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**PRESERVING THE LIGHTHOUSES OF MARTHA'S VINEYARD**

An Interactive Qualifying Project Report submitted to the Faculty of

**WORCESTER POLYTECHNIC INSTITUTE**

In partial fulfillment of the requirements for the Degree of Bachelor of Science

99A003I

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## **Abstract**

This project prepared for the Martha's Vineyard Historical Society describes the steps needed to preserve the Lighthouses leased by the Society. This evaluation examines preservation against weather, structural failure, erosion, and human tampering. Financing the preservation involves investigating grant studies, enhancing donation expectations and tour profits through advertisement, as well as miscellaneous contributions. Tourists, the local community, and history buffs honor the Lighthouses; a plan for the future of these monuments needs to be established.

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Paint Recommendations	Benjamin Falk
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# 1. Introduction and Project Overview

Nothing is forever. It is a fact that even the strongest of materials eventually degrades, and transforms into an entirely different substance. Lighthouses are certainly no exception to this phenomenon, and the longer certain lighthouses are maintained, the greater the precaution against degrading factors needs to be taken.

The Martha's Vineyard Historical Society governs three lighthouses on the island, and the consensus of the society is that the lighthouses are important pieces of historical significance to the island's history. Steps to preserve these local (and possibly national) treasures are vital to the longevity of their function. Simple maintenance procedures and schedules will help to lessen the effects of time and passage.

The lighthouses are of historical and functional importance to the islanders, and those who frequent the island. All of these lighthouses are used by the local sea-goers for safe navigation. With the advent of the Global Navigational Electronic devices, coast detection is downloaded via satellite, and to the owners of these new gadgets the lighthouses seem obsolete. Many vessels do not have electronic global navigation instruments, however, so there must be lighthouses to keep ships off shore. The lighthouses also serve as historical monuments to the days prior to electronic devices. As the world's technology grows, the need for these massive beacons of safety diminishes. Since the lighthouses are some of the largest structures, easily visible for many miles, they are proud reminders of the days before digitization.

To produce a sound maintenance plan of attack, one needs several kinds of knowledge to thoroughly examine lighthouses: Vineyard lighthouse history, material coatings, metal properties, structural degradation behavior, and topographical properties.

Each lighthouse must be inspected and recorded with photographs and notes. Previous inspections of the lighthouses allow for a time-elapsd comparison to discover patterns and problem areas. Upon discovering the problems facing the lighthouses, a schedule of solutions is created to correct the issue.

Problem areas such as paint decay or grant applications are discussed with experts in the fields of museum direction, architecture, research, and the Coast Guard. Plans are created for the keepers and lease owners for the ongoing suggested maintenance, repair, and funding for the restoration.

The schedules are given to the keepers and lease owner(s) for the specific elements or aspects to address, such as scraping and repainting rust that tends to collect in a certain area. Funding for the work done is obtained through monies allocated in the preservation fund. These monies are obtained through touring profits, grants, donations, and novelty sales.

All of these discussed areas are outlined in this report, providing a complete guide for the keepers and directors of the lighthouses to continually maintain and restore these national treasures.

## 2. Project Background

In order to determine what steps are necessary in preserving these huge structures, several questions were to be answered first. What monies are available to the preservation of these lighthouses via the Historical Society, the U.S. government, and other sources? What has been done in the past to preserve the lighthouses, and how effective were the actions? What techniques of preservation were used to preserve other lighthouses, and how do those techniques apply to the Martha's Vineyard Historical Society's lighthouses?

Funding for the preservation of the lighthouses can be achieved by registering the lights with certain beneficiary societies. The government and Coast guard can provide funding and maintenance as well. The Coast Guard is responsible for maintaining the function of the actual lighting device, but the care of the buildings that hold the light high is the responsible for the Martha's Vineyard Historical Society, the current lease holders of the three lights.

The lighthouses are tested for lead paint as well. Unfortunately, from this project's findings, the Edgartown lighthouse will need to be treated with sandblasting and acid washing, to remove the toxic paint.

All of the lighthouses have rust spots that need to be removed, as well as other specific problems that are addressed in later sections of this report, such as the mold in the Gay Head lighthouse.

The lighthouses have suffered many calamities as described in the "Historical Background" section, as well as subtle problems. Currents, caused by dredging for World War II, have changed. Sand moved from the Gay Head cliffs is appearing on the

Edgartown Lighthouse beach. This erosion caused by this dredging is a real threat to the stability of the Gay Head light.

Past intervention to these lighthouses involves the lighthouses' history, and similar studies of their preservation. One such study conducted in 1997 by two WPI students, Edward Cameron and Eric Wilhelm, aggressively studied the restoration required to renew the original look of the structures. Their study provided background information about the lighthouses' histories, their problems, and some leads to more information sources, as well as who to contact for specific restoration needs. They created a list of specific cosmetic problems, which need to be spruced up in order to return these monuments to their original condition.

Under the direction from Bruce Andrews, the previous architect for the lighthouses was replaced by summer resident Geoffrey White, a commercial housing architect. The change was made to accommodate funding restraints, and because of his skill and presence in the community. Mr. White is to create blueprints for the Edgartown lighthouse's inside stairs, as well as the concrete skirt at the base of the structure. Using the information obtained in this report about the paint, stability, lean, and other tests, Mr. White will best decide what steps are taken in the restoration.

To better understand the effects of time on the structures, a history of the lights is created, as outlined in the next section.

### 3. Historical Background

#### East Chop

Built in 1869, the original East Chop light was constructed of wood and maintained by Silas Daggett. The wooden structure caught fire in 1872 and the light had to be rebuilt. In 1873 the U.S. Government proposed to take over the light, and in 1875 the East Chop lighthouse was purchased from Daggett for a price of \$5,000. The Lighthouse Department requested an inspection of the beacon, and recommendations were made for a 35-foot cast-iron tower lined with brick. The tower was to be equipped with a fourth-order fresnel lens that displayed a constant white light instead of the original red light. In 1893 the light was again changed to a flashing red. The tower was painted red in 1880; eventually the red paint oxidized and became brown. This brown color became the trademark of the lighthouse for the next hundred years, so subsequent paint jobs kept the brownish hue. Shown here is a photograph of East Chop in its red/brown state, date unknown. (MVHS



Figure 1

Collection Box 12) In 1933 an electric green lamp replaced the Fresnel lens, making the keeper obsolete. The keeper's dwelling was abandoned and moved to another location causing the light to become the responsibility of the West Chop keepers. In 1957 the land around the lighthouse was sold to Oak Bluffs for \$3000, with the stipulation that it



be used for a park or recreational site. In 1962 the lamp was changed to the present signal, six seconds green and six seconds darkness.

In 1984 the U.S. Coast Guard repaired all of the lighthouse windows, replaced all the bulbs, and repainted the tower. A special division of the Coast Guard called ANTS (Aid to Navigation) was designated to research and combat deterioration of the



**Figure 2**

Vineyard's lighthouses. On July 13, 1984 Mark Alan Lovewell wrote in the Vineyard Gazette, "The ANTS at East Chop Light are the A-Team in War on Rust." Also, according to this article, the Coast Guard used Dupont Imram paint, at a cost of \$100 a gallon. An inspection by the guardsmen determined that the job was "perfect." The picture to the left is an action photo of the painting. (MVHS Collection Box 12) The Coast Guard again renovated the light in 1987, using \$40,000 left over from the

reconstruction of a light on Cape Cod. Six of the bulbs in the lamp were replaced and upgraded to 500-hour bulbs with a flash frequency of three seconds followed by three seconds of darkness, the light's characteristic signal since 1962. A mechanism was installed so that as each bulb burnt out, the next one was automatically rotated to take its place. In 1986 the Vineyard Environmental Research Institute received the bid for maintenance of the light and in 1988 they painted the tower white.

## Edgartown

The Edgartown lighthouse was erected on a man-made island a quarter-mile from



**Figure 3**

shore in 1828. The light was housed in a wooden tower, mounted upon the roof of the keeper's dwelling. To the left is a picture of the original configuration.

*(MVHS Walking Tour of Historic*

*Edgartown)* In 1829 a wooden pier was

constructed so the keeper and visitors did

not have to row the quarter-mile to the island. The original design to the lighthouse did not account for the breakwater, so the structure was constantly being battered from the storm waves.

The original tower consisted of a fourth order fixed white light that consisted of ten lamps totaling 680 lumens or 'candle power.' The light was visible for farther than



**Figure 4**

twelve miles on a clear night, according to Edward R. Snow. (MVHS Collection Box

12) The Edgartown tower was replaced in

1938. Shown here was a sketch of the

proposed design. (Vineyard Gazette

"Official Sketch of Proposed Edgartown

Harbor Lighthouse") The light that was to

replace the original, however, was

controversial. The U.S. government wanted to replace the existing house's shell with a

skeleton. The residents of Edgartown thought this new tower would diminish the landscape and fought for a different design. In August 1938, a compromise was made. The lighthouse service decided upon the same structure that exists in East Chop: a cast-iron cylindrical white tower with a red light.

The new lighthouse did not last long, only about a month. On September 21, 1938, a hurricane struck and destroyed the lighthouse and damaged the pier. A new lighthouse was in order. In 1939 the lighthouse in Ipswich, Massachusetts, was being dismantled and was transported to Edgartown using a barge. The light was finished and illuminated on June 6, 1939.

It is unknown how many times the lighthouse has been painted, until 1992, when the lighthouse was repainted with funds generated by V.E.R.I., a foundation founded by William Marks for the preservation of these lighthouses. (*Vineyard Gazette "Lighthouse Facelift"*)



**Figure 5**

Shown to the right is a photograph of the repainting from the same article. This is the most recent paint job, pending the repainting suggested in this report.

## Gay Head

In 1796, a man from Nantucket, named Peleg Coffin, wrote to his congressman and requested a lighthouse be erected at Gay Head. A ridge of stones and sand, known as Devil's ridge, extended from the base of the Gay Head cliff toward the Elizabeth Islands and was the cause of numerous shipwrecks.

The plan was presented to Congress in 1798, and a \$570 grant was awarded for the construction. In the next year the Federal government received a deed for the site of the lighthouse, a generous



Figure 6

two acres and four rods from the Commonwealth of Massachusetts. To the right is a picture of the original keeper's house connected to the light. The building contract was awarded to Martin Lincoln, who was ordered to construct a wooden structure with a keeper's dwelling and outbuildings. Ebenezer Skiff was appointed the first keeper and on November 7 the Light was turned on for the first time. Winslow Lewis replaced the "spider" lamp with ten Argand-type lamps in 1813. In 1838 the upper part of the tower had to be rebuilt owing to the rotting of the timber. Because of the erosion of the cliffs the tower was moved back 75 feet in 1844. In 1854 a number of more powerful lamps

replaced the older Argand-types, and in August Congress appropriated \$30,000 for a new lighthouse and dwelling. A new Fresnel lens was ordered from Henry Lepaute of Paris and Caleb King was awarded the contract to build the new Lighthouse. On December 1, 1856, the light was lit in its new 35-foot brick tower accompanied by a new brick dwelling for the keepers. In 1874 the characteristic flashing white was changed to three white flashes and one red. At the turn of the century the keepers dwelling had to be rebuilt because of the unhealthy conditions which had developed over the years. Mold inside the lighthouse and the keeper's house was infecting the keeper's children with deadly spores. The Fresnel lens was replaced in 1952, and the lens was given to the MVHS where it is proudly displayed as an exhibit at the museum in Edgartown, Massachusetts.

## **4. Project Procedure**

### **4.1 Overall Study Procedure**

Creating a plan of action for the preservation of lighthouses uses past information about the lighthouses to determine what needs to be done for them. The first step, after properly researching the lighthouses, is to inspect them for damage, problem spots, behavior patterns of different influences on the structures such as weather and vandalism, and other intricacies of these historic monuments. After much is known about the target structure, other tests specific to the needs of the lights may be needed to determine certain aspects.

Ventilation is a great concern in the Edgartown lighthouse, and a thorough study with the Coast Guard and Geoffrey White leads to a solution, discussed later.

Tilt measurement is a means of determining the stability of the structure, and to determine if surrounding terrain is shifting. Hand rails support tourists and keepers alike, so they need to be tested for stability, and stress.

Funding is sought for next, to pay for the restorations, improvements, and other jobs for maintain the ‘fix.’

These are just a few of the sample tests and steps outlined later in this report in their respective sections.

Once all of these aspects have been fully examined, a more precise list of maintenance tasks, and maintenance schedules can be created for the keepers. The director of the historical society needs a schedule as well, to keep the workers on task, and see that the overall goal of the restoration and preservation are achieved. These

‘Plans of Action’ for the lighthouses are methodical, exhaustive means of organizing the necessary steps to keep the lighthouses ‘ship shape.’

## 4.2 Lighthouse Inspection

### 4.2.A Inspection Procedure

Inspecting the lighthouses involves many steps, as there are many different factors to consider. First, location is the most important. The surrounding area is examined for neighboring terrain effects such as sandy cliffs, or dense tree cover. Height of the location is important, as well as drainage habits of the topography. Once location has been studied, the actual structure itself can be inspected.

A simple convention for referring to the lighthouses was created in this report for the simplicity of the reader. The lighthouses have 4 inspection locations: exterior, interior, inner cupola, outer cupola. The exterior location is the outside shell of the lighthouse base, which leads up to the outer cupola section. The interior is the guts of the base that usually houses a staircase or ladder to the cupola area. The inner cupola is the where the light is located, and the outer cupola is the walkway on the outside surrounding the light room. We use this naming convention when describing particular details located in those areas.

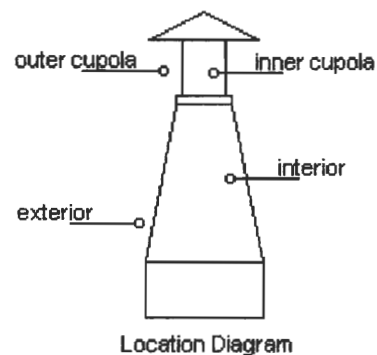


Figure 7

The exterior is checked for rust, peeling paint, and wear on operational parts such as doors. It is closely examined for signs of stress in the support of the structure, as well as the wear on any footing or base. Every item located in the interior is scrutinized for signs of moisture damage, stability for the ladder or stairs, rust, operation of all moving parts, and signs of stress on the internal structure. The inner cupola and outer cupola



locations need special attention, as they are the main functional areas of the lighthouse and need the most care. Every seam is checked for leakage and rust, all of the paint is closely inspected for chipping or peeling. The glass leading to the outside is checked for cracks, a good seal, and clear visibility. The porthole between the inner cupola and the outer cupola is inspected for rust, a good seal, and operation. The outer cupola is checked for stability, safe railings, rust, seals on the exterior of the glass, and paint chipping/peeling.

Each of the three lighthouses leased by the MVHS is checked using this convention. This systematic approach encompasses the entire building, in a methodical manner.

On June 20, 1999, we met with Bruce Andrews at the Museum in Edgartown Massachusetts. We visited Edgartown lighthouse, and under his supervision we inspected the inside. East Chop was the next stop, and Mr. Andrews pointed out the seclusion of the structure, as it is surrounded by private property. A longer ride took us to Gay Head light, where we surveyed the cliffs, and inspected the innards.

#### 4.2.B East Chop

The lighthouse is nestled between private residences with less than an acre of surrounding grass. There are tall brush and houses to the sides of the lighthouse, which prevent some wind battery.

The exterior of the East Chop lighthouse is in very good condition, and there is little to no indication of rust, peeling paint, or any other

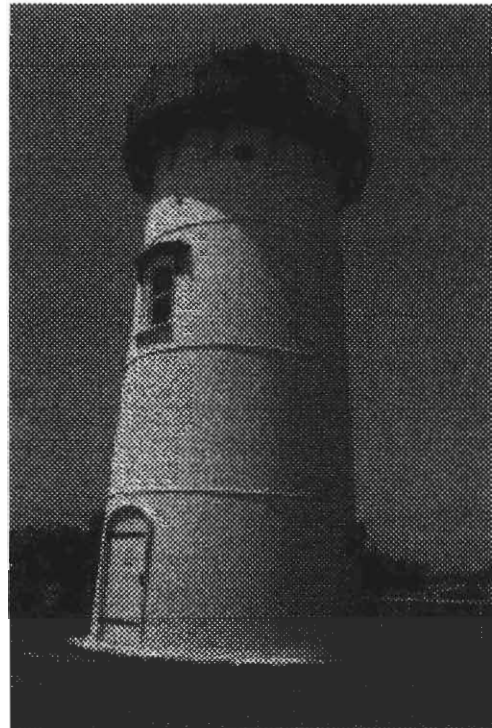


Figure 8

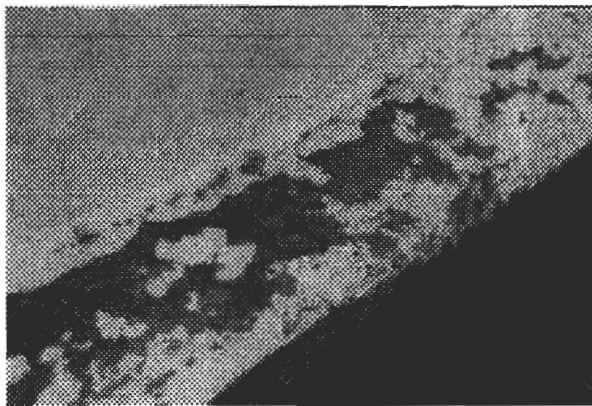


Figure 9

surface problem, save for the concrete skirt outlining the base of the structure, shown to the left here. There is no real concern for damage to the stability of the lighthouse due to this damage. A simple

paint job on the skirt will freshen up the look of the base.

The interior of the East Chop lighthouse seemed very stable as the brick-lined walls showed no sign of stress or degradation. The stairs leading up have rust eating away at

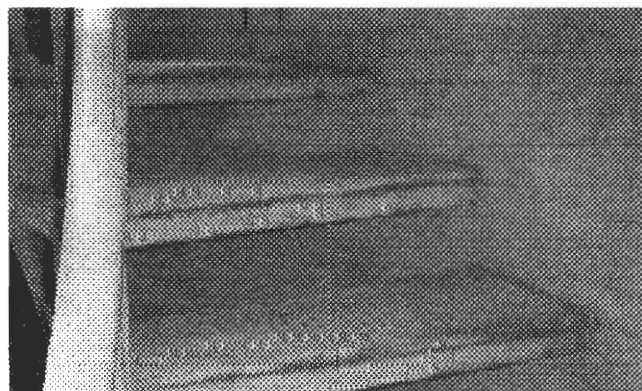
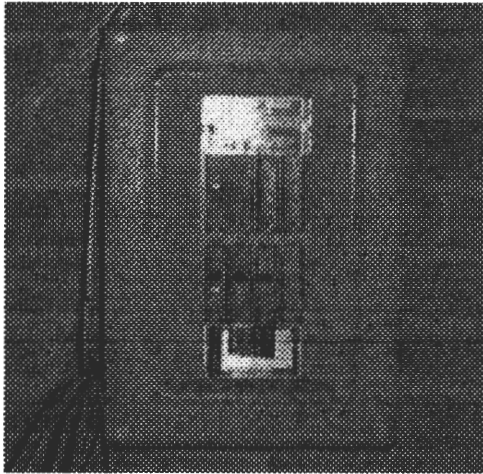


Figure 10

the surface as depicted here, and the handrail is made of varnished wood.



**Figure 11**

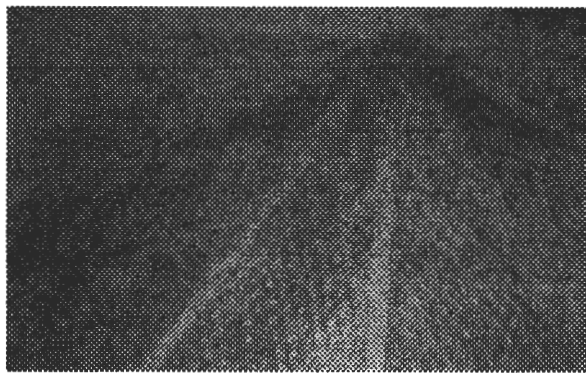
There is a great concern about moisture damage in this lighthouse. Interior components are collecting rust, which could spell disaster for some of the sensitive electronic components.

Pictured here is a circuit breaker panel for the electrical functions of the East Chop lighthouse.

Notice the rust damage near the switches. Over time, the metals could move from the rust, and

possibly cause a fire-starting short. All it takes is for one live wire to touch another, and sparks will occur. Coupled with the high voltages involved in illuminating the light, a short is a dangerous concern indeed. Even with the brick lining, a fire would mean disaster to the interior woodwork.

The metal platforms have taken a beating as well. Shown here is a picture of a platform with the surface rusting away. These platforms service many people from tours to keepers. The surface rust indicates paint failure due to foot



**Figure 12**

traffic. There needs to be a better coating on these areas, such as a high-traffic epoxy ground paint, to combat a foot grinding sand into these metal platforms.

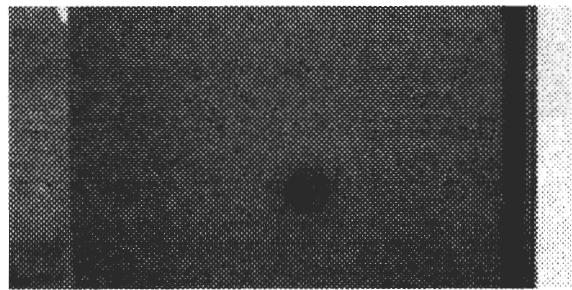
Moving our inspection to the inner cupola section, we immediately notice paint peeling and cracking on the ceiling, above where the beacon sits. A sample section of



**Figure 13**

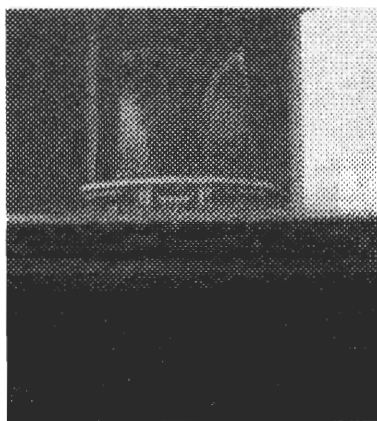
ceiling with paint peeling and cracking is displayed here. This indicates there is a moisture leak to be concerned with. The moisture damage in the inner cupola section does not stop at the ceiling. The walls on the interior are also steadily collecting their own rust, and desperately need a new coat of paint, as well as a

good seal against moisture. Shown here is a sample wall behind a ‘cabinet,’ which displays to the public the metal shell that encompasses the lighthouse’s outer skin, showing the pitted rust. Notice as well that there is wood lining inside the ‘cabinet’



**Figure 14**

door, which separates the shell from the interior woodwork of the metal. This gives moisture a place to collect, which could be very damaging to the longevity of the



**Figure 15**

lighthouse and will eventually rust the shell where holes could appear.

The outer cupola section causes much concern as far as weathering and water damaging the operational components. Shown here is the pane along the windows facing the light. There are leaks along the windows above where the door to the inner cupola section is. The

rust caused by these leaks could be devastating to the integrity of the light housing, as



**Figure 16**

well as to the sensitive electronic components, which operate the actual light function. Notice the rust underneath the paint right at the point where glass meets metal. Water will eventually destroy these seals, and more water damage will occur inside the housing. The railing along the outer cupola area is shown here. Vincent Salemi is 6'3" tall, and the rail meets his waist. This height of the rail seems

adequate for the average man (which is about 5'9"), but

every person needs to be considered, especially if these lighthouses are to be open to the public. The condition of the rail is very good, with little to no rust.

The porthole door from inner cupola to outer cupola has also received extensive rust damage. This is where the initial leak started, and this is a functional piece, with many places for water to hide. The hinges supporting the door are rusting out as well as the metal area around the hinges where water collects. Notice how the paint cracks upward, indicating the water seeping under the paint via the rusted areas.



**Figure 17**

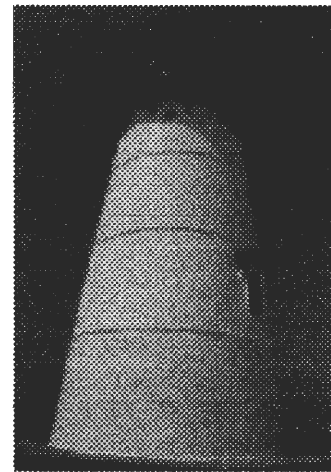
To summarize, the East Chop lighthouse seems to be in sound structural condition, but moisture is a constant problem. There are leaks, paint failure, and external crevices for water to collect. The inside brick lining is a concern as well, as it gives many pores and places for moisture to collect, with little room

for air to circulate. All of these factors can lead to a severely deteriorated lighthouse in several years, provided no work is done to stop the rust and leak problems.

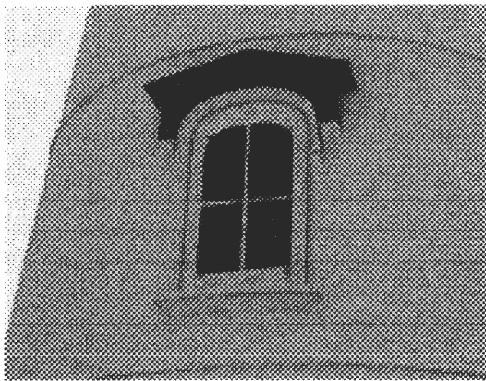
#### 4.2.C Edgartown

After walking along a sand bridge to the Edgartown lighthouse, we approached the structure with questions. Why were the 'windows' made out of plywood with windowsills painted on them? What was happening to the concrete base surrounding the structure?

These answers are to be evaluated by the inspection of the lighthouse.



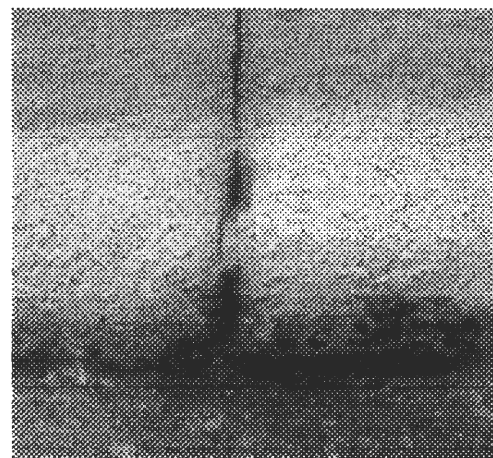
**Figure 18**



**Figure 19**

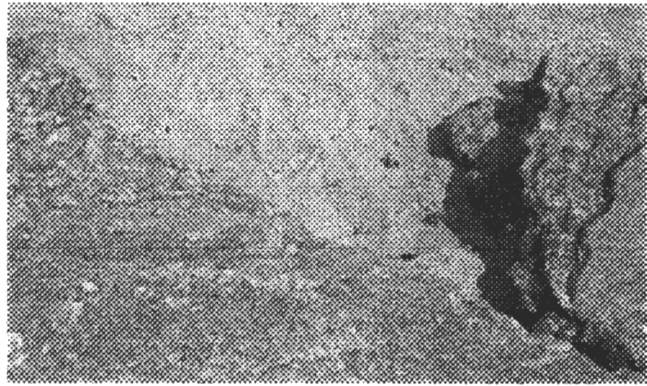
where the modular sections meet at the base leading up to the first ring, shown to the left. The south-facing window is deteriorating at an alarming rate. There are cracks and paint failure at the weld, accounting for leakage. The black paint is slightly tinted blue, due to certain pigments in the paint fading faster than others are. There is exposed rebar, ribbed metal bars used to reinforce concrete, on the upper concrete foundation. There is a massive hole in

The exterior of the Edgartown lighthouse is in fair condition. There are no major visible problems, but a few points of interest are to be noted here. First, the windows are made of plywood with a frame painted on them, as depicted to the right. There are rust crack lines



**Figure 20**

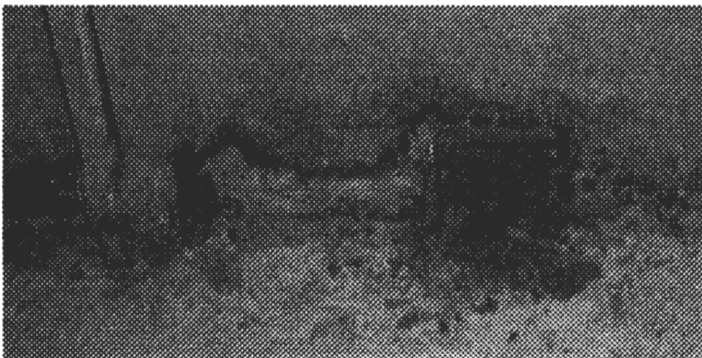
the concrete skirt foundation near the south side. A picture of the crumbling concrete is displayed here to the right. The door to the lighthouse has numerous dents, with chipped paint. The concrete steps leading to the door are cracking and breaking apart.



**Figure 21**

The interior of the Edgartown lighthouse is cause for concern. A

single ladder leads over 20 feet to the inner cupola section, which is not conducive to tour traffic. The base of the interior is seriously rusted at the seam between the metal and the



**Figure 22**

concrete. The rust is especially bad at the sections where the modules that make up the shell of the lighthouse are joined. Shown here is a sample of this rust.

Notice the 'outlining' of the rust around the seams and welds.

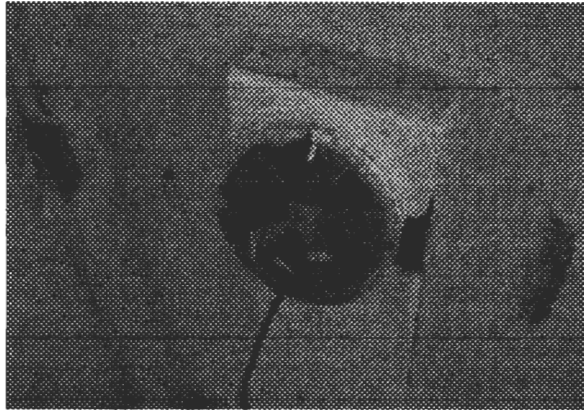
This indicates water collection, and there is a great concern for moisture levels on the inside, around the base of the structure.

The inner cupola section has some major problem areas. First, the paint is cracking and peeling along the entire surface. Second, there are many rust problems, cracked windowpanes, and damaged vents. Third, most of the seams seem to be failing. The vents here are of particular concern, as they monitor both the moisture levels in the



housing, and the temperature. Should the moisture collect in the wrong place, more serious problems with rust will develop.

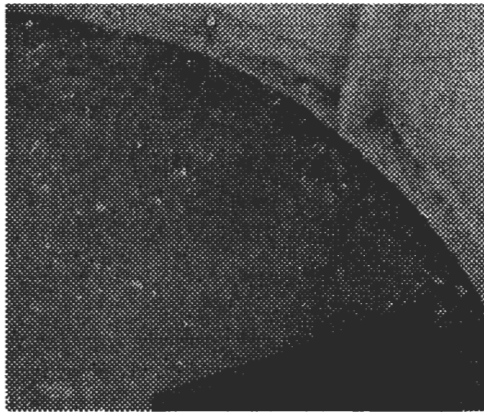
Shown here is a picture of the damage around the vents, clearly displaying the rusted out-jut vent housing. The paint all around this area is cracking and peeling, indicating moisture seepage.



**Figure 23**

Since these vents can only be set

manually, better control over the ventilation levels needs to be obtained to properly monitor moisture and condensation.



**Figure 24**

The floor of the inner cupola section is covered with rust, and littered with paint chips from the ceiling, window sills, and the vent cover on the ceiling. The rust on the floor can be solved with a high-traffic floor epoxy, and the paint on the inside of the cupola section needs to be

removed and repainted.

The inside window-sill is in poor condition as well, indicating a leak around the sills, causing a great deal of rust damage. The rubber seals holding the windows in place are decaying as well. Shown here is a picture of the rusting sills and the poor rubber seal. The



**Figure 25**

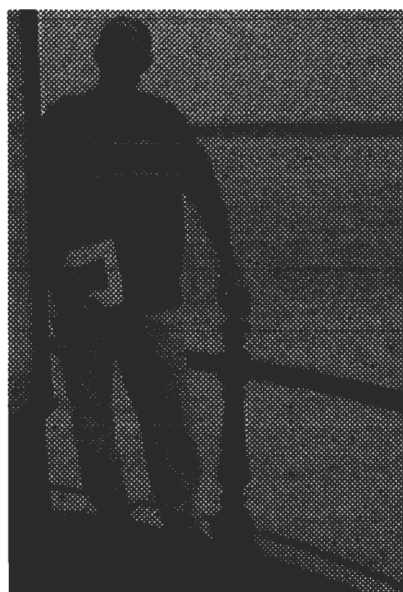


**Figure 26**

outside of the sill is just as decayed. Moving to the outer cupola section, an examination shows that the metal brackets holding the window are thoroughly rusted as well. Shown to the left is a picture of the outside sill.

The outside railing of the outer cupola

section is not doing as well either. The same subject used earlier, Vincent Salemi, is depicted here next to the hand-rail. Notice that the railing only reaches his mid thigh. This is completely unsafe, and Geoffrey White is making plans for a rail on the inside of this one that will be tall enough for code. A more thorough analysis of the stress these rails can hold is in the “Hand-Rail Stress Analysis” section.



**Figure 27**

To summarize the condition of the Edgartown lighthouse, a great deal of work needs to be done to restore, repair, and repaint the entire structure. In addition to the staircase being installed on the inside to accommodate tourists and the handrail being modified to meet code, any problems with the paint need to be addressed before the structure is open for tours.

#### 4.2.D Gay Head

The Gay Head lighthouse overlooks the cliffs of Aquinnah, on the western end of the island. Just over seventy feet to the edge of the cliffs, the tower can be seen for 21 miles for the white light, and 17 miles for the red one. The brick, mortar, and stone that makes up most of the structure is in good shape save for a few spots where the mortar is failing and brick is missing.



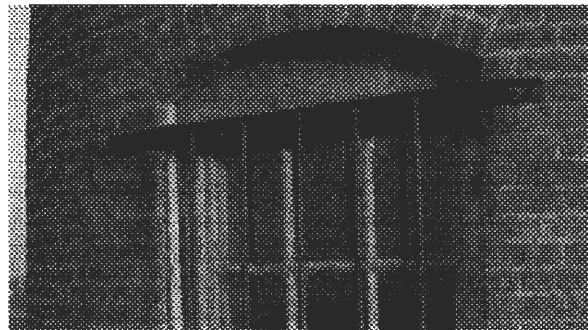
**Figure 28**



**Figure 29**

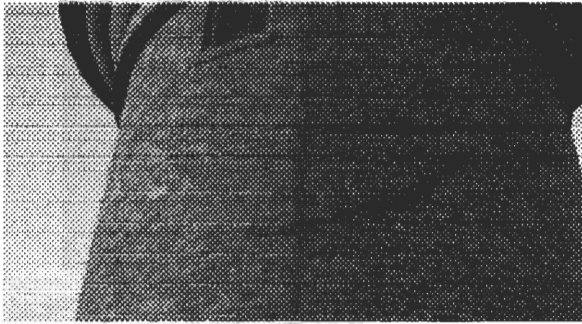
The exterior of the light has few danger spots, but the ones that exist need to be addressed soon. To the left is a picture of one of the window eaves. Notice the broken concrete under the overhang. This entire section needs to be chipped out and filled in properly. A window that faced inland is in very good

shape, and only the metal bars protecting the glass have rusted some. If the masonry around the entire structure is touched up, and the wood scraped and repainted on the wooden portions of the window, then these bars could be removed, unless there is a constant threat of vandalism in this area.



**Figure 30**

Roughly twenty feet up on the lighthouse is an abrasion where an antenna wire rubbed against the brick on the outside. These gouges are no structural or leaking

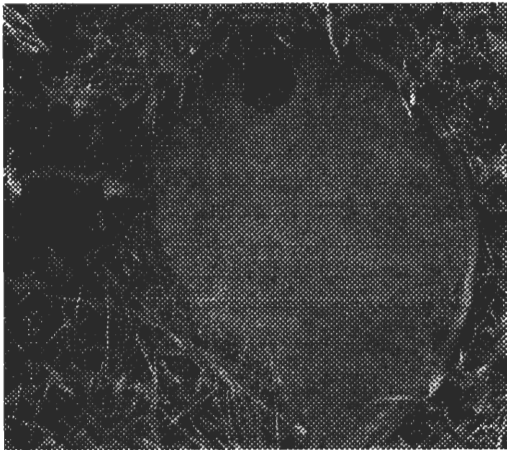


**Figure 31**  
the entrance door is completely rusted away, as pictured to the right here. It seems the rain is running inside under the eave, and corroding the metal from years of rain. The porous brick gives the water a good surface to cling to as it runs down the side. There is

problem, as the wire has been removed/restrained, and there is no more rubbing to worsen the condition of the marks, shown here. The top 5-6 inches of



**Figure 32**



**Figure 33**

no drip/run deflector above the door, which might stop most of this rust. To finish the exterior inspection, a barrel is buried a few feet away from the lighthouse in the surrounding grass, shown to the right. A closer inspection indicates it was an oil barrel with a Boston, Massachusetts, origin. The barrel contains what appears to be rainwater; however a closer

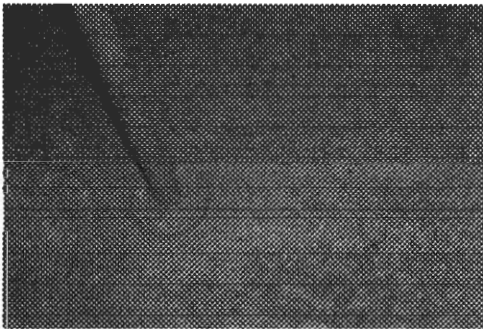
inspection from the keeper is recommended, to determine if there is remaining oil, which poses as a significant environmental hazard.

The interior of the Gay Head light has a few major concerns. The masonry is very strong against water damage, but produces some unique concerns. There are

'wooden bricks' on every floor of the inside, as shown to the right. These used to be past floor supports where the stairs stop in a landing or shelve supports, but since they are unused now, they have wooden blocks placed in them to plug the holes. If these holes are



**Figure 34**



**Figure 35**

not to be used, they should be filled in with real brick. Each of the metal landings on the staircase leading up the inside has some surface rust on them. Shown to the left is an example of one of the landings. As mentioned earlier, these need to be de-rusted, and repainted with a high-traffic

epoxy paint. One of the largest concerns in the tower is the mold that collects on the brick. As mentioned in the "Historical Background" section, mold on the bricks can release deadly spores. Shown here is a picture of the mold



**Figure 36**

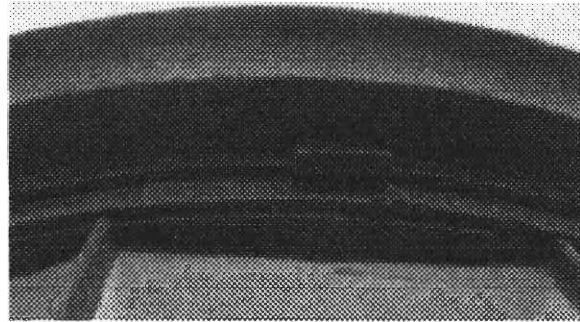


**Figure 37**

currently clinging to the brick. This mold needs to be scrubbed off of the wall to provide the healthiest conditions possible for people in the structure.

The cupola is in fairly good condition

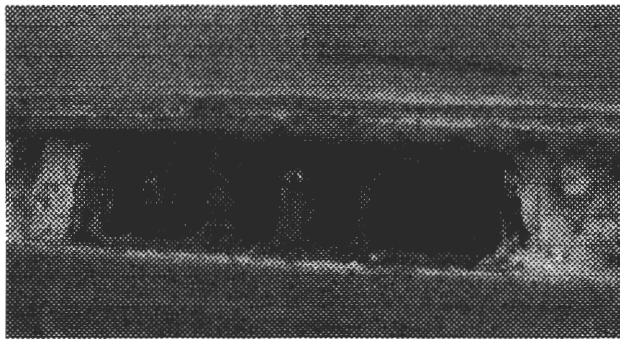
save for the metal ladders on the outside of the cupola leading onto the upper landing. Notice the rust destroying the iron ladder. This ladder services people touring the light, and needs to be replaced for the safety of the tourists, and keepers alike. The outer cupola seam holding the windows in place is in good condition except for missing pieces in window sills, which will rust the rest of the metal from the inside out.



**Figure 38**

Shown to the right here is a picture of one of the panes with a missing piece on the top right of the seam. Inside the cupola, the vents controlling moisture for this operational

area are almost rusted away. The corrosion here is heavy, indicating high moisture levels



**Figure 39**

in this beacon room. Moisture here must be controlled to protect the sensitive components keeping the light itself functional. Shown to the left is a picture of one of the vents. The vents should be replaced with a passive

ventilation control system. In closing, the condition of the Gay Head lighthouse is very good, except for the few outlined problems. As long as the keeper/restorer keeps these problem areas in mind, and the proper masonry procedures are used as outlined in the “Maintenance Summary” section, the Gay Head light will have no large impending problems.

### 4.3 Ventilation Study

Rusting on the inside of the lighthouse is caused by inadequate ventilation. Water accumulates at the base of the lighthouse on the inside and is very slow to leave. This has caused the anchor brackets of the lighthouse to corrode and they are no longer structurally sound. The lack of brackets should not cause a problem. According to Jeff Harvey, “A

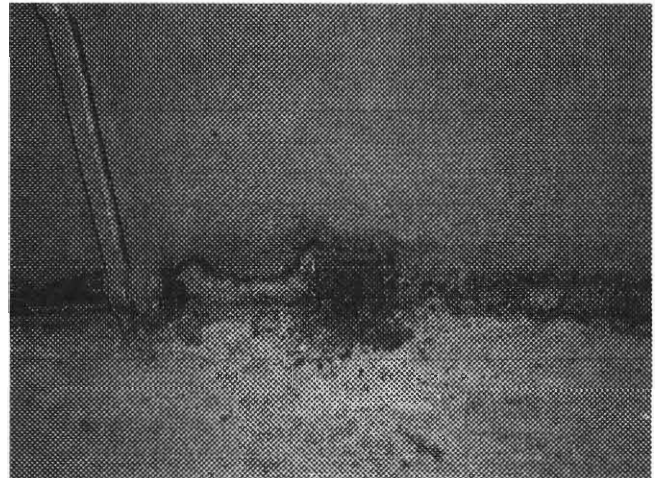


Figure 40

hurricane couldn't blow this lighthouse over even with no brackets.” The puddle patterns on the floor indicate that water is frequently introduced to the interior of the lighthouse.

There is a few different ways that water is getting inside the lighthouse. The first passage for water is when there is incredibly rough seas, and the ocean water can seep into the lighthouse through the bottom edge. The original rubber gasket that separated the lighthouse from the concrete has deteriorated.

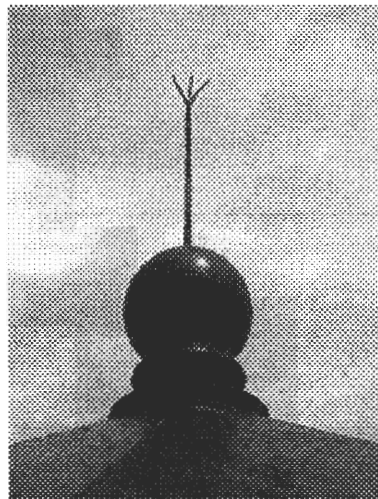


Figure 41

The second passage to enter is through the ball ventilator. The inside shaft of the ball ventilator, which is designed to not let water enter, has disintegrated.

Water can enter through the ventilation holes on the side of the ball. Rain water passes down from the top of the light house.

The third entry of water is condensation on the interior of the lighthouse may help the deterioration of the inside. However, there is not a considerable amount of rust on the eves of the lighthouse. This indicates that water could not be running down the inside wall of the lighthouse.

The lighthouse needs to be ventilated in order to solve these problems. Here are some simple solutions to this important problem. First the ball of the lighthouse must be remanufactured in order to prevent water from entering through the top. The bottom of the lighthouse must be sealed to prohibit water. It is

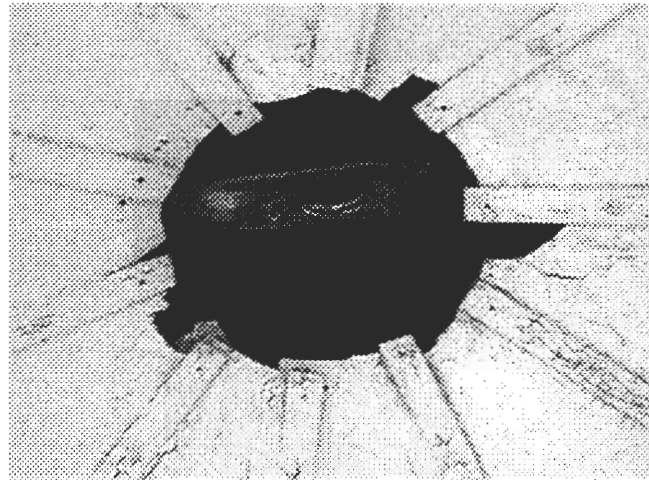


Figure 42

impossible to seal the lighthouse completely from the elements. Once the elements enter they must be removed quickly. An active ventilation system needs to be installed. First

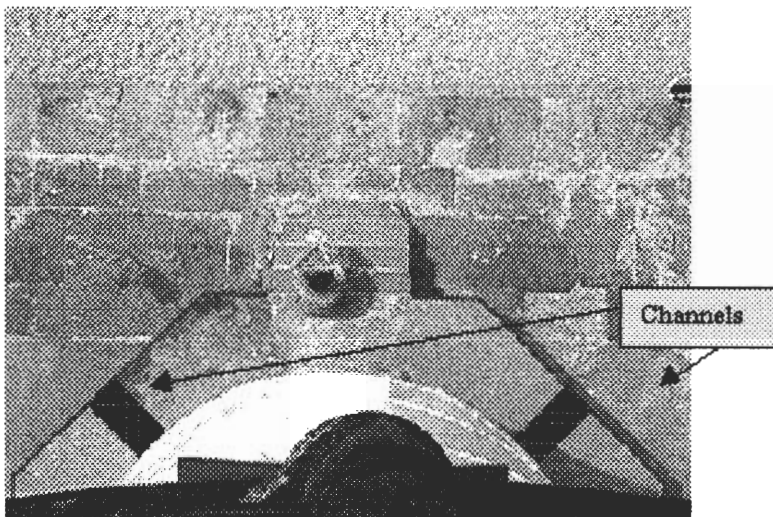


Figure 43

a high volume fan would be installed in the ball ventilator. Next four channels need to be cut in the floor of the lighthouse. They would be arranged so that they flow from the center of the lighthouse in a



compass arrangement (i.e, North, South, East, West).

The channels would run under the lighthouse and off of the exterior ledge. They would be 1 foot deep and one foot wide. Metal grates would be installed over the channels so that they would not be a hazard to foot traffic. The inside floor of the lighthouse would be skimmed with concrete and angled so that all water would run into the channels.

These channels would serve a dual purpose. One would be to drain any water that accumulates on the floor of the lighthouse. The second would be to let in fresh air through the bottom of the lighthouse. This would help to cool the interior and dry the air. If the air quality is improved the deterioration of the lighthouse would slow dramatically.

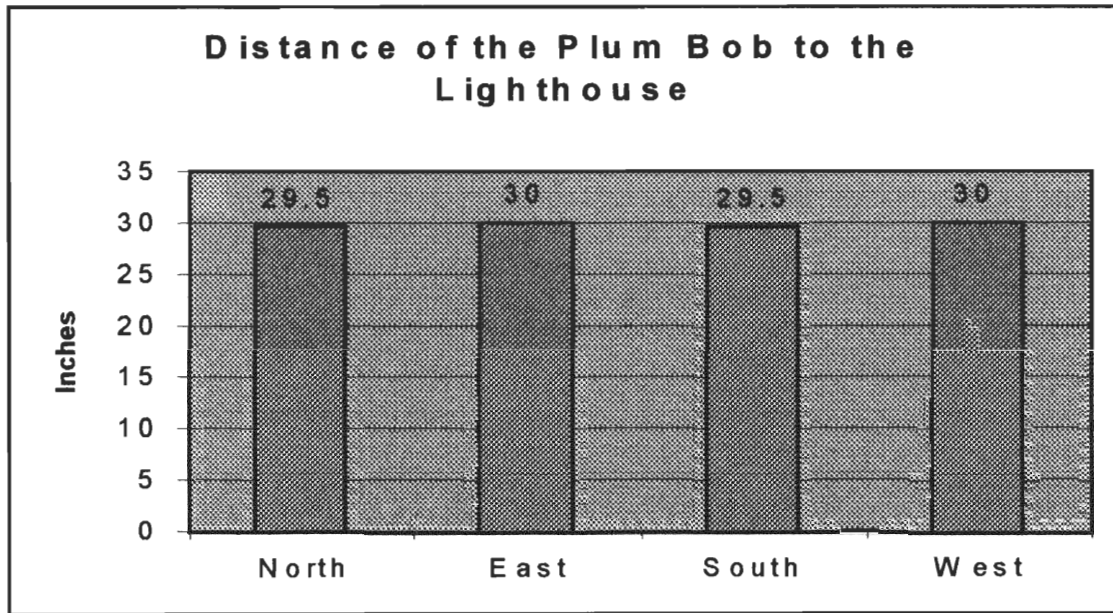
#### 4.4 Tilt Measurement Procedure

An analysis of the Edgartown Lighthouse needed to be done. In particular, the lean of the lighthouse needed to be determined. The lean of the tower will indicate the foundation stability of the lighthouse. There is no evidence so far that there is a lean but the study is done for safety. If the tower has an extensive lean, the foundation may have to be replaced to ensure the safety of the structure and that the tower will withstand the extra weight of the staircase.

We decided to use a plum bob and a compass to determine the exact lean (if any) and the direction of the lean. First we built a board exactly 4 feet in length. Then we hung a 24-gauge line off the end of the board to the bottom of the lighthouse. We measured the distance of the string to the wall of the lighthouse. We took measurements from multiple locations. The first attempt to measure the lean of the tower was to hang the plum bob off of the platform on top of the exterior of the Edgartown lighthouse. The measurements were taken at four points. Each point was placed on the Four Corners of the compass (i.e. North, South, East, and West). Using geometry the exact lean of the tower was determined  $\pm 3^\circ$  and the direction of the tilt was determined. The second method we used was to hang the plum bob down the exact middle of the tower. Four measurements were taken of the distance to the wall of the lighthouse from the plum bob hung at the bottom of the tower. Again the measurements were taken at the Four Corners of the compass.

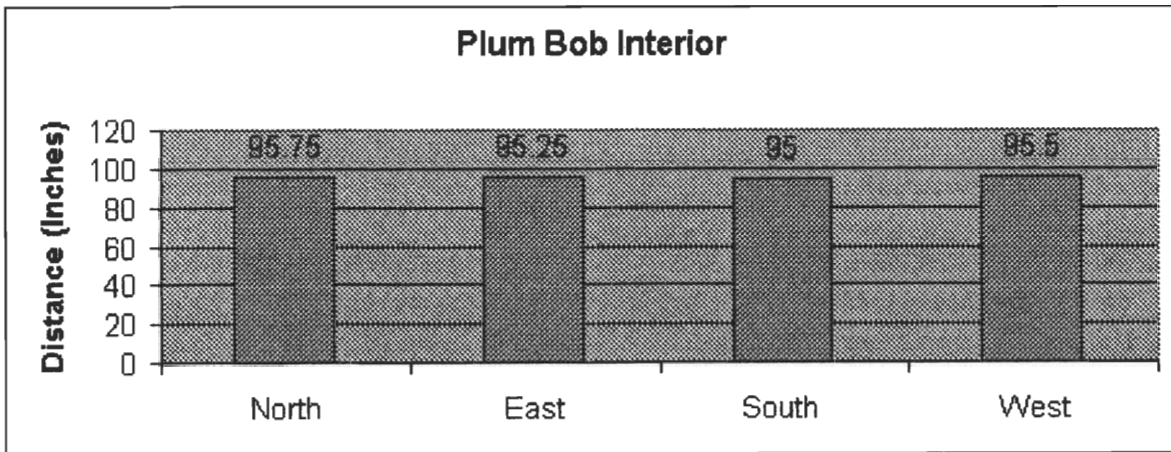
Using the first technique, placing the plum bob on the exterior, the lighthouse was determined to be vertical with no lean. The experimental error for this procedure was  $\pm 0.06^\circ$ . This was determined by taking the two extremes of the measurements. Then the

angle that the lighthouse would be to ground level was determined. The two values were subtracted and the procedure error was determined. In table 1 there is a graph of the values measured.



**Table 1**

The second technique, hanging the plumb bob down the center, was more accurate. This was because there was no wind inside the lighthouse, whereas there was quite a bit of wind outside. The experimental error in this technique was  $\pm 0.04^\circ$ . Again the lighthouse was determined to be perpendicular to ground level. A table of values can be found in table 2



**Table 2**

#### 4.5 Hand-Rail Stress Analysis

The current handrail at the top of the Edgartown lighthouse is too low to meet government standards. The national safety standards state that the railing must be 42 inches in height, with have verticals every 4 inches. The current rail on top of the Edgartown lighthouse is 28.5 inches in height, with verticals every 51 inches. Clearly this does not meet code. In order for the Martha’s Vineyard Historical Society to open the lighthouse to the public, the railing must meet code. The plan is to build another fence inside of the old fence that meets national standards. Since the new fence will be anchored to the old one a test of the current handrail needed to be performed.

We hung a rope off of each vertical. We measured the location of the vertical relative to the wall of the lighthouse. We placed a 190 pound weight on the end of the rope and held the rope at a 45 degree angle. The horizontal force applied to the railing was 95 pounds. Table 3 contains the measured values. The verticals were label in a clockwise fashion starting from the post above the stairs. Figure 44 offers a schematic of the post and their respective numbers.

Values of Initial and Final Distances in Inches		
Post Number	Initial Distance	Final Distance
1	50	50
2	51	51
3	52	52
4	52.75	52.75
5	52	52
6	51	51
7	51	51
8	51	51
9	52.625	52.625
10	52.375	52.375
11	51.75	52.5
12	50.25	50.25

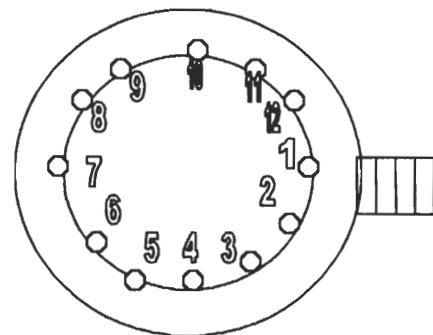
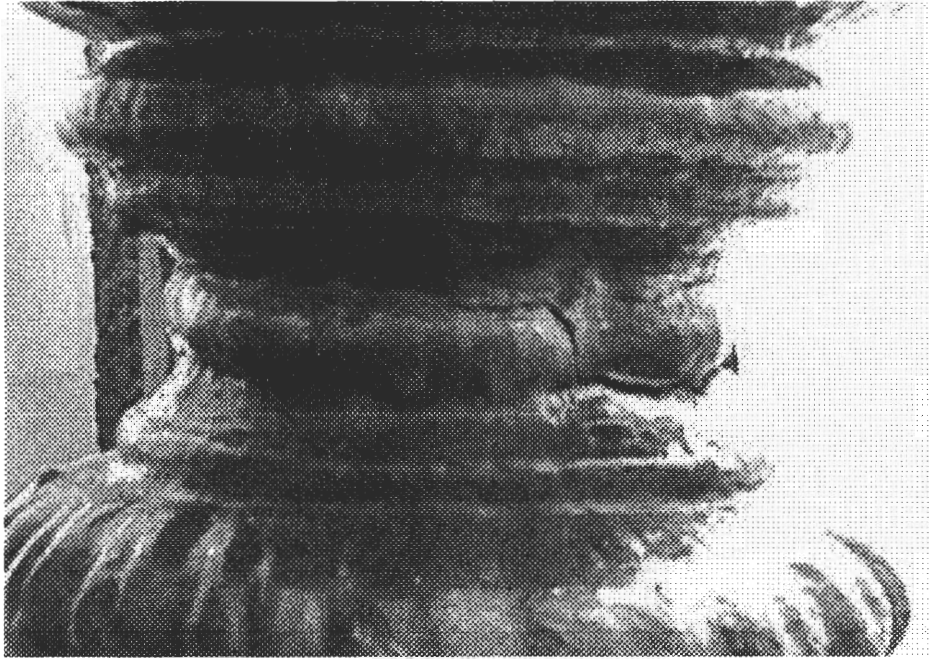


Figure 44

Table 3

Post 11 deflected when all the rest did not. A closer inspection of the post revealed a crack in the base of the vertical, as shown in figure 45. This will have to be addressed in order for the new handrail to be safely installed.



**Figure 45**

## 4.6 Lead Testing Procedure







Before any paint preparation of the lighthouse can be performed, a study needed to be done on whether the old paint contained lead paint or not. The environmental aspects of the removal of paint may cause serious side effects. The Edgartown lighthouse is located in a high-traffic area as well as being next to a major harbor inlet.



**Figure 46**

The EPA has many regulations for the removal of lead paint. If the lighthouse does not contain lead then there is fewer regulation therefor reducing the cost.

A preliminary test of the lighthouse paint was conducted using a “Lead Check Swabs” testing kit, the paint was examined for lead. These kits where purchase at “Home Depot”. There were six test sites where the experiment was performed. (See table 4 below). The surface of the lighthouse was scratched in a V shape until the cast iron was exposed. Then the applicator was crushed then shaken for 30 seconds until the yellow liquid appeared. The swab was rubbed onto the surface of the paint for another 30 seconds. The resulting color was observed on the swab.

	<b>Location</b>	<b>Color of Paint</b>	<b>Result</b>	<b>Color</b>
1	Inside next to Landing	Gray	Negative	
2	Inside Lantern Room	White	Positive	
3	Outside Lantern Room	Gray	Negative	
4	Porthole Outside	White	Positive	
5	Inside Bottom	White	Positive	
6	Outside Panel By door	White	Positive	

**Table 4**

All of the white paint found on the Edgartown lighthouse was determined to contain lead paint. There was no lead paint detected in the gray paint inside the lighthouse. This was just a preliminary test. A more thorough test needs to be performed by a licensed lead-paint-testing laboratory. The concentration of the lead in the paint could not be determined by this test, but there is enough lead in the white paint to cause concern. The paint must be remove in a responsible manner and with safety and the environment held in the highest regards. The most local certified and licensed lead-testing laboratories are listed below.



All Safe Deleading

Easton, MA 1-(508)-238-5136

Lead Paint Inspection By Fred Hemmila

East Sandwich, MA 1-800-286-8378

Paint by Numbers INC.

1-800-696-4858

Woods Hole Painting & Deleading Co.

Woods Hole, MA 1-(508)-540-4809

#### **4.7 Paint Recommendations**

Paint selection is an important aspect of the restoration of the lighthouse. Painting is the most expensive aspect of the restoration of the Edgartown lighthouse. If done improperly the lighthouse may need to be painted again in a matter of just a few years. The lighthouse was recently painted in the summer of 1995 and now it needs another repainting. Painting is the number one method to prevent corrosion. Corrosion leads to the demise of the lighthouse.

Two types of corrosion occur. The first is environmental. The salt water (saline solution) found in the air around the coastline accelerates corrosion. Corrosion is synonymous with the term oxidation, which is defined as the chemical reaction of a metal with oxygen or other substances. Oxidation may occur rapidly when the relative humidity of the surrounding atmosphere is above 65%; however this number can be lowered if the structure is near seawater. The lighthouse is constantly above 65% humidity and enveloped in a high chloride (seawater) atmosphere.

The second is galvanic corrosion. This is where dissimilar metals come in close contact with each other. A list of common metals can be found on table 5 below. This shows the steady-state electrode potential. The larger the potential difference in the metal the greater the galvanic corrosion effect will be. The metal with the more negative potential will become the anode and will corrode. This is why Zinc is a corrosion inhibitor to cast iron due because the Zinc forms a protective zinc oxide layer over the cast iron. Copper is not an acceptable material to use on the cast iron. Because of the potential difference between the two metals the cast iron will deteriorate at a greater rate

than if they were not in contact. If two different metals must be used, an insulating layer should be installed between the two pieces. Teflon tape works well for this application.

**Galvanic Series in Seawater**

<b>Material</b>	<b>Steady-state electrode potential, volts (saturated-calomel half cell)</b>
Zinc	-1.03
Cast Iron	-0.61
Stainless	-0.57
Copper	-0.36
Bronze	-0.31
Nickel	-0.2

**Table 5**

**(Table 14.2 in Paint Handbook)**

The lighthouse is composed of cast iron. This is important to note because the painting properties of iron and steel are completely different. Cast iron contains 2%-4% carbon when it is cast. Iron is an inexpensive metal and can be formed into many intricate designs. However, there are no rust inhibitors contained in the iron itself. Therefore, the coating of the iron must be its only protection from weather.

In order to paint over cast iron the iron must be brought down to white metal. White metal is reached when the structure is sandblasted until only virgin metal remains. The national standard for this blasting technique is SP-5. (*Paint Handbook* p6-14) SP-5

is the specification given by the government for the quality of the sandblasting. All of the old paint and rust is removed. A number of slags are available for the task. A slag is the abrasive substance that is used in the sandblasting procedure (the sand). It is important to choose a slag that is non-conductive. Otherwise galvanic corrosion will take place. The pressure of the blast should not exceed 100 pounds per square inch (psi). This will minimize the damage to the iron surface and will remove all of the paint and rust effectively.

Then the surface is coated as soon as possible with zinc-enriched primer. The zinc forms a galvanic protection of the iron against being oxidized into rust. The second coat of paint consists of an epoxy composition. The epoxy is an extremely durable coating. It is impervious to water and protects the iron from further decay. Epoxies, however, do not make a very good topcoat. They are usually thick and are susceptible to ultraviolet degradation. Two coats of a urethane are applied to the epoxy paint.

Another choice in the type of coating system to choose from is moisture-cured urethanes. This is a relatively new technology. The Providence cost guard stated that moisture-cured urethanes are the best coating system to date. Moisture-cured urethanes are painted onto the surface of the lighthouse. They are cured through a chemical reaction with the water contained in the air. Moisture-cured urethanes are surface tolerant and can be applied at lower temperatures. The setback to this system is that moisture-cured urethanes thicken quickly in high humidity. This would cause the paint to be applied too densely.

However, it is more cost effective to use the zinc-enriched primer and the moisture cured urethanes than the epoxy undercoat system. In either top coat application the zinc-enriched primer should be used.

#### **4.8 Time-Elapsed Photographic Comparison**

Edward Cameron and Eric Wilhelm conducted a previous IQP on the renovation of these lighthouses for their Bachelor of Science degree requirements. Their report on what needed to be repaired on the lighthouses gave us a glimpse of these lighthouses from 2 years ago. This glimpse gives us a good insight on what the particular problem areas are, and what should be closely monitored. We have since taken pictures of similar areas, and conducted a comparison to determine what certain rates of degradation are for these structures. In our comparison the old and new pictures are paired side by side, the old on the left and the new on the right.

## *East Chop*

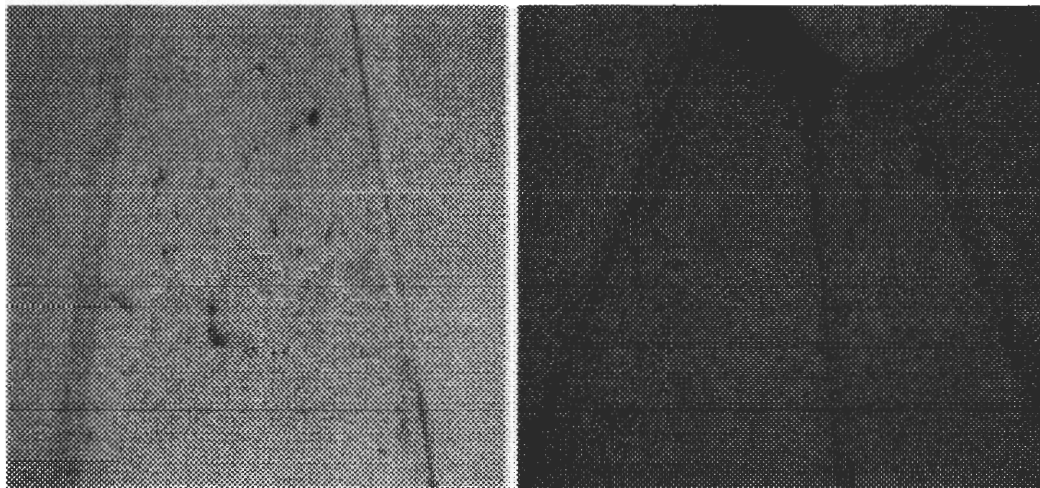
The East Chop light is in the best shape of all three lighthouses under the administration of the historical society. Problem areas do still exist however, and will grow worse if left untended. For instance the broken hinge of the door leading from the



**Figure 47**

lantern room to the lantern deck. It can be seen from the earlier picture that the cast iron around the hinge had rusted away and cracked badly. Since then the affected area has been sealed and painted over, and the missing screw was replaced. This is not a permanent solution to the problem, and the hinge will continue to degrade until it is either welded or replaced.

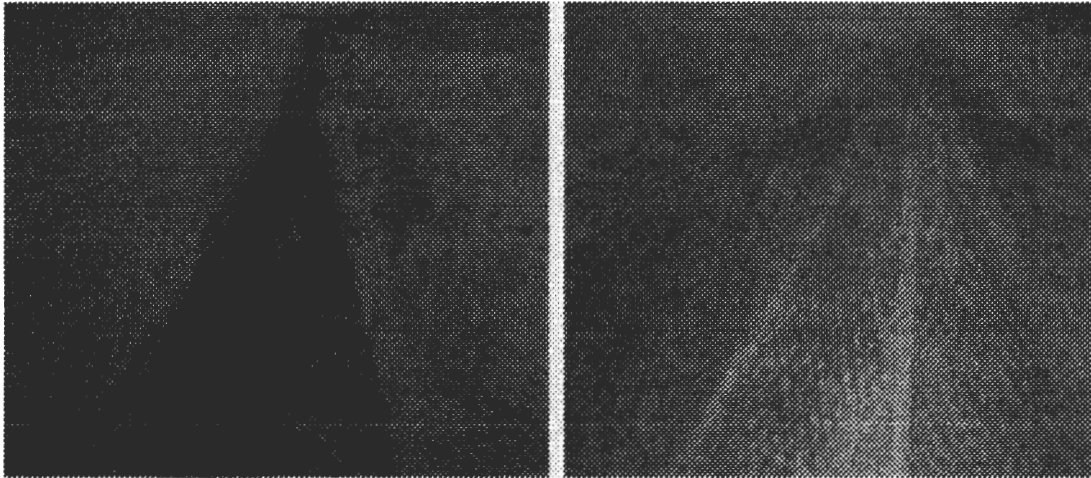
The ceiling of the lantern room is another area of concern. The paint on the ceiling panels is still peeling off and will continue to do so. There have not been any



**Figure 48**

noticeable improvements in this area. Protracted neglect could lead to the rusting of ceiling panels, and their eventual replacement.

The floor of the room below the lantern room has been accustomed to rust. It seems to have been scrubbed well or treated within the last two years however the rust continues to be a problem. This rust will need to be removed before the floor is



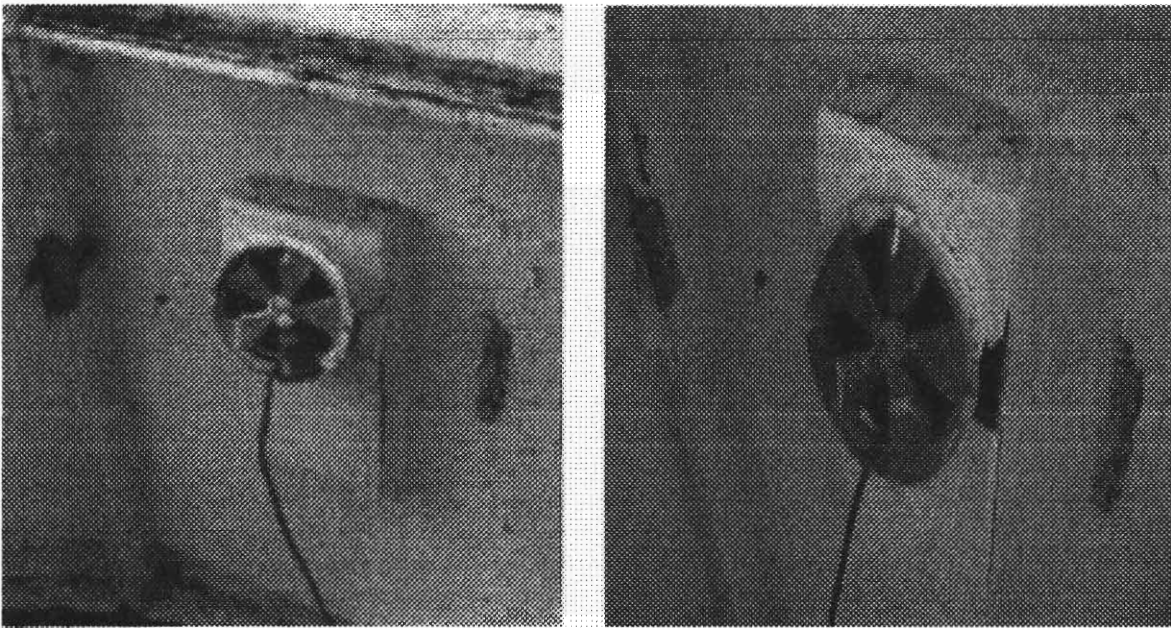
**Figure 49**

repainted. If the rust is allowed to build up, the floor could deteriorate to the point of being unsafe.



## *Edgartown*

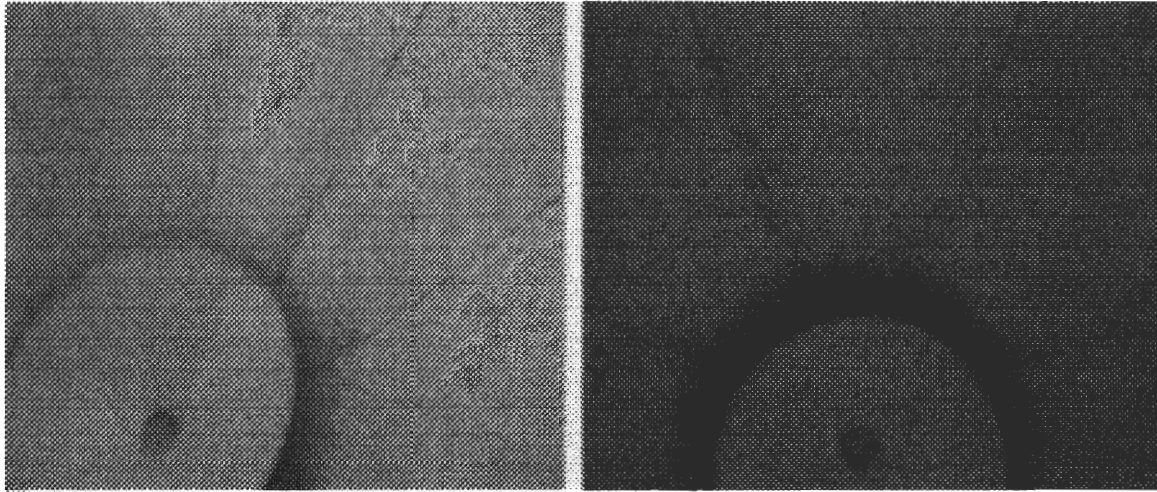
The Edgartown lighthouse is in the greatest need of repair and has continued to decline over the past couple of years. Rust seems to be the foremost concern here, since it is everywhere and will cost the most to restore. The lantern room should be a high priority in the full restoration of the lighthouse due to its state of dilapidation. The vent shown in these pictures is in working order, but moisture is still building up within the lantern. As can be seen in both pictures, rust has settled into each of the joints, on the



**Figure 50**

sills, and the paint is peeling off of the panels. The vent itself, which exhibited only a crack in the earlier picture, is now missing a piece of its casing. This piece of duct tape present in both pictures is good evidence that the interior of the lantern has remained relatively untouched for the entire period of this comparison.

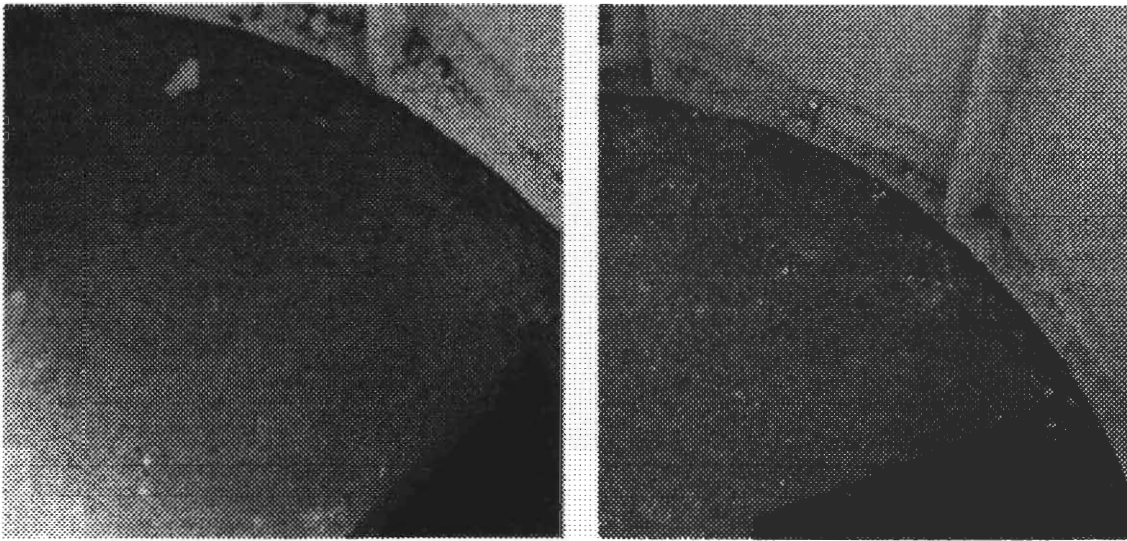
The ceiling of the lantern room has not shown a significant deterioration over the two year period. There has been no improvement in this area, and the paint continues to



**Figure 51**

peel away from the panels. Similar to the ceiling of the East Chop light, these panels could quickly deteriorate and require replacement if left neglected for an extended period. Another area of concern is the vent in the center of the ceiling. It is not functional in either of the pictures and is a major reason that moisture builds up within the lantern room. This is a plausible explanation for the increase in peeling paint towards the center of the ceiling.

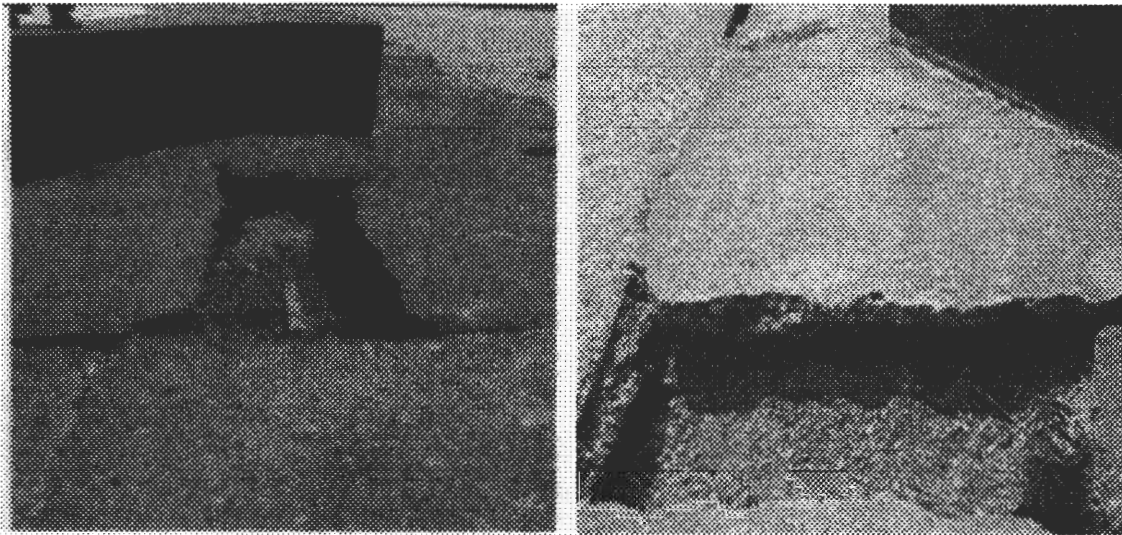
The floor of the lantern room is plagued by the same rust problems as the rest of



**Figure 52**

the room. The later picture shows the spreading of rust spots where moisture most likely collected over the years. The entire platform is littered with paint chips and rust flakes, but is still in fair condition relative to the rest of the room. The main item of concern is the rusting of the joints between the wall panels and the platform. These weak points are another inlet for the moisture which troubles the lantern room.

The concrete skirt that surrounds the tower foundation has been a hazard for some time and needs to be addressed. This hole in the concrete slab seems to have been

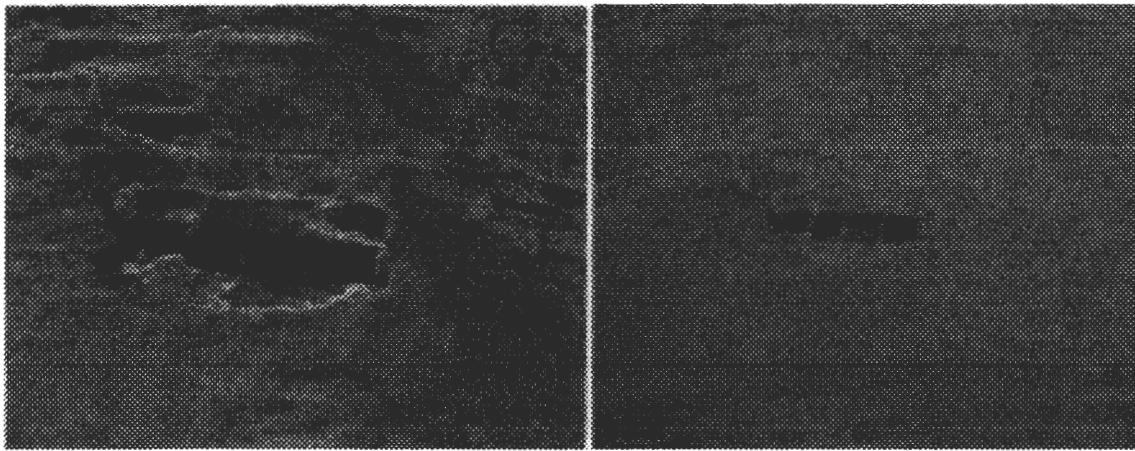


**Figure 53**

ignored completely, despite the obvious danger it poses. This is not the only spot of neglect associated with the foundation. The stairs leading to the front entrance are badly damaged, the outer sides of the skirt have eroded away in some spots, and there are numerous cracks and heaves over the surface of the slab.

## *Gay Head*

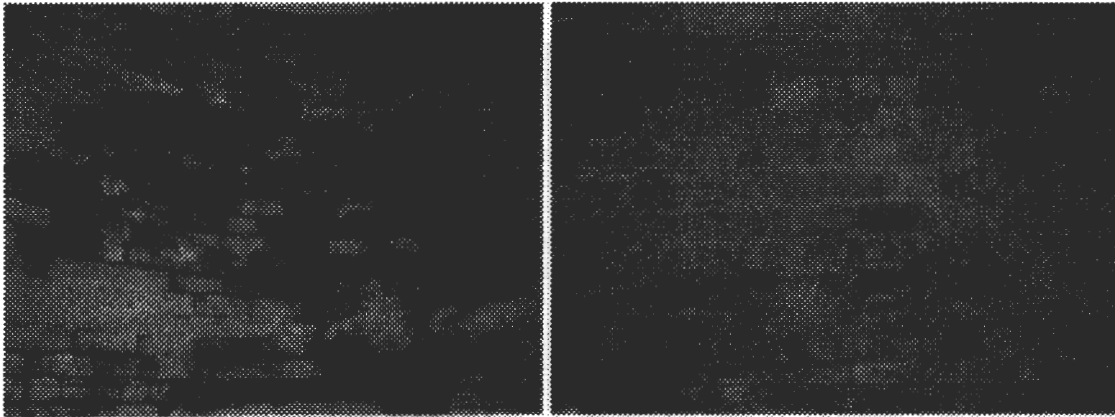
The Gay Head Light is a brick tower, presenting a totally new set of difficulties for the MVHS. The problems faced by this lighthouse are unique from those at East Chop and Edgartown, and entail entirely unique solutions. This light is isolated atop the cliffs at Gay Head, vulnerable to the elements and the most violent storms. Due to the constant attacks of nature, the masonry tower is in poor shape, with large sections of deteriorating mortar and brick. The area pictured is a section of the tower exterior which



**Figure 54**

was patched some time ago, but has begun to degrade. This hole should have been repaired when it was first discovered, yet it has been left untouched for at least two years now. Cracks and holes such as this allow water to penetrate deep into the mortar and can cause much larger cracks to develop.

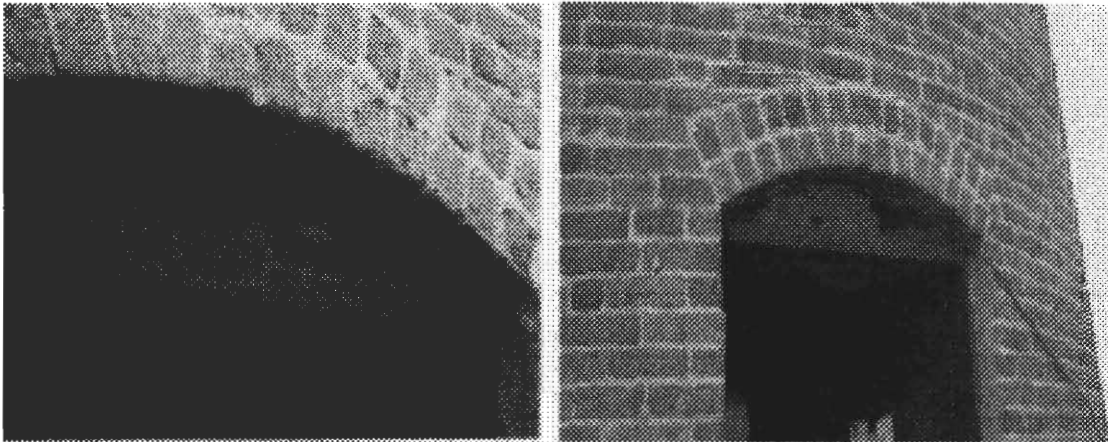
Another problem, which appears as moisture enters the tower, is mold. The interior wall pictured below was covered with mold when it was first inspected by the



**Figure 55**

previous group. This site has since been cleaned, and the mold throughout the tower seems well controlled by the keeper.

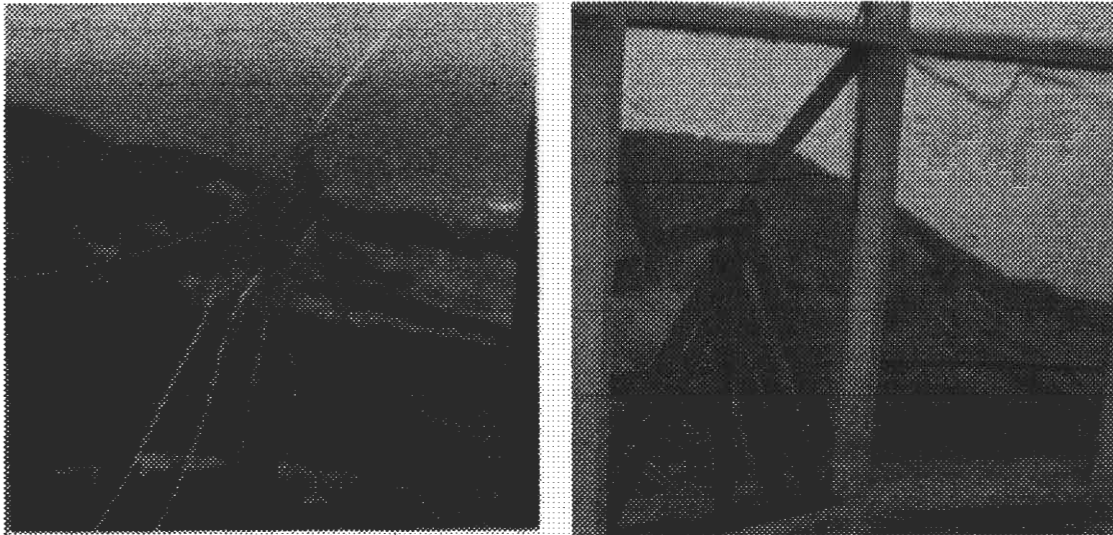
The door leading into the tower is in need of some serious work, and has been for some time. Both pictures show that the panel above the entrance has rusted away completely in



**Figure 56**

a number of places. This is another source of moisture infiltration, and should be replaced.

The final area of comparison at the Gay Head light is the window panes in the lantern room. The pictures below are of the same pane two years apart. In the first picture the pane is cracked and seems to be sealed with a sort of caulk or glue. This should have



**Figure 57**

been a temporary solution, but it was not. Instead of replacing the pane, the seal was reinforced using duct tape. As well as being aesthetically displeasing, this solution is unsafe and unsuitable. While this might not be the responsibility of the keeper, the Coast Guard should have been informed to remedy the situation properly.



## *Conclusion*

The conclusion of this photo comparison is that the problem areas of each light are degrading quickly and are in need of immediate attention. Most of the deterioration is due to the excess moisture in each lighthouse, but could easily be avoided or delayed. Preventative maintenance performed on the problem areas cited in the previous project would have alleviated much of the work that is now required to restore each light.

#### **4.9 Maintenance Summary**

There are many factors which lead to the deterioration of a lighthouse, not least of which is neglect. This problem can, however, be easily avoided if a schedule of maintenance and inspection is implemented. For evidence of this, one needs look no farther than the East Chop and Edgartown lights. Two similar, “cookie-cutter”, cast iron towers in very different conditions. East Chop has been well maintained by the keepers and residents of the area, is in little need of repair and pleasing to visit. At the same time, Edgartown has deteriorated immensely over the years, is in dire need of repair and unappealing to visit.

The following two sections are detailed inspections which should be performed at each house at least once a year. The lighthouses are broken down into sections such as interior, foundation and windows. Each of the sections contains a list of typical distinguishing marks that should be investigated and examined. This list is paired with another list of possible problems that match the symptoms of the first column. As trouble spots appear, they should be observed so as to determine the source of the problem, the proper method of repair as well as the appropriate materials.

Preserving the investment of the MVHS and the community, the upkeep of each light will be a paramount concern. After the restorations are complete, more time should be put into creating a thorough, long-term schedule for the maintenance of the houses. Though not a full-time position, future keepers and volunteers will have to be devoted to not only the lighthouse, but the tourists as well.

<b>EDGARTOWN AND EAST CHOP YEARLY INSPECTION</b>	
<b>IRON</b>	
<i>HISTORY</i>	
<b>Things to know</b>	<b>Possible problems</b>
Types of iron (wrought, cast, steel, etc.)	Susceptibility to damage, proper repair methods
Previous fire/flooding damage	Weakened structural members, cause of excessive moisture
Composition of foundation	Stone/brick are more receptive to water damage than concrete
Construction method(iron plate, wood frame, brick lined etc.)	Problems easier to analyze, proper solutions easier to determine
<i>FOUNDATION</i>	
<b>Things to Look For</b>	<b>Possible Problems</b>
Moisture around foundation	Moisture accumulation could lead to differential settlement and untimely damage of structure
Walls resting on concrete	Rain back-lash and accumulation accelerate rusting of iron walls
<i>LANTERN</i>	
<b>Things to Look For</b>	<b>Possible Problems</b>
Gaps in gallery deck, copings, seams	Water penetrating into inner cavities of tower wall
Cracks in storm panels	Infiltration point for moisture
Non-functioning vents	Cause high humidity and condensation in lantern room
<i>WINDOWS AND DOORS</i>	
<b>Things to Look For</b>	<b>Possible Problems</b>
Openings not straight/square	Indication of settling
Condensation	Corrosion occurring between joints and at base resting on foundation
<i>WALLS</i>	
<b>Things to Look For</b>	<b>Possible problems</b>
Masonry lined	Rust-jacking of members may crack in-fill, in-fill can expand and contract at different rate from iron wall when wet

Sheet iron cavity walls	Rust on interior and blistering on exterior indicative of water infiltration
<i>MATERIALS</i>	
<b>Things to Look For</b>	<b>Possible problems</b>
Intricate castings	Need special attention/protection
Missing/broken components	May allow water penetration
Evidence of sandblasting, pitting	Aesthetically displeasing and could lead to complete deterioration of lighthouse
<i>MOISTURE</i>	
<b>Things to Look For</b>	<b>Possible problems</b>
Accumulated dirt	Traps water and causes corrosion
Water penetration through joints	Usually unnoticed until extensive corrosion occurs
Type of corrosion	Corrosion may indicate source of deterioration
Rust weep between seams	Moisture penetration point should be identified and sealed or repaired
<i>COATINGS</i>	
<b>Things to Look For</b>	<b>Possible problems</b>
Blistering	Paint is failing, probably at the end of life
Rust streaks	Localized failure, remove rust and repaint area
<i>EAST CHOP MASONRY</i>	
<b>Things to Look For</b>	<b>Possible Problems</b>
Cracked and sloped or wavy mortar joints	Indicate previous water movement, cracks let water into walls
Rust on embedded iron anchors or structural members etc.	Rust causes the members to expand and will damage masonry
Cracks in wall, growing cracks	Movement within wall. Growing crack is indicative of a more serious problem which must be attended to before crack is patched
Stairs/landings askew, cracked plaster, patching	Lighthouse is settling
Damp walls, mildew, mold, rotting wood	Water infiltration or severe condensation
Streaking	Possible deterioration of internal material
Water penetration	Deterioration of masonry
Staining/white deposits	Excessive dampness
Salt deposits/standing water	Source of dampness
Moisture/condensation on windows	High moisture level/poor ventilation

<b>GAY HEAD YEARLY INSPECTION</b>	
<b>MASONRY</b>	
<i>HISTORY</i>	
<b>Things to know</b>	<b>Possible problems</b>
Previous fire or flood damage	Weakened structural members or caused excessive moisture
How walls were constructed	Aid in finding problems as well as proper solutions
Parts constructed at different times	Similar problems may require different solutions
Composition of foundation	Stone/brick are more receptive to water damage than concrete
<i>TOWER AND WALLS</i>	
<b>Things to look for</b>	<b>Possible problems</b>
Cracked and sloped or wavy mortar joints	Indicate previous water movement, cracks let water into walls
Rust on embedded iron anchors or structural members etc.	Rust causes the members to expand and will damage masonry
Small holes at top or bottom of walls	Should be kept open and clear at all times as a means of ventilation
Attached antennas or other heavy devices	Uneavily distributed loads cause cracks and structural failure
Small bulges, outer-face bulges	Wall has moved. Immediate action necessary
Cracks in wall, growing cracks	Movement within wall. Growing crack is indicative of a more serious problem which must be attended to before crack is patched
Consistent wall plane	Wall movement present, monitor motion as well as wall stability problems
<i>WINDOWS AND DOORS</i>	
<b>Things to look for</b>	<b>Possible problems</b>
Examine all flashing to ensure that water is	Water could collect under door or inside of

directed away from lighthouse	lighthouse, causing deterioration of door and interior
Openings not straight/square	Indicate uneven settlement or failure of internal members
Inadequately sloped sills, drip, caulking	Water could penetrate lighthouse walls
Bowing or misalignment of parts, bound or tight parts	Abuse/misuse or corroding components that have deformed or deteriorated, may be painted shut or stuck
Condition of glass and glazing	Careful probing of glazing with an awl will aid in determining its soundness
Areas of corrosion on all surfaces of frame and hardware (typically inside the frame channel and along the sash)	Moisture infiltration problem
Missing/unsealed frame components	Moisture penetrating and damaging frame and masonry
<i>FOUNDATION</i>	
<b>Things to look for</b>	<b>Possible problems</b>
Uneven settlement	Tower could begin to lean
Undermining of foundation by erosion	Catastrophic failure of the foundation and total lighthouse collapse
Damp proof course	Rising damp will accelerate deterioration of foundation and cause drainage problems
<i>INTERIOR</i>	
<b>Things to look for</b>	<b>Possible problems</b>
Stairs/landings askew, cracked plaster, patching	Lighthouse is settling
Damp walls, mildew, mold, rotting wood	Water infiltration or severe condensation
Streaking	Possible deterioration of internal material
Water penetration	Deterioration of masonry
Staining/white deposits	Excessive dampness
Salt deposits/standing water	Source of dampness
Moisture/condensation on windows	High moisture level/poor ventilation

#### 4.10 Suggested Budget

Revised from the Matha's Vineyard Historical Society's Projected

Rehabilitation Expense, June 9, 1998.

#### COMPLETE RESTORATION

<u>CATEGORY</u>	<u>GAY HEAD</u>	<u>EAST CHOP</u>	<u>EDGARTOWN</u>	<u>TOTAL</u>
<b>1. General Conditions</b>				
Insurance Personal Property	\$1,000.	\$1,000.	\$1,000.	\$3,000.
Staging & scaffolding	\$ 750.	\$ 750.	\$ 2,750.	\$4,250.
Trash Removal	\$ 750.	\$ 750.	\$ 1,750.	\$3,250.
Temporary Utilities Power/lighting Water Toilet	\$1,750.	\$1,750.	\$1,750.	\$5,250.
<b>2. Sitework</b>				
Remove existing metal Railing @ balcony	\$ 500.			\$ 500.
Remove wood, bricks, windows, and other materials to be replaced.	\$ 500.	\$ 500.	\$500.	\$1,500.
Remove existing metal fence and posts around site perimeter		\$ 500.		\$ 500.
Remove all debris from existing sub foundation			\$1,000.	\$1,000.
<b>3. Concrete</b>				
Install new concrete pad at least 4" thick as base for memorial bricks (CM)			\$6,000.	\$6,000.
<b>4. Masonry</b>				
Exterior and Interior, all brick and stone surfaces	\$ 300.	\$ 300.	\$ 300.	\$ 900.
Remove all mold, mildew Clean surfaces completely Repoint Install sealing coat				
Engrave bricks (CM)			\$3,000.	\$3,000.
Install bricks (CM)			\$8,000.	\$8,000.
Install granite perimeter per drawing (CM)			\$5,000.	\$5,000.

<b>5. Metals</b>				
Install new steel metal railing @ balcony to match existing but height of top rail: 42", space between spindles less than 4"	\$5,000.			\$5,000.
Replace or repair air vents @ light room as necessary	\$1,000.			\$1,000.
Install metal latches @ entrance door to keep it open		\$ 300.		\$ 300.
Install railing extension to existing interior railing to bring height to 42"		\$2,500.		\$2,500.
Replace or repair existing window jambs for glass panels @ light room	\$3,000.	\$3,000.	\$3,000.	\$9,000.
Install extension to existing railing @ balcony, finish height of top rail to be 42"		\$2,500.		\$2,500.
Repair or replace any severely corroded elements with new material, rod @ roof, brass air vents and galvanized screens @ light room specifically.	\$1,500.	\$1,500.	\$1,500.	\$4,500.
Specifically, window jambs @ light room, cast iron tower (stop water leaking at base of tower)			\$2,500.	\$2,500.
Install railing @ ladder to light room		\$1,000.		\$1,000.
Fabricate and install stair case from ground to light room specifically: railing height: 42" tread width: 48" expand landing under entrance to light room			\$17,000.	\$17,000.
Install railing @ balcony outside light room			\$2,500.	\$2,500.
Install railing @ existing concrete foundation and stairs			\$5,000.	\$5,000.
Railing specifications:				



height at top rail to be 42", space between spindles to be no more than 4", and match existing design and material.				
<b>6. Wood/Plastics</b>				
Install framing to accept new doors and windows	\$1,500.	\$1,500.		\$3,000.
Install new window trim	\$1,500.	\$1,500.		\$3,000.
Install new split rail fence	\$1,200.			\$1,200.
Install handicap access ramp from ground to level of new sub foundation, 48" wide pressure treated wood			\$2,500.	\$2,500.
<b>7. Thermal/Moisture</b>				
Repair roof as necessary including new gasket @ outer door of control room	\$3,000.	\$2,500.	\$2,500.	\$8,000.
<b>8. Doors/Windows/Glass</b>				
Fabricate and install new entrance door and frame to existing door and frame	\$1,200.			\$1,200.
Install new door lock keyed same as other lighthouses	\$ 250.	\$ 250.	\$ 250.	\$ 750.
Replace or repair existing windows, match style, jamb and frame material: wood, single glazed glass, and install protective metal screen over all windows	\$2,500.			\$2,500.
Replace or repair new windows at light tower and portholes(include lexan), clad exterior finish double hung 2 over 2, single glazed glass		\$2,500.	\$2,500.	\$5,000.
Repair glass brick panel @ ground floor as necessary			\$ 300.	\$ 300.
<b>9. Finishes</b>				
Prepare all exterior surfaces for painting removing rust, dirt, loose or deteriorated paint, paint all surfaces including entrance @ door, door to balcony,	\$7,000.	\$80,000. (Due to lead paint found on outside surface)	\$11,000.	\$98,000.

railings, wood window frames, sash, metal roof, concrete base, cast iron tower walls, windows except where clad finish door @ light room, entrance door				
Remove paint, rust, and dirt & paint all interior surfaces including railings, ladder, stair treads, floors, jambs, trim, sash, windows and wall paneling to USCG spec. and existing colors	\$4,000.	\$3,000.	\$3,000.	\$10,000.
<b>10. Specialties</b>				
Benches	\$ 750.	\$ 750.	\$ 750.	\$2,250.
Moisture proof supply cabinet with lock(keyed alike other lighthouses)	\$ 300.	\$ 300.	\$ 300.	\$ 900.
<b>16. Electric</b>				
Repair or replace existing wiring and fixtures to meet MA specs.	\$2,000.	\$2,000.	\$2,000.	\$6,000.
Install exterior 4-plug receptacle	\$ 300.	\$ 300.	\$ 300.	\$ 900.
Install 200 amp service			\$2,500.	\$2,500.
TOTAL				

**ANNUAL REPORT**

DETAIL	GAY HEAD	EAST CHOP	EDGARTOWN	TOTAL
Admissions (Projected)	\$20,000.	\$ 1,500.	\$25,000.	\$46,500.
Rental	\$1,500.	\$1,000.	\$2,500.	\$5,000.
Additional museum admissions	\$2,000.	\$ 500.	\$4,000.	\$6,500.
<b>TOTAL INCOME</b>	<b>\$23,500.</b>	<b>\$3,000.</b>	<b>\$31,500.</b>	<b>\$58,000.</b>
<b>LABOR</b>				
Wages, taxes	\$2,100.		\$2,100.	\$4,200.
Housing	\$1,500.		\$1,500.	\$3,000.
Insurance	\$1,000.	\$ 300.	\$1,000.	\$2,300.
Paint (5 year)	\$1,500.	\$2,000.	\$2,000.	\$5,500.
Repairs and general	\$1,000.	\$ 500.	\$1,000.	\$2,500.
<b>UTILITIES</b>				
Electric	\$ 600.	\$ 300.	\$ 600.	\$1,500.
Trash	\$ 300.	\$ 100.	\$ 300.	\$ 700.
Telephone	\$ 300.		\$ 300.	\$ 600.

Miscellaneous	\$ 750.	\$ 300.	\$ 750.	\$1,800.
<b>TOTAL EXPENSE</b>	\$9050.	\$3,500.	\$9,550	\$22,100.
<b>NET SURPLUS (LOSS)</b> total income–total expense	\$14,450.	(\$ 500.)	\$21,950.	\$35,900.

## **4.11 Funding**

### *4.11.A Procedure*

Fund raising is an essential aspect of any restoration or preservation project. Understanding the procedures to properly restore and preserve the lighthouses is invaluable. This information, however, is useless without the funding required to complete the project. This section outlines the possible avenues for funding that is available to the Martha's Vineyard Historical Society in their quest for preservation as well as maintenance. Over \$42 million is given to the Historic Preservation Fund every year. (National Register Pamphlet) This is a federal fund that distributes taxpayer monies to organizations that are deemed worthy of assistance. If the MVHS could receive a portion of this it would make it easier to restore and preserve in the correct manner which will make maintenance easier in the future.

The first step is to make sure that the lighthouses in question were registered in the National Register for Historic Sites. The National Park Service under the Secretary of the Interior maintains the Register. This list was authorized under the National Historic Preservation Act of 1966. (National Register Pamphlet) Included are any historic districts in a National Park, landmarks designated to have historical significance to America, and other properties that have been nominated and approved by the National Park Service for their significance. As a part of this list, the sites qualify for aid from the government to guarantee the historical significance is preserved. The Register awards funding through their Grants-in-Aid program in which it matches aid for listed properties through the State Historic Preservation Officer. Ms. Judith McDonough is the SHPO for Massachusetts. We contacted her at the Massachusetts Historical Commission in mid

June. Currently there is no funding available however this is the Historical Society's best bet for the assistance that they desire. (Telephone conversation with MHC) The Historical Society had documentation that the three lighthouses were registered but did not have their registration numbers. We researched this and found that all Massachusetts lighthouses are grouped together and registered. All three lighthouses were also individually registered in 1987. Their registration numbers are as follows:

East Chop: 19870615            MA Lighthouse: TR87001480

Edgartown: 19870615        MA Lighthouse: TR87001465

Gay Head: 19870615        MA Lighthouse: TR87001464

Another important aspect that will help the chances of receiving aid is that the MVHS is a non-profit organization with a 501(c)(3)(*Great American Lighthouses*) rating, this is the highest rating that the IRS gives to a non-profit organization. This gives charitable status and without this many grants will be impossible. We also found contacts in Washington D.C. with which to apply for funding through the National Register that require this rating, they are as follows:

Advisory Council on Historical Preservation  
1100 Pennsylvania Ave. Suite 809  
Washington, DC 20004

Grants Administration  
Heritage Preservation Services  
National Park Service  
PO Box 37127  
Washington, DC 20013

National Building Museum  
3820 Cathedral Ave NW  
Washington, DC 20016

We also found a couple of local organizations:

Northeast National Trust Office  
Seven Fanieul Hall Marketplace  
Boston, MA 02109

Margaret Dyson  
Historic Massachusetts  
45 School St.  
Boston, MA 02108

(Through links on the National Registers web site)

We have contacted these organizations and they sent us general information about the application requirements. (listed above) We will research as many possibilities as we can short of writing grants. The best bet that we have found so far for funding is a 50/50 grant under which the historical society puts up 50% and the Massachusetts Historical Commission puts up 50%. (Historic Massachusetts) They have sent information so that we may go over the details with the MVHS and appropriately apply. Unfortunately funding for 1999 has been distributed. The state will vote at the beginning of August to see how much will be available for 2000. We will then apply for any available aid in which will be decided upon and distributed starting January 1. Many of the above organizations exist to help restoration projects like the lighthouses of Martha's Vineyard. We do not see any problems with receiving support through these organizations due to the subject matter and significance of the project. The amount of support varies and we cannot say yet how much each project is qualified for.

There are many different types of funding available through different types of charitable organizations. The most popular type is private foundations. They are non-profit organizations that support social as well as charitable activities. There are a few types of private foundations; funds, trusts, or foundations. These institutions generally give exclusively to non-profit 501(c)(3)(*Great American Lighthouses*) rated

organizations. These foundations are managed by a group of directors that decide which applicants receive funding; they also are in charge of monitoring all financial activity in the foundation. Bank trusts are a type of private foundation whose financial activity is monitored by trust departments at the specified bank. Bank representatives or trustee's, decide which applicants receive funding. A municipal trust office monitors public trusts' financial activity. An elected or appointed official makes the decision about applicants. Community foundations are publicly supported and are focused on a certain region for donating. A staff or board make the decision on perspective applicants. In some cases the original donor will have a specific intention with the money therefore certain criteria must be met before the application can be approved. Corporate foundations are setup by a company to distribute their charitable donations. There is an employee that is appointed to approve desirable applicants. Funders are pooled funds from other funding sources that are allocated to a specific cause or problem. Committees representing the various funding sources make all decisions on applicants. It is important to understand what each of the foundations are and how they work to determine where to start.

(Association of Massachusetts Grantmakers Guide)

The following is a list of privately funded grant programs for which the Martha's Vineyard Historical Society meet the pre-existing criteria. Each of the respective foundations requires a written application and a plan of action. There is no application form that must be followed, and so we will create our own. We will use a version of the standard form from the Association of Massachusetts Grantmakers as a basis for our application. This form is accepted by most of the available funds. Geoff White will complete the plan of action and we will send one copy of each to every one of the

following foundations. These foundations have been arranged in order of preference based on amount given and compatibility to the project and Historical Society.

Massachusetts Historical Commission  
220 Morrissey Boulevard  
Boston, MA 02125  
Attn: Ms. Judith McDonough, SHPO

Osceola Foundation, Inc.  
4 North Water Street  
Nantucket, MA 02554  
Attn.: Ann B. Oliver

The Doyle Charitable Foundation  
c/o First National Bank of Boston  
PO Box 1890  
Boston, MA 02105  
Attn.: Sharon M Driscoll

The Abbot & Dorothy H. Stevens Foundation  
PO Box 111  
North Andover, MA 01845  
Attn.: Elizabeth A. Beland

The Nathaniel & Elizabeth P. Stevens Foundation  
PO Box 111  
North Andover, MA 01845  
Attn.: Elizabeth A. Beland

Edward C. Johnson Fund  
82 Devonshire Street  
Boston, MA 02109  
Attn.: Anne-Marie Soulliere

Note: Deadline Oct. 30, 1999

Amelia Peabody Charitable Fund  
201 Devonshire Street  
Boston, MA 02110  
Attn.: Jo Anne Borek

The Tupancy-Harris Foundation of 1986  
175 Federal Street  
Boston, MA 02110  
Attn.: Robert N. Karelitz



Massachusetts Society of the Cincinnati  
c/o Loring, Wolcott & Coolidge  
230 Congress Street  
Boston, MA 02110  
Attn.: Samuel H. Wolcott

The following organizations are based in Worcester and therefore the participation of the two groups of students from Worcester Polytechnic Institute could be noted. Each did mention a preference to Worcester schools and their endorsed projects as well as historic preservation throughout the state of Massachusetts.

George & Sybil H. Fuller Foundation  
105 Madison Street  
Worcester, MA 01610  
Attn.: Russell E. Fuller

The Herald Foundation  
446 Main Street  
Worcester, MA 01608  
Attn.: Brian Collins

George I. Alden Trust  
370 Main Street Suite 1250  
Worcester, MA 01608  
Attn.: Francis H. Dewey III

The Fred Harris Daniels Foundation  
c/o Mechanics Bank, Trust Department  
200 Mechanics Tower  
Worcester, MA 01613

The Albert W. Rice Charitable Foundation  
446 Main Street  
Worcester, MA 01608  
Attn.: Stephen G. Fitch

Note: Deadline Oct. 1, 1999

The Stoddard Charitable Trust  
370 Main Street Suite 1250  
Worcester, MA 01608  
Attn.: Warner S. Fletcher

Note: 5 copies of each

The application that will be used will consist of vital information about our plans for the lighthouse, who we are and why we need and deserve the funding that is available. Included will be the museum's non-profit standing as well as amount requested and amount raised. A copy of the application will be attached. This application along with the plans that Geoff White is working on will determine whether or not the Historical Society will get the needed funding. Craig Dripps and Bruce Andrews will both play key roles in determining what the application and plan of action will focus on. The following is the Association Grantmakers of Massachusetts Common Proposal Form:

Date: \_\_\_\_\_

1. Legal name of organization, address, and name of executive director:
2. IRS 501(c)(3) nonprofit? (Please circle)    **YES**    **NO**
  - 2a. If no, identify your fiscal agent and attach the written agreement from the fiscal agent. (Funders using this form may have special requirements as to the use of a fiscal agent, or may not permit such use.)
3. Contact person and title: \_\_\_\_\_
4. Phone: \_\_\_\_\_ FAX: \_\_\_\_\_ Email: \_\_\_\_\_
5. **AMOUNT REQUESTED:\$** \_\_\_\_\_
6. TYPE OF REQUEST (operating, project, capital, other): \_\_\_\_\_
7. State you organization?s mission:
  
8. No more than four sentences summarizing the proposal and its strategic link with this funder(Include the name of the project or capital campaign, if applicable):
9. List the proposal?s target population, constituents, and geographic communities:

10. Total number of board members: \_\_\_\_\_ Total number of volunteers: \_\_\_\_\_
11. Total number of staff: Full-time \_\_\_\_\_ Part-time \_\_\_\_\_
12. Total annual organizational budget: \$ \_\_\_\_\_ Fiscal Year End \_\_/\_\_/\_\_
13. Project or capital budget (if applicable):\$ \_\_\_\_\_
14. The period this grant will cover: \_\_/\_\_/\_\_ to \_\_/\_\_/\_\_
15. United Way affiliate? (Please circle); **YES NO**
16. List any previous support from this funder in the last five years.

A proposal narrative will follow that is up to ten pages long that shows the reader that the goals, objectives, and amount requested in the proposal match the criteria of the funder that is being approached. The following questions are ones that funders have identified as important information to answer. While it is necessary to encompass all the following information in the proposal narrative, the order in which the questions are answered may be changed.

**Profile of the organization and of the request**

- **If requesting operating support, please provide information about the organization?s overall programs and activities.**
  - **If requesting project or capital support, please provide information about that specific project or capital request.**
1. Brief summary of organization?s history, goals, and key achievements.
  2. Overview of organization?s structure and programs, including board, staff, and volunteer involvement.
  3. Describe the organization?s constituents for the organization overall, or, for a specific project. For example, total number and breakdown by age, gender, race/ethnicity,

income levels, disabilities, geography, language spoken, or other criteria relevant to the organization or project.

4. Describe the community or regional need(s) and/or challenges that this effort will address. What is the level and nature of involvement of the community-at-large?
5. Description of the specific request that includes goals and objectives. (If it's a project request, provide a profile of the project).
6. Specific activities and timetable for meeting the stated objectives.
7. Future plan for sustaining this effort and strategy for building the funding base.
8. Who are the staff and volunteers and what are their qualifications?
9. If applicable, identify organizations that are collaborated with to address the issue(s) in this proposal.

### **Evaluation**

10. Define the criteria for success for the organization, project or capital campaign. State how success will be measured in the short-term and in the long-term. What tool(s) will be used to evaluate the program or organization? What is the strategy for implementing the evaluation process?

### **Attachments**

1. IRS letter confirming tax-exempt status – 501(c)(3) and 509(a).
2. Current board list with relevant background, affiliations, town residents, and number of times a year it meets.
3. Financial Information:
  - Total Board approved organizational budget for the fiscal year(s) (See Page 4 for details).

- If seeking project or capital support, include project or capital budget for fiscal year(s).
- Most recent independent audit or account review (as required by law).\*
- Year-to-date financial statement for the current fiscal year.
- List companies and foundations being approached to fund this proposal, with dollar amounts, indicating which sources are committed, pending or anticipated.

**Proposal Budget/Budget Narrative**

**Two Pages Maximum**

1. Time period budget covers:
2. Revenue: provide a line item revenue statement for all applicable budget categories.
  - a) Grants and Contracts
    - Local Government
    - State Government
    - Federal Government
    - Foundations and Corporations
    - United Way and Other Federated Campaigns
  - b) Other Fundraising and Earned Income
    - Individuals
    - Events
  - c) Earned Income
    - Publications and Products
    - Membership Income
    - Fees
3. Expenses: Provide a line item expense budget, with narrative footnotes for those applicable items, which need further explaining. Typical line items may include:
  - Salaries (specify number of full time equivalents)
  - Payroll Taxes

- Fringe Benefits
  - Consultants and Professional Fees
  - Insurance
  - Travel/Transportation
  - Equipment
  - Supplies
  - Printing and Copying
  - Telephone and Fax
  - Postage and Delivery
  - Rent
  - Utilities
  - Maintenance
  - Evaluation
  - Staff Development and Training
  - Child Care
  - Administrative Overhead
4. In-Kind Support

We have prioritized the available funding by amount funded and probability of approval and came up with a small list. We will give this list to the grants committee of the MVHS in hopes that they will be able to follow up in the months to come and succeed with the project funding necessary. The committee will need to do grant writing for the various foundations that they see fit. The lighthouse committee will determine the

probability of support for the remaining funds and proceed accordingly to the grants committee. Unfortunately our project is for a limited time and we will not be able to be involved in the approval process.

This is the list that should be given to the grants committee when appropriate:

Massachusetts Historical Commission      Note: Highest Priority  
220 Morrissey Boulevard  
Boston, MA 02125  
Attn: Ms. Judith McDonough, SHPO

Osceola Foundation, Inc.  
4 North Water Street  
Nantucket, MA 02554  
Attn.: Ann B. Oliver

The Doyle Charitable Foundation  
c/o First National Bank of Boston  
PO Box 1890  
Boston, MA 02105  
Attn.: Sharon M Driscoll

The Abbot & Dorothy H. Stevens Foundation  
PO Box 111  
North Andover, MA 01845  
Attn.: Elizabeth A. Beland

The Nathaniel & Elizabeth P. Stevens Foundation  
PO Box 111  
North Andover, MA 01845  
Attn.: Elizabeth A. Beland

Edward C. Johnson Fund      Note: Deadline Oct. 30, 1999  
82 Devonshire Street  
Boston, MA 02109  
Attn.: Anne-Marie Soulliere

The MVHS should also look into the publications that are offered by the National Trust for a nominal fee of \$6 each. These publications would be well worth the money spent. They are:

“Successful Fund-raising Activities for Preservation Organizations”

“Quest for Funds Revisited: A Fund-Raising Starter Kit” and

“Share your Success: Fundraising Ideas”

As stated above, each of these external funds will require grant writing. We did want to describe the steps that go into successfully writing a grant. We have already discussed the application and plan, which are both important parts of this procedure. The application consists of sponsoring institution, author of grant, title of grant, synopsis of plan as well as desired support and total cost. A background is then written to show the reader who the writer is and what the institution stands for. At this point the writer is trying to sell the project. They should be focusing on related work and credentials that will instill confidence that the project will be completed correctly. This includes a list of directors, employees, and volunteers. Be specific, show what everyone has done in the past, this will again instill confidence in the team that you have compiled.

Now the writer should show why the project should be done. Be specific about the benefits involved to society and what will be missed if the project is not completed. Financial data should be discussed in some detail as well as what is needed and what has been raised. Also what assets the institution brings to the table and why they should be chosen for this grant.

Next is where the plan of action is laid out. Be as specific as possible. This should list everything that will be done from start to finish. If it is an on-going project then detail the long-term requirements. Give backgrounds and responsibilities of every member of the team. If possible, give the reader concrete dates as to when certain aspects will be completed. This will keep the project in check and give the reader something to



look forward to. This section is also where any personal comments or concerns should be expressed.

To finish up, a timeline or chart will be helpful to the project and also to the reader. This will show what can be done simultaneously and what steps require another to finish. A detailed budget should be laid out as well. This should list every penny. What will be funded and what will not. If it is an approximate figure, say so, the reader expects things to change somewhat. It is nice to let them know where to expect the change. (Taken from an example grant written for the Historical Society, c/o Bruce Andrews)

Other methods of fund raising can be internal. We will need future funding for maintenance so charging for admission is required. This is already done at Gay Head and East Chop and as soon as Edgartown is opened to the public there will be an admission there as well. The amount that is raised does not quite offset the cost of maintenance (as seen in annual budget) therefore we need higher revenue at each lighthouse. We should then try to attract more visitors to the Lighthouses so they can tour these treasures. Advertising should be looked at seriously because it can be done at a low cost and will attract the crowds necessary to offset the high cost of maintenance. The various ferry services, for instance, would be a great ally because they are transporting mostly tourists that are looking for something to do. We have contacted The Steamship Authority and a representative expressed interest in displaying leaflets at no cost. Once the leaflets are printed we will bring them to the information booth and they will distribute them to all of the vessels. We have also contacted the Island Queen and HyLine boats and both concurred with the steamship's willingness to offer free advertising. A concern was

brought up by Craig Dripps that printing costs may exceed what is budgeted to distribute to all of the ferry services therefore we will keep our focus on The Steamship Authority. This leaflet is described in more detail with an example in the flyer section. It is this type of publicity that will keep people coming back time after time. This will make future fund raising efforts easier and less reliant on donations.

We should now look at what other restoration projects have used to raise the necessary funds. Many have come up with their own activities for local private fund-raisers. Many lighthouse societies use concerts to raise funds. The MVHS has sponsored concerts in the past and they have been successful. There has been some trouble this year confirming an act however this is a great way to raise the funding necessary. Famous singer Arlo Guthrie has given benefit concerts for the Montauk lighthouse in New York. These funds have been used mostly for erosion control. Poet and songwriter's Lee Paulet and Betsy Bolger-Paulet as well as singer Bertie Higgins perform benefit concerts for the Anclote Key lighthouse in Florida. A "Barefoot Black Tie" event raises funding for the Fire Island lighthouse with formal dining and entertainment located at the lighthouse. Another interesting idea was used by the Grand Haven lighthouse in Michigan. They were replacing a catwalk and therefore sold "a piece of the catwalk". The Cape May lighthouse sold "ownership" of the pieces of the lighthouse. For \$1 you could "buy" a brick and receive a certificate of "ownership". To "own" a step is \$100, a window is \$500, and landings are \$1000. (Historic Lighthouse Preservation Handbook) They also have a plaque of any contributor of more than \$500. Most of these ideas could be used by the MVHS. Getting the wealthy summer community involved would be financially beneficial. With the notoriety that frequents Martha's Vineyard the lighthouses are in a

prime location to reap the benefits from local fame. If we could somehow harness this towards the restoration project the Historical Society would have far fewer financial problems facing them.

4.11.B Sample Letter

Funding Director's Name

Funding Director's Address

Company's Name

Company's Address

Dear Sir or Ma'am,

We are writing to inform you of an opportunity to help preserve an important part of American history. The three lighthouses on the island of Martha's Vineyard are in jeopardy of being closed due to decay. The Martha's Vineyard Historical Society assumed the responsibility to care for these lighthouses in 1994. The MVHS is a non-profit organization that depends on admission and fund-raising for revenue. Your business could be a valued sponsor for the community. We urge you to show your support for these national treasures by becoming a sponsor of the MVHS, this sponsorship is tax-deductible. Enclosed is a number of suggested donations however any amount would be greatly appreciated and applied to preserving these historic landmarks for many years to come.

Thank You for your support.

Islander	\$50
Seafarer	\$100
Light Keeper	\$500

This is an example of a letter that can be sent to prospective corporate donors. We will refine this to MVHS's specifications and send it to area and national

corporations including a brochure on each of the lighthouses with pictures. This letter could also be modified for personal contributors. Corporations will be rated on their likeliness of donation; therefore we will not be soliciting the uninterested. This determination will be made by demographics as well as related activities to the Island and the specific lighthouses.

#### *4.11.C Sunset Tours Flyer*

As we have mentioned before we must be able to gain funding through admissions to maintain the lighthouses in good shape after the renovations. All lighthouses will soon be able to have public tours and therefore advertising will be helpful to draw the crowds that will pay for admission. We have made a flyer for each of the three lighthouses. This advertisement consists of a picture, hours of operation, and directions, all on a 3-2/3 x 8 piece of paper so it may fit into the rack at the Steamship Authority, edited and approved by both Craig Dripps and Bruce Andrews.

East Chop light is located in a residential neighborhood and therefore may not use the design for advertisement. There is little parking for this light and therefore it cannot handle a large amount of tourists. We have looked into prospective parking areas so that the light may be open to the public if this is ever desired. Across the street from the lighthouse there is a perfect location however this is prime private real estate and without a generous donation it will be impossible to open up to large crowds. The quiet neighborhood in which the lighthouse sits would probably be against any large crowds as well. These facts unfortunately mean that the Historic Society will be more dependent on funding in the future.

There are many ways to raise and earn money for preservation and maintenance, everywhere we look there are more ideas, we will look at as many relevant methods as we can however there will be many that we will miss unfortunately.



You are cordially invited to tour this historic treasure. Maintained by the Martha's Vineyard Historical Society, the Gay Head Lighthouse is open for sunset tours. The top of the Gay Head lighthouse is the absolute best place to enjoy a Vineyard sunset.

Located on the western end of the island, the Gay Head Lighthouse is open for tours an hour before sunset, to an hour after sunset on Fridays Saturdays and Sundays from mid June until mid September. Follow the signs to Aquinnah, and you can't miss this national landmark.

Built in 1799, Gay Head shines an alternating white and red beacon every 15 seconds, reaching ships up to 24 miles out to sea. In 1952 the original Fresnel lens was replaced with an electric light. The Fresnel lens can be viewed on the grounds of the Martha's Vineyard Historical Society Museum, located at the intersection of Cooke and School Streets in Edgartown.

There is a \$2 admission charge for adults. All admission fees and additional donations go toward the Historical Society's restoration and preservation of this lighthouse.

For more information please call the Historical Society at (508) 627-4441.

Above is the front half of the flyer on the right hand side, and the back on the left.

Another idea to raise funding was brought up by Craig Dripps. This is to show the community of Edgartown and Martha's Vineyard the option that the Coast Guard would use if the lighthouse were not to be restored. On one side of the poster a picture of the current lighthouse and the current date. On the other side a picture of a light pole where the lighthouse once stood and a date twenty years in the future. Needless to say



**Figure 58**

the lighthouse is far more aesthetically pleasing, which in Edgartown harbor weighs heavily. These posters will be printed and displayed in strategic areas including the Vineyard Gazette to gain community support for the Edgartown lighthouse project. There will also be information on whom to contact to help.



## 5. Erosion

Erosion is a gradual and continuous process caused by wind, rain and waves. Coastal regions worldwide are plagued by the effects of erosion, causing the loss of beaches and other natural environments. The rise and fall of the tides drag material from beaches. Crashing waves and strong current cut away the land and deposit it elsewhere (*New book of knowledge*, p.312-313). Beaches are left barren as the water and wind beat them. Long shore currents move sand and rock, eliminating some beaches and building up new ones further down the coast. Beaches are easily eroded by the force of wind carrying silt and sand out to sea or inland. As rain strikes the ground, its erosive effects begin. Soil which is not shielded or anchored by vegetation is easily washed displaced by sheets of rain water which run downhill (p.312). As these sheets meet aberrations in the surface, they separate into swift moving channels, digging deep groves into the ground.

Beach cliffs also feel the effects of erosion, as surf and storms pound them. The barrage of waves wears away the lower sections of the cliffs, eventually the entire area destabilizes and drops into the water. When a storm approaches waves become much more violent and winds increase, magnifying and intensifying the effects of erosion (p.313). This is especially true at Gay Head on Martha's Vineyard, where countless years of erosion and misuse have diminished the cliffs and left the lighthouse in danger. If nothing is done to protect the lighthouse a beautiful and historic landmark will be lost into the ocean.

The light at Gay Head is not in immediate danger of falling into the ocean, but this event is on the horizon and should not be ignored. The cliffs decay in such an unpredictable manner that it is impossible to establish exactly how much time the light has left. It is only possible to speculate on this matter using data from the past to model the future. In a meeting with Richard Skidmore, the keeper of the Gay Head Lighthouse, it was reported that the cliffs experience an average loss of over 22 inches every year (*Interview on June 27, 1999*). Recently however, there have been recorded losses of almost 5 feet in one storm (*Interview*). The current distance between the tower and the edge of the cliffs is approximately 75 feet. Dividing this distance by the average ground loss per year allows for a timeline of the erosion of the cliff to be established. In this case, the timeline was found to be just about forty years.

To better model the possible future of the cliffs, the present conditions were compared to a topographical map from 1855. In this map, the closest edge of the cliffs is almost 350 feet from the tower (Gay Head Light Station Site Map). Using this figure, it was possible to calculate the average yearly ground loss over a 140 year period and check the statistic that was being used. The average over the 140 year period was 23.5 inches, proving the original average to be relatively accurate. The comparison (Appendix A) also shows that the cliffs have eroded in a rather uniform band since the map was made. The northwest face seems to be falling away at the quickest rate, while the protruding section almost directly to the west has managed much better over time. The relatively recent rise of beach vegetation along the faces of the cliffs could be responsible for the slowed rate of erosion, or it could be due to the lack of many powerful storms.

Regardless, this is not enough to protect the light permanently and a real solution must be found.

There have been numerous attempts to curb erosion in locations all over the world, but a guaranteed formula has yet to be found. Different techniques ranging from the simple to the more involved to the extreme have been implemented with varying success. Barrier reefs have been built at high cost in time as well as money, only to be lost in a number of years leaving the same problem. One such instance occurred at the Brant Point lighthouse, where the beach was being washed right out from under the tower. A reef was quickly constructed only to be destroyed within a few years. Luckily, a ship wreck up shore caused a shift in the currents along the beach, allowing sand to be deposited in front of the house instead of being dragged away (*Legendary Lighthouses: California and Pacific Northwest, Western Great Lakes and South Atlantic, North Atlantic and Maine*). In other cases, a week or two of work planting beach grass and other deep rooting vegetation was all that was necessary to preserve the site. Regardless of the means used to stop erosion, there is always the risk of displacing the problem rather than solving it. In still other cases however, no solution could be found and it became necessary to abandon the location for a safer spot. The Truro lighthouse had to be rebuilt in the 1800s after it fell into the sea, and was moved not much later when it was threatened by the same fate (*Legendary Lighthouses*). In the instance of lighthouses, this last solution is the absolute last resort due to its profound cost and complication. Moving a lighthouse is an immense undertaking, requiring much time to fund and plan. It is therefore necessary for those involved to decide whether the cost of securing this historic

landmark is worth it. In some cases, it may be necessary to simply abandon the lighthouse and rebuild at another site.

A suitable location needs to be acquired for the tower and funds need to be raised. Looking over the area, there does not seem to be many choices for a new site. The land behind the light is shaped almost like a saddle and the closest area that is at the same height as the current location is more than half of a mile away. While this is quite a distance for a lighthouse to be moved, it may be the MVHS' only choice.

## **6. Pertinent Contact Information**

### **6.1 Geoffrey White**

Housing architect by trade, Geoffrey White was given the job of restoring and building additions to the lighthouses leased by MVHS within the past two years. Some meetings with Mr. White were held at his house in West Tisbury, while others were in the presence of other people such as Mr. Andrews, and conducted at the museum in central Edgartown. Mr. White's first design was coordinated with Bruce Andrews and Craig Dripps to memorialize the death of Rick Harrington's, a prominent contributor to the Historical Society, son. A kiosk was designed, and will be erected near the Edgartown lighthouse, with the ability to display historical, local, and touring information. Mr. White's second task was to design the inside stairway for the Edgartown lighthouse, so that public tours can be conducted. A simple spiral design hugging the inside circumference to the top was devised by Mr. White, and the blueprints for which construction will follow. Tilt measurements and stress analysis helped alleviate the worry for shifting or collapse. The base of the Edgartown lighthouse will be laid brick, with a compass rose denoting the true cardinal directions. A poem, to be determined later, will be carved into the side, or top of the concrete skirt. All designs by Geoffrey White were submitted to the MVHS for the improvements and memorial display.

## **6.2 Bruce Andrews**

The director of the Martha's Vineyard Historical Society, Bruce Andrews is responsible for many different tasks concerning the society and the museum, and is the director of most actions involving the society. One such task is maintaining the lease of the lighthouses under the agreement with the historical society. Mr. Andrews helped coordinate meetings with Craig Dripps and Geoffrey White. Bruce Andrews allowed entry for the study of the lighthouses, and monitored work performed by this project team for the benefit of the society in repairing, renovating, and maintaining the three lighthouses. Bruce is also responsible for any fund raising opportunities, including the sale of locally created artistic renditions of the lighthouses. These prints sell for \$250 apiece, and are intended to raise over \$25,000 for the preservation fund. Bruce has appeared in the PBS television special "Legendary Lighthouses" as a valuable source of information on lighthouse keeping, and maintenance.

The prize display of the museum in Edgartown is the Fresnel Lens, moved from the Gay Head light when the coast guard replaced the magnificent oil lantern lens with an electric one. Bruce is very fond of the display of the lens at the museum, and prides on giving an informational tour of the prism laden light fixture mounted on a mock cupola.

### **6.3 Craig Dripps**

The Chairman of the Lighthouse Restoration Committee for the MVHS, Craig Dripps has been fundamental in most projects involving the lighthouses. With a keen eye for fund raising opportunities and general common sense, Craig handles the funding work for the society with ease. During the school year, Craig teaches at the Martha's Vineyard High School. This educational background gives Craig the necessary skills to deal with people, including the ability to easily explain concepts such as the Children's Memorial Kiosk.

Craig is also in charge of obtaining funding for the restoration/preservation fund, and has many ideas to credit for this task. The 'Sunset Tours' flyer and another poster used as a warning advertisement, are a few of his advertisement ideas. The tour flyer will produce a greater turnout at the Gay Head light, and the poster (which depicts the Edgartown lighthouse to be a light on a stick in a few years) is hoped to encourage some of the island residents to donate.

#### **6.4 Coast Guard: Jeff Harvey, Howard Greeson, and Joe Miner**

In charge of over 50 lighthouses along the eastern seaboard, these officers are responsible for the functionality of the beacon in the cupola of all three lighthouses leased by the Historical Society. Petty Officer Jeff Harvey has worked on lighthouses for many years, and his experience with historic lighthouse restoration will be vital to the historical society's goals. Mr. Greeson and Mr. Miner explain some of the past solutions to water leakage, such as silicone sealant around problem area, which have been moderately successful as a short term solution. Environmental problems with sand blasting to remove paint was another of their concerns: they advise using a fume skirt around the whole structure if sand blasting is to occur. Lead paint should be tested for as well, using standard lead paint test kits, before any paint is removed.

Water damage was another of the Coast Guard's concerns. One such way to alleviate the moisture in the cupola section is to place a fan above the beacon where a vent above the light used to whisk lantern smoke to the outside. Now that the light is electric, this vent can be used for ventilation of moisture levels in the cupola via a small electric fan.

According to Jeff Harvey, the only equipment in the Edgartown lighthouse that is still being used is the light, the white battery box, and the solar panel. The location of the solar panel was discussed. Geoffrey White wishes to move the solar panel so that it is not easily seen. Jeff Harvey approved if we wished to move the panel. However, the panel will have to face south and be at a 20° to vertical in order to maximize the power gain. After some discussion with these men the panel was determined to be in the best location presently.



The paint of the lighthouse was the next issue. The lighthouse needs to be cleaned of all its existing paint before a new coat can be applied. The last time it was painted was the summer of 1992, and the paint is failing once again. All of the joints in the lighthouse are rusting and the underside of the black platform on top of the lighthouse is barren of paint. The major problem of paint removal is the environmental impact of the paint. The lighthouse may contain lead paint. This will need to be investigated using a laboratory to determine the validity of the content of lead paint. Since the lighthouse is so close to the Edgartown harbor extra steps must be taken in order to ensure the preservation of the surrounding environment. Howard Greeson recommended that we research the Cleveland Ledge lighthouse restoration. They are using a special paint-removing coating. The coating is applied to the exterior of the lighthouse, and then a blanket of fiberglass is pressed onto the coated lighthouse. After some time the fiberglass is peeled and the paint is removed with the fiberglass coating.

Once the paint is removed, all of the rust needs to be sand blasted off of the lighthouse and a rust stabilizing treatment applied. Finally a coating of either rubberized paint or epoxy is applied to the lighthouse for the finish color.

Lightning is a concern for the lighthouse. Its location and height are ideal for lightning strikes. The lightning rod on top of the lighthouse is not adequate for its purpose. Over time it has decayed to the point where it may fall off, resulting in a hazard of its own. A grounding strap needs to be installed as well as a new lightning rod.

dlksjfd (insert picture of the lightning rod here)

Power needs to be run to the lighthouse. The submerged cable that is presently located at the lighthouse is beyond repair and a new line must be installed. There is a

power box 100 feet from the lighthouse from which the power may be taped. The power will be for the lighting of the lighthouse and the children's memorial, as well as the exhaust fans for the ventilation system.

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## **Appendix A:**

**140 Year Comparison of Site for Gay Head Light**

**Beach Movement around Martha's Vineyard**

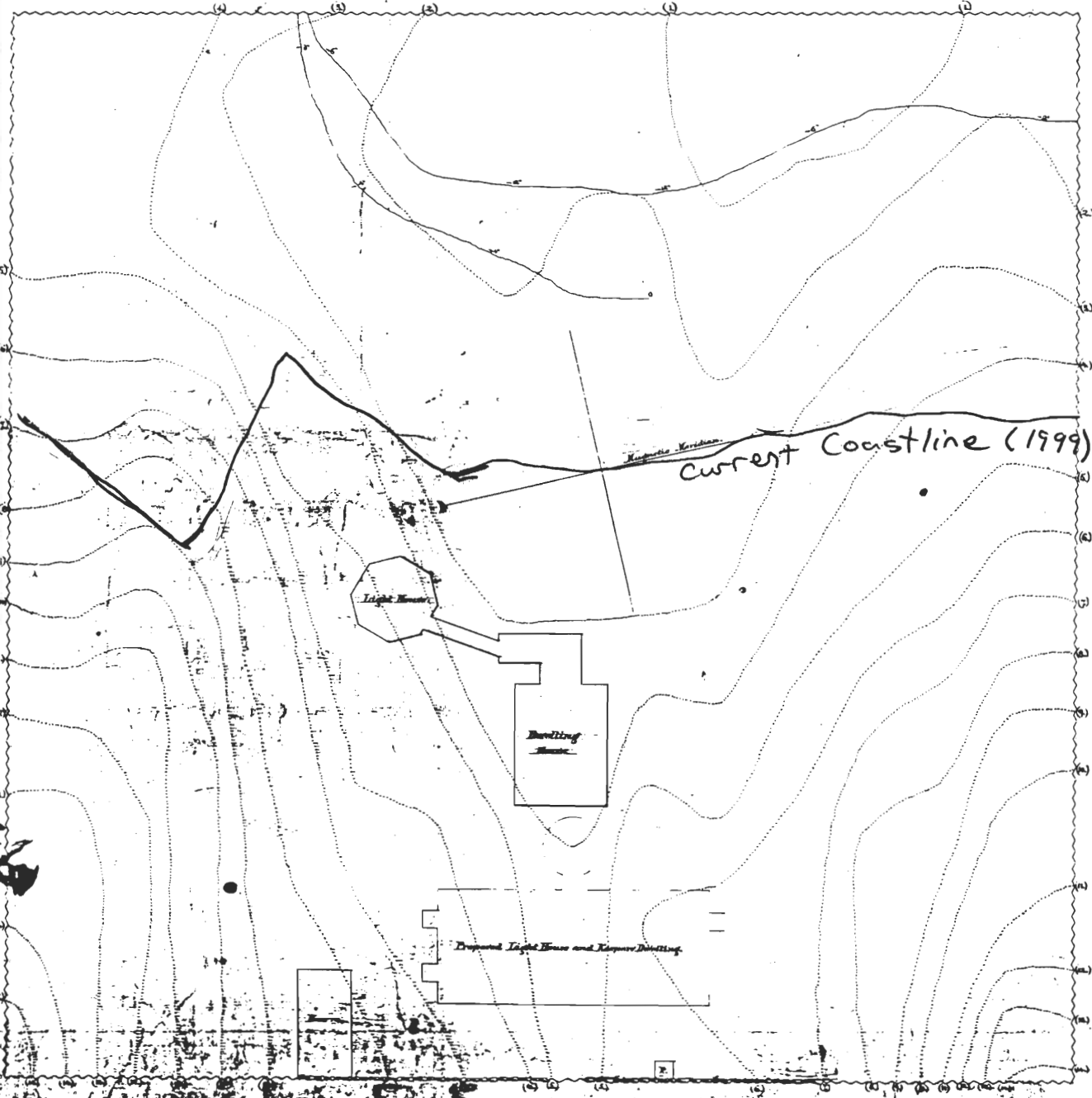
Recd. May. 26. 1855 with Major Ogden's  
letter of 24<sup>th</sup> inst.

Ref. to Committee on Engineering  
May 26. 1855.

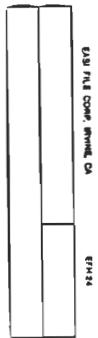
Approved with the following modifications, viz-  
To displace with the sand-stone and to substitute  
therein a cast iron structure in place of the wooden  
one proposed - to make all the heights of build,  
and to ~~displace~~ ~~the~~ ~~building~~ in all  
aspects similar. June 7. 1855.

J. S. Ogden

original Coastline (1855)



2-26-13  
26 May 1855



Plan of Public Lands at Gay Head

2<sup>d</sup> Dist. Major C. B. Dutton, U.S. Army  
with Eng's letter, B. 29-p. 56, of 24<sup>th</sup> May '55-

2-26-13  
p.l.d. 26 May '55-