POWER HOUSE

Chronology of Alterations and Use

Original Construction

The Michigan Island Power House was built in 1928 as part of the site expansion associated with the Second Tower. On November 21, 1928, Keeper Lane writes in the Michigan Island Log that the crew, "Put [the] flue in Power House and put lock on door."[45] It was built to house a fog signal, but by the time it was completed, the technology had changed and an early radio beacon was installed instead. The building also houses the hoisting engine that powers the tramway.[46]

The tram cart photographed in 1975 may be different than the existing tram cart, which may have been taken from Outer Island (Historic Image MI-14). Two 1978 photos show the current concrete stairs with another flight of stairs from the dock leading to the beach that no longer exist today (Historic Images MI-18 and 19).

The historic construction drawings for the Power House from 1929 show in great detail the mechanical and electrical systems in the building (Historic Drawing MI-12).

Significant Alterations / Current Condition

Work on the Power House includes the mitigation of the bat infestation that the Historic Structure Preservation Team of the Park Service completed between 1998 and 2009.

The original electrical branch circuit wiring and equipment was installed in 1929 when the building was constructed. Lighting, receptacles, switches and wiring have not been replaced. However, major electrical equipment such as electric generators and hoisting systems have been removed and/or replaced with newer systems. Originally, the Power House was equipped with two small oil-fueled engine generators (one Kohler and one Cummins) to provide power for the facility and lighthouse equipment. There was an additional small gasoline-powered engine generator for power to the residences on the island. All of this original equipment has been removed. In the 1970s, the Coast Guard installed a replacement diesel engine generator to provide power for the tram hoist and for radio equipment on the site. At that time, a new hoist motor and winch was added along with a contactor assembly and control station for control of the hoist for the tram.

The Power House is currently in good condition.

[45] E. Lane, Michigan Island Log, Nov 23, 1926 – Aug 19, 1936.
[46] List of Classified Structures, National Park Service, 2009.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1928, October	Oct 2: “Crew laying rails on tramway and getting mixer.” Oct 15: “Crew finished putting in foundation for power house.”	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1928, November	Nov 9: “Crew put roof on Power House. Light snow flurries.” Nov 10: “Finished outside of Power House roof and chimney.” Nov 15: “Crew ready to start plastering Power House.” Nov 21: “Put flue in Power House and put lock on door.”	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1975	Stabilization of Power House	APIS/NPS Business Office File D3423
1979	Repoint Power House APIS/NPS Business Office File D3423)	APIS/NPS Business Office File D3423
1981	Asbestos roofing installed	APIS/NPS Business Office File D3423
1982	Reshingle Power House roof, reroute propane lines and install new hoses, install gasoline storage cabinets	APIS/NPS Business Office File D3423
1985, July 26	“Maintenance workers were out today taking final measurements for the new electric winch and generator, etc. to be installed next week. They were discussing how they could remove the old donkey engine and whether it should be left there for historic purposes.” (Terry Blomberg)	From “Excerpts from Michigan Island Volunteer Logs- 1978–1999,” page 7
1985, August 5	Maintenance crew dismantled and removed old engine from Power House, installed “numerous storage batteries and the new generator” (Terry Blomberg)	From “Excerpts from Michigan Island Volunteer Logs- 1978–1999,” page 8
1985, August 7	Work resumed on new water system that pumps water directly from the Lake into a small tank in the Power House	From “Excerpts from Michigan Island Volunteer Logs- 1978–1999,” page 8

Notable Actions with Unknown Dates

Date Range	Work Described
1998–2009	Mitigated bat infestation

General Physical Description

The building is a one-story, rectangular utilitarian structure, brick walls with a brick foundation. It has a gable roof, exposed rafter tails, panel doors on the north and south elevations, and a full basement. It is adjacent to the tram tracks.

Physical Description – Architecture

Architecture – Roof

The roofing is asbestos shingle with a 9” wide × 7” exposure, similar to three other buildings at the Light Station. This appears to be original roofing as it is consistent with notes on the original construction drawings. The step flashing at the chimney and south appurtenance is noted as copper. The exposed 1x6

sheathing is painted, tongue and groove. The eave, extends 1’6” and consists of exposed rafter tails with a 1x fascia and frieze board with an ogee closure trim, all wood painted white (MI-PH-07).

The roof of the south appurtenance is a reinforced concrete sloped slab.

Architecture – Gutters and Downspouts

There is currently no gutter and downspout system on the building although the original construction drawings call for their installation and there are remnants of their attachments in situ.

Architecture – Chimney

The chimney is red brick with a stone cap and a vent flue located due south of the chimney (MI-PH-06).

Architecture – Exterior Walls

The exterior walls consist of a red brick running bond face brick (noted as “Iron Spot Brick” on the original construction plans) and a 2½” tile block with plaster on the interior. There are stone sills, headers and thresholds and a brick soldier course at the first floor level.

A mortar sample of the exterior brick wall indicates it is a mixture of Portland cement and sand. The mortar is dark gray colored, hard and brittle, and has fine sand.

Architecture – Windows

Typical Windows. These windows are steel casements with eight lites and are paired. The windows are painted white and trimmed with beige brick on the interior. Each window has a limestone header and sill. The sills have drip edges. The typical dimensions for these windows are 3’2” × 4’3”. These windows are original (MI-PH-14 and 21).

Gable Vents. These vents are screens at masonry openings.

Basement Vents. These vents are wood louvers in wood frames and open inward. They have metal screens on the interior. The vents are 2’3” × 3’0”. They appear to be retrofit at the openings of former steel awning windows.

Architecture – Exterior Doors

The original two exterior doors are five-panel, painted wood doors with raised panels. These doors have wood frames set into masonry openings with brick trim at the interior. The exterior trim has a stone header, possibly limestone, and a concrete sill. The doors have metal thresholds, a padlock on the south elevation door, and three ball-tipped hinges per door. The doors are 2’8” × 7’0” × 1¾” (MI-PH-13).

Architecture – Exterior Trim

Refer to roof section.

Architecture – Interior Doors

The original interior doors are five-panel, painted wood doors with raised panels. The wood trim is ¾” × 4 ½” with rounded edges (similar to the trim at the remodeled spaces of the Old Michigan Island

Lighthouse). Each door has knobs with a mortise plate on both faces and two hinges. The typical door dimension for this type of door is 2’0” to 2’8” × 7’0” × 1¼” (MI-PH-16).

Architecture – Wall Finishes

There are three types of original wall finishes for this building. The primary type is plaster over 2½” tile block. This is the wall finish for the generator room, the hall, and the hoist room. The water closet has plaster over lath as its wall finish. The basement has red brick walls.

Architecture – Ceiling Finishes

There are two types of original ceiling finishes in this building. The generator room, the hall, the hoist room, and the water closet have plaster over lath ceilings. The basement’s ceiling has a board-formed concrete ceiling.

Architecture – Interior Trim

The generator room, hoist room, and the hall have vertical beige brick trim lining the exterior walls. The water closet and the basement have no interior trim.

Architecture – Floor

The floor for each room in the building is concrete, once-painted gray.

Architecture – Stairs

These stairs are concrete with a landing separating the upper flight from the lower. The upper flight has five risers at 7” high with treads that are 11” deep and 3’4” wide. There is a steel pipe railing for the upper flight that is 1½” diameter and 3’0” from nosing to center of the rail. The landing distance is 5’0” from the wall to the bottom riser of the upper set of stairs. The lower flight of stairs has eight risers at 7½” high with treads that are 10” deep and 2’8” wide. There is no railing for this portion of the stairs. These stairs are original to the building (MI-PH-12 and 15).

Architecture – Accessibility

The building is currently not accessible. The south elevation entry door opening is 2’7” clear with a grade to finished floor elevation change of 13¼”. The north entry door opening is 2’7” clear with a grade to finish floor elevation change of 11”. At the interior there are no accessibility upgrades. The main entry doors are at a landing level, which along with the narrow door widths, precludes accessibility.

Physical Description – Structural

Structural – Foundation

The perimeter foundation system consists of brick masonry walls. The walls are supported on 12” thick by 18” wide continuous concrete footings reinforced with three #5 bars based on information in the 1928 drawings.

Structural – Floor Framing

The first floor is a reinforced concrete slab that is 6” thick. The slab is reinforced with #5 bars at 8” based on information in the 1928 drawings. The slab spans approximately 7½’. The slab is supported on the

perimeter foundation walls and a 10” deep by 12” wide reinforced concrete beam. The beam spans approximately 15’. The beam is supported on the perimeter foundation walls and an interior masonry wall.

Structural – Roof Framing

The wood roof framing was measured to be 2x6 rafters spaced at about 24”. The rafters span approximately 8’. The rafters are supported on the exterior masonry walls. The rafters are sheathed with 1x10 solid wood underlayment.

The concrete roof framing over the extension of the basement is a 4” thick reinforced concrete slab. The slab is reinforced in two directions with #3 bars spaced at about 12” based on information in the 1928 drawings.

Structural – Ceiling Framing

The ceiling framing was measured to be 2x6 joists spaced at about 16”. The joists span approximately 16’. The ceiling joists are supported on the exterior masonry walls.

Structural – Wall Framing

The interior and exterior walls are constructed of brick masonry. The interior walls in the basement are supported on 12” deep by 18” wide continuous concrete footings based on information in the 1928 drawings.

Structural – Lateral System

Lateral stability for the building is provided by the exterior masonry walls.

Structural – Load Requirements

The required floor load capacity for the power house is 150 psf. The required ceiling live load capacity is 10 psf (no storage allowed). The required roof snow load capacity for the power house is 40 psf.

Physical Description – Mechanical

Mechanical – Plumbing Systems

The original 2,000-gallon steel water pressure tank is still located in the basement of the building. The domestic water system has been replaced with a 200-gallon plastic tank and water filtration system with copper piping that serves the Keepers Quarters with nonpotable water. The galvanized steel domestic water piping to the first floor toilet and lavatory has been disconnected.

The basement floor drain is connected to a 3” sewer main. This 3” line connects to a 6” clay sewer pipe that runs to the southwest and into a septic tank and leach field located to the southwest of the Power House that serves the entire building complex. A second 4” cast iron sewer and vent stack that served the first floor toilet and lavatory has been capped at the first floor.

The toilet pedestal has been disconnected, but remains in the first floor toilet room. The lavatory and toilet tank have been removed.

Mechanical – HVAC

A coal furnace installed in 1929 is located in the basement of the building with a duct up to a floor grille on the first floor. The furnace is no longer functional.

Basement ventilation consists of a 32” x 24” ground level louver on the north side of the building. There is a grille and transfer duct to provide ventilation for the toilet room.

Mechanical – Fire Suppression

None in the building.

Mechanical – Other

The original 1,066-gallon steel fuel tank is still in the basement with a galvanized steel fuel intake pipe on the north side of the building. The fuel intake pipe has been capped. There is also a smaller steel gasoline tank (approximately 30-gallon capacity) that served a Kohler generator. The original generators have been removed. The current generator and fuel tank are in the generator room on the first floor.

Physical Description – Electrical

Electrical – System Configuration

Power for the building and for the facility comes from two separate systems. Power for the tram hoist and for selected lighting and receptacles in the building comes from a 15 kW (18.75 kVA), 120/240 volt three phase diesel engine generator. For this equipment to function, the engine generator must be manually started. The electrical distribution system is known as a “High Leg” system in that one phase has a higher voltage to ground (208 volts) than the other two phases (120 volts). With this system, care must be taken to insure that no single phase line-to-neutral loads are connected to the “high-leg” phase as downstream equipment failure will likely follow.

Power for small equipment within the building and power for selected equipment in the Keepers Quarters is provided via a PV (photovoltaic) system consisting of collector, controllers, and storage batteries. The photovoltaic collection array is a flat panel system approximately 80" by 52", located near the Shed on a freestanding rack. The collector provides dc power to the Power House building via an underground cable protected by two 15 ampere single pole circuit breakers at the collector. The dc power from the PV array charges three 100 ampere hour, 12 volt storage batteries located in the Power House through a Outback Power Systems Flexamp 60 charging controller. The system also employs a GNC Battery Company 33 ampere battery charger with 120 volt input and 12 volt output to charge the batteries when the generator system is running. A manual throwover switch is used to select whether the batteries are charged via generator or PV power. Power for small pumps and equipment in the Power House building is derived directly from the dc storage batteries at 12 volts dc via a dc load center. The dc load center is equipped with a 40 ampere 1 pole main breaker, two 15 amp 1 pole branch breakers and one 20 amp 1 pole branch breaker. These branch breakers feed dc equipment, including small pumps in the Power House, lighting in the Keeper's Quarters via an underground cable, and the generator battery charger. At present, there is an empty conduit from the Power House to the Old Michigan Light House for future addition of PV derived power. The diesel engine starting batteries are charged directly from the PV battery system via a Harger BC Series dc to dc charging controller.

Electrical – Conductor Insulation

Original branch circuit cable is generally of the corrugated armor, rubber insulated BX type. BX cable is exposed in utility areas and concealed in finished walls. Several lighting fixtures have been removed.

Receptacles are of the two wire ungrounded type. Interconnecting cables for the hoist controllers, receptacles in the power plant and for newer lighting are thermoplastic insulated copper wiring in EMT (electro-metallic tubing) conduit.

Electrical – Overcurrent Protection

Overcurrent protection for the engine generator system is via engine control panel mounted 50 amp 3 pole circuit breaker which feeds the facility panel board. The facility panel board is rated 150 amps and contains 20 circuit breakers for circuits in the building. Building circuits fed from the generator panel board are limited to a few overhead lights and two receptacles.

Electrical – Lighting Systems

Lighting systems inside of the building are incandescent lamp porcelain keyless type, switched via toggle switches on the wall.

Electrical – Telecommunications

None in the building.

Electrical – Fire Alarm System

None in the building.

Electrical – Lightning Protection

None on the building.

Electrical – Other

The original tram hoist is in the Power House (MI-PH-25).

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos

The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding damage to structures. Asbestos is assumed to be present at the following locations:

1. Wall and Ceiling Insulation (black matting or felt paper observed above ceilings, this suspect ACM may also be present in wall interiors),
2. Brick and Block Filler (the exterior of the structure is stone and has the potential to have a block filler or grout that is potentially asbestos containing),
3. Roofing Materials (roofing felt, tar, and shingles were identified),
4. Gaskets (various gaskets were seen around tanks, ducting, and pipe fittings),
5. Adhesives (miscellaneous adhesives were seen at pipe/wall interfaces, between ducting, and on heater components),

6. Caulk (around window and door penetrations),
7. Wall and Ceiling Plaster (a plaster/ wallboard application was seen in the entry storage area and mechanical room),
8. Flooring and Subflooring (suspect ACMs in flooring applications were not observed and asbestos is commonly present in vapor barrier felts and tar-papers used in subflooring applications), and,
9. Thermal System Insulation (TSI) (was not observed and asbestos is commonly present in insulation on water pipes, metal ducting for heating systems, behind floor registers, steam piping, etc.).

The assumed ACM was observed to be in good condition.

Hazardous Materials – Lead Containing Paint

The LCP inspection included a visual inspection of the structure. A previous inspection and testing for LCP was conducted using an x-ray florescence (XRF) detector coupled with bulk paint sampling and laboratory analysis. The XRF inspection was conducted by NPS staff in 1993. The findings of this study are incorporated into this report by reference.

Detectable lead in paint was confirmed for the following testing combinations:

1. Window Sash (Wood Substrate with white paint),
2. Window Trim (Wood Substrate with white paint),
3. Doors (Wood Substrate with white paint),
4. Door Trim (Wood Substrate with white paint),
5. Walls (Walls of various substrates are dark gray on the lower half and yellow/tan on the upper half),
6. Ceilings, and,
7. Exterior Trim (Assumed wood substrate with white paint).

Detectable lead is assumed to be present at the following locations:

1. Interior Painted Surfaces (Based on testing of the first floor, LCP is assumed to be present on painted surfaces), and,
2. Exterior Painted Surfaces (The trim on this structure is the only exterior component currently painted and is confirmed to be LCP).

Based on the dates of construction of the various structures and the available testing data LCP is assumed to be present throughout the structure. The confirmed LCP was observed to be in poor condition and the assumed LCP was observed to be in fair condition.

Loose/flaking LCP is not identified on the exterior walls of the structure. Paint chip debris is not noted on localized areas of surface soils surrounding the structure.

Hazardous Materials – Lead Dust

Wipe sampling for lead dust analysis was not conducted in the Power House because this is a commercial rather than residential structure and also because the observed paints were in fair to good condition.

Hazardous Materials – Lead in Soils

Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were not observed to have LCP debris and areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to vegetative

cover surrounding the structure. Preliminary lead-in-soil sampling was not performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

Soil Sampling was not conducted around the Power House.

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was not visually identified.

Character-Defining Features

Mass/Form. A simple gable structure with chimney and a small shed appurtenance at grade.

Exterior Materials. Red brick masonry with trim and windows painted white, exposed rafter tails, stone sills and lintels and an asbestos shingle roof.

Openings. Metal casement windows, eight lites each sash, and five panel wood doors, painted white.

Interior Materials. Exposed masonry and plaster, concrete floors, painted wood panel doors and plaster ceilings.

General Condition Assessment

In general, the Michigan Island Power House is in good condition. The original interior finishes are in remarkably good condition. The original windows and doors are also in good condition.

Structurally, the Power House is in good condition. However, the deterioration of the concrete roof framing and the exterior wall below the concrete roof requires further investigation.

Mechanically, a majority of the original 1929 mechanical components are still in place and are in poor to fair condition and they are no longer functioning. These include a domestic water pressure tank, coal furnace, and generator fuel tanks.

Electrically, the original branch circuit wiring and equipment is well beyond its expected life. The original 1929 electrical systems for this building are not salvageable. Newer systems added by the Park Service are generally in good condition and can provide continued service.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
Condition: *Poor*
The asbestos roofing is in poor condition and at the end of its serviceable life. The concrete slab over the brick shed extension is in fair condition due to the drip line/drainage from the main roof. The eave and associated trim are in good condition.

Architecture – Chimney
Condition: *Poor*
The chimney is in poor condition due to spalling and cracks at the southwest and west faces, likely due to the proximity of the adjacent pipe/vent.

Architecture – Exterior Walls
<u>*Condition:*</u> *Good*
The exterior walls are in good condition with the exception of efflorescence at the north wall and damage due to the roof drainage drip line at the south appurtenance's east and west stem walls (MI-PH-04, MI-PH-08 and MI-PH-22 to 24).

Architecture – Windows
<u>*Condition:*</u> *Fair*
Typical Windows. The windows are in fair condition with a few broken panes, some rusting at the header support angle and window sash. The windows operate sluggishly, the glazing putty is brittle, and the paint is peeling.

Basement Vents. The wood vents are in good condition.

Architecture – Exterior Doors
<u>*Condition:*</u> *Good*
The doors are in good condition, but there is one panel missing at the north elevation exterior door and the hardware is loose.

Architecture – Exterior Trim
<u>*Condition:*</u> *N/A*

Architecture – Interior Doors
<u>*Condition:*</u> *Good*
The doors are in good condition but the hardware is loose.

Architecture – Wall Finishes
<u>*Condition:*</u> *Good*
The plaster over masonry walls are in fair condition with some peeling paint and cracks in the plaster. The plaster over lath wall finish in the water closet is in poor condition with cracks and scars in the plaster from previous fixtures. The basements brick walls are in good condition.

Architecture – Ceiling Finishes
<u>*Condition:*</u> *Good*
The original lath and plaster ceilings are in good condition with some cracks and unevenness in the hoist room and some areas of bubbling paint, signifying possible moisture issues, in the generator room. The basement's ceiling is in fair condition as above the oil tank at the south end, there are stains and damage in the concrete in the area around the pipes.

Architecture – Interior Trim
<u>*Condition:*</u> *Good*
The existing interior vertical brick trim is in good condition.

Architecture – Floor
Condition: *Good*
The concrete flooring is in good condition as it has typical wear and tear for a utility building. There are oil and water stains and most of the paint has disappeared.

Architecture – Stairs
Condition: *Good*
These stairs are in good condition except the existing handrail is not adequate and there is no handrail for the lower flight of stairs. Also, the upper flight of stairs has a large chip out of a step.

Architecture – Accessibility
Condition: *Poor*
This building is not accessible.

Condition Assessment – Structural

Structural – Foundation
Condition: *Good*
The visible portion of the foundation is in good condition.

Structural – Floor Framing
Condition: *Good*
The floor slab is in good condition.

Structural – Roof Framing
Condition: *Good*
The wood roof framing is in good condition. The concrete roof over the brick extension of the basement is in fair condition. The lower corners of the roof and the top surface are deteriorating due to freeze/thaw damage and the growth of moss and lichens (MI-PH-22 and 23).

Structural – Ceiling Framing
Condition: *Good*
The ceiling framing is in good condition.

Structural – Wall Framing
Condition: *Fair*
The interior walls are in good condition. The exterior walls are in good condition with the exception of the walls supporting the concrete roof. These walls are deteriorating due to freeze/thaw damage and the growth of moss and lichens (MI-PH-24).

Structural – Lateral System
Condition: *Good*
Lateral stability of the power house is good.

Structural – Load Requirements
<u>Condition:</u> *Good*
The roof, ceiling and floor framing have adequate capacity to support the required loads.

Condition Assessment – Mechanical

Mechanical – Plumbing Systems
<u>Condition:</u> *Poor*
The original 2,000-gallon steel water pressure tank in the basement is in poor condition with rust damage. The new domestic water system serving the Keepers Quarters is in good condition. This includes a 200-gallon plastic storage tank, water filtration system, and copper distribution piping. The original galvanized steel domestic water piping to the first floor toilet and lavatory has been disconnected and is in poor condition.

The cast iron building waste lines are in fair condition. While the basement floor drain is in good condition, the condition of the buried clay sewer pipe that runs to the septic tank could not be determined.

The first floor toilet pedestal is in poor condition and the toilet tank has been removed.

Mechanical – HVAC
<u>Condition:</u> *Fair to Poor*
A coal furnace installed in the basement is in poor condition with a large dent in the sheet metal siding and some rust on the vent stack. The furnace is not functional.

The basement ventilation louver on the north side of the building is in fair condition. The ventilation grille and transfer duct in the toilet room are also in fair condition. The basement ventilation louver is not adequately sized for the space.

Mechanical – Fire Suppression
<u>Condition:</u> *N/A*

Mechanical – Other
<u>Condition:</u> *Poor (Original Equipment), Good (Contemporary Equipment)*
The original 1,066-gallon fuel tank in the basement is in poor condition with considerable rust damage. The 30-gallon gasoline tank is dented and in poor condition. The current generator and fuel tank located in the first floor generator room are in good condition.

Condition Assessment – Electrical

Electrical – System Configuration
<u>Condition:</u> *Good*
The diesel generator set is approximately 22 years old and appears to be in good condition. The operating time meter indicates that the unit has been run for only 1,300 hours. The building's distribution panel is in good condition as well.

Electrical – Conductor Insulation
<u>*Condition:*</u> *Poor (1929 Equipment), Good (Modern Equipment)*
Conductor insulation remaining from the 1929 installation is in poor condition. Conductor insulation installed in 1987 as part of the new diesel generator addition and new tram hoist addition is in good condition. Conductor insulation installed as part of the photovoltaic equipment installation is in good condition.

Electrical – Overcurrent Protection
<u>*Condition:*</u> *Good*
Overcurrent protection devices in the building including circuit breakers in the generator control panel, generator panel boards, and in miscellaneous panel boards are in good condition. Overcurrent protection devices related to the PV system are in good condition.

Electrical – Lighting Systems
<u>*Condition:*</u> *Poor*
Lighting systems inside the building are old, inefficient, and do not meet current codes.

Electrical – Telecommunications, Fire Alarm System, and Lightning Protection
<u>*Condition:*</u> *N/A*

Electrical – Other
<u>*Condition:*</u> *Good*
The tram hoist, although in good condition, is not supported by its manufacturer (MI-PH-25). Parts and service are very difficult to obtain. PV system equipment is relatively new and is in good condition.

Condition Assessment – Hazardous Materials

Refer to “Physical Description – Hazardous Materials” for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as a support building from 1929 until automation in 1943. It still retains some functioning equipment that provides basic systems for staff, volunteers and visitors.

The building is currently used for storage and systems use. The proposed use for this building is to retain its existing functions and to preserve the historic character of the building.

Preservation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the preservation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Severe*
Remove the existing asbestos shingle roof and replace with an asphalt shingle roof of 9” wide × 7” high exposure to match the dimensions of the 1928-1929 era. Verify/provide proper underlayment and flashings at all eaves, rakes, valleys and intersections. Replace in kind (copper) as needed. Scrape, sand, and repaint the wood trim at the eave, exposed rafter tails and underside of sheathing, fascia, and frieze using the paint analysis to guide the color selection.

Monitor roof drainage at the concrete slab at the shed appurtenance.

Architecture – Gutters and Downspouts
Priority: *Severe*
Install a new half round gutter system with 3½” fluted downspouts to provide drainage away from the building. Add splash stones at each downspout

Architecture – Chimney
Priority: *Severe*
Repair chimney by replacing brick in-kind where spalling is evident. Repoint with mortar to match existing. Coordinate chimney repair with roof work to allow proper step flashing. Consider relocating the roof vent to allow better clearance to chimney to prevent future damage.

Architecture – Exterior Walls
Priority: *Low*
Repair damage due to the roof drainage drip line at the south appurtenance’s east and west stem walls.

Architecture – Windows
<u>*Priority:*</u> *Low*
Repair select windows with damaged glazing putty and replace cracked panes of glass. Scrape, sand, and repaint exterior and interior of windows and frame. Repair existing hardware as required to allow smooth operation.

Architecture – Exterior Doors
<u>*Priority:*</u> *Low*
Replace in-kind the one panel missing at the north elevation exterior door and repair existing hardware as required to allow smooth operation.

Architecture – Interior Doors
<u>*Priority:*</u> *Low*
Repair or tighten existing hardware as required to allow smooth operation.

Architecture – Wall Finishes
<u>*Priority:*</u> *Low*
Repair damaged plaster repaint using the paint analysis to guide the color selection.

Architecture – Ceiling Finishes
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Interior Trim
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Floor
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Stairs
<u>*Priority:*</u> *Low*
Add code compliant handrails and repair the large chip in a tread located at the upper flight of stairs.

Architecture – Accessibility
<u>*Priority:*</u> *Low*
Provide program access through interpretive wayside exhibits.

Treatment Recommendations – Structural

Structural – Foundation
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Floor Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Roof Framing
<u>*Priority:*</u> *Low*
The concrete roof slab should be protected. Water and snow from the upper roof should not be allowed to fall on the slab. The height of the trees to the south of power house should be reduced to allow the sun to help keep the roof dry.

Structural – Ceiling Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Wall Framing
<u>*Priority:*</u> *Low*
The damaged walls under the concrete roof slab should be repaired or reconstructed and protected from future deterioration.

Structural – Lateral System
<u>*Priority:*</u> *Low*
No recommendations at this time.

Treatment Recommendations – Mechanical

Mechanical – Plumbing Systems
<u>*Priority:*</u> *Low*
No recommendations at this time.

Mechanical – HVAC
<u>*Priority:*</u> *Moderate*
The existing basement ventilation louvers do not provide adequate ventilation to prevent condensation and high humidity levels. The additional passive ventilation is recommended.

Mechanical – Fire Suppression
<u>*Priority:*</u> *N/A*

Mechanical – Other
<u>*Priority:*</u> *Moderate*
The existing tram hoist is beyond its useful life and replacement parts are no longer available. Recommend replacing with a self-contained diesel powered winch.

Treatment Recommendations – Electrical

Electrical – System Configuration
<u>*Priority:*</u> *Moderate*
Electrical devices, lighting and wiring dating to the original 1929 installation is no longer connected to a source of power. These items should remain in place for historical context. Existing diesel engine generator system is old and is becoming unserviceable. The existing tram hoist is to be replaced with a diesel powered unit. With the deletion of electrically driven tram hoist, the need for a diesel engine generator ceases. It is recommended to remove the existing diesel engine generator along with all associated equipment such as fuel tank, muffler, starting batteries, and associated panelboard. It is recommended that the existing tram hoist contactors and wiring be removed. It is recommended to remove the ac battery charger and throwover switch feeding the existing PV battery bank.

Electrical – Conductor Insulation
<u>*Priority:*</u> *Low*
No recommendations at this time.

Electrical – Overcurrent Protection
<u>*Priority:*</u> *Moderate*
Overcurrent protection for removed hoist contactors should be removed. Overcurrent protection for removed generator set and associated electrical equipment should be removed.

Electrical – Lighting Systems
<u>*Priority:*</u> *Low*
No recommendations at this time.

Electrical – Telecommunications, Fire Alarm System, and Lightning Protection
<u>*Priority:*</u> *N/A*

Electrical – Other
<u>*Priority:*</u> *Low*
No recommendations at this time.

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
<u>Priority:</u> *Low*
Recommend sampling of suspect asbestos containing materials, including adhesives, TSI, roofing materials, caulking, gaskets, and flooring. Removal and replacement of asbestos roofing is recommended.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
<u>Priority:</u> *Low*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
Priority: *Low*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Low*
No recommendations at this time.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
Further investigation and sampling is recommended.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

1. Although a new gutter and downspout system are proposed, consideration could be given to forgoing this recommendation given that the base of the exterior walls is in fair condition. It appears that the original gutter installation could not withstand the winter conditions on-site. Careful installation detailing would need to be designed for a successful gutter installation.
2. Consideration should be given to the location of the existing vent adjacent to the chimney. This may be promoting the deterioration seen at the chimney given their close proximity.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
2. Replace existing roof with new composite shingle	Removes original material.	Roof is at end of serviceable life. New exposure of shingles and coloration shall match original.	- Abates a hazardous material - New roof will aid in the preservation of the structure
3. Add splash stones	Adds a new element to the structure.	Using a stone (versus precast) will be less visually disruptive to the historic fabric.	- Improves existing drainage to flow away from the building
4. Add a gutter system	Original has failed likely due to snow/ice loads.	Design an attachment that can withstand the snow/ice loads.	- Controlling roof drainage will protect the resource and minimize the efflorescence

Power House Photographs, 2009

MI-PH-01: Aerial, 2009 (Source: A&A DSC00608)

MI-PH-02: South elevation, 2009 (Source: A&A DSC00649)

MI-PH-03: West elevation, 2009 (Source: A&A DSC00650)

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MI-PH-04: North elevation, 2009 (Source: A&A DSC00646)

MI-PH-05: East elevation, 2009 (Source: A&A DSC00647)

MI-PH-06: Chimney, trim, and roof (Source: A&A IMGP2836)

MI-PH-07: Roof, trim, and eaves (Source: A&A IMGP2837)

MI-PH-08: Detail of south appurtenance, east elevation (Source: A&A IMGP2842)

MI-PH-09: Basement vent (Source: A&A 102_9578)

MI-PH-10: Basement, east elevation (Source: A&A 100_9673)

MI-PH-11: Basement, looking southeast (Source: A&A 100_9676)

MI-PH-12: Stairs to north entry from basement, looking up (Source: A&A DSC00819)

MI-PH-13: North entry, interior (Source: A&A 102_9579)

MI-PH-14: Hoist room, looking north (Source: A&A 100_9684)

MI-PH-15: Stairs to main level, looking down (Source: A&A DSC00818)

MI-PH-16: Generator room and water closet doors (Source: A&A 102_9577)

MI-PH-17: Water closet (Source: A&A 100_9664)

MI-PH-18: Generator room (Source: A&A 100_9665)

MI-PH-19: Generator room, east elevation (Source: A&A 100_9668)

MI-PH-20: Generator room, south elevation (Source: A&A 100_9667)

MI-PH-21: Window latch detail (Source: A&A 102_9576)

MI-PH-22: Roof damage (Source: Martin/Martin)

MI-PH-23: Roof damage (Source: Martin/Martin)

MI-PH-24: Masonry wall deterioration (Source: Martin/Martin)

MI-PH-25: Tram hoist winch (Source: RMH)