OIL BUILDING

Chronology of Alterations and Use

Original Construction

The Long Island Oil Building was constructed in 1896 as a support building for the two new light towers constructed that same year.[36]

A historic photo of the Oil Building clearly shows the relationship of the building to LaPointe Light Tower as most of the vegetation is cut back. The radio tower is visible, so the photo was taken after the 1950s but before 1987. (Historic Image LI-12)

There are no available historic drawings for this building.

Significant Alterations / Current Condition

There have been no significant alterations to the Oil Building.

The Oil Building originally and currently has no mechanical system except for the circular gravity vent in the roof. It is now used as a general storage space.

There is no electrical system in the Oil Building.

The Oil Building is currently in stable condition and is solidly constructed of sheet metal on the exterior and brick on the interior with a sheet metal roof.

[36] List of Classified Structures, National Park Service, 2009

General Physical Description

The building is a one-story, rectangular utilitarian structure with riveted metal panels over brick walls, on a concrete foundation. There is a metal door with strap hinges located on the south elevation.

Physical Description -- Architecture

Architecture – Roof
The roof and cornice is sheet metal with sheet metal ridge caps and a metal vent in the center.

Architecture – Exterior Walls
The exterior walls are riveted sheet metal panels painted yellow.

Architecture – Exterior Door
The original entry door is plate steel with heavy strap hinges, mortise lock, and is painted yellow. The door is 2’3” x 6’6” x 3/8” frame with a 1/8” plate. (LI-BO-01 and 07)

Architecture – Wall Finish
The wall finish for this building is the original brick painted white. A sample of the mortar indicates that it is composed of roughly one part lime to two parts sand by volume, with very fine sand. The mortar is gray in color and soft.

Architecture – Ceiling Finish
The ceiling is sheet metal attached to the pyramidal roof structure. The roof framing has metal cross-bracing. (LI-OB-06)

Architecture – Floor
The floor is concrete, which is original to the building.

Architecture – Casework
There are metal shelving units that line all walls, painted white, which are not original to the building.

Architecture – Accessibility
The building is currently not accessible. The south elevation entry door opening is 2’3” clear with no grade to finished floor elevation change. The metal walls are on top of a concrete plinth which has become floor level due to vegetation growth and dirt build-up along the walls.

Physical Description -- Structural

Structural – Foundation
The perimeter foundation system consists of cast-in-place concrete.

Structural – Floor Framing
The floor is a concrete slab-on-grade.

Structural – Roof Framing
The steel roof framing was not accessible and could not be measured.

Structural – Wall Framing
The exterior walls are constructed of steel plate on the exterior face and brick masonry on the interior face.

Structural – Lateral System
Lateral stability for the building is provided by the exterior walls.

Structural – Load Requirements
The required floor load capacity is 125 psf and the required roof snow load capacity is 48 psf.

Physical Description -- Mechanical

Mechanical – Plumbing Systems
None in the building.

Mechanical – HVAC
The original circular gravity vent remains on the roof.
Mechanical – Fire Suppression
None in the building.

Physical Description -- Electrical

Electrical – System Configuration
None in the building.

Electrical – Conductor Insulation
None in the building.

Electrical – Overcurrent Protection
None in the building.

Electrical – Lighting Systems
None in the building.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in the building.

Electrical – Lightning Protection
None on the building.

Physical Description -- Hazardous Materials

Landmark Environmental collected seven bulk samples from a total of seven different types of suspected asbestos containing materials (ACMs). Of the seven suspect ACMs that were sampled and analyzed, none resulted in concentrations of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding damage to structures. Asbestos is assumed to be present in:

1. Adhesives,
2. Caulk,
3. Transite, and,
4. Brick and Block Filler.

The assumed ACMs could be present between the brick interior and the outer metal-cladding and/or interior to the roof vent.

Hazardous Materials – Lead Containing Paint
Detectable lead is assumed to be present at the following locations:

1. Interior Painted Surfaces, and,
2. Exterior Painted Surfaces.

Based on the estimated dates of construction of the structure 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 poor condition.

Paint chip debris was not observed on the ground surface in the vicinity of the Oil Building.

Hazardous Materials – Lead Dust
Wipe sampling for lead dust was not conducted in the Oil Storage Building because it is a noninhabited.

Hazardous Materials – Lead in Soils
The historical paint maintenance activities may have the potential to impact the surrounding soil. The surface soils adjacent to the structure were observed to have lead paint debris. Preliminary lead-in-soil sampling was not performed to assess whether these soils contain lead concentrations above applicable residential soil standards.

Soil Sampling was not conducted around the Oil Storage Building.

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of the 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 in the Oil Storage Building.

Hazardous Materials – Petroleum Hydrocarbons

Localized areas of staining were observed on concrete floor in the Oil Storage Building. Stained areas are likely associated with fuel oil, diesel or other petroleum hydrocarbons. Tank and piping systems may also contain petroleum hydrocarbons.

Character Defining Features

Mass/Form. Simple utilitarian hipped roof structure.

Exterior Materials. Steel painted yellow with sheet metal roofing dark red.

Openings. One plate steel door – painted yellow.

Interior Materials. Exposed painted masonry walls, concrete slab, exposed roof panels.

General Condition Assessment

In general, the Long Island Oil Building is in fair condition on the exterior and good condition on the interior. The original interior brick walls, underside of the metal roof, and concrete floor are in good condition. The original metal door is in fair condition as it is rusted on the exterior and has badly peeling paint. Overall, the Oil Building is in fair condition.

Structurally, the Oil Building is in good condition.

Mechanically, the only attribute in the Oil Building is a circular gravity vent on the roof that is in fair condition.

Electrically, the Oil Building has no systems.

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: *Good*
The sheet metal roof is in good condition with some paint peeling. The metal vent is also in good condition.

Architecture – Exterior Walls
Condition: *Fair*
The sheet metal is in fair condition as the yellow paint is peeling and a large amount of surface rust is visible.

Architecture – Exterior Door
Condition: *Fair to Poor*
The door is badly rusted on the surface, is missing one hinge pin, no longer has its original hardware, and has badly peeling paint.

Architecture – Wall Finish
Condition: *Good to Fair*
The painted brick is in good condition, but there is some spalling at the floor level, which indicates moisture may be trapped between the masonry and the sheet metal siding.

Architecture – Ceiling Finish
<u>*Condition:*</u> *Good to Fair*
The sheet metal roof is in good condition but the cross-bracing is rusting.

Architecture – Floor
<u>*Condition:*</u> *Good*
The concrete floor is in good condition as it appears currently, with some debris obscuring the corners.

Architecture – Casework
<u>*Condition:*</u> *Poor*
These metal shelving units are oxidizing and have badly peeling paint. In general, they are in poor condition.

Architecture – Accessibility
<u>*Condition:*</u> *Poor*
This building is not accessible.

Condition Assessment -- Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The visible portion of the foundation system appeared to be in good condition.

Structural – Floor Framing
<u>*Condition:*</u> *Good*
The concrete slab-on-grade is in good condition.

Structural – Roof Framing
<u>*Condition:*</u> *Unknown*
The steel roof could not be observed, thus its condition is unknown.

Structural – Wall Framing
<u>*Condition:*</u> *Good*
The walls are in good condition.

Structural – Lateral System
<u>*Condition:*</u> *Good*
Lateral stability of the building is good. No obvious signs of distress or damage were observed.

Structural – Load Requirements
<u>*Condition:*</u> *Good*
The floor has adequate capacity to support the required loads. The roof framing could not be observed, thus its capacity is unknown.

Condition Assessment -- Mechanical

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

Mechanical – HVAC
<u>*Condition:*</u> *Fair*
The original circular gravity vent on the roof is in fair condition.

Condition Assessment -- Electrical

N/A

Condition Assessment -- Hazardous Materials

Refer to 'Physical Description -- Hazardous Materials' for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

The Oil Building was constructed in 1896 and has served as a utilitarian structure since that time. It is currently vacant and the proposed use is for it to remain vacant.

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 NPS 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: *Low*
Scrape and repaint the roof.

Architecture – Exterior Walls
Priority: *Low*
Scrape, patch and prepare areas of rust and repaint the walls.

Architecture – Exterior Door
Priority: *Moderate*
Scrape, patch and prepare areas of rust and repaint the door. Replace the missing hinge pin and knob/lock mechanism. Without replacing the hardware, this building remains open to possible damage and vandalism.

Architecture – Wall Finish
Priority: *Low*
Repaint the masonry walls to make more water-tight. Monitor the moisture issues and spalling at the base of the interior of the wall. Providing a path for any trapped moisture to escape between the masonry and sheet metal siding and/or introducing a flashing component between the brick and concrete slab to prevent moisture wicking up into the brick wall should both be explored for future mitigation.

Architecture – Ceiling Finish
Priority: *Low*
No recommendations at this time other than to monitor the rust on the cross bracing.

Architecture – Floor
Priority: *Low*
No recommendations at this time.

Architecture – Casework
Priority: *Low*
No recommendations at this time.

Architecture – Accessibility
Priority: *Low*
Provide program access through interpretive exhibits and waysides at the Visitor Center.

Treatment Recommendations -- Structural

Structural – Foundation
Priority: *Low*
No recommendations at this time.

Structural – Floor Framing
Priority: *Low*
No recommendations at this time.

Structural – Roof Framing
Priority: *Low*
No recommendations at this time.

Structural – Wall Framing
Priority: *Low*
No recommendations at this time.

Structural – Lateral System
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Mechanical

Mechanical – Plumbing Systems and Fire Suppression
Priority: *N/A*

Mechanical – HVAC
Priority: *Low*
Clean and paint roof vent.

Treatment Recommendations -- Electrical

N/A

Treatment Recommendations -- Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Low*
Recommend sampling of suspect asbestos containing materials, including adhesives and brick and block filler.

Hazardous Materials – Lead-Containing Paint and Lead Dust
Priority: *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*
Recommend further investigation and sampling.

Alternatives for Treatment

One alternative treatment for consideration would be to remove the metal panel at the exterior to fully observe the moisture at the base of the brick. However, the expense and complexity of this approach may not be warranted on this smaller utilitarian structure which is why only monitoring has been called for at this time.

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 missing hardware to secure building	Adding new (modern) hardware elements may be visually disruptive and may require removal of historic hardware to allow proper door and hardware operation.	Attempt to match finish of existing hardware elements.	-Provides secure storage for NPS - Proper security will prevent possible future damage due to vandalism

1 ***Oil Building Photographs, 2009***

2
3 *LI-OB-01: South elevation, 2009 (Source: A&A CIMG3930)*

4

LI-OB-02: West elevation, 2009 (Source: A&A CIMG3931)

LI-OB-03: North elevation, 2009 (Source: A&A CIMG3933)

LI-OB-04: East elevation, 2009 (Source: A&A CIMG3934)

LI-OB-05: View into interior, looking north (Source: A&A CIMG3912)

LI-OB-06: Sheet metal ceiling (Source: A&A IMGP3002)

LI-OB-07: Door and brick interior walls, looking south (Source: A&A CIMG3923)

GLOSSARY OF TERMS

PRIMARY TREATMENT APPROACH – PRESERVATION

Preservation standards include measures necessary to sustain the existing form, integrity, and materials of a historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. Preservation requires the retention of the greatest amount of historic fabric, including the landscape's historic form, features, and details as they have evolved over time. Limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work is permitted.

HOW TERMINOLOGY IS USED IN THE PRESERVATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities

Protect – short term and minimal measures used to stabilize and protect features, such as fencing around landscape features

Relocate – the removal and resetting of noncontributing features

Remove – the removal of nonhistoric features

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small-scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material.

Retain – are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition.

Stabilize – immediate measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

PRIMARY TREATMENT APPROACH – REHABILITATION

Rehabilitation in intended to return a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values. Rehabilitation allows for repairs, alterations, restoration of missing features, and additions necessary to enable a compatible use for a property as long as the portions or features which convey the historical, cultural, or architectural values are preserved. Limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work is permitted.

HOW TERMINOLOGY IS USED IN THE REHABILITATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities or the restoration of missing features.

Reestablish – are those measures necessary to depict a landscape feature as it occurred historically. Reestablishment may include the replacement of missing landscape features such as views, planting patterns, spatial relationships, or small scale features.

Relocate – remove and reset noncontributing features

Remove – removal of nonhistoric features

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small-scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material.

Restore – are those measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically or it may include replacement of missing features or qualities.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition.

Stabilize – immediate, more extensive measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

PRIMARY TREATMENT APPROACH – RESTORATION

Restoration standards allow for the accurate depiction of a property as it appeared at a particular time in its history by means of the removal of features from other periods in its history and reconstruction of missing features from the period of significance. The limited and sensitive upgrading of systems (mechanical, electrical, plumbing) and other code related work is appropriate.

HOW TERMINOLOGY IS USED IN THE RESTORATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities or the restoration of missing features

Relocate – remove and reset noncontributing features

Remove – removal of nonhistoric features

Reestablish – are those measures necessary to depict a landscape feature as it occurred historically. Reestablishment may include the replacement of missing landscape features such as views, planting patterns, spatial relationships, or small scale features.

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small-scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material.

Restore – are those measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically or it may include replacement of missing features or qualities.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition.

Stabilize – immediate, more extensive measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

CONDITION ASSESSMENT DESCRIPTION LEVELS

Feature Condition Definitions
(Note: These terms are also applied to the overall structure/building.)

GOOD The feature is intact, structurally sound and performing its intended purpose. The feature needs no repair or rehabilitation, but only routine or preventive maintenance.

FAIR The feature is in fair condition if either of the following conditions is present:

- There are early signs of wear, failure or deterioration though the feature is generally structurally sound and performing its intended purpose – or –
- There is failure of a portion of the feature.

POOR The feature is in poor condition if any of the following conditions is present:

- The feature is no longer performing its intended purpose – or –
- Significant elements of the feature are missing – or –
- Deterioration or damage affects more than 25% of the feature – or –
- The feature shows signs of imminent failure or breakdown.

UNKNOWN Not enough information is available to make an evaluation.

RATINGS OF TREATMENT SEVERITY

An impact is a detectable result of an agent or series of agents having a negative effect on the significant characteristics or integrity of a structure and for which some form of mitigation or preventative action is possible. The assessment should include only those impacts likely to affect the structure within the next five years.

The Level of Impact Severity and their definitions are given below. For all levels, except UNKNOWN, two criteria are given. At least one of the criteria must be met for the declared Level of Impact Severity.

SEVERE	1. The structure/feature will be significantly damaged or irretrievably lost if action is not taken within two (2) years. 2. There is an immediate and severe threat to visitor or staff safety.
MODERATE	1. The structure/feature will be significantly damaged or irretrievably lost if action is not taken within five (5) years. 2. The situation caused by the impact is potentially threatening to visitor or staff safety.
LOW	1. The continuing effect of the impact is known and will not result in significant damage to the structure/feature. 2. The impact and its effects are not a direct threat to visitor or staff safety.
UNKNOWN	Not enough information is available to make an evaluation.

DEFINITIONS OF TERMS

A

AAS: Atomic Absorption Spectroscopy

AC: Alternating current; the movement of current through an electrical circuit that periodically reverses direction. Alternating current is the form of electric power that is delivered to businesses and residences.

ACM: Asbestos Containing Material

Accessibility: a term used to describe facilities or amenities to assist people with disabilities and can extend to Braille signage, wheelchair ramps, elevators/lifts, walkway contours, reading accessibility, etc. According to its website, the Park Service is "committed to making all practicable efforts to make NPS facilities, programs, services, employment, and meaningful work opportunities accessible and usable by all people, including those with disabilities. This policy reflects the commitment to provide access to the widest cross section of the public and to ensure compliance with the Architectural Barriers Act of 1968, the Rehabilitation Act of 1973, the Equal Employment Opportunity Act of 1972, and the Americans with Disabilities Act of 1990. The Park Service will also comply with section 507 of the Americans with Disabilities Act (42 USC 12207), which relates specifically to the operation and management of federal wilderness areas. The accessibility of commercial services within national parks is also covered under all applicable federal, state and local laws" (source: http://www.nps.gov/aboutus/eeo.htm).

AES-ICP: Atomic Emission Spectroscopy – Inductively Coupled Plasma

AIHA: American Industrial Hygiene Association

Air Terminal: A rod that extends above a surface to attract lightning strikes.

AL: Action Level

B

Beam: a structural member, usually horizontal, with a main function to carry loads cross-ways to its longitudinal axis.

Branch Circuit: Insulated conductors used to carry electricity to an associated device or devices that originate from a single circuit breaker.

BTUH: British Thermal Unit per Hour; A traditional unit of energy.

BX Cable: Cable with flexible steel armored outer tube with individual copper conductors insulated with rubber and covered with a cotton braided sheath.

C

Cantilever: refers to the part of a member that extends freely over a beam or wall, which is not supported at its end.

Cast Iron: a large group of ferrous alloys that are easily cast. Cast iron tends to be brittle and is resistant to destruction and weakening by oxidation. The amount of carbon in cast irons is 2.1 to 4 wt%.

CFR: Code of Federal Regulation

Cistern: An underground receptacle for storage of liquids, usually water.

Clay Sewer: Sewer pipe made from vitrified clay that is highly resistant to corrosion.

Column: a main vertical member that carries axial loads from beams or girders to the foundation parallel to its longitudinal axis.

D

DC: Direct current; the unidirectional flow of current through an electrical circuit. Direct current is produced through such sources as batteries, thermocouples, or photovoltaic solar cells.

Dead Load: describes the loads from the weight of the permanent components of the structure.

Deflection: the displacement of a structural member or system under a load.

DRO: Diesel-Range Organics

E

ELPAT: Environmental Lead Proficiency Analytical Testing

EMT: Electro-metallic tubing; a metallic tube raceway that is used to carry and protect current carrying conductors or cables.

EPA: Environmental Protection Agency

F

Flue Vent: A duct or pipe conveying combustion by-products from a heater or furnace.

Fluorescent: A source of light that emits light radiation at longer wavelengths and lower energy.

Footing: a slab of concrete or an assortment of stones under a column, wall, or other structural member to transfer the loads of the member into the surrounding soil.

Foundation*:* supports a building or structure.

FRP: Fiberglass reinforced plastic

Full Sawn (FS): Lumber cut, in the rough, to its full nominal size.

G

Gable: located above the elevation of the eave line of a double-sloped roof.

Galvanized Steel: Steel coated with zinc carbonate to resist corrosion.

GPM: Gallon per minute; a standard unit of volumetric liquid flow rate.

Grade: the ground elevation of the soil.

Gravity Vent: Openings in a roof intended to vent hot air by the action of convection.

Gray Water: Wastewater generated from domestic washing activities and not containing human waste.

GRO: Gasoline Range Organics

H

Header: a member that carries joists, rafters or beams and is placed between other joists, rafters or beams.

Hip Roof: a roof sloping from all four sides of a building.

HUD: Housing and Urban Development

HVAC: Heating, Ventilation, and Air Conditioning.

I

IAQ: Indoor Air Quality

IEUBK: Integrated Exposure Uptake Biokinetic

Incandescent: A source of light that works by incandescence, or works by a heat-driven light emission through black-body radiation.

Inverter: A device that converts electrical direct current (DC) to electrical alternating current (AC).

J

Joist: a horizontal structural load-carrying member which supports floors and ceilings.

K

kVA: Kilovolt-ampere equal to 1,000 volt-amperes. kVA is a unit to express the apparent power consumed in an electrical circuit or electrical device.

kW: Kilowatt equal to 1,000 watts. A kilowatt is typically used to express the output power consumption of large devices or electrical systems.

L

LBP: Lead-Based Paint

LCP: Lead-Containing Paint

LCS: Lead-Contaminated Soils

Leach Field: A drain field used to remove contaminants and impurities from liquid that emerges from a septic tank.

LED: Light emitting diode; a semiconductor light source that can emit light in various colors and brightness.

Live Load: nonpermanent loads on a structure created by the use of the structure.

Load: an outside force that affects the structure or its members.

Louver: An opening with horizontal slats angled to allow passage of air while keeping out rain and snow.

M

Mg/kg: Milligrams per Kilogram

N

NEC: National Electric Code.

NESHAP: National Emission Standards for Hazardous Air Pollutants

Nonpotable Water: Water that has not been approved for safe human consumption.

NVLAP: National Voluntary Laboratory Accreditation Program

O

OSHA: Occupational Safety and Health Administration

Overcurrent Protection: A fuse, circuit breaker or relay that will open the electrical circuit when the downstream electrical current exceeds the stated current rating.

P

Passive Ventilation: Ventilation of a building without the use of a fan or other mechanical system.

Pitch: the slope of a member defined as the ratio of the total rise to the total run.

PLM: Polarized Light Microscopy

PV: Photovoltaic; An array of solar modules or cells that collect solar energy and convert the energy into direct current electricity.

PVC: Polyvinyl Chloride; A biologically and chemically resistant plastic widely used for household sewage pipe.

R

Rafter: a sloped structural load-carrying member which supports the roof.

RBM: Regulated/Hazardous Material

Reaction: the force or moment developed at the points of a support.

RLM: Industrial stem mounted reflector.

Romex: Wiring with rubber insulated conductors in an overall sheath of braided cotton fiber.

S

Seismic Load: loads produced during the seismic movements of an earthquake.

Septic Tank: A sewage tank containing anaerobic bacteria which decomposed waste discharged into the tank.
Shear: forces resulting in two touching parts of a material to slide in opposite directions parallel to their plane of contact.

Snow Load: loads produced from the accumulation of snow.

Span: the distance between supports.

Step-down Transformer: A device that converts a high voltage down to a lower voltage through a series of winding coils.

Structural Steel**:** an iron alloy with a carbon content of 0.16% to 0.29%. Steel is malleable, and easily welded.

Strut: a structural brace that resists axial forces.

Stud: a vertical wall member used to construct partitions and walls.

T

Thermal Expansion Tank: A tank used in a closed water heating system to absorb excess water pressure caused by thermal expansion.

TSI: Thermal System Insulation

Turbine Vent: Vents utilizing rotating wind vanes to create air flow.

V

Vent Stack: A vertical pipe proving ventilation.

W

WAC: Wisconsin Administrative Code

WDNR: Wisconsin Department of Natural Resources

Wrought Iron: an iron alloy with very low carbon content, in comparison to steel. Wrought iron is tough, malleable, ductile, and easily welded.

X

XRF: X-ray fluorescence analyzer

Other

30 µg/m3: 30 micrograms per cubic meter

µg/SF: Micrograms of Lead Dust per Square Foot of Floor Space

1x: Piece of dimensional lumber 1” (nominal) / ¾” (actual) thick

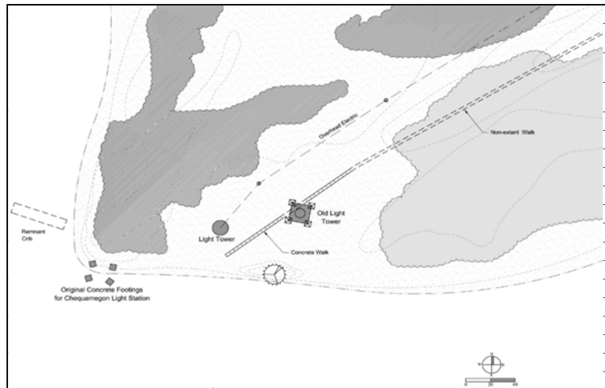
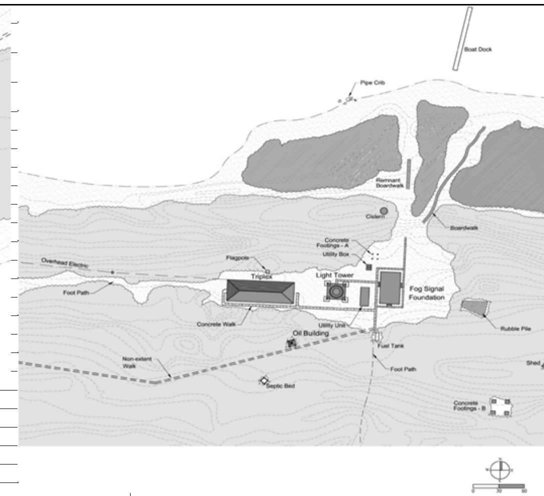
APPENDIX A: MATRIX OF TREATMENT ALTERNATIVE

LONG ISLAND

Preferred Alternative: Rehabilitation A

A Navigational Continuum

REVISED 03.08.2011

Existing Conditions Site Plans - for reference only

General Description:
This treatment alternative proposes rehabilitating each island's cultural landscape to best portray the continuum of navigational history that characterizes the Apostle Islands as a system of light stations. Each island (and each light station) conveys specific characteristics related to particular periods of development in the navigation of the archipelago. This treatment will reveal this continuum by restoring missing historic features, and by repairing or altering others to convey the full historical significance of the system. Additions that are necessary to enable the compatible use of the light stations or islands are allowed as long as portions or features that convey the historical, cultural, or architectural values are preserved.

Period of Significance: 1858 - 1964

Please refer to the proposed treatments below.

	LaPointe Tower	Chequamegon Pt Lighthouse	Triplex	Oil Building	
Proposed Use of Building	Rehabilitate for guided visitor access.	Rehabilitate; no visitor access.	Preserve and maintain current use as vacant.	Preserve and maintain current use as vacant.	
Architecture	Increase ventilation at Tower; repair rust and delamination, seal joints; repair cracked glass at Lantern; repair windows and doors; paint interior and exterior complete.	Complete current rehabilitation project including: installing floor and access; installing windows; paint interior and exterior complete; Verify condition of roof and lantern.	Reroof; repair hole at soffit; repair broken wall shingles; repair windows and paint; replace missing exterior doors; repair entablature trim and north porch and paint all trim; remove all damaged gyp. board at walls and ceilings, patch in-kind; no interior paint/finish work; install moisture barrier at foundation.	Repaint roof and walls; repair door; mitigate moisture issues at masonry.	
Structural	Investigate structural significance of concrete foundation cracking, investigate structural significance of cracked bell fittings	No action at this time	Stop the moisture coming through the foundation walls, reduce the humidity in the basement to reduce the moisture content of the first floor joists, repair the first floor joists and sheathing, properly frame the first floor joists at the windows, repair the roof	No action at this time	
Mechanical	Increase ventilation for moisture control.	No action at this time.	Increase ventilation for moisture control. Cap and seal open sewer piping. Remove abandoned plumbing fixtures and unused mechanical components.	Clean and paint roof vent.	
Electrical	Provide PV power system to facilitate running of new ventilation equipment. Engage an LPI (Lightning Protection Institute) certified inspector to perform an inspection of the lightning protection system and provide findings and recommendations in accordance with LPI-175.	Remove overhead conductors (de-energized) from newer light structure and connect them with suitable distribution equipment to historic tower. Investigate possibility of moving existing USCG light (USCG Aids to Navigation) from USCG Culvert tower to Historic Tower and removing USCG Culvert Tower. Engage an LPI (Lightning Protection Institute) certified inspector to perform an inspection of the lightning protection system and provide findings and recommendations in accordance with LPI-175.	Provide PV Array and storage battery system to provide power for increased ventilation.		
HazMat	Soil characterization (lead); remove/stabilize lead paint	Soil characterization (lead); remove/stabilize lead paint	Bat guano abatement; water intrusion/mold mitigation; soil characterization (lead); asbestos sampling of materials to be preserved/stabilized; abatement of damaged asbestos siding; remove/stabilize lead paint	Remove/stabilize lead paint	
Accessibility	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.	
	Spatial Organization/ Views and Vistas/ Clearing/ Topography	**Circulation/ Site Accessibility**	**Structures**	**Small Scale Features**	**Station Vegetation**
Landscape - LaPointe	1. Clear trees along shoreline to open views to Light Tower from lake 2. Clear trees at light station 50' from buildings and structures and restore station grounds 3. Clear trees at Concrete Footings - B (Radio Beacon Tower) 4. Maintain clearing at footpath from LaPointe to south shoreline (4' width)	1. Maintain Dock in current location and alignment 2. Repair concrete walks in current location (leveling; minor repair) 3. Construct new boardwalk in historic alignment 4. Remove east boardwalk 5. Retain corrugated metal path from LaPointe Light Station to south shoreline. 6. Reestablish cross island footpath corridor (10' width)	1. Stabilize Fog Signal Building foundation 2. Stabilize shed (roofing) 3. Remove utility units 4. New NPS accessible privy (location TBD by NPS)	1. Maintain cistern and piping (remove vegetation, masonry pointing) 2. Retain concrete rootings - A (steel framed radio tower) 3. Retain concrete footings - B (radio beacon tower) 4. Retain rubble pile (protect in place) 5. Retain fuel tank 6. Retain septic bed 7. Repair flagpole - weld; paint; reset 8. Retain pipe crib remnants in water	
Landscape - Original Lighthouse	1. Clear trees in and around lighthouse ruin and Oil Building	1. Further investigation - locate concrete walks under sand 2. Reestablish cross island footpath corridor (10' width)	1. Stabilize Lighthouse ruin (remove vegetation) 2. Maintain Oil Building 3. Stabilize privy (repair roofing) 4. Stabilize root cellar (repair roofing) 5. Retain and protect remnant shed		1. Maintain Cottonwoods and Maple (pruning)
Landscape - Chequamegon Point	1. Clear trees 50' from tower	1. Further investigation - locate, uncover concrete walks under sand 2. Maintain concrete walks (uncover; leveling; minor repair)	1. Maintain Chequamegon Point Lighthouse in current location 2. Remove USCG Culvert Tower	1. Retain original concrete footings for Chequamegon Point Lighthouse in water 2. Retain rubble crib remnants	
Landscape - Reservation	1. Reestablish cross-island footpath corridor (10' width)	1. Further investigation - locate cross-island concrete walk		1. Further Investigation - locate cross-island concrete walk	

APPENDIX B: SUMMARY OF HAZARDOUS MATERIAL FINDINGS

LONG ISLAND LAPOINTE LIGHT TOWER

Building Number	LCS ID 101643
Building Name	Long Island LaPointe Light Tower
>1% Asbestos Confirmed	
Asbestos Assumed[37]	Brick/Block Filler and Adhesives
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [38]	
Lead Dust on Floors >40 µg/SF Assumed [2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed [2]	
Visual Mold	
Lead in Soils >50 mg/kg[39]	Outside Tower Braces
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[37] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[38] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[39] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

CHEQUAMEGON POINT TOWER

Building Number	LCS ID 101656
Building Name	Chequamegon Point Tower
>1% Asbestos Confirmed	
Asbestos Assumed[40]	
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [41]	
Lead Dust on Floors >40 µg/SF Assumed [2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed [2]	
Visual Mold	
Lead in Soils >50 mg/kg[42]	Roof Drip line
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[40] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[41] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[42] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

TRIPLEX

Building Number	LCS ID 101647
Building Name	Long Island Triplex
>1% Asbestos Confirmed	
Asbestos Assumed[43]	Transite, Plaster, Brick/Block Filler, Adhesives, Caulk, Wall Interiors, Insulation, Plaster, Drywall and Roofing
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [44]	
Lead Dust on Floors >40 µg/SF Assumed [2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed [2]	
Visual Mold	Yes
Lead in Soils >50 mg/kg[45]	Roof Drip line
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[43] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment

[44] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.

[45] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

OIL BUILDING

Building Number	LCS ID 101648
Building Name	Long Island Oil Building
>1% Asbestos Confirmed	
Asbestos Assumed[46]	
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [47]	
Lead Dust on Floors >40 µg/SF Assumed [2]	
Lead Dust on Floors <40 µg/SF Confirmed [2]	
Visual Mold	
Lead in Soils >50 mg/kg[48]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	Yes

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[46] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[47] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[48] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

APPENDIX C: MATERIAL ANALYSIS REPORTS, LONG ISLAND

LONG ISLAND ACM SAMPLE CHART

Sample #	Sample Date	API ID	Sample Location	Material Description	Laboratory Result
B-LITRI-SF1-01	9/16/2009	25217	Triplex	Brown/tan marble pattern sheet flooring	ND
B-LITRI-SF2-01	9/16/2009	25217	Triplex	Multicolor splash pattern sheet flooring with pink mastic	ND
B-LITRI-SF3-01	9/16/2009	25217	Triplex	Green multicolor floor covering	ND
B-LITRI-SF4-01	9/16/2009	25217	Triplex	Red carpet patter sheet flooring with red mastic	ND
B-LITRI-SF5-01	9/16/2009	25217	Triplex	Green carpet patter sheet flooring with brown mastic	ND
B-LITRI-SF6-01	9/16/2009	25217	Triplex	Blue carpet pattern sheet flooring with red mastic	ND
B-LITRI-TP1-01	9/16/2009	25217	Triplex	Black tar paper with brown fibrous backing	ND

ND=None Detected
TR=Trace, <1% Visual Estimate

LONG ISLAND LEAD SAMPLE CHART

Sample ID	Sample Type	API ID	Sample Location	Sample Date	Reporting Limit (ug/sq ft)	Lead Concentration (ug/sq ft)
S-LILH-01	Soil Composite	25215	LaPointe Light Tower dripline	9/16/2009	16.5	BRL
S-LILH-02	Soil Composite	25215	LaPointe Light Tower outside braces	9/16/2009	19.2	3002.6
S-LITRI-01	Soil Composite	25217	Triplex dripline	9/16/2009	17.6	1373.1
S-LITRI-02	Soil Composite	25217	Triplex 5' out from dripline	9/16/2009	17.9	6955.4
S-LICLH-01	Soil Composite	25221	Chequamegon Point Tower dripline	9/16/2009	14.1	1743.5

APPENDIX D: FABRIC ANALYSIS

Fabric Analysis
Long Island Light Complex
Apostle Island National Lakeshore
October 15, 2009

On Tuesday, October 6, 2009, David Arbogast, architectural conservator, of Davenport, Iowa, received a large box containing paint and mortar samples from Elizabeth Hallas, AIA, LEED AP. Senior Associate of Andrews & Anderson Architects, PC of Golden, Colorado. She is in the process of preparing Historic Structures Reports for the historic lighthouse complexes of the Apostle Islands National Lakeshore, headquartered in Bayfield, Wisconsin. As part of the HSR's paint and mortar/plaster analysis is required in an attempt to ascertain historic finishes, mortars, and plasters for the subject structures. The samples were divided into sets contained within large manila mailing envelopes. The analysis follows the order in which the large envelopes have been arranged. The sixth set which is contained within this report was from the set of samples collected from the complex at the Long Island Light. There were 37 samples in the set, of which 33 were paint samples and four (nos. 13, 27, 33, and 36) were of plaster and mortar.

During the preceding twenty or more years Mr. Arbogast has performed paint analyses for various structures at the Apostles Islands. Those samples and his reports are in the archives at the headquarters in Bayfield and may be examined in relation to the findings from this analysis.

Analysis of the paint samples commenced on Friday, October 15, utilizing the same procedures used for the first set of samples. Numbering of the samples commenced with one and ended with 37. The following results were obtained from the analysis:

Triplex

Sample 1	**Munsell**
Light green	10GY 8/2
White	N 9.5/
White	N 9.5/

The first sample was collected from the wall of room A of the second floor of the triplex. It retained two layers of paint above a thick coating of plaster.

Triplex

Sample 2	**Munsell**
Light blue	7.5B 8/2
Off-white	2.5Y 8.5/2

The second sample came from the wall of room B of the second floor of the triplex. It revealed a thin layer of off-white paint beneath a light blue layer of paint.

Triplex

Sample 3	**Munsell**
Gray	N 5.75/

The third sample was removed from the door trim of room C of the second floor of the triplex. It consisted of a single, very thin layer of gray paint.

Triplex

Sample 4	**Munsell**
Light green	5GY 8/3
White	N 9.5/
White	N 9.5/
White	N 9.5/

The fourth sample was from the wall of room D of the second floor of the triplex. It retained four very thin paint layers – a layer of light green above three layers of white.

Triplex

Sample 5	**Munsell**
Pink	5YR 8/3
White	5Y 9/1
Glaze	--------
White	5Y 9/1

The fifth sample was found on the wall of room E on the second floor of the triplex. There was a very thin, very shiny glaze coat between the two white layers. This may have been either a coat intentionally applied to impart a high gloss to the paint or may been an atmospheric contaminant that was deposited on the surface, although this is quite unlikely.

Triplex

Sample 6	**Munsell**
White	N 9.5/
Off-white	2.5Y 8.5/2

The sixth sample was collected from the ceiling of room A of the second floor of the triplex. It revealed two paint layers on the paper surface of the gypsum board substrate.

Triplex

Sample 7	**Munsell**
Pink	5YR 8/3
White	N 9.5/
White	N 9.5/

The seventh sample was taken from the wall of room H of the first floor of the triplex. There were two paint layers above a whitewash layer which rested on the paper of the gypsum board.

Triplex

Sample 8	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/

The eighth sample was from the ceiling of room H of the first floor of the triplex. It was quite similar to its counterpart, sample 7, but with a layer of white paint on its surface rather than pink.

Triplex

Sample 9	**Munsell**
Light green	10GY 7.5/2
Light green	10GY 7.5/2
White	N 9.5/

The ninth sample was removed from the wall of room I of the first floor of the triplex. It revealed two layers of light green paint above a stark white layer which rested on the paper of the gypsum board.

Triplex

Sample 10	**Munsell**
Dark gray	N 4.75/
Gray	N 5.25/
Gray	N 5.75/
White	5Y 9/1

The tenth sample was taken from the trim paint of room I of the first floor of the triplex. Above a base coat of white paint was a set of increasingly dark gray paint layers.

Triplex

Sample 11	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Off-white	2.5Y 8.5/2
White	5Y 9/1

Sample 11 was collected from the wall of room G of the first floor of the triplex. It retained a set of three layers of white paint and a layer of off-white paint above a relatively thick layer of lime (probably whitewash). Between this layer and the white layer above it was a thick, fuzzy black layer which appeared to be black mildew or mold.

Triplex

Sample 12	**Munsell**
Light blue	7.5B 7.5/2
Light green	10GY 7.5/2
White	5Y 9/1
White	5Y 9/1
Paper	--------

Sample 12 was taken from the wall of room F of the first floor of the triplex. Above a paper substrate was a relatively thick layer of lime (probably whitewash) above which was a set of three paint layers. The paper substrate probably was that used for a gypsum board substrate.

Sample 13 was the first of the mortar and plaster samples. It was analyzed on Thursday, October 15, utilizing the standard testing procedure developed by E. Blaine Cliver, Regional Historical Architect of the North Atlantic Region of the National Park Service. It came from room I of the first floor of the triplex. It was white in color with painted paper firmly adhered to its surface. The paper with its paint was removed from the plaster prior to analysis, although some wood pulp appeared as part of the fines in the analysis. There was no reaction with the hydrochloric acid, indicating the presence of gypsum rather than lime. The sand sieve analysis, such as it was, revealed unground bits of gypsum plaster and no sand at all. The plaster proved to be composed of pure gypsum and no sand. There is little doubt that, in conjunction with the paper, this was gypsum board.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No.____ 13

Building:____ Triplex, Long Island, Apostle Islands NL

Location:____ First floor Room I plaster

Sample Description:____ White with wallpaper and paint (removed prior to analysis), moderately soft, no reaction, extremely fast filtering time

Test No. 1 – Soluble Fraction

Data:

1. 192.0 Container A weight
2. 203.0 Container A and sample
3. 761.24 Barometric pressure
4. 23 Temperature
5. 0.00 Liters of water displaced
6. Off-white Filtrate color
7. Brown Fines color
8. No Hair or fiber____type
9. 2.3 Fines and paper weight
10. 2.1 Filter paper weight
11. 197.3 Sand and Container A weight
12. 10.2 cc. of sand
13. 34.1 Weight of graduated cylinder and sand
14. 28.8 Weight of graduated cylinder

Computations:

15. 11.0 Starting weight of sample: No. 2 – No. 1
16. 0.2 Weight of fines: No. 9 – No. 10
17. 5.3 Weight of sand: No. 11 – No. 1
18. 1.9245 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 5.5 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 00 Gram weight of CaCO3: 100 x No. 20
22. 5.5 Gram weight of Ca(OH)2: No. 19 – No. 21
23. 0.0743 Mols. of Ca(OH)2: No. 22 divided by 74
24. 5.5 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.00 Gram weight CO2: No. 20 x 44
26. 3.27 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. ------- %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 11.0 Gram weight of sample: No. 15 – No. 25
29. 1.82 Fine parts/volume: No. 16 divided by No. 28

30.____92.73___Sand parts/volume: (No. 17 divided by No. 28) x No. 18
31.___________Lime parts/volume: (No. 24 divided by No. 28) x 1.1

Cement (if present)
32.___________Portland cement parts/volume: (No. 16 divided by No. 28) x 0.78
33.___________Natural cement parts/volume: (No. 16 divided by No. 28) x 0.86
34.___________Lime with cement parts/volume: (No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0.00
No. 20	107.0	106.4	0.6	11.32
No. 30	100.7	99.3	1.4	26.42
No. 40	101.9	100.8	1.1	20.75
No. 50	94.3	93.2	1.1	20.75
Base	72.3	71.2	1.1	20.75

Triplex

Sample 14	**Munsell**
Light green	10GY 7.5/2
Light green	10GY 7.5/2

The fourteenth sample continued the series of paint samples. It was removed from the wall of room M of the first floor of the triplex. It retained two very thin layers of light green paint without any substrate.

Triplex

Sample 15	**Munsell**
White	N 9.5/
White	N 9.5/
Light green	10GY 7.5/2
Dark tan	2.5Y 6/4
Light green	10GY 7.5/2
White	N 9.5/

The fifteenth sample was from the wall of room J of the first floor of the triplex. Above a thick base of lime (probably whitewash) there were five paint layers.

Triplex

Sample 16	**Munsell**
Off-white	2.5Y 8.5/2
Gray	5Y 7/1

The sixteenth sample was found on the trim of room M of the first floor of the triplex. On its wood substrate were two very thin coats of paint.

Triplex

Sample 17	**Munsell**
Pink	5YR 8/3
Pink	5YR 8/3

The seventeenth sample was collected from the wall of room N of the first floor of the triplex. It consisted of a pair of extremely thin layers of pink paint without any substrate attached to them.

Triplex

Sample 18	**Munsell**
White	N 9.5/
White	5Y 9/1

The eighteenth sample came from the ceiling of room N of the first floor of the triplex. Above a thick layer of lime (probably whitewash) was a layer of stark white paint. The substrate was paper.

Triplex

Sample 19	**Munsell**
Light blue	7.5B 7.5/2
Light green	10GY 7.5/2
White	5Y 9/1

The nineteenth sample was removed from the wall of room K of the first floor of the triplex. On its paper substrate were three thin paint layers.

Triplex

Sample 20	**Munsell**
Pink	5YR 8/3

The twentieth sample was from the wall of room O of the first floor of the triplex. It consisted of a single layer of pink paint without any substrate.

Triplex

Sample 21	**Munsell**
Light green	10GY 7.5/2
White	N 9.5/

Sample 21 was found on the wall of closet L of the first floor of the triplex. On the paper substrate were two layers of paint – white and light green.

Triplex

Sample 22	**Munsell**
Light blue	7.5B 7.5/2
Off-white	2.5Y 8.5/2
Off-white	2.5Y 8.5/2

Sample 22 was collected from the wall of room F of the first floor of the triplex. It revealed three paint layers on its paper substrate.

Triplex

Sample 23	**Munsell**
Tan	2.5Y 8/4
White	5Y 9/1

Sample 23 came from room Q of the second floor of the triplex. On its paper substrate was a layer of white paint followed by a layer of tan paint.

Triplex

Sample 24	**Munsell**
Light gray	10Y 7.5/1
Off-white	2.5Y 8.5/2

Sample 24 was removed from room P of the second floor of the triplex. It revealed two paint coats on its paper substrate.

Triplex

Sample 25	**Munsell**
White	N 9.5/

Sample 25 was from the trim of room S of the second floor of the triplex. It consisted of a single layer of white paint without any substrate.

Triplex

Sample 26	**Munsell**
Light tan	2.5Y 8.5/4
White	N 9.5/

Sample 26 was found on the second floor closet of the triplex. On its wood substrate were two layers of paint – white and light tan.

Sample 27 continued the mortar and plaster samples. It, and the remaining samples, was analyzed on Saturday, October 17. The sample was taken from the plaster of room S of the second floor of the triplex. It gave every evidence of being a standard sample of gypsum board. On one side there was paper with paint on its surface and other side merely had paper. The paper layers and the paint was removed prior to the analysis. The sample had a nominal reaction with the hydrochloric acid which was not measurable. This is clearly indicative that the plaster was not composed of lime but of gypsum. The fines proportion was disproportionately high. The fines were brown in color which probably indicated dirt associated with the gypsum. The “sand”, such as it was, consisted entirely of unground bits of plaster with no silicate sand at all. The 94.56 parts of sand shown on the data sheet merely represents the unground bits of plaster which, in truth, was not sand at all.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 27
Building: Room S, Second Floor, Triplex, Long Island, Apostle Islands NL
Location: Plaster
Sample Description: White with painted paper on one side and paper on other side, (paper and paint removed), moderately soft, miniscule reaction, rapid filtering time

Test No. 1 – Soluble Fraction

Data:
1. 185.5 Container A weight
2. 238.8 Container A and sample
3. 761.49 Barometric pressure
4. 23 Temperature
5. 0.00 Liters of water displaced
6. Yellow-green Filtrate color
7. Brown Fines color
8. No Hair or fiber ______ type
9. 9.9 Fines and paper weight
10. 3.3 Filter paper weight
11. 213.3 Sand and Container A weight
12. 50.4 cc. of sand
13. 41.9 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:
15. 53.3 Starting weight of sample: No. 2 – No. 1
16. 6.6 Weight of fines: No. 9 – No. 10
17. 27.8 Weight of sand: No. 11 – No. 1
18. 1.813 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 18.9 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0.00 Gram weight of CaCO3: 100 x No. 20
22. 18.9 Gram weight of Ca(OH)2: No. 19 – No. 21
23. 0.2554 Mols. of Ca(OH)2: No. 22 divided by 74
24. 18.9 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.00 Gram weight CO2: No. 20 x 44
26. 11.24 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. -------- %CO2 gain: No. 25 divided by No. 26

Conclusions:
28. 53.30 Gram weight of sample: No. 15 – No. 25
29. 12.38 Fine parts/volume: No. 16 divided by No. 28
30. 94.56 Sand parts/volume: (No. 17 divided by No. 28) x No. 18
31. ______ Lime parts/volume: (No. 24 divided by No. 28) x 1.1

Cement (if present)
32. ______ Portland cement parts/volume: (No. 16 divided by No. 28) x 0.78
33. ______ Natural cement parts/volume: (No. 16 divided by No. 28) x 0.86
34. ______ Lime with cement parts/volume: (No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	107.5	106.8	0.7	2.53

No. 20	115.9	106.4	9.5	34.42
No. 30	105.8	99.3	6.5	23.55
No. 40	108.8	100.8	8.0	28.99
No. 50	95.4	93.2	2.2	7.97
Base	71.9	71.2	0.7	2.53

Triplex

Sample 28	**Munsell**
Light tan	2.5Y 8.5/4
White	5Y 9/1
Off-white	2.5Y 8.5/2
White	5Y 9/1
White	5Y 9/1

Sample 28 resumed the series of paint samples. It was collected from the first floor of apartment #3 of the triplex. On top of its paper substrate was a lime (probably whitewash) coat followed by four paint layers.

Triplex

Sample 29	**Munsell**
Light green	10GY 7.5/2
White	N 9.5/
White	5Y 9/1

Sample 29 came from the first floor of apartment #3 of the triplex. It consisted of three very thin paint layers without any substrate attached to them.

Triplex

Sample 30	**Munsell**
Light gray-green	5G 8/1

Sample 30 was removed from the second floor of apartment #3 K of the triplex. It was merely a single layer of paint without any substrate attached to it.

Triplex

Sample 31	**Munsell**
Light green	10GY 7.5/2
White	N 9.5/

Sample 31 was from the second floor of apartment #3 of the triplex. It consisted of a stiff cardboard substrate with two paint layers firmly adhered to it.

Triplex

Sample 32	**Munsell**
Gray	N 5.5/
Gray	5Y 7/1

Sample 32 was found on the basement trim of the triplex. It consisted of a lighter gray paint coat beneath a dark gray over coat.

Sample 33 was of the mortar of the triplex. It was tan in color and was quite soft. It had a quick and bubbly reaction which is typical of lime mortar, but the very small water displacement is not typical. If the gray fines are considered to be dirt associated with the original sand an approximate mixture of two parts of lime to seven parts of sand, by volume, was discovered. The sand sieve analysis revealed extremely fine sand of which over one-quarter passed all of the sieves and almost two-thirds was trapped in the finest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 33
Building: Triplex, Long Island, Apostle Islands NL
Location: Mortar
Sample Description: Tan, very soft, fast and bubbly reaction, very rapid filtering time

Test No. 1 – Soluble Fraction

Data:
1. 188.9 Container A weight
2. 215.1 Container A and sample
3. 761.49 Barometric pressure
4. 23 Temperature
5. 0.08 Liters of water displaced
6. Yellow-green Filtrate color
7. Gray Fines color
8. No Hair or fiber ____ type
9. 3.8 Fines and paper weight
10. 3.0 Filter paper weight
11. 210.4 Sand and Container A weight
12. 14.0 cc. of sand
13. 50.2 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:
15. 26.2 Starting weight of sample: No. 2 – No. 1
16. 0.8 Weight of fines: No. 9 – No. 10
17. 21.5 Weight of sand: No. 11 – No. 1
18. .65116 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 3.9 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0032911 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 33 Gram weight of CaCO3: 100 x No. 20
22. 3.57 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0483 Mols. of Ca(OH)2: No. 22 divided by 74
24. 3.81 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.14 Gram weight CO2: No. 20 x 44
26. 2.27 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 6.17 %CO2 gain: No. 25 divided by No. 26

Conclusions:
28. 26.06 Gram weight of sample: No. 15 – No. 25
29. 3.07 Fine parts/volume: No. 16 divided by No. 28
30. 53.72 Sand parts/volume: (No. 17 divided by No. 28) x No. 18

31._____16.08___Lime parts/volume: (No. 24 divided by No. 28) x 1.1

Cement (if present)
32.____________Portland cement parts/volume: (No. 16 divided by No. 28) x 0.78
33.____________Natural cement parts/volume: (No. 16 divided by No. 28) x 0.86
34.____________Lime with cement parts/volume: (No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.9	106.8	0.1	0.46
No. 20	106.6	106.4	0.2	0.02
No. 30	99.5	99.3	0.2	0.92
No. 40	102.1	100.7	1.4	6.45
No. 50	107.4	93.2	14.2	65.44
Base	76.8	71.2	5.6	25.81

Triplex

Sample 34	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
Gray	5Y 6/1
White	N 9.5/

Sample 34 continued the paint analysis and was collected from the exterior window trim of the triplex. Above an extremely thin coat of white paint, which probably served as a prime coat, there was a coat of gray paint followed by a lengthy succession of coats of stark white paint.

Oil House

Sample 35	**Munsell**
Yellow-orange	10YR 6/7
Yellow-orange	10YR 6/7
Yellow-orange	10YR 6/7
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
Yellow-green	10Y 6/4
Charcoal	N 2.0/
Very dark maroon	7.5R 2/4

Sample 35 came from the exterior of the oil house. The quality of the sample was quite excellent with all layers being solid and easily discerned. The oldest very dark maroon only appeared as spots on the underside of the charcoal layer which did not adhere to any substrate.

Sample 36 was of the mortar of the oil house. It was gray in color and was moderately soft. It had a fast and bubbly reaction which is typical of lime mortar. It produced a strong sulfurous odor which may be related to its location in the oil house. It also produced an unusually high proportion of fines which consisted of black and red specks. The black specks floated on the water of filtration. If the fines are considered to have been associated with the original sand an approximate ratio of nine parts of lime to seventeen parts of sand, by volume, was discovered or, very roughly, one part of lime to two parts of sand. The sand sieve analysis revealed very fine sand, of which all passed the largest sieve and almost 30% passed all of the sieves. Over 43% was trapped in the finest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 36
Building: Oil House, Long Island, Apostle Islands NL
Location: Mortar
Sample Description: Gray, moderately soft, fast and bubbly reaction, sulphurous odor, rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1. 185.1 Container A weight
2. 194.5 Container A and sample
3. 761.49 Barometric pressure
4. 23 Temperature
5. 0.40 Liters of water displaced
6. Yellow-green Filtrate color
7. Black & red Fines color
8. No Hair or fiber ______ type
9. 3.7 Fines and paper weight
10. 3.0 Filter paper weight
11. 191.0 Sand and Container A weight
12. 4.2 cc. of sand
13. 34.6 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:

15. 9.4 Starting weight of sample: No. 2 – No. 1
16. 0.7 Weight of fines: No. 9 – No. 10
17. 5.9 Weight of sand: No. 11 – No. 1
18. .7118644 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 2.8 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0164557 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 1.65 Gram weight of CaCO3: 100 x No. 20
22. 1.15 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0156 Mols. of Ca(OH)2: No. 22 divided by 74
24. 2.37 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.72 Gram weight CO2: No. 20 x 44
26. 1.47 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 48.98 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	8.68	Gram weight of sample:	No. 15 – No. 25
29.	8.06	Fine parts/volume:	No. 16 divided by No. 28
30.	48.39	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.	30.03	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.		Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.		Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.		Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0.00
No. 20	106.6	106.4	0.2	3.92
No. 30	99.6	99.3	0.3	5.88
No. 40	101.6	100.7	0.9	17.65
No. 50	96.4	93.2	2.2	43.14
Base	72.7	71.2	1.5	29.41

Lighthouse

Sample 37	**Munsell**
White	N 9.5/
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Orange-red	10R 5/8
Charcoal	N 2.0/

Sample 37 was removed from the interior of the lighthouse. The top layer was stark white, but the other white layers had yellowed as is typical with oil paint. The orange-red layer is a typical color for red lead prime paint used for metal. It is strikingly bright and intense. The charcoal colored layer may be a factory-applied prime finish for metal.

Chequamegon Point Light

Sample 38	**Munsell**
White	N 9.5/
White	5Y 9/1
Cream	2.5Y 8/4
Cream	2.5Y 8/4
Gray	N 5.75/
Gray	N 5.75/

Sample 38 was from the Chequamegon Point light. It consisted of a long piece of aged wood with weathered paint on its surface. The pair of upper white layers readily detached from the cream layer beneath them as did the cream layers from the gray layer beneath them. All told there were six layers of paint on the surface of the wood.

A number of conclusions can be drawn from the analysis, as follow:

1. There was a low degree of consistency between the samples, making it difficult to draw any firm conclusions.

2. A number of samples had so few layers that one of the following conclusions can be reached:

    a. The building was relatively recent in construction as appears to be the case with the triplex. That fact, coupled with a relatively short period of occupancy would naturally leave relatively few paint layers.

    b. The oldest layers had either weathered away over time, which is probable with exterior paint.

    c. They may have been stripped.

    d. The element itself had been replaced.

    e. Other coverings such as wallpaper may have preceded the paint and were removed prior to painting. Wallpaper was a popular covering, especially for damaged plaster.

3. Whitewash was apparent used on several surfaces of the triplex interior as their probable original finish.

4. As can be seen with many of the mortar sample discussions no relative ratios of sand to Portland cement or sand to Portland cement and lime has been stated. The acid reduction method which was used is better than other methods for determining lime to sand ratios. Hence, they were provided for those samples composed of sand and lime. For samples containing Portland cement, the best this form of testing can do is to indicate the presence of Portland cement and the sand itself.

    The primary goal in repointing is to achieve a compatible mortar. This can be done for lime and sand samples that were analyzed. It can also be done for Portland cement samples with a bit of trial and error. If the mortar is very hard then a higher ratio of Portland cement to sand will work. One must take into consideration any deterioration of the masonry as a result of the mortar. If this has been the case it may be advisable to use a softer mortar for repointing.

    The other primary mode of mortar analysis is spectrographic testing. Unfortunately, it also cannot accurately determine exact ratios of Portland cement to sand and/or to lime.

    The secondary goal is to match the appearance of the mortar, which depends to a very large extent on the sand. This is where acid reduction testing shines. It provides and exact calculation of the sand grain sizes as well as a sample of the sand for matching of color. If the sand is carefully matched then the appearance will be successful. This is especially critical in partial repointing and patching.

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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