upper floor level a steep wood stair provides access to a walkway that leads to the Service Room below the Lantern Room. This walkway runs the length of the building and once provided access from the elevated catwalk prior to 1922 into the building through a door at the gable end, Photo III-B-13, now closed off. Four $\frac{1}{2}$ " diameter steel rods support two 5" deep c-channels that span between outside walls and provide support for the walkway. Floor/ceiling rafters in this area are $1\frac{3}{4}$ " x $5\frac{7}{8}$ " wood rafters spaced 16" on center. Part of the floor is decked with random width $\frac{3}{4}$ " tongue and groove wood plank, part with plywood and part of the floor is open. All structural members appeared in reasonably good condition.



Photo III-B-13

The building roof is wood framed with 1¾" x 5 7/8" wood rafters spaced 16" o.c. Roof sheathing is 1" thick random width planking. A partial view of the roof structure is shown in Photo III-B-14 looking up through the attic access hatch. Where observed, the roof framing appeared to be in sound condition.



Photo III-B-14

Finish material in the Lantern Room was not removed as part of this investigation and the wood frame structure could not be seen. The lantern deck has been covered with a PVC single-ply membrane that has a very large section missing at the northwest corner, as seen in Photo III-B-15, exposing the wood deck and creating a major point of entry for water into the structure. The wood decking appeared sound, however, this situation warrants immediate repair.



Photo III-B-15

EXTERIOR CONDITIONS AND ANALYSIS

A character defining feature of the Entrance Light is the red color. Major exterior materials include corrugated metal wall cladding painted red, concrete walls painted light grey, and a standing seam metal roof.

The first floor structure, located at the pier deck level, is a painted concrete structure. The main pier walking surface transitions 1' – 1" up to a concrete walking surface that wraps the structure on the north and east sides and once again steps down as it wraps the far west end. This walking surface is shown in Photos III-B-16, III-B-17, III-B-18 and III-B-19. The concrete surface, along with a concrete step, is in poor condition with severe deterioration and spalling along edges. This raised walking surface is a barrier and the termination point on the pier for barrier free accessibility.



Photo III-B-16



Photo III-B-17

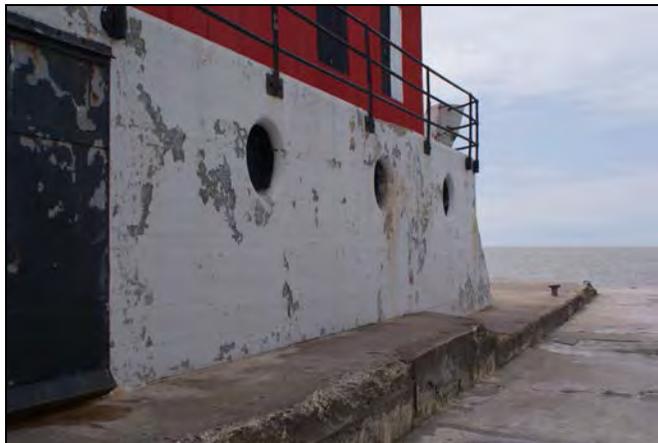


Photo III-B-18



Photo III-B-19

There are a number of steel pipe posts, hand-holds and stanchions cast into the concrete along this walkway. These elements are in good condition, however, all paint is in poor condition. The steel pipe posts adjacent to the concrete stair appear to have been for a chain safety rail system, which is missing.

The vertical poured concrete walls of the Entrance Light are in fair condition with some areas of spalling as seen in Photos III-B-20, III-B-21, III-B-22 and III-B-23. A cast iron clean-out, Photo III-B-24, is cast into the south wall. This clean-out served the sanitary waste line in the main level of the building.



Photo III-B-20



Photo III-B-21



Photo III-B-22



Photo III-B-23



Photo III-B-24

A set of cast concrete steps is located at the southeast corner of the building and provides access to the upper level walkway as seen in Photo III-B-25. There is extensive deterioration of the concrete steps including cracking and spalling. Refer to Photos III-B-26 and III-B-27. A metal pipe handrail, which is in good condition, is anchored to the concrete wall and a 1 3/4" metal pipe handrail/guardrail is bracketed to the face of the exposed stairway wall. This handrail/guardrail is in poor condition. The base of the lowest support post, as seen in Photo III-B-28 has completely rusted and broken loose from the support bracket. Severe rusting has also occurred at other post bases and brackets.



Photo III-B-25



Photo III-B-26



Photo III-B-27



Photo III-B-28

An 8' – 3" high wire mesh security fence is located at the top of the exterior stair and along the eastern edge of the upper deck level to prevent public access. This security fence is shown in Photo III-B-29 and the 36" wide gate located at the top of the stairs is shown in Photo III-B-30.



Photo III-B-29



Photo III-B-30



Photo III-B-31

The upper level walkway which is also the roof of the main level, is 2' – 2" wide on the north side, Photo III-B-31; and south side, Photo III-B-32 and 4' – 0" wide on the east side, Photo III-B-33. Spalled concrete edges present a safety hazard as seen in Photo III-B-34. The narrow walkway transitions to a larger deck at the west end "bow". Refer to Photos III-B-35 and III-B-36. Poured concrete walls form the guardrail along this area. The paint on these walkway surfaces, which is also the roof surface for the lower level, is in poor condition and there is some minor cracking. A metal coal room hatch, as seen in Photos III-B-37 and from the interior in Photo III-B-38, is located on this deck. The metal hatch cover and frame are rusted and the paint is in poor condition.



Photo III-B-32



Photo III-B-33



Photo III-B-34



Photo III-B-35



Photo III-B-36



Photo III-B-37



Photo III-B-38

A 3' – 6" metal pipe guardrail with three horizontal rails extends around this upper level walkway. The guardrail is constructed of 1 3/4" diameter metal pipe as seen in Photos III-B-39 and III-B-40. Similar to the railing at the stair, the guardrail posts are bracketed to the face of the concrete wall surface. Refer to Photos III-B-41 and III-B-42. Three of the guardrail pipe posts have been replaced with 2 x 2 steel angle. Many of the metal pipe guardrail components are in poor condition with members bent and rusted. The paint finish, Photo III-B-43, is in poor condition.

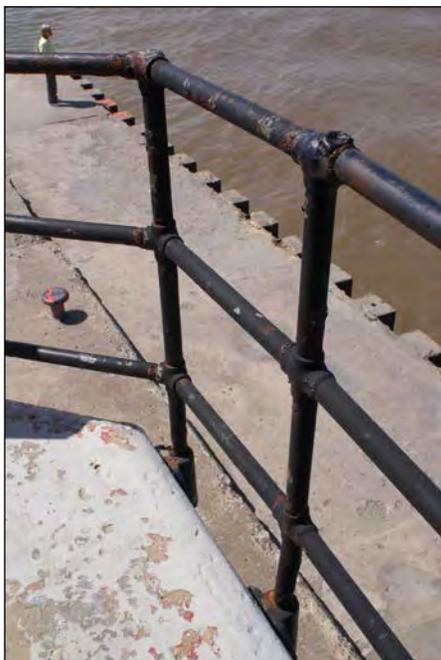


Photo III-B-39

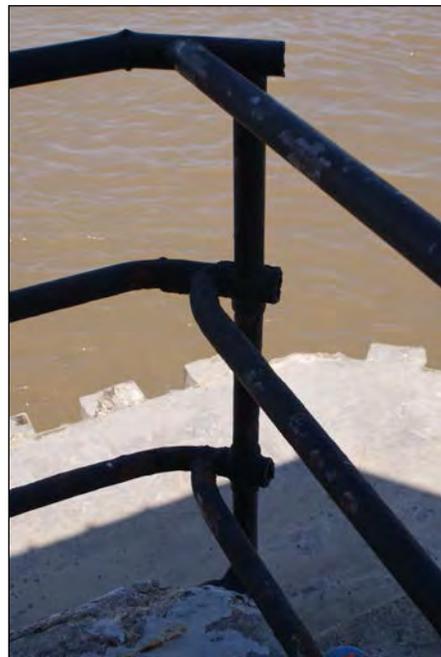


Photo III-B-40



Photo III-B-41



Photo III-B-42



Photo III-B-43

The wood frame structure of the original Fog Signal Building is placed on an 8" high poured concrete curbs that extend around the perimeter. On three sides the corrugated metal siding overlaps this curb, Photo III-B-44; however, it transitions to a different condition on the west side as seen in Photo III-B-45. On the west side repairs or modifications have been made and the concrete curb was extended and poured over the face of the corrugated metal siding. This condition is seen in Photos III-B-46, III-B-47 and III-B-48. In addition to the voids and missing concrete, there is a gap between the concrete and the corrugated metal siding, as seen in Photo III-B- 49 that allows water to flow down the siding face and penetrate the curb.



Photo III-B-44



Photo III-B-45



Photo III-B-46



Photo III-B-47



Photo III-B-48



Photo III-B-49

The exterior surface of the walls, the fascia and soffit are clad with a corrugated metal siding with ribs spaced 2 ¾" on center and an overall profile thickness of ½". Records indicate that this metal siding, which is painted red, was installed in 1922. Contrasting metal panels painted black are installed at former window locations as seen in Photo III-B-50. Fascia and soffits are shown in Photos III-B-51 and III-B-52. The metal siding is in fair condition with some areas of damage and rust. The paint finish is in poor condition throughout.



Photo III-B-50



Photo III-B-51



Photo III-B-52

A number of objects including a fixed ventilation louver, Photo III-B-53, an equipment support bracket and radio beacon high voltage wire terminal, Photo III-B-54, are located on the east wall of the building.

The main roof of the Entrance Light is covered with a concealed fastener standing seam metal roof that is painted a medium grey color. The roof, seen in Photos III-B-55, III-B-56, and III-B-57, has 2" high ribs spaced 16" on center. This roof was installed in 2006 and is in very good condition. Various metal flashing and trim components, matching the same roof material color, are used throughout. Although the previous roof is reported to be a rubber membrane roof, the presence of any former roofing material was not observed.



Photo III-B-53



Photo III-B-54



Photo III-B-55



Photo III-B-56



Photo III-B-57

All windows in the original wood frame structure have been removed and the openings either filled in with wood or concrete masonry units. A series of small framed openings measuring 1' – 7" x 1' – 7" on the north and south walls for original windows are visible from the building interior, Photo III-B-58. The 1922 drawings indicate these original windows to be removed, covered over, and new larger double hung windows to be installed. These larger window units are also no longer extant, with concrete masonry units infilling the 2' – 7" wide by 5' – 4" high openings as seen in Photo III-B-59. As previously discussed, black corrugated metal panels are placed on the exterior face to highlight the former window locations. On the main level of the Entrance Light there are seven large porthole style windows measuring 2' – 5" in diameter. The heavy glass, measuring $\frac{3}{4}$ " in thickness, is either missing or broken in six of the seven windows, as seen in Photos III-B-60, III-B-61 and III-B-62. All windows are covered on the exterior with steel plate that is painted black. Refer to Photo III-B-63. The frames and inward opening sash of all porthole style windows are in good condition, however, some are missing. A pivoting steel sash window located below the exterior concrete stairway was also called out on the 1922 drawings. This window has also been removed and is now filled in with concrete masonry units as seen in Photos III-B-64 and III-B-65.



Photo III-B-58



Photo III-B-59



Photo III-B-60



Photo III-B-61



Photo III-B-62



Photo III-B-63



Photo III-B-64



Photo III-B-65

There are three exterior doors on the Entrance Light; two heavy steel doors on the main pier deck level and one at the upper level that provides access to the walkway. The main entrance door into the main level is a 2' – 4" x 5' – 8" watertight steel door and frame set into the original opening in the poured concrete wall. Views of this door are shown in Photos III-B-66, III-B-67 and III-B-68. The door is in good operating condition, however the paint finish is in poor condition. The 1922 drawings indicate a conventional door with a half glass light. The watertight door was installed in the 1990's.



Photo III-B-66



Photo III-B-67



Photo III-B-68

Adjacent to the watertight door is a large door measuring 6' – 8" wide x 6' – 11 ½" high that served as the door into the boat room, as seen in Photo III-B-69. Original drawings indicate doors with half glass lights, however, these doors have been removed and replaced with steel plates. Additional bracing has been installed and welded to the steel plate as seen in Photo III-B-70. The door and frame are in poor condition with extensive rust and deterioration. A large floor drain, Photo III-B-71, is found inside this door and is in similar poor condition. The paint finish on all door, frame and grating components is very poor.

A hand operated derrick, as detailed in historic drawing # RHL1018434, was located above this boat room door to facilitate the handling of boats and materials. Although this derrick is no longer extant, bolt locations for the original mounting brackets above the doors are still visible as seen in Photo III-B-69.



Photo III-B-69



Photo III-B-70



Photo III-B-71

On the upper level a single 3'-0" x 6'-8" hollow metal steel door is set in a 6'-0" x 7'-0" framed door opening. This door, seen in Photos III-B-72 and III-B-73 is in poor condition and replaced a pair of doors with glass lights previously located in this opening.



Photo III-B-72



Photo III-B-73

INTERIOR CONDITIONS AND ANALYSIS

There are four distinct interior spaces in the Entrance Light resulting from various renovations over different time periods: the main pier deck level constructed in 1922; the upper level originally the Fog Signal Building constructed in 1875; the attic catwalk and lantern service room; and the lantern and lantern deck constructed in 1907 with the addition of the lantern to the building.

The building is entered at the pier deck level into a room identified as the Boat Room on the 1922 drawings. The interior floor level is approximately 5 inches above the entry walk at the pier deck. Finishes include a poured concrete floor and ceiling and 4" thick hollow glazed tile on the walls. Views of this room are shown in Photos III-B-74 and III-B-75. There is some minor damage of the hollow glazed tile but overall these walls are in good condition. All floor, ceiling and wall surfaces are painted and all paint finishes are in poor condition. A 4" hollow glazed tile wall separates the Boat Room from the adjoining Equipment Room. A 5'-0" x 6'-7" door opening is located in this wall. The wood door frame is intact but the doors are missing, as seen in Photo III-B-76. Original drawings show a pair of doors of unequal width, presumed to be a 3'-0" and 2'-0" wide doors with glass lights.



Photo III-B-74



Photo III-B-75



Photo III-B-76

The Equipment Room is of similar construction with a poured concrete floor and ceiling and hollow glazed tile on the walls. Views of this room are shown in Photos III-B-77 and III-B-78. Photo III-B-79 shows the substantial exposed concrete column and beam that are in this space. Two large air tanks and a 1'-4" high concrete curb containment area are located on the north wall as seen in Photo III-B-80. These tanks measure 4' in diameter by 6' high. The tanks are in good condition although most of the piping is no longer present. On the south side of the room there is a brick masonry chimney, Photo III-B-81, and an 8" high curbed structure that was the well, Photo III-B-82. There is a solid ½" thick steel plate cover on the well. This cover is rusted and the paint finish is poor. A single floor drain is present near the center of the room as seen in Photo III-B-83. The cover is missing from this drain and it is plugged with debris. It is presumed that this drain emptied directly into the lake. In the southwest corner of the Equipment Room a concrete stairway provides access to the upper level. Refer to Photos III-B-84, III-B-85 and III-B-86. A steel pipe handrail is found along the first length of the stair. The poured concrete treads and risers are in good condition however, the paint finish is in poor condition. The small space below the stairway housed a bathroom with a water closet and sink. The plumbing fixtures are no longer present, however, some remnants of piping remain, as seen in Photo III-B-87. The wood door frame into this previous bathroom remains in place, however, the 2'-4" x 6'-7" door is missing.



Photo III-B-77



Photo III-B-78



Photo III-B-79



Photo III-B-80



Photo III-B-81



Photo III-B-82



Photo III-B-83



Photo III-B-84



Photo III-B-85



Photo III-B-86



Photo III-B-87

At the far west end there is another room identified on the 1922 drawings as the Coal Room, however, the presence of four large tanks indicates that the use of this room was changed. Each of the four tanks is 4' in diameter and 6' in height. As with the other tanks, most of the piping is no longer present. These tanks are quite rusted as seen in Photo III-B-88. This photo also shows the unpainted glazed hollow wall and ceiling tile in this room. A 2'-6" x 6'-6" door leading into this room is missing. Previous Photo III-B-38 shows the interior side of the metal access hatch in the ceiling of the former Coal Room. Photo III-B-89 shows the presence of water leakage into the building at a location directly below the west wall of the wood frame structure above.

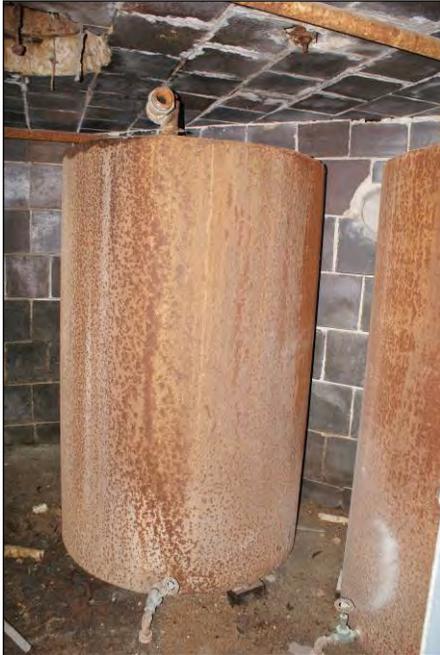


Photo III-B-88

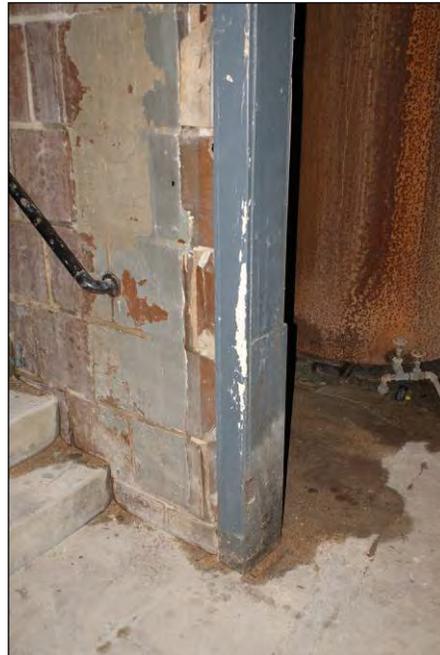


Photo III-B-89

The interior concrete stairway allows access to the upper level of the Entrance Light, which is the original wood frame Fog Signal Building. Photo III-B-90 shows this stair as it transitions to the upper floor. A simple two pipe steel guardrail system, as seen in Photo III-B-91 protects the stair opening. There is no handrail on the upper run of the stair. This room is one large space with no interior finish material on the walls or ceilings; studs and ceiling joists are exposed as seen in Photos III-B-92. A small room measuring 8' x 13' constructed of 2" x 4" studs, wood paneling and gypsum board, is located within the large room, as seen in Photo III-B-93. Interior views of this room, Photos III-B-94 and III-B-95 show the damaged wall paneling and graffiti. A 2'-8" x 6'-8" hollow core wood door, Photo III-B-96, provides entry into this room. All elements of this room are in very poor condition.



Photo III-B-90



Photo III-B-91



Photo III-B-92



Photo III-B-93



Photo III-B-94



Photo III-B-95



Photo III-B-96

There are four floor openings in the concrete floor slab that allow ventilation between upper and lower floors. One floor opening at the center of the room measures 2'-6" x 2'-6" and is covered with a steel grate, as seen in Photo III-B-97. Although this grate has a broken corner it is in good condition. A second floor opening that measures 2'-0" x 1'-9" is on the east side at the door opening. The grate over this opening, as seen in Photo III-B-98 is in good condition. A floor opening on the west side of the room below the lantern room is open and presents a safety hazard, as seen in Photo III-B-99. The metal grate is broken and stored against a wall. Refer to Photo III-B-100. The remaining floor opening, measuring 2'-0" x 1'-1", is along the north wall and is covered with a light gage metal grate that is bent and in bad condition, as seen in Photo III-B-101. The concrete floor / ceiling slab around this opening is badly spalled and there are remnants of a metal duct. Refer to Photo III-B-102. There are two six inch high raised concrete equipment pads in this room that present tripping hazards. See Photos III-B-103 and III-B-104. Exposed ceiling joists and the underside of partial sheathing material of the third level catwalk are visible throughout the room, as seen in Photo III-B-105.



Photo III-B-97



Photo III-B-98



Photo III-B-99



Photo III-B-100



Photo III-B-101



Photo III-B-102



Photo III-B-103



Photo III-B-104



Photo III-B-105

A wood ship's ladder style stairway provides access from the upper level floor to the third level catwalk and lantern service room. This ladder, as seen in Photos III-B-106 and III-B-107, measures 2'-3" wide and has a steel pipe handrail on each side. The stair and the handrails are in good condition. Paint finish on the handrails is in poor condition.

The ship's ladder stair passes through a small floor opening, Photo III-B-108 that enters a small hallway at the third level, Photo III-B-109. A 2'-7" x 6'-7" door from the hallway to the catwalk is missing. A built-in storage compartment that measures 1'-4" wide by 2'-4" high is located on the south wall, as seen in Photo III-B-110. Hinges are intact but the compartment door is missing. Finishes in this small hallway include hardboard wall paneling, a tin ceiling and wood trim. All substrate materials are in fair condition. All surfaces are painted with paint surfaces in fair to poor condition.



Photo III-B-106



Photo III-B-107



Photo III-B-108



Photo III-B-109



Photo III-B-110

To the east of the hallway is a 2' – 8 ½" wide wood catwalk that connects to the east end of the building where a former door was located. Views of this catwalk are seen in Photos III-B-111 and previous Photo III-B-13. The 3 ¾" x 1 ¾" painted wood handrails along the catwalk stop where plywood floor sheathing is laid on the ceiling joists, approximately 11'-8" from the east wall. The 5 1/2" wide wood sheathing is randomly place in different locations, however, much of the third level floor is open to below. Refer to Photos III-B-112 and III-B-113. Walls and ceilings of the third level are painted metal sheets as seen in previous photos. There are many rusted and deteriorated areas throughout, as seen in Photo III-B-114. At the far east end of the attic the former door opening, measuring 2'-7" x 5'-4", has been filled in with concrete masonry units. Two ventilation units are set into the masonry, as seen in Photo III-B-115. A small attic access hatch, measuring 1'-6" x 1'-3", is also located at the east end of the room. Refer to Photo III-B-116. There is also a floor and floor framing opening at the former chimney location. The wall and sloped ceiling area has been patched with metal sheets at this area, as seen in Photo III-B-117. This photo also shows the floor opening at the former chimney location. Two small lifting rings are set in the attic ceiling, as seen in Photo III-B-118.



Photo III-B-111



Photo III-B-112



Photo III-B-113

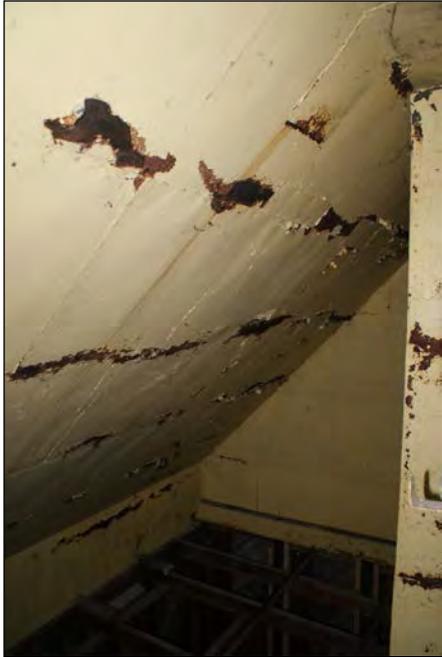


Photo III-B-114



Photo III-B-115



Photo III-B-116



Photo III-B-117



Photo III-B-118

To the west of the small hallway is the lantern service and fog horn room that measures 6'-0" x 5'-3". Based on historic photographs, the fog horn would have been located directly outside of this room and piping to the fog horn would have been inside the room. Photo III-B-119 shows a view looking into this room through the hallway door. This door frame measures 2'-6" x 6'-7" and the door is missing. A variety of electronic equipment is located in this room. Interior finishes include a plywood floor, 3 ½" wide vertical wood paneling and random width wood paneling on the ceiling. The wood substrate is in good condition, however paint finishes on the walls and ceiling are in poor condition. A small ladder leads to a 1'-2" x 2'-5" floor access hatch into the Lantern, as seen in Photo III-B-120. The ladder is in good condition but it is not properly secured. There is no floor hatch cover or lid and the floor opening presents a safety hazard for anyone in the lantern.



Photo III-B-119



Photo III-B-120

The lantern is an octagon, or eight sided structure, with an inside diameter of 6'-7" that houses a red navigational light. The lantern floor is 2 ¼" wide tongue and groove hardwood flooring with a paint finish and the walls at the base are lined with 3 ½" wide tongue and groove vertical wood paneling. Floor and lower walls are shown in Photos III-B-121, III-B-122 and III-B-123. The paint finish is in poor condition on floor and wall surfaces and there are many rotting and damaged areas of the wood. There is no base trim. There are three wall ventilators on the lantern walls. At one location the brass ventilator remains and is used for wiring, as seen in Photo III-B-124. The inner cover for this ventilator is missing. Photos III-B-125 and III-B-126 show one location where the brass ventilator is completely missing and another where it is missing but a simple wood screen has been applied.



Photo III-B-121



Photo III-B-122



Photo III-B-123



Photo III-B-124



Photo III-B-125



Photo III-B-126

Of the eight glazed openings in the Lantern three panels are glazed with Lexan material and two of the remaining five glass panels are broken. The glazed openings measure 2'-4 1/2" wide x 3'-0 1/2" high. The exposed metal sill and vertical mullions of the lantern are in good condition, however, the paint is in poor condition. There is considerable moss growth along the metal sill, as seen in Photo III-B-127. The lantern ceiling is exposed light gage metal with a paint finish. All metalwork is in sound condition, however, the paint finish on all surfaces is in poor condition. Refer to Photos III-B-128, III-B-129 and III-B-130.



Photo III-B-127



Photo III-B-128



Photo III-B-129



Photo III-B-130

The exterior of the lantern and the lantern deck is accessed through a 1'-8" wide x 2'-5" high access door on the east side of the lantern. Refer to Photo III-B-131. The door is a 1/4" thick metal door as seen in Photo III-B-132. The door is in good condition, however, the metal flashing and roof membrane flashing at the door sill is in poor condition as seen in Photos III-B-133 and III-B-134. The wood floor and wood trim at the base is also in poor condition around the door opening.



Photo III-B-131



Photo III-B-132



Photo III-B-133



Photo III-B-134

The exterior of the lantern is shown in Photos III-B-135 and III-B-136. Exterior walls of the lantern are flush metal with a paint finish. Vents are simple capped openings, as seen in Photo III-B-137. Minor areas of damage including rust are found in various locations, as seen in Photos III-B-138, III-B-139 and III-B-140. The lantern roof is flat metal panels terminating at a simple fascia without gutters. All exterior metal on the lantern is in good condition. The paint finish is in average condition. At the peak of the lantern is a ventilator that was apparently installed as part of the 1922 renovation. It is identified as a “new ‘Kernchen’ ventilator” on these drawings and is shown in Photo III-B-141.



Photo III-B-135



Photo III-B-136



Photo III-B-137



Photo III-B-138



Photo III-B-139

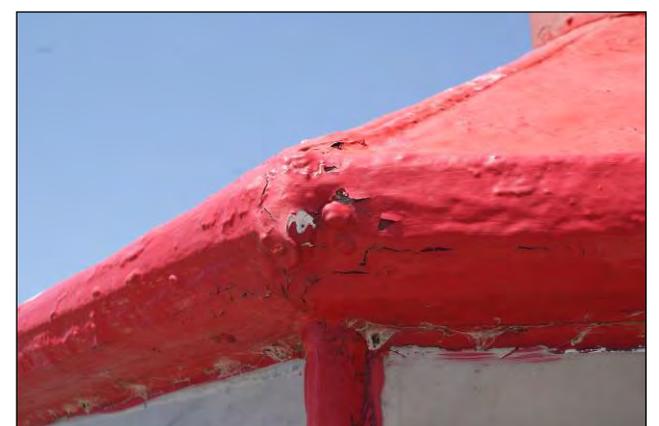


Photo III-B-140



Photo III-B-141



Photo III-B-142



Photo III-B-143

The lantern deck is 11'-4" square with a metal pipe guardrail all around. The metal pipe guardrails and posts are 1 5/8" in diameter and have two horizontal members. The top rail is 2'-9" above the deck surface, as seen in Photo III-B-142. One original section of the top rail on the west side is missing and has been replaced with a metal pipe with a smaller outside diameter. Refer to Photo III-B-143. The metal railing is used to support navigation signage and brackets for various aids, as seen in Photos III-B-144 and III-B-145. The metal pipe rail system is in sound condition, however, the paint finish is in poor condition. The deck surface is covered with

a single ply membrane roof. Precast concrete walkway pads are placed on the roof for ballast as well as to provide a walking surface, as seen in Photos III-B-146 and III-B-147. This membrane is missing a very large section at the northwest corner of the deck, exposing the wood deck structure. Refer to Photos III-B-148 and III-B-149. This serious condition is allowing water to penetrate into the interior of the building. The roof membrane flashing wraps the guardrail posts, Photo III-B-150 and the gable end of the main building roof, Photo III-B-151. Other navigation aids, such as the fog signal device shown in Photo III-B-152, are also located on the lantern deck surface.



Photo III-B-144



Photo III-B-145



Photo III-B-146



Photo III-B-147



Photo III-B-148



Photo III-B-149



Photo III-B-150



Photo III-B-151



Photo III-B-152

MECHANICAL AND ELECTRICAL SYSTEMS AND ANALYSIS

Electrical service to the Entrance Light is provided by two electrical service cables that run on the surface of the pier and are protected by steel channel and angle covers. The steel angle cover can be seen in previous Photo III-A-28 where it is located along the continuous step where the pier surfaces transition between levels. Photo III-B-153 shows the electrical service cables protected by an 8" steel C-channel where it runs on the pier surface and enters the building through the doors at the northeast corner. This surface mounted channel is another potential tripping hazard on the pier surface. Two electrical cables pass through the bottom corner of the steel doors, as seen in Photos III-B-154 and III-B-155, and run vertically to the electrical panels on the upper floor. These cables are exposed and not in any protective conduit. Two electrical panels and two shut-off switches are located on the north wall of the upper floor level as seen in Photo III-B-156 along with another box. The panels include a 600 V / 120 V Main Panel and a 100 Amp, 240 V/ 120 V sub-panel. Another electrical sub-panel is located in the lantern service room, as seen in Photo III-B-157. All electrical panels and switches appear to be newer and in good condition.



Photo III-B-153



Photo III-B-154



Photo III-B-155



Photo III-B-156



Photo III-B-157

A small number of lights and switches, most of which are operational, are located throughout the building. A non-operational fluorescent fixture, Photo III-B-158, is located in the upper level equipment room. Wall mounted fixtures, Photo III-B-159, are located on the upper floor level and similar fixtures are ceiling mounted in the various rooms on the main floor level, Photo III-B-160. Light fixtures on the upper and lower levels are controlled by a timer switch located near the entry door. A single light fixture, Photo III-B-161, and duplex receptacle, Photo III-B-162, are located in the lantern service room. All conduit is exposed.



Photo III-B-158



Photo III-B-159



Photo III-B-160



Photo III-B-161



Photo III-B-162



Photo III-B-163

The navigation light located in the lantern is a red Marine Rotating Beacon, Model VRB-25, Serial No. 25-036, manufactured by Vega Industries, Ltd. This light, which is functional and maintained by the U.S. Coast Guard, is seen in Photo III-B-163.

Plumbing fixtures including a water closet and lavatory were installed in the building as part of the 1922 renovation. These fixtures are no longer extant. Some plumbing piping remnants remain such as the floor drain located in the main level, Photo III-B-164, and a plumbing clean-out located on the south wall, Photo III-B-165. Drawings indicated that the waste lines drained to the lake. There is no evidence of water supply piping from the well located in the main level, shown in previous Photo III-B-82.



Photo III-B-164



Photo III-B-165

LIFE SAFETY SYSTEMS CONDITIONS AND ANALYSIS

No life safety systems, such as alarms or detectors, are present in the Entrance Light.

C) INNER LIGHT

The light tower known as the Inner Light is a simple utilitarian tapered cylindrical metal structure located approximately 600 feet east of the Entrance Light on the South Pier. It is constructed of twelve progressively smaller cylinders stacked on top one another with an ornamental cylindrical lantern on top and rests upon a simple concrete base on top of the pier. A view of the tower from the east and its relationship with the Entrance Light is shown in Photos III-C-1. The interior of the tower serves as a stair access to the lantern. The Inner Light was constructed in 1904 at the end of the pier west of the Fog Signal Building. In 1907 it was moved 600 feet closer to shore, when the present inner and outer range light system was developed.



Photo III-C-1

STRUCTURAL SYSTEM ANALYSIS

The cylindrical tower is constructed of cylindrical metal rings and angles. The bottom section of the tower base is 12'-6" outside diameter and steps down in 3" increments to 10'-0" outside diameter at the top section below the lantern deck. These metal sections form the walls and the structure of the tower. Original 1902 drawings indicate plate thicknesses of 3/8" at the lower three sections of the tower, and incrementally stepping down to 5/16", 1/4" and 3/16" in plate thickness. Riveted metal angle seats form the bearing points between the cylindrical sections. These horizontal ledges tend to trap water causing rust and scale to form, as seen in Photo III-C-2.



Photo III-C-2

Interior views of these horizontal joints are shown in Photos III-C-3 and III-C-4 which show rust sealant material, and coatings of rust inhibitive primer. Internally there are a number of struts, bracing and other metal framework that reinforce the structure and provide framing for the floors. Photos III-C-5 and III-C-6 show some of the internal framework, which is in relatively good condition.



Photo III-C-3



Photo III-C-4



Photo III-C-5



Photo III-C-6

The metal tower is placed on an eight sided solid concrete base that extends 2'-8" above the pier deck surface, as seen in Photo III-C-7. The overall depth of the concrete base is not known but it is presumed to tie into the superstructure of the pier. The concrete base provides the floor structure at the main level of the tower. Refer to Photo III-C-8. As with the horizontal joints in the steel structure, the outer ledge of the concrete base allows water to flow into the interior.



Photo III-C-7



Photo III-C-8

EXTERIOR CONDITIONS AND ANALYSIS

The exterior of the Inner Light is a simple metal structure with exposed metal plate, angles and rivets. All metal surfaces are painted and the paint finish is in poor condition. Refer to Photo III-C-9. Many metal surfaces have extensive rust and scale. The elevated catwalk structure is framed into the east side of the tower and then makes a dog-leg around the tower as it continues to the west. Views of the catwalk framing from the top of the tower are shown in Photos III-C-10 and III-C-11. Angles and brackets are welded to the exterior face of the tower, as seen in Photos III-C-12 and III-C-13. Extensive rusting has occurred around some brackets and the paint finish is in poor condition as seen in Photo III-C-14. The concrete base, which is in good condition, has a paint surface that is in poor condition.



Photo III-C-9



Photo III-C-10



Photo III-C-11



Photo III-C-12



Photo III-C-13



Photo III-C-14

The lantern and lantern deck are placed on top of the cylindrical structure approximately 41'-8" above the main pier deck surface. The cylindrical lantern, Photo III-C-15 is 7'-8" in diameter and the circular lantern deck is approximately 13'-0" in diameter. The lantern deck is surrounded by a 3'-0 1/2" high decorative metal guardrail with a lattice pattern constructed of 1" x 1/8" flat bar as seen in Photos III-C-15 and III-C-16. The top rail is a 2" x 1 1/2" flat metal bar, and the bottom and intermediate rails are 2" wide "U" shape sections. All are connected to 2" x 2" square steel posts as seen in Photo III-C-17. The bottom horizontal rail is rusty and some connections at the posts are weak. All other guardrail components are in good condition except for some rusted areas. Paint finish is in poor condition on all guardrail components. The exterior lantern deck is metal plate that is in good condition. Paint finish is in poor condition.



Photo III-C-15



Photo III-C-16



Photo III-C-17

The lower walls of the lantern are curved metal with a paint finish. The exterior face of the walls are in good condition, however, the paint finish is in poor condition, as seen in Photo III-C-18. Four vent openings with perforated metal covers, Photo III-C-19, are placed around the perimeter of the lantern. One vent opening has been covered with a solid metal plate, Photo III-C-20 and at another location the cover is missing, Photo III-C-21. The lantern glazing is a unique diamond pattern, Photo III-C-22, with curved glazing mullions. Exterior glazing bars, 7/8" and 1 1/16" wide are curved and screwed into the supporting mullions, as seen in Photo III-C-23. Of the twenty openings, seven are glazed with Lexan. The remainder of the openings are glazed with curved glass which is in good condition.



Photo III-C-18



Photo III-C-19



Photo III-C-20



Photo III-C-21



Photo III-C-22



Photo III-C-23



Photo III-C-24



Photo III-C-25



Photo III-C-26

The Inner Light tower is entered through a 2'-2" x 5'-6" gasketed, water-tight steel door, as seen in Photos III-C-27, III-C-28 and III-C-29. This style of door also has a continuation of the frame at the bottom of the opening, requiring extra caution when stepping through. This condition is seen in Photo III-C-30. The door hardware consists of a pull handle and padlock hasp on the exterior and a multi-point lock mechanism on the interior. All door components are in good condition and operating order. Paint finish is in poor condition. The original 1922 drawings indicate a solid steel plate door. The water-tight door was installed in the 1990s.



Photo III-C-27



Photo III-C-28



Photo III-C-29



Photo III-C-30

A former door opening was located at the second level where the catwalk met the light tower, as seen in Photo III-C-31 and III-C-32. This door opening, 2'-0" x 6'-5" is now covered with a metal plate that is bolted and caulked in place. An interior view of this door opening is seen in Photo III-C-33.



Photo III-C-31



Photo III-C-32



Photo III-C-33

The lantern door is a large metal and glass door 2'-3 1/2" wide by 5'-10" high that is curved to match the curvature of the lantern. Refer to Photos III-C-34, III-C-35 and III-C-36. The original curved glass has been replaced with Lexan. There is a major crack in the metal door at the lower northern corner of the glazed opening directly above the latch. The crack is completely through the metal and affects the integrity of the door. Another area of concern is a loose middle hinge, as seen in Photos III-C-37. This hinge is no longer connected to the body of the lantern, with the door only supported on the lower and upper hinge, Photo III-C-38. The head and sill of the door are shown in Photos III-C-39 and III-C-40. Door frame metalwork is in good condition, however, all paint finishes are in poor condition. Door hardware consists of a small turn handle on the exterior, Photo III-C-41, and partial components of a vertical rod latch mechanism, Photo III-C-42. Remnants of the vertical rod latch device are laying in the lantern, as seen in Photo III-C-43.



Photo III-C-34



Photo III-C-35



Photo III-C-36



Photo III-C-37

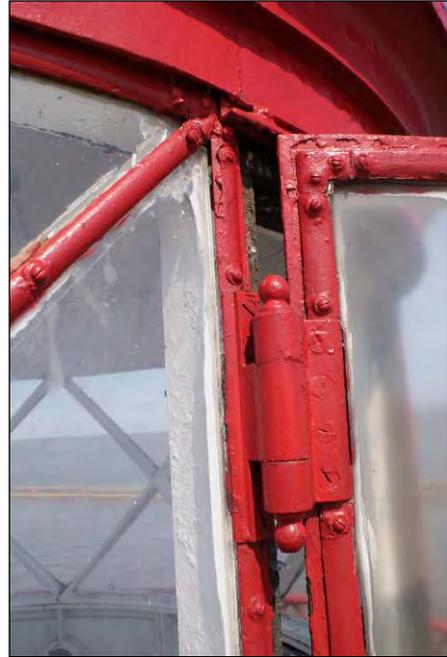


Photo III-C-38



Photo III-C-39

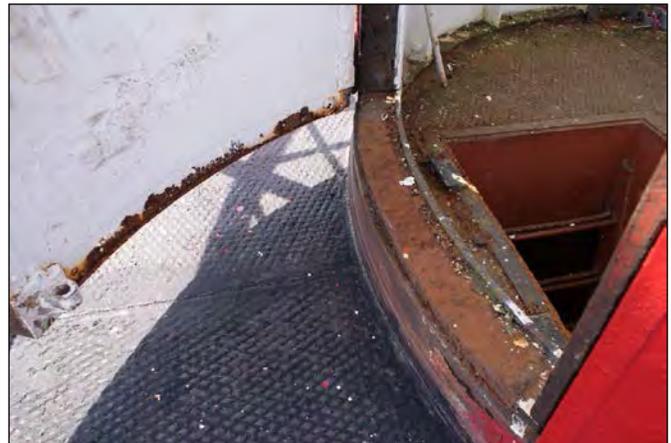


Photo III-C-40



Photo III-C-41



Photo III-C-42



Photo III-C-43

Other than the lantern glazing, previously discussed, window openings include five small porthole style windows located at different elevations along the height of the tower. These porthole windows are seen in previous photographs and Photo III-C-44. The inward swinging sash at the two porthole windows at the first level are missing and a steel plate cover has been welded to the frame, as seen in Photo III-C-45. The operable sash and glazing are intact at the three window openings at the upper levels. Refer to Photo III-C-46. The inward swinging sash is 1'-4" in diameter with a 1'-2 1/2" diameter glass opening. Paint finish is in poor condition on all windows.



Photo III-C-44



Photo III-C-45



Photo III-C-46

INTERIOR CONDITIONS AND ANALYSIS

The interior of the Inner Light tower is a simple and utilitarian space consisting of open rooms and stairs that allow access to the lantern and the light. All walls are the inside face of the metal cylindrical sections that form the structure of the tower. The main floor, at 2'-8" above the pier deck surface, is an open room approximately 12'-4" in diameter with a series of electrical panels and the circular stair that provides access to the second level. A partial view of this room at the bottom of the stair is seen in Photo III-C-47 and a view looking up in Photo III-C-48. The concrete floor slab is in reasonably good condition with some minor spalling and deterioration at the entry door. There is moisture around the perimeter where the metal cylindrical walls sit upon the concrete base. Refer to Photo III-C-49. There is considerable rusting along many of the horizontal joints around the perimeter walls, as seen in Photos III-C-50 and III-C-51. All interior wall surfaces are painted with a red primer paint that is in poor condition.

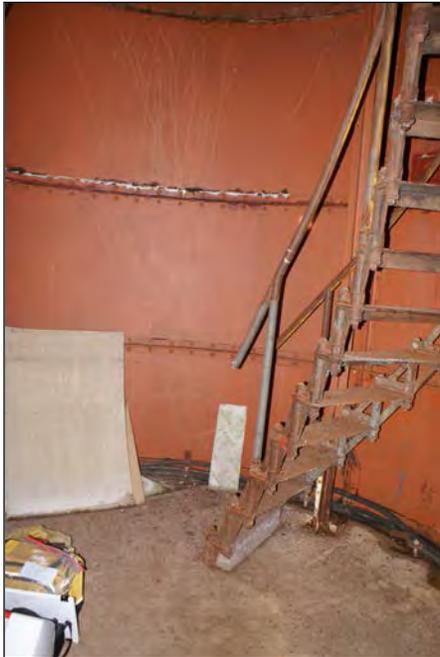


Photo III-C-47



Photo III-C-48



Photo III-C-49



Photo III-C-50



Photo III-C-51

The curved 2'-0" wide metal stair, as seen from the second level in Photo III-C-52, provides access to a partial floor that is 11'-1" above the main level. A metal pipe handrail is present on both sides of the stair. The second floor level, which functions as more of a stair landing, is only one-half of the floor structure and 11'-9" in diameter as seen in Photo III-C-53. The open side of the floor, which is constructed of 1/4" thick steel plate, is protected by a single 1 5/8" steel pipe guardrail that is 3'-2" above the floor. With no intermediate rail or toe plate, as seen in Photos III-C-54 and III-C-55, this is a rather dangerous condition for people on this level. At the base of the stair that goes up from this second level there is an unprotected floor opening along the outside wall that also presents a safety concern. This condition is shown in Photo III-C-56.



Photo III-C-52



Photo III-C-53



Photo III-C-54



Photo III-C-55



Photo III-C-56

From the second level, the curved metal stair goes up 15'-10 ³/₄" to the third level, Photo III-C-57. Photo III-C-58 shows the intricate tread and riser system typical of the circular stair in this tower. The paint finish, as seen in Photo III-C-59, is in poor condition on all stair components. A floor opening allows access from the stair to the third floor, as seen in Photos III-C-60 and III-C-61. Two hinges remain on the outside edge of this opening indicating the past presence of a hatch cover at this opening. Photo III-C-62 shows one of the hinges. A simple two pipe guardrail, constructed of 1 5/8" diameter steel pipe protects this opening, as seen in Photo III-C-63. The third floor level, which is 10'-8" in diameter, is constructed of 1/4" thick steel plate. There is severe water penetration through the tower walls that is collecting at this floor level, as seen in Photos III-C-64 and III-C-65. The steel plate floor is severely rusted and appears weakened in one area. A loose steel cover plate, Photo III-C-66, is positioned over a 12" diameter floor opening. Because this cover plate is not secured, this floor opening is a safety hazard.



Photo III-C-57



Photo III-C-58



Photo III-C-59



Photo III-C-60



Photo III-C-61



Photo III-C-62



Photo III-C-63



Photo III-C-64



Photo III-C-65



Photo III-C-66

A fixed steel ladder with double rungs provides access to the lantern. Refer to Photo III-C-67. A 1'-11" x 2'-5" floor opening in the lantern floor is seen in Photos III-C-68 and III-C-69. Two damaged hinges, Photo III-C-70, are found along the edge of the opening and the steel plate hatch cover is removed and laid against the lantern wall as seen in Photo III-C-71. The ceiling of the third level, or the underside of the lantern deck floor, is cement plaster which is in poor condition. Photo III-C-72 shows the loose and missing plaster. The paint finish is in poor condition.



Photo III-C-67



Photo III-C-68



Photo III-C-69



Photo III-C-70



Photo III-C-71



Photo III-C-72

The lantern is cylindrical with an inside diameter of 7'-7" and houses the navigational beacon. The lantern floor is metal plate. The paint finish on the floor is in poor condition as seen in Photos III-C-73 and III-C-74 with water penetration and rusting occurring at the edge of the lantern walls, Photo III-C-75. Eight sections of wall panels form the base of the lantern that is 3"-6 5/8" high, as seen in Photo III-C-76. Four vents are symmetrically placed around the lantern. All are missing the covers, as seen in Photo III-C-77. The wall panels transition to a unique diamond pattern curved glazing system, Photos III-C-78. The diagonal mullions are in good condition, however, the paint finish is in poor condition. As previously discussed there are twenty two glass panels. Fifteen are curved glass and seven panels have been replaced with Lexan material. The original glass panels are in good condition. The lantern glass transitions to a metal ceiling, as seen in Photo III-C-79. The metal ceiling panels, which are topped by a vent as seen in Photo III-C-80, are in good condition. All paint surfaces are in poor condition.



Photo III-C-73



Photo III-C-74



Photo III-C-75



Photo III-C-76



Photo III-C-77



Photo III-C-78



Photo III-C-79



Photo III-C-80

MECHANICAL AND ELECTRICAL SYSTEMS AND ANALYSIS

Electrical service to the Inner Light is extended along the south pier from the shore. Cables are run in a conduit constructed of 8" steel c-channel that is nestled along the lower surface of the pier deck. This c-channel is shown in Photo III-C-81 where it is positioned against the step that is formed between the upper and lower walking surfaces. The electric service extends into the Inner Light tower on the north side where the 8" steel c-channel conduit steps up the pier and tower base and enters into the bottom of the metal tower, as seen in Photo III-C-82. The steel channel is in sound condition, however, the paint finish is in poor condition; some of the anchors and straps are broken. This electrical service is under the jurisdiction of the U. S. Coast Guard. Three large electrical cables enter the metal tower, Photo III-C-83, and run unprotected along the perimeter of the main floor, Photo III-C-84, and then extend into the first electrical junction box, as seen in Photo III-C-85. Although these electrical cables are sheathed, they present a safety hazard and possible tripping hazard. A plywood panel is placed on the south wall of the main level and a series of electrical panels and shut-offs are located there that include a 600 volt Main Sub-Cable junction box, a 600 volt to 120 volt step-down panel, a 100 amp sub-panel, a 600 volt disconnect for the Entrance Light and a 600 volt disconnect for the Inner Light. The Inner Light electrical distribution panel acts as the junction box and disconnect for the Entrance Light. These panels are shown in Photo III-C-86. Two electrical panels are located on the third level of the tower, as seen in Photo III-C-87, and one is in the lantern, Photo III-C-88. All electrical panels and disconnects appear in good condition.



Photo III-C-81



Photo III-C-82



Photo III-C-83

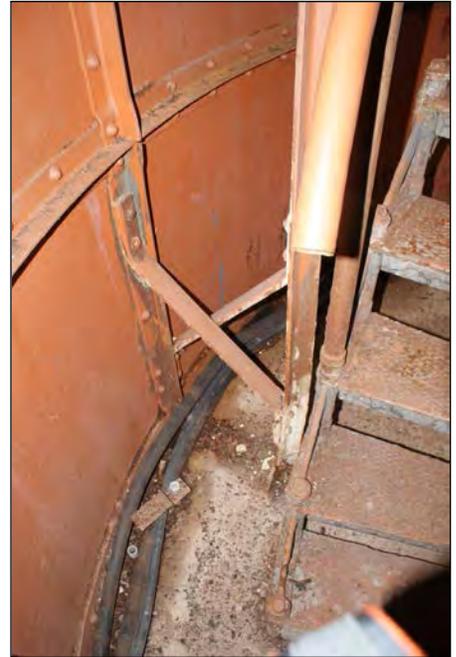


Photo III-C-84



Photo III-C-85



Photo III-C-86



Photo III-C-87



Photo III-C-88

A small number of light fixtures are placed throughout the interior of the light tower and lantern, as seen in Photos III-C- 89, III-C-90 and III-C-91. A timer switch, Photo III-C-92, is located on the main level at the entry door and controls all lights. A few duplex electrical receptacles are located throughout. Wiring to all lights and receptacles is placed in PVC conduit.



Photo III-C-89



Photo III-C-90



Photo III-C-91



Photo III-C-92

The navigation light located in the lantern is a Marine LED Beacon manufactured by Vega Industries, Ltd., Model Number VLB – 38, Serial Number 38-0261-1999. This light, which is maintained by the U. S. Coast Guard, is shown in Photo III-C-93.

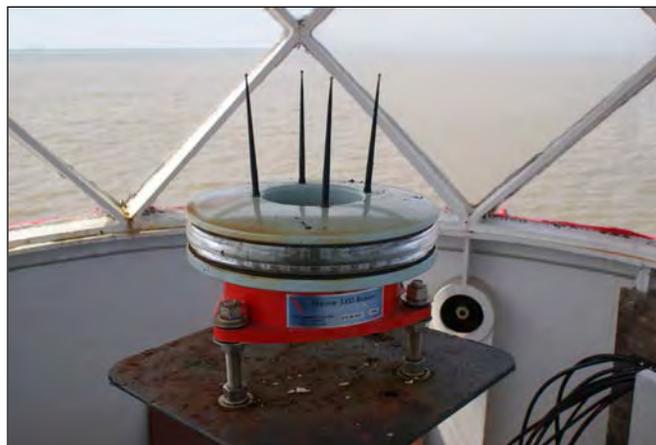


Photo III-C-93

There are no plumbing or mechanical systems in the Inner Light.

LIFE SAFETY SYSTEMS CONDITIONS AND ANALYSIS

No life safety systems, such as alarms or detectors, are present in the Inner Light.

PART IV – TREATMENT AND USE RECOMMENDATIONS

OVERVIEW

The Grand Haven South Pier Entrance and Inner Lights, along with the pier and catwalk structure, are important maritime structures that continue to serve as working navigational aids. Both the Entrance and Inner Lights are in reasonably sound condition due to the long term use and care by the U. S. Coast Guard and the more recent care by the City of Grand Haven and the Grand Haven Lighthouse Conservancy. The present day configuration and location of both lights reflect a lengthy time period from initial construction in 1875 to the 1920s when the last major renovation occurred. This presents ample opportunity to interpret these various time periods.

The Period of Significance of the Grand Haven Pier and Revetments identified in the National Register Listing is 1857 to 1935 with significant dates of 1857, 1867 and 1916. The National Register amendment that added the Inner and Entrance Lights and the Catwalk identifies the Period of Significance for these structures as 1907 to 1959 with significant dates of 1907 and 1922. The end date of 1959 is noted as "...The most year of its operation 50 years before the present." (This National Register Amendment is dated 2009).

The significant date of 1907 represents a major change when the Inner Light was relocated from its original location at the far west end of the pier to its present day location at the mid-point of the pier, first establishing the present day range light system on the south pier. Other physical changes to the Inner Light have been minor since the 1907 relocation and are primarily associated with the navigation aids. Also in 1907 the Fog Signal Building was modified to include the installation of a lantern and navigation light, now defining that structure as the "entrance light" to the harbor. The next identified significant date of 1922 represents major changes made to the Entrance Light, pier and catwalk. In 1922 the substantial lower level concrete base structure with the ship's prow design was constructed and used to house equipment. The original wood frame building was placed on top of this concrete base creating the present day range light system and significantly altering the appearance of the west end of the pier. Removal of the original wood catwalk and construction of the present metal catwalk structure also occurred in 1922, representing the last significant physical change on the South Pier and establishing the arrangement of the structures as seen today. From the mid-1920s to the 1950s modifications of the structures were largely related to changes in equipment and for general maintenance. The mid-to-late 1960s represents the time period when the lights were fully automated, permanent personnel were removed from the site and the original lighthouse/dwelling located on shore was sold by the Federal Government as surplus property. 1969 is the date of the end of an active era at the Grand Haven Lights. Based upon this activity and the present day appearance, the recommended Period of Interpretation is 1922-1930.

The treatment of historic properties is guided by a series of principles formulated by the Secretary of the Interior to help protect cultural resources through consistent preservation practices known as the Secretary of the Interior's Standards for the Treatment of Historic Properties. These Standards are divided into four distinct, interrelated approaches: Preservation, Rehabilitation, Restoration and Reconstruction (refer to Appendix F). Many factors determine the choice of treatment including a property's current physical condition, its proposed use and historic significance. The treatment standards are applied to the Grand Haven South Pier Entrance and Inner Lights as follows:

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

No buildings or structures are recommended for "preservation".

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

No buildings or structures are recommended for "restoration".

Rehabilitation, as defined by the Secretary of the Interior's Standard is "...the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values."

Buildings or structures for which "rehabilitation" is the recommended treatment include:

- Entrance Light – Interior and Exterior
- Inner Light Tower – Interior and Exterior
- Elevated Catwalk
- Pier surface immediately surrounding both the Entrance and Inner Light

Reconstruction, as defined by the Secretary of the Interior's Standard is "...the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time in its historic location."

No buildings or structures are recommended for "reconstruction".

GENERAL TREATMENT AND USE RECOMMENDATIONS

Recommendations for the use of the Entrance Light and Inner Light are presented in this section. With no further involvement at the site by the United States Coast Guard other than maintenance of the navigation aids, all responsibility for rehabilitation of these structures rests with the City of Grand Haven and the Grand Haven Lighthouse Conservancy. As publicly owned structures, the Entrance and Inner Lights will be used for interpretation of regional maritime history.

Situated on the Grand Haven south pier, both the Entrance and Inner Lights present a challenge to access, primarily the lengthy walk from public parking areas. Inclement and seasonal weather will also prevent or restrict public access to these lights. Barrier free accessibility to the structures is also limited with obstacles due to the condition of the pier deck surface. Although these challenges are present, large numbers of people currently take the opportunity to walk the pier to experience Lake Michigan and the Grand River and to get up close to the light structures to witness Great Lakes maritime history. General recommendations are as follows:

A) ELEVATED CATWALK AND SOUTH PIER

- Maintain public access on the pier to allow access to the lights.
- Collaborate with the U. S. Army Corps of Engineers to make minor safety and barrier free access improvements on the pier deck surface.
- Preserve and maintain the catwalk as an important historical element and as a supporting structure for lighting and other utilities.
- Do not permit public access on the catwalk.

B) INNER LIGHT TOWER

- Rehabilitate the interior and exterior of the Inner Light Tower to reflect the 1922 – 1930 Period of Interpretation. Provide public access throughout the interior on limited occasions or for special events.
- Provide interpretive signage at the pier deck level for visitors unable to enter the tower and ascend the tower stairs.
- Provide interpretive signage at the lowest level of the tower.
- The non-historic water-tight metal door at the base of the tower will be retained for security and weather protection.

C) ENTRANCE LIGHT

- Rehabilitate the interior and exterior of the Entrance Light to reflect the 1922-1930 Period of Interpretation. Provide public access throughout the interior.
- Provide exhibits and interpretive signage throughout the interior.
- Provide interpretive signage at the pier deck level for visitors unable to enter the building or ascend the stairs.
- Non-historic water-tight metal doors at the base of the structure will be retained for security and weather protection.

Some recommendations made in this report are not the responsibility of the City of Grand Haven or the Grand Haven Lighthouse Conservancy but relate to general safety items concerning the public access on the pier. These items are included as general recommendations only.

In the summer of 2013 an extensive painting project of the interior and exteriors of the Inner and Entrance Lights was started, with work expected to continue in 2014. Many recommendations initially presented in this report have been completed.

DETAILED TREATMENT AND USE RECOMMENDATIONS

Treatment and Use Recommendations for the Catwalk and South Pier are included here for general reference only. All recommendations pertaining to the South Pier are the responsibility of the U. S. Army Corps of Engineers.

A) ELEVATED CATWALK AND SOUTH PIER

A.1) REPAIR CONCRETE SURFACE OF PIER

Remove sections of deteriorated concrete on the pier deck surface along the length of the pier. Replace or patch concrete as appropriate to provide a safe walking surface without trip hazards. Construct small ramps to transition between sections of varying deck surface elevations to improve barrier free accessibility.

A.2) REPAIR CONCRETE STEP AND LANDING AT ENTRANCE LIGHT

Remove deteriorated concrete at the small step and walkway surfaces around the Entrance Light. Replace or patch concrete as appropriate to provide a safe walking surface without trip hazards.

A.3) REPAIR CATWALK CONCRETE FOOTINGS

Remove damaged and spalled concrete at the small pad footings that support the structural metal columns of the catwalk. Repair with concrete patching material.

A.4) CONDUCT STRUCTURAL INVESTIGATION OF CATWALK

Conduct a detailed structural evaluation of all catwalk components including concrete pad footings, columns, bracing, beams, rails and other members. Repair damaged components as required.

A.5) RESTORE METAL CATWALK COMPONENTS

Remove deteriorated paint, rust and scale from all metal components including columns or stanchions, bracing, beam rails, cross beams and other members. Clean and properly prepare all metal surfaces and paint with marine grade paint. Test existing paint for evidence of colors appropriate for the Period of Interpretation.

A.6) INSTALL INTERPRETIVE SIGNAGE

Install interpretive signage near the shoreline end of the South Pier, at various locations along the Catwalk, and near the Entrance and Inner Lights. Identify the history and use of the site and structures. The placement, mounting height and orientation of the interpretive sign panels should be consistent with the U. S. Access Boards Standards for Outdoor Developed Areas. Where feasible, interpretation via Braille panels, audio devices, web accessed podcasts and similar interpretive materials should be investigated for inclusive site interpretive plans.

B) ENTRANCE LIGHT

Refer to Items A.1 and A.2 for recommendations pertaining to the South Pier deck surface immediately surrounding the Entrance Light.

Where missing elements are stated to be replaced with new material matching existing, original drawings, as exhibited in Appendix B, shall be used to guide the design of these elements. If no such record exists, then designs from other maritime structures of a similar period shall be used as a guide. All such work, along with all plans for rehabilitation, shall be submitted to the Michigan State Historic Preservation Office for review and approval.

Paint colors shall match existing colors if there is no determination or recommendation from the historic paint color analysis.

B.1) RESTORE METAL BOLLARDS AND GUARDRAIL

Remove deteriorated paint, rust and scale from the metal pipe bollards on the east side. Clean and properly prepare all metal surfaces and paint with a marine grade paint. Replace the missing safety chains with chain material appropriate to the 1920/1930 time period.

B.2) RESTORE EXTERIOR CONCRETE WALL AND DECK SURFACES

Remove deteriorated and spalled concrete material on vertical wall and horizontal deck surfaces of the lower level structure and patch with concrete patch material. Refer to NPS Preservation Brief #15 "Preservation of Historic Concrete". Remove deteriorated paint and debris from all concrete surfaces. Install a non-slip deck coating on all upper level horizontal walking surfaces. Paint all other surfaces with marine grade paint for concrete surfaces. Match existing paint color.

B.3) RESTORE PORTHOLE STYLE WINDOWS IN MAIN LEVEL

Remove steel plate covers, replace missing glass and other missing components and restore all windows to operating condition. Remove deteriorated paint from all surfaces. Clean and properly prepare all previously painted surfaces with marine grade paint. Do not paint bronze or brass surfaces.

B.4) RESTORE PEDESTRIAN ENTRY DOOR AT MAIN LEVEL

Although the present day water-tight steel door, installed in the 1990s, is not appropriate to the 1922-1930 Period of Interpretation, replacing the door with a replica of the original historic door is not recommended for security reasons and the extreme weather conditions. Restoration of the present day door and an interior interpretive display of the original door are recommended.

Remove all paint, rust and scale and lightly blast all door and frame surfaces to white metal. Install sealant material as needed. Clean, properly prepare all metal surfaces and paint with marine grade paint. Restore all hardware and operating mechanisms to good working order.

B.5) RESTORE EQUIPMENT ACCESS DOOR AT MAIN LEVEL

Although the present day steel plate panels and steel frame, installed in the 1990s and now infilling the door opening, is not appropriate to the 1922-1930 Period of Interpretation, replacing the door with a replica of the original historic door is not recommended for security reasons and the extreme weather conditions this door is subject to. Restoration of the present day steel plate and framing members and an interior interpretive display of the original door are recommended.

Remove all paint, rust and scale and lightly blast all plate and frame surfaces to white metal. Install sealant material as needed. Clean, properly prepare all metal surfaces and paint with marine grade paint.

B.6) RESTORE UPPER DECK HATCH

Remove deteriorated paint, rust and scale from all interior and exterior hatch cover and frame surfaces and lightly blast to white metal. Replace severely damaged or missing components. Repair any damaged concrete in accordance with Item B.2. Install sealant as required to make hatch water-tight. Clean and properly prepare all metal surfaces and paint with marine paint.

B.7) RESTORE EXTERIOR METAL GUARDRAIL AND HANDRAIL

Repair damaged railings, posts and brackets and replace missing or severely deteriorated components of the metal pipe guardrail system on the upper deck level and at the exterior concrete stair leading to the upper deck. Remove deteriorated paint, rust and scale from all components and lightly blast to white metal. Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.8) RESTORE EXTERIOR CONCRETE STAIR

Remove deteriorated and spalled concrete material on stair tread and riser surfaces of the lower level structure and patch with concrete patch material. Refer to NPS Preservation Brief #15 "Preservation of Historic Concrete". Remove deteriorated paint and debris from all concrete surfaces. Install a non-slip deck coating on all tread surfaces. Paint all other surfaces with marine grade paint for concrete surfaces. Match existing paint color.

B.9) RESTORE CONCRETE CURB AND INSTALL NEW METAL FLASHING

Restore concrete curb on the west wall at the base of the metal siding in accordance with Item B.2. Install new metal flashing material to divert water over the curb.

B.10) RESTORE CORRUGATED METAL SIDING

Remove deteriorated paint and rust and lightly blast to white metal all exterior surfaces of the corrugated metal siding, trim, fascia and soffit on the upper structure. Repair or replace damaged area with new material matching the profile of the existing. Remove corrugated siding panels at former window locations for installation of new windows per Item B.12. Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.11) REPLACE METAL ROOF

Replace the existing standing seam metal roof with a corrugated metal roof appropriate for the 1922 – 1930 Period of Interpretation.

B.12) INSTALL WINDOWS IN UPPER LEVEL

Remove the concrete masonry unit infill from the former window openings in the upper level and install ten new windows replicating the original windows shown in the 1922 drawings. Windows shall be wood double hung units with 4 lights in the upper and lower sash. Nine windows shall be located at the second floor level and one at the attic level. Temporary (seasonal) security panels shall be provided on the exterior to protect the glass from winter ice. Security panels shall be removable and stored in the building during the summer season.

B.13) REPLACE UPPER LEVEL EXTERIOR DOOR

Remove the hollow metal door and infill material from the original double door opening on the east wall and replace with a new pair of metal clad doors with glass as shown in the 1922 drawings. Replacement doors shall include new door hardware.

B.14) RESTORE INTERIOR CONCRETE FLOOR AT MAIN LEVEL

Remove minor deteriorated concrete surfaces and patch. Remove dirt and debris. Clean, properly prepare and paint the floor surface with a non-slip marine grade floor paint. Install new floor drain cover at missing location.

B.15) RESTORE INTERIOR CONCRETE WALLS AND CEILINGS

Remove deteriorated and spalled concrete material on wall and ceiling surfaces of the lower level structure and patch with concrete patch material. Refer to NPS Preservation Brief #15 "Preservation of Historic Concrete". Repair/replace damaged concrete beam at east end with wood support columns. Remove deteriorated paint and debris from all concrete surfaces. Paint all other surfaces with marine grade paint for concrete surfaces. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.16) RESTORE CLAY TILE WALL AND CEILING SURFACES

Remove damaged clay tile wall and ceiling surfaces and repair with new material matching existing in terms of face size, thickness and color. Remove dirt and debris. Clean, properly prepare and paint all wall and ceiling tile surfaces, if previously painted, with marine grade paint.

B.17) REFINISH AIR AND WATER TANKS

Existing equipment tanks shall remain in place for interpretive purposes. Remove deteriorated paint, rust and scale from tank and pipe surfaces located in the main level. Clean, properly prepare and paint all tank and miscellaneous pipe surfaces with marine grade paint. Install interpretive signage.

B.18) REPLACE MAIN LEVEL DOORS

Replace four missing interior doors and hardware in the main level. Replacement doors shall be 1¾" thick wood two-panel doors. The pair of doors in the large opening shall have glass lights as shown in the building section on Drawing #3 in Appendix B. Re-use existing wood frames.

B.19) RESTORE WELL COVER

Remove deteriorated paint, rust and scale from the steel plate well cover and frame surfaces and lightly blast to white metal. Replace severely damaged or missing components. Repair any damaged concrete in accordance with Item B.2. Clean and properly prepare all metal surfaces and paint with marine paint. Securely fasten the cover to the concrete curb.

B.20) RESTORE BRICK MASONRY CHIMNEY

Remove deteriorated mortar and repoint with new mortar matching the physical properties of the existing mortar. Refer to NPS Preservation Brief #2 "Repointing Mortar Joints in Historic Masonry Buildings". Remove deteriorated paint from the masonry surfaces. Clean, properly prepare and paint all interior masonry surfaces with marine grade paint. The missing upper section of the chimney shall not be reconstructed.

B.21) REFINISH STAIR HANDRAIL AND GUARDRAIL

Remove deteriorated paint and rust from all metal handrail and guardrail components at the interior stair from the main level to the upper level. Clean, properly prepare all components and paint with marine grade paint.

B.22) INSTALL NEW HANDRAILS

Install new steel pipe handrails on the upper section of the interior stair from the main level to the upper level for safety. New handrails shall match the existing in terms of material and size.

B.23) INSTALL NEW INTERIOR WALL AND CEILING SHEATHING

Install new one-inch thick wood sheathing on the interior face of the walls and ceiling to replace the missing sheathing. Install new wood trim at windows and doors. Sheathing shall be installed horizontally. Trim shall match profiles seen in Drawing #8 in Appendix B. Paint all new wood surfaces with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.24) REFINISH SHIP'S LADDER STAIR

Remove deteriorated paint from all wood treads and stringers and the metal handrail. Clean and properly prepare all wood and metal stair components and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.25) REMOVE OFFICE

Remove the small office constructed of wood framing and wood paneling on the second floor level. Remove all electrical items including lights, switches and panels located on the walls and ceiling.

B.26) INSTALL CATWALK GUARDRAIL

Install new sections of wood guardrail along the attic catwalk to replace the missing guardrail sections. Replacement guardrail shall match the wood profiles and sizes of the existing guardrail components. Remove deteriorated paint from existing wood guardrail components. Clean and properly prepare all new and existing components and paint with marine grade paint. Paint Color to be in accordance with the Historic Color Report in Appendix D.

B.27) RESTORE METAL WALL AND CEILING PANELS

Remove minor deteriorated and rusted light gage metal (tin) wall and ceiling surfaces in the upper level attic space and patch with new material matching the existing. Remove deteriorated paint. Clean and properly prepare all wall and ceiling surfaces and paint with marine grade paint.

B.28) RESTORE BUILT-IN SHELVING

Install new wood door to replace the missing door at the built-in shelving units located in the attic. Remove deteriorated paint from all wood shelves and trim. Clean and properly prepare all wood components and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.29) REPLACE DOORS AT ATTIC LEVEL

Replace two missing wood doors and hardware leading to the attic catwalk and to the lantern service and fog horn room. Doors shall be 1¾" thick wood two-panel doors. Reuse existing wood frames.

B.30) RESTORE CONCRETE FLOOR AT SECOND LEVEL

Remove minor deteriorated concrete surfaces and patch. Remove dirt and debris. Clean, properly prepare and paint the floor surface with a non-slip marine grade floor paint. Install new floor drain cover at missing location.

B.31) RESTORE FLOOR GRATES

Replace floor grate located on the second level that is badly damaged with a new metal floor grate matching the size and profile of the existing. Remove deteriorated paint, rust and scale from other floor grates. Clean and properly prepare all floor grates and paint with marine grade paint.

B.32) RESTORE LANTERN AND FOG HORN SERVICE ROOM

Restore damaged wood paneling wall and ceiling surfaces. Remove deteriorated paint from wall and ceilings. Clean, properly prepare and paint all surfaces with marine grade paint. Install new wood flooring with paint finish. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.33) REFINISH LANTERN ACCESS LADDER

Remove deteriorated paint from all ladder components. Clean and properly prepare all wood ladder components and paint with marine grade paint. Secure ladder to floor and wall for safety.

B.34) RESTORE LANTERN FLOOR

Remove damaged and deteriorated tongue and groove wood flooring and replace with new material matching the species, profile and size of the existing. Remove deteriorated paint from remaining floor surface. Clean, properly prepare and paint the floor surface. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.35) RESTORE EXTERIOR LANTERN DECK

Remove the damaged single ply roof membrane and all related flashing material. Repair any damaged or deteriorated wood deck and deck framing members. Replace the deck with heavy gage sheet metal with a paint finish.

B.36) RESTORE LANTERN INTERIOR

Restore all interior surfaces of the lantern including wood paneling walls, glazing mullions and ceiling. Replace missing vent covers. Remove deteriorated paint and rust from all metal (cast iron) and wood surfaces and make minor repairs as required. Lightly blast all metal surfaces to white metal. Clean and properly prepare all wood and metal surfaces and paint with marine grade paint. Paint colors to be in accordance with the Historic Color Report in Appendix D. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron".

B.37) RESTORE LANTERN GLAZING

Remove broken glass and replace with new glass matching the thickness of original lantern glass. Remove deteriorated paint and rust from all metal mullions and covers. Replace missing components. Clean and properly prepare all metal (cast iron) surfaces and paint with marine grade paint. Paint colors to be in accordance with the Historic Color Report in Appendix D. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron".

B.38) RESTORE LANTERN DOOR

Remove deteriorated paint and rust from all metal (cast iron) door surfaces. Clean and properly prepare all metal surfaces by lightly blasting to white metal and paint with marine grade paint. Repair metal flashing at door sill and head to ensure water tightness. Paint color to be in accordance with the Historic Color Report in Appendix D. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron".

B.39) RESTORE LANTERN EXTERIOR

Restore all exterior metal (cast iron) surfaces of the lantern including walls, glazing mullions, roof and ventilator. Remove deteriorated paint, rust and scale from all metal surfaces and lightly blast to white metal. Make minor repairs as required. Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint colors to be in accordance with the Historic Color Report in Appendix D. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron".

B.40) RESTORE LANTERN DECK RAIL

Replace the section of metal railing that has previously been replaced with material not matching the original. Remove deteriorated paint, rust and scale from all components and lightly blast to white metal. Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

B.41) REPLACE MISSING EXTERIOR ELEMENTS

Replace missing exterior elements including the metal handrails and ladder brackets located on the north wall of the concrete base structure. Refer to the 1922 drawings in Appendix B.

B.42) INSTALL ELECTRICAL CONDUIT / COVER

Install a metal cover plate to protect the exposed electrical wires on the interior of the main floor level.

B.43) INSTALL LIGHTING AND POWER

Install additional interior lighting, receptacles and switches, including emergency egress lighting, on the interior to provide illumination and safety. Light fixture style shall include both period lighting and modern lighting, such as track lighting, to highlight displays or exhibits. All wiring shall be located in conduit in accordance with the electrical code.

B.44) ENCLOSE ELECTRICAL PANELS

Install a wood frame partition or wire mesh security fence to enclose the electrical panels located on the second floor level to provide safety and protection from the electrical gear and wiring.

B.45) INSTALL INTERPRETIVE SIGNAGE

Install interpretive signage around the exterior of the Entrance Light for times when the building is not open, and on the interior at the pier deck level for those unable to access the upper floor. Coordinate the location of the exterior signage with the U.S. Army Corps of Engineers. Do not attach signage to the structure. The placement, mounting height orientation of the interpretive sign panels should be consistent with the U.S. Access Boards Standards for Outdoor Developed Areas. Where feasible, interpretation via Braille panels, audio devices, web accessed podcasts and similar interpretive materials should be investigated for inclusive site interpretive plans.

B.46) INSTALL MECHANICAL VENTILATION SYSTEM

Install a mechanical ventilation system to facilitate air movement throughout the building. The elements of the system shall be concealed as much possible and shall consist of air intake louvers installed at the lower level of the building and the exhaust at the height point. Initial recommendations are to install a weather-proof ventilation louver in the former window opening on the east wall at the Pier Deck Level for air intake. Install the mechanical exhaust fan unit in the building on the east side. Utilize the existing wall louvers in the east gable end for the exhaust port. Operation of the mechanical unit should be temperature and humidity controlled.

C) INNER LIGHT TOWER

Where missing elements are stated to be replaced with new material matching existing, original drawings, as exhibited in Appendix B, shall be used to guide the design of these elements. If no such record exists, then designs from other maritime structures of a similar period shall be used as a guide. All such work, along with all plans for rehabilitation, shall be submitted to the Michigan State Historic Preservation Office for review and approval.

Paint colors shall match existing colors if there is no determination or recommendation from the historic paint color analysis.

C.1) PAINT CONCRETE BASE

Remove deteriorated paint and debris from concrete surfaces. Clean, properly prepare and paint the tower's concrete base with marine grade paint for concrete surfaces.

C.2) REFINISH EXTERIOR METAL WALL SURFACES

Remove deteriorated paint, rust and scale from all exterior metal wall surfaces of the light tower and lightly blast to white metal. Repair or replace damaged components. Clean and properly prepare all exterior metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.3) RESTORE PORTHOLE STYLE WINDOWS

Remove steel plate covers, replace missing glass and other missing components and restore all windows to operating condition. Remove deteriorated paint from all surfaces. Clean and properly prepare all previously painted surfaces and paint with marine grade paint. Do not paint bronze or brass surfaces.

C.4) INSTALL SEALANT AT TOWER BASE

Install sealant around the tower base where the metal structure is seated on the concrete base in order to minimize water penetration at this joint.

C.5) REPAIR METAL FLOOR AT THIRD LEVEL

Remove badly rusted and weakened sections of the steel floor plate that is the floor structure of the third level. Install a protective steel plate cover over the large opening. Install new steel floor plate and paint with marine grade paint.

C.6) REFINISH INTERIOR METAL SURFACES

Remove deteriorated paint, rust and scale from all interior metal wall, floor and ceiling surfaces of the light tower and lightly blast to white metal. Repair or replace any damaged components. Clean and properly prepare all interior metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.7) RECONSTRUCT GUARDRAIL AT SECOND LEVEL

Reconstruct the single pipe guardrail located at the second level by installing two additional horizontal pipe rails to provide safety and fall protection. New rails should utilize clamps to avoid damage to existing material.

C.8) COVER FLOOR OPENING AT SECOND LEVEL

Install a steel floor plate cover to close the large floor opening along the exterior wall at the second floor level to provide safety and fall protection.

C.9) REFINISH METAL STAIRS, HANDRAILS AND GUARDRAILS

Remove deteriorated paint, rust and scale from all interior metal stair, ladder and railing components including treads, stringers, handrails and guardrails. Clean and properly prepare all metal stair, ladder and railing components and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.10) RESTORE PLASTER CEILING AT THIRD LEVEL

Remove damaged and deteriorated plaster at the ceiling of the third level, install new plaster and paint. Refer to NPS Preservation Brief #21 "Repairing Historic Flat Plaster – Walls and Ceilings". Paint color to be in accordance with the Historic Color Report in Appendix D.

C.11) REINSTALL LANTERN FLOOR HATCH COVER

Reinstall the steel plate floor hatch cover in the lantern floor to operating condition for safety and fall protection. Repair hinges as required. Remove deteriorated paint and rust and lightly blast to white metal. Clean and properly prepare all metal surfaces and paint with marine grade paint.

C.12) RESTORE CONCRETE FLOOR AT MAIN LEVEL

Remove minor deteriorated concrete surfaces and patch. Remove dirt and debris. Clean, properly prepare and paint the floor surface with a non-slip marine grade floor paint.

C.13) RESTORE METAL FLOOR IN LANTERN AND LANTERN DECK

Remove deteriorated paint, rust and scale from interior and exterior metal (cast iron) floor surfaces and lightly blast to white metal. Clean and properly prepare all surfaces and paint with marine grade paint. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron". Paint color to be in accordance with the Historic Color Report in Appendix D.

C.14) RESTORE LANTERN INTERIOR

Restore all interior metal (cast iron) surfaces of the lantern including walls, glazing mullions and ceiling. Replace missing vent covers. Remove deteriorated paint and rust from all metal surfaces and make minor repairs as required. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron". Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.15) RESTORE LANTERN GLAZING

Remove Lexan glazing material and replace with curved glass matching the thickness of the original glass. Remove deteriorated paint and rust from all metal (cast iron) mullions and covers. Replace missing components. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron". Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.16) RESTORE LANTERN DOOR

Repair the crack in the metal door around the glass. Replace all missing hardware components. Remove the Lexan glazing material and replace with glass matching the thickness of the original glass. Repair the loose middle hinge. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron". Remove deteriorated paint and rust from all door surfaces and lightly blast to white metal. Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.17) RESTORE LANTERN EXTERIOR

Restore all exterior metal (cast iron) surfaces of the lantern including walls, glazing mullions, roof and ventilator ball. Replace missing vent cover. Remove deteriorated paint and rust from all metal surfaces and lightly blast to white metal. Make minor repairs as required. Refer to NPS Preservation Brief #27 "The Maintenance and Repair of Architectural Cast Iron". Clean and properly prepare all metal surfaces and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.18) RESTORE LANTERN DECK RAIL

Repair damaged metal guardrail components and secure all loose connections. Remove deteriorated paint, rust and scale from all guardrail components and lightly blast to white metal. Clean and properly prepare all components and paint with marine grade paint. Paint color to be in accordance with the Historic Color Report in Appendix D.

C.19 RESTORE PEDESTRIAN DOOR AT MAIN LEVEL

Although the present day water-tight steel door, installed in the 1990s, is not appropriate to the 1922-1930 Period of Interpretation, replacing the door with a replica of the original historic door is not recommended for security reasons and the extreme weather conditions. Restoration of the present day door and an interior interpretive display of the original door are recommended.

Remove all paint, rust and scale and lightly blast the all door and frame surfaces to white metal. Install sealant material as needed. Clean, properly prepare all metal surfaces and paint with marine grade paint. Restore all hardware and operating mechanisms to good working order.

C.20) RESTORE DOOR AT SECOND LEVEL

Remove the steel plate infill and reconstruct the steel door at the second level of the tower that provided entry from the catwalk. Incorporate a ventilation louver in the door per item C.26.

C.21) INSTALL ELECTRICAL CONDUIT / COVER

Install a metal plate cover to protect the exposed wires on the interior of the tower at the main level.

C.22) ENCLOSE ELECTRICAL PANELS

Install a wire mesh security fence in front of the electrical panels at the mail level to provide safety and protection from the electrical gear and wiring.

C.23) INSTALL LIGHTING

Install additional lighting, receptacles and switches on the interior to provide additional illumination and safety. Match existing fixture style. All wiring shall be located in conduit in accordance with the electrical code.

C.24) INSTALL INTERPRETIVE SIGNAGE

Install interpretive signage around the exterior of the light tower for times when the tower is not open, and on the interior at the first floor level for those unable to access the stairs. Coordinate the location of exterior signage with the U.S. Army Corps of Engineers. Do not attach signage to the structure. The placement, mounting height and orientation of the interpretive sign panels should be consistent with the U.S. Access Boards Standards for Outdoor Developed Areas. Where feasible, interpretation via Braille panels, audio devices, web accessed podcasts and similar interpretive materials should be investigated for inclusive site interpretive plans.

C.25) CONSTRUCT PORTABLE STAIR

Construct a portable metal stair and landing with appropriate safety railings for temporary placement on the pier deck surface at the entrance door for visitor convenience and safety when the tower is open to the public. When not open to the public the portable stair shall be stored on the interior or off site.

C.26) INSTALL PASSIVE VENTILATION SYSTEM

Install a passive ventilation system to facilitate air movement throughout the tower. Utilize existing roof and wall vents in the lantern for upper end exhaust; clean all vents to allow free air movement. Install a new weatherproof ventilation louver on the new door at the second level of the tower, or install the louver on the existing steel plate cover over the second floor door opening. Install a removable screen door on the lantern deck access door in the lantern room; open the door to allow for additional ventilation when possible.

PRIORITY RANKING FOR TREATMENT AND USE RECOMMENDATIONS

In order to prioritize the Treatment and Use Recommendations, all items are ranked with a “high”, “medium”, or “low” priority, so that the Grand Haven Lighthouse Conservancy and the City of Grand Haven may give priority to critical items needing immediate attention. Priority rankings can be defined as follows:

HIGH Work requiring immediate attention in order to prevent further deterioration and/or loss of historic components and work that impacts the Period of Significance.

MEDIUM Work that should be completed in a period of 3 to 5 years. If not addressed in this time period, items may likely be moved to a “high” priority classification.

LOW Work that is primarily of cosmetic nature or desirable to complete, in order to enhance the interpretation of the Period of Significance.

B) ENTRANCE LIGHT

ITEM NO.	DESCRIPTION	PRIORITY RANKING		
		HIGH	MEDIUM	LOW
B.1	Restore metal bollards and guardrail		•	
B.2	Restore exterior concrete wall and deck surfaces	•		
B.3	Restore porthole style windows		•	
B.4	Restore pedestrian door at main level		•	
B.5	Restore equipment access doors at main level		•	
B.6	Restore upper deck hatch	•		
B.7	Restore exterior metal guardrail and handrail	•		
B.8	Restore exterior concrete stair	•		
B.9	Restore concrete curb and install new metal flashing	•		
B.10	Restore corrugated metal siding		•	
B.11	Replace metal roof			•
B.12	Install windows in upper level			•
B.13	Replace upper level exterior door			•
B.14	Restore concrete floor at main level		•	
B.15	Restore interior concrete walls and ceilings		•	
B.16	Restore clay tile wall and ceiling surfaces		•	
B.17	Refinish air and water tanks			•
B.18	Replace main level doors			•
B.19	Restore well cover		•	
B.20	Restore brick masonry chimney			•
B.21	Refinish stair handrail and guardrail		•	
B.22	Install new handrails	•		
B.23	Install new interior wall and ceiling sheathing			•
B.24	Refinish ship's ladder stair			•
B.25	Remove office		•	
B.26	Install Catwalk guardrail	•		
B.27	Restore metal wall and ceiling panels		•	
B.28	Restore built-in shelving			•
B.29	Replace doors at attic level			•
B.30	Restore concrete floor at second level		•	
B.31	Restore floor grates	•		
B.32	Restore Lantern and Fog Horn Service Room		•	
B.33	Refinish Lantern access ladder			•
B.34	Restore Lantern Floor		•	
B.35	Restore exterior Lantern deck	•		

PART V – CONSTRUCTION COST ESTIMATES

Construction cost estimates for all of the work identified in Part IV – Treatment and Use Recommendations are included in this section. All cost estimates are projected for work to be completed in 2015; escalation factors for future labor and material cost increases must be applied to all figures when projecting beyond that time period. All estimates may vary considerably depending on the scope of the specific work and the efficiency of scale.

PROJECT: GRAND HAVEN SOUTH PIER – ENTRANCE AND INNER LIGHTS
 GRAND HAVEN, MICHIGAN

BUILDING OR COMPONENT NAME: ENTRANCE LIGHT

DATE: MARCH 2015



ITEM NO.	DESCRIPTION	QUANTITY	UNIT OF MEASURE	LABOR AND MATERIAL		EQUIPMENT COST	TOTAL COST	REMARKS
				UNIT PRICE	COST			
B.1	Restore metal bollards and guardrail	One	Lump Sum				\$1,000	
B.2	Restore exterior concrete wall and deck surfaces	2,074	Sq. Ft.	\$2,500			75,000	426 s.f. deck and 1648 s.f. walls
B.3	Restore porthole style windows	Seven	Each	2,500			17,500	
B.4	Restore pedestrian door at main level	One	Each	2,500			2,500	
B.5	Restore equipment access doors at main level	One	Each	5,000			5,000	
B.6	Restore upper deck hatch	One		3,000			3,000	
B.7	Restore exterior metal guardrail and handrail	160	Ln. Ft.				18,000	
B.8	Restore exterior concrete stair	One	Lump Sum				4,000	
B.9	Restore concrete curb and install new metal flashing	20	Ln. Ft.				3,000	
B.10	Restore corrugated metal siding	1,752	Sq. Ft.				45,000	
B.11	Replace metal roof	1,512	Sq. Ft.				50,000	
B.12	Install windows in upper level	Ten	Each	3,500			35,000	
B.13	Replace upper level exterior door	One	Each	4,000			4,000	
B.14	Restore concrete floor at main level	1,106	Sq. Ft.				10,000	
B.15	Restore interior concrete walls and ceilings	1,854	Sq. Ft.				18,000	
B.16	Restore clay tile wall and ceiling surfaces	716	Sq. Ft.				7,000	

ITEM NO.	DESCRIPTION	QUANTITY	UNIT OF MEASURE	LABOR AND MATERIAL		EQUIPMENT COST	TOTAL COST	REMARKS
				UNIT PRICE	COST			
B.17	Refinish air and water tanks	One	Lump Sum				5,000	
B.18	Replace main level doors	Four	Each	2,000			8,000	
B.19	Restore well cover	One	Lump Sum				1,000	
B.20	Restore brick masonry chimney	One	Lump Sum				2,000	
B.21	Refinish stair handrail and guardrail	One	Lump Sum				2,500	
B.22	Install new handrails	One	Lump Sum				3,000	
B.23	Install new interior wall and ceiling sheathing	2,120	Sq. Ft.				30,000	
B.24	Refinish ship's ladder stair	One	Lump Sum				1,000	
B.25	Remove office	One	Lump Sum				5,000	
B.26	Install Catwalk guardrail	One	Lump Sum				1,500	
B.27	Restore metal wall and ceiling panels	One	Lump Sum				3,000	
B.28	Restore built-in shelving	One	Lump Sum				500	
B.29	Replace doors at attic level		Each				4,000	
B.30	Restore concrete floor at second level		Sq. Ft.				7,000	
B.31	Restore floor grates		Each				4,000	
B.32	Restore Lantern and Fog Horn Service Room	One	Lump Sum				10,000	
B.33	Refinish Lantern access ladder	One	Lump Sum				1,000	
B.34	Restore Lantern Floor		Sq. Ft.				2,500	
B.35	Restore exterior Lantern deck		Sq. Ft.				9,000	

PROJECT: GRAND HAVEN SOUTH PIER – ENTRANCE AND INNER LIGHTS
 GRAND HAVEN, MICHIGAN

BUILDING OR COMPONENT NAME: INNER LIGHT

DATE: MARCH 2015



ITEM NO.	DESCRIPTION	QUANTITY	UNIT OF MEASURE	LABOR AND MATERIAL		EQUIPMENT COST	TOTAL COST	REMARKS
				UNIT PRICE	COST			
C.1	Paint concrete base	One	Lump Sum				\$1,500	
C.2	Refinish exterior metal wall surfaces	One	Lump Sum				150,000	
C.3	Restore porthole style windows	Five	Each	\$1,500			7,500	
C.4	Install sealant at tower base	One	Lump Sum				500	
C.5	Repair metal floor at third level	86	Sq. Ft.				9,000	
C.6	Refinish interior metal surfaces	One	Lump Sum				100,000	
C.7	Reconstruct guardrail at second level	One	Lump Sum				4,000	
C.8	Cover floor opening at second level	One	Lump Sum				2,000	
C.9	Refinish metal stairs, handrails and guardrails	One	Lump Sum				15,000	
C.10	Restore plaster ceiling at third level	86	Sq. Ft.				3,500	
C.11	Reinstall lantern floor hatch	One	Lump Sum				1,500	
C.12	Restore concrete floor at main level	122	Sq. Ft.				2,500	
C.13	Restore metal floor in lantern and lantern deck	One	Lump Sum				5,000	
C.14	Restore lantern interior	One	Lump Sum				12,500	
C.15	Restore lantern glazing	One	Lump Sum				10,000	
C.16	Restore lantern door	One	Lump Sum				3,000	
C.17	Restore lantern exterior	One	Lump Sum				12,500	

