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February 10, 2010

Chris Riddle
Ohio Lake Erie Protection Fund
One Maritime Plaza, 4th Floor
Toledo, Ohio 43604

Grant SG 346-08

Dear Chris:

Attached is the Technical Report and historical assessment performed by Duket & Associates required to finalize the Lake Erie Protection Fund Grant, Phase One Toledo Lighthouse Plans and Specs. Also attached, as required is a short abstract about the project and the future of the lighthouse. This completes the Task One/Phase 1 exterior plans and specs, the building condition assessment and historic review. The final accounting was previously submitted.

The Toledo Lighthouse Society sincerely appreciates the grant provided by the Lake Erie Protection Fund and hopes that the Lake Erie Commission will continue to be part of the Toledo Lighthouse Restoration. Like the unique waters the Toledo Lighthouse serves, the lighthouse itself is one of a kind with the rolled roof and the buff brick. The view from the top about 64' out of the water is spectacular.

Please let me know if there are any questions regarding the final submissions. Thanks to Chris Riddle for his help and guidance throughout this process.

Sincerely,

Sandy Bihn
President

Toledo Lighthouse Phase One Plans and Spec and Reviews

The 4000 sq. foot Toledo Lighthouse is in good condition according to the Duket & Associates Architectural Firm. Restoration plans call for the lighthouse to be occupied by two couples three to four days at a time for six months of the year. The couples will schedule dock use and tours, clean the lighthouse and man the gift shop. The lighthouse will have new windows, doors and shutters, and will be powered by solar voltaic, there will be no air conditioning. Drinking water will be brought in from shore, gray water will have a filtration system. Wastewater will have a marine sanitation system. The lighthouse structure needs some 'filling in reinforcement ' which is minor thanks to the 1989 work by the Coast Guard that reinforced the crib, redid the brick work and secured the structure. The estimated cost of the project is $1 million. Grants will be sought for the restoration. The Toledo Lighthouse Society thanks: the Lake Erie Protection Fund and the O.D.N.R. Ohio Coastal Zone Management program for 61% of the cost; and its members and the public for raising funds for the remaining 39% to assess the lighthouse condition and to prepare restoration plans and specifications.

TOLEDO HARBOR LIGHTHOUSE

SUMMARY OF TASK ONE/PHASE ONE - TECHNICAL REPORT

1. SITEWORK

A. Crib Platform

The existing concrete deck appears to have been repaired or replaced in 1989 under the direction of USCGS. Surface finish is in good condition; neoprene expansion joint strips are missing or displaced and will be removed with new urethane sealant installed at the perimeter of the structure and all concrete joints in the platform deck.

Sides of the platform will not be addressed with the exception of any modification or reinforcement required for installation of photovoltaic panels. Steel shoring added along the northeast platform face in 1989 is in good condition.

B. Access Deck and Dock Platform

The modern dock and access ramp constructed in 2008 attached to the northeastern steel shoring was damaged by winter ice or vandalism. This will be replaced under a separate contract prior to construction to facilitate access.

2. CONCRETE

Excepting the Crib platform deck, exposed structural concrete is limited to the basement. There are no major visible problems. Corrosion of embedded steel beams occurs in vaulted areas exposed to view. There are some vertical cracks in the walls between vault rooms within the crib platform; these will be either filled with compatible material or an elastomeric sealant. Cleaning by low pressure wash followed by thorough inspection will reveal any concealed damage requiring attention.

3. MASONRY

Prior to renovation work, all masonry will be thoroughly cleaned using a low pressure wash with recommended products using methods appropriate for historic structures (detergents, alkaline prewash and acid neutralizer for stone, etc) following recommendations of the US Department of the Interior; National Park Service (NPS) Heritage Preservation Program - *Preservation Brief 1: Assessing Cleaning and Water-Repellant Treatments for Historic Masonry Buildings* (November 2000).

A. Basement walls

Care will be taken to isolate areas with displaced and fractured brick at vaults and areas exhibiting stress concentrations. Crack monitor gauges will be installed and a monitoring program will be implemented to evaluate building movement over time and provide data to assess building conditions.

B. Exterior walls

1989 repairs included replacement of brick pilasters and tuck pointing. This work is in good repair, although there is some indication of limited deterioration that will require further scrutiny. Unfortunately, the tuck pointing of masonry joints was performed using a Portland cement based mortar instead of a softer lime putty mortar as in the original construction.

Visual inspection of areas accessible from the crib platform did not reveal any major damage, with the exception of the pilaster adjoining the Tower and Engine Room at the main entry vestibule and the top course of brick in the wall recess below the stone cornice belt course at

the Third Floor line. Minor stress fractures have appeared in the modern brick along the stress lines recorded in a copy of one sheet of the 1989 drawing that has been located. The damaged course of historic brick shows compressive failure consistent with problems associated in the use of repair mortar that is harder than the original masonry. A thorough general cleaning of all masonry surfaces will be done to remove surface grime and allow close inspection of the exterior conditions. Remedial work will be performed on this area as follows:

Tuckpointing

All deteriorated or defective mortar joints shall be removed to a depth of 3/4" or until sound mortar is reached. Following joint evacuation, a proper and compatible mortar mix shall be installed matching the original mortar as closely as possible. Deteriorated or defective mortar joints are defined as those joints with faces that have weathered greater than 1/4" from their original profile, a fracture has occurred on one (1) side of the mortar joint greater than 1/32" (credit card width), if fractures are on both sides of a mortar joint, or the joint is missing entirely. Mortar removal shall be performed using either hand tools or small grinders specially designed for this type of work.

Expansion Joint

Grind out the entire vertical joint on both sides of all masonry pilasters abutting the exterior brick to create a new expansion joint. At designated locations, new expansion joints shall be installed by grinding through the exterior masonry veneer and creating a new joint approximately 1/2" to 3/4" in width (to be determined). After joint preparation, a backer rod shall be installed to achieve proper joint configuration, and a new high-quality elastomeric sealant shall be installed. All sealants shall be installed per standard industry practices.

Brick Patching

All damaged, random brick having lost less than 50% of their original unit size and still considered structurally sound, shall be patched with an integrally colored patching material after the surface has been properly prepared with a bonding agent.

Random Brick Replacement

Remove all random defective brick and replace with a new and approved matching unit. A defective brick shall be that as having lost greater than 50% of its original unit size, is structurally unsound, or is a brick unit where patching is undesirable.

Stress Fracture

Elastically repair all building movement stress fractures. The repaired areas will be treated with an aggregate impingement system so as to appear mortar-like.

Material Removal & Sealant Replacement

Remove all existing joint material to a minimum depth of one-half the width of the joint. Following joint evacuation and cleaning, a bond breaker shall be installed, and a high-quality elastomeric sealant shall be applied. If necessary to achieve proper depth, a backer rod will be installed. All sealants shall be applied per standard industry practices.

Stone Horizontal Patching

Inspect the stone window sills and cornice belt course by visual and acoustic methods. Any delaminated areas shall be removed to a depth of stable and sound stone. Voids shall

be prepared with a bonding agent, and a compatible patching material shall be installed, finished to the original contour and matched to the original surface as closely as possible.

4. METALS

Renovation shall conform to the guidelines provided in NPS publication *Metals in America's Historic Buildings* (1992).

A. Platform Railing

The original perimeter railing consisted of three strands of steel chain strung between wrought iron stanchions of two sizes. A pair of large stanchions were located at the center of each face of the platform. These were 2" square stock approximately 5'-6" high and topped by an ornamental ball and crown resembling Neptune's scepter. One of the original stanchions was retrieved during dredging operations in the 1989 repairs and will be donated for display purposes. Two of the smaller stanchions survive in the collection of the Inland Seas Maritime Museum in Vermillion, Ohio. These will be used as patterns for replication of design and finish.

B. Roofing/Siding

The Lantern Roof, Watchroom enclosure and Engine Room are all fabricated of rolled sheet. Because of limited roof access, close visual inspection has not been practical. Samples will be taken prior to construction to verify physical properties of the roof coating and confirm materials of construction. Observation of physical characteristics on the underside of the material suggests the roof is made of wrought iron with a carbonized linseed oil finish. The underside is uncoated in the Engine Room attic where conventional sheet steel has been used to cover the original window openings. This will be removed to install new clerestory windows. Deteriorated coatings in the Watchroom will be evaluated to determine material properties, age and whether appropriate for replacement.

C. Lantern turret and platform

Cast iron repair to minor damage in the door from the Lantern Room leading to the platform and removal of surface oxidation at the bottom sill is required. The steel will be cleaned and refinished and glazing replaced with reproduction units. Platform and railings are in good condition, requiring only surface cleaning and refinishing.

D. Interior railings/Miscellaneous

Stairs in the Engine Room Basement and attic are constructed of steel channel stringers with cast iron risers, treads and newels and steel pipe railings. These are in good original condition and will be cleaned and refinished. Stairs in the Tower from the Basement to the Watchroom are constructed similarly with ornamental wrought iron balustrade panels and wood railings. Only one of the original 24 baluster panels remains, which is sufficient for pattern replication. The original wood railing is in very good condition and will be refinished.

The original coal chute for the vaults on the southwest end of the platform were previously removed and filled with concrete. The original hinged wrought iron hatchway doors for the vaults at the northeast end of the platform have been replaced with modern steel lift-off style hatch covers. These are leaking and have significant corrosion and will be replaced. The design is problematic, as the original vault doors were set flush to the concrete and may not be suitable for excluding water intrusion. It may be necessary to install a modern sealed hatch cover with cosmetic rivets to replicate the original construction.

A complicating factor may be the size of wastewater treatment equipment to be installed in the Basement. Depending upon the requirements of the final system design, some enlarged access may be required which could entail enlarging the hoistway doors or providing a new floor opening in the Engine Room. This is currently under design review.

5. WOOD

Virtually all of the historic wood finish materials are intact and in excellent condition, requiring only cleaning and refinishing.

A. Flooring

Original floors in the occupied spaces within the tower (First through Third Floors only) are traditional tongue and groove wood strip flooring installed on sleepers over the concrete structural floor system. Following World War II (ca. 1951), modifications were made to remove the raised floors in the two toilet rooms and vinyl asbestos tile flooring was installed. Renovation work will be bid with two options, 1) remove and dispose of all VAT floor covering and refinish historic wood strip flooring OR 2) encapsulate VAT flooring with new resilient floor covering. The selected approach will be driven partly by available funding and functional requirements.

B. Framing and Blocking

Existing wall framing in the First Floor Engine room are remnants of a 1939 and 1941 remodeling to provide space for radio equipment and an operator. These are of minimal historic significance and will be removed to restore the room configuration to pre-war condition for use as an orientation and gathering place.

C. Wainscot and trim

Wainscot is in place where originally installed, baseboards were removed in some areas. No paneling was installed behind the original galley Kitchen on the First Floor. New matching wainscot will be installed for the new use (Gift Shop).

D. Cabinets

New counter base unit and upper cabinets will be installed in the new Kitchen to match the original millwork and finish.

6. THERMAL AND MOISTURE PROTECTION

The structure will be closed during the winter months and will rely on natural ventilation for summer operation. No modern HVAC or heating equipment will be required. The building is intended to be left in its original state without added building insulation.

A. Roof Flashing

Minimal repairs to be performed where required.

B. Sealants

New deck perimeter and control joint sealants installed as described in previous sections.

7. DOORS AND WINDOWS

A. Exterior Doors

Wood Engine Room doors removed previously will be replaced. Existing entrance doors will be refinished to their original condition. Steel (1913) storm doors (Engine Room) will be cleaned and refinished. Matching new steel storm door will be installed at the recessed main entry doors.

B. Interior Doors

The original doors have been removed from their frames. All doorways and trim will be refinished to their original condition. New doors matching the original design will be provided where functionally required. A new cased opening will be made between the First Floor Hall and adjacent closet providing a vestibule for circulation and access to the Toilet Room. The existing Toilet Room door will be relocated from the new Kitchen to open into the vestibule. Similar modification will be done on the Second Floor.

C. Hardware

Existing hardware will be cleaned and repaired.

D. Windows

The single remaining original window and storm sash will be removed and restored for use as an exhibit. New replacement windows will be installed in existing openings to match the original windows in profile and design. Option 1 will be a custom aluminum unit with historic frame profiles, option 2 will be an aluminum clad wood window of matching design.

E. Shutters

Original frame and panel shutters were face mounted to the window jambs and have not survived. Several steel propeller style shutter dogs of more recent vintage remain in the exterior masonry wall construction. Post-war (undated) building photographs do not show any shutters in place which may indicate the original shutters were abandoned during the period of occupancy. New shutters will be installed on offset pintels to match original units.

F. Glass and Glazing

Window glazing at the exterior was 3/16" thick clear polished plate glass, some fragments remain in the building. Interior transom lites and door glass are intact and in good repair. Stair risers at the main entrance had glass risers which are broken with many shards remaining in place. These will be removed and kept intact for exhibit use and replaced with new tempered glass.

The lantern was glazed using ¼" clear bent glass units in a diamond pattern. These have not survived and acrylic panels have been installed in silicon sealant. New ¼" tempered laminated units will be fabricated for the lantern and door and installed using the remaining original brass glazing stops. New stops required will be cast using patterns from the originals.

8. FINISHES

Interior finishes will be reproduced following the NPS guidelines in *Preservation Brief 18: Rehabilitating Interiors in Historic Buildings – Identifying and Preserving Character-Defining Elements* (October 1988) and *Preservation Brief 28: Painting Historic Interiors* (June 1992).

A. Walls and Ceilings

Plaster on lath. Ceiling work is flat with no deterioration. Walls are largely free of damage with limited areas requiring repair. Visible evidence of metal and wood lath suggest the locations of coal-burning floor furnaces in the original structure.

B. Flooring

Concrete floors in the Basement and First Floor Engine Room will be patched and sealed. Wood floors will be refinished as described above.

9. BUILDING SYSTEMS

A. Water Storage

We propose to use the existing cistern to provide water for washing. The water will be pumped through treatment to remove suspended solids (using replaceable cartridge filters) and disinfected using UV. A water analysis needs to be carried out to assess if further treatment is required to remove other contaminants such as iron, manganese and hydrogen sulfide.

This disinfected water will be held in a bladder tank until demanded by the bathroom or kitchen sinks. Once demanded, the bladder tank will empty and the cistern pump will be called to run. A single lamp domestic UV disinfection system will be provided, which will remain on at all times.

B. Sanitary Facilities

Temporary portable facilities will be provided during renovation. New plumbing fixtures will be selected to replicate historic fixtures where possible.

Dirty water from the sinks will drain to a grey water system. The grey water system will filter and store the water and will be used to flush the toilets. If the output of grey water is less than the input to the tank, it will be supplemented by water from the bladder tank.

Toilet water will pass to a black water system. The system will be a Marine Sanitation Device (made by Microphor) which uses filtration, biological treatment and chlorination. Discharge from this system will go to Lake Erie.

C. Power Generation

Temporary power during renovation will be the contractors' responsibility.

Electrical Service during operation will be provided by photovoltaic array with battery storage in the Basement. Panels will be rack mounted to the side of the crib platform on the southeast and southwest face.

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December 31, 2009

NHLPA Program
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ATTN: Geoffrey Burt
NHLPA Coordinator Ohio

Toledo Harbor Lighthouse
Maumee Bay at Lake Erie
DAP Commission No. 05021

BUILDING CONDITION ASSESSMENT REPORT

Toledo Harbor Light Station (GSA 1-U-OH-801) is located offshore at the western end of Lake Erie (N 41°45'42.680" W083°19'44.470") marking the entrance to the Toledo Harbor channel in Maumee Bay. It was designed in 1898, construction began in 1902 and the building was dedicated May 23, 1904. The structure was erected on a concrete perimeter beam and deck supported by a timber and stone crib rising approximately 20 feet from the bed of Lake Erie creating a platform 48 feet in width x 86 feet in length with its long axis oriented approximately 32 degrees east of true north. Average Mean Lake Level is 7-8' with the waterline approximately 6' below the Basement Floor level.

The building design is a unique blend of styles combining Romanesque masonry detailing with Russian Revival/Byzantine design elements in the domed roof cupolas which are adapted to its maritime purpose. The beacon is housed in a Lantern Room built of bronze and copper castings set on a cylinder built of steel angle shapes covered with steel plate. The Lantern was originally clad with ¼" bent glass which has been replaced with clear acrylic panels set in a bed of silicone sealant using the cast bronze glazing bars where they remain. Beneath the Lantern Room is a larger steel cylinder housing the Watchroom with five portholes to provide views of the shipping lanes. The remainder of the structure housed equipment, signals and communication gear and the support staff. The building was occupied continuously from 1904 through 1965. The property has been mothballed since that time. Except for very minor interior changes in the Engine Room, there are no building alterations, Significant repairs were made by the United States Coast Guard in 1989 with addition of armor stones along three sides of the platform and sheet piling to create a dock along the northeast side.

EXTERIOR INSPECTION:

1. ROOFS:

The Lantern and Watchroom are situated atop a three story steel-frame and masonry Tower centered on the southwest end of the platform. The cupola and roof structure consist of fabricated steel trusses covered with ¼" steel plate and battens (Photos 1and 3). There is a perimeter gutter of fabricated steel sections and plate that also functions as an ice and snow fence.

The Engine Room at the northeast end of the platform consists of a single story bearing wall structure with basement. As in the Tower structure, the roof structure is fabricated from rolled steel angle trusses forming a cupola topped with a clerestory extending over the center portion of the ridge (Photo 2). The clerestory roof is constructed in a similar manner using wood timbers fastened to the steel angle framing to anchor the original windows which have subsequently been covered by steel plate (date unknown).

A. Metal:

From a visual inspection of exterior metal, there are no indications of significant corrosion or penetration in the sheet metal (see flashing section below). The absence of extensive oxidation in the original protective coating suggest that the roofing sheet material is wrought iron rather than a Bessemer-process steel. It likely has a "Forge Black" iron finish (primarily carbon black with a linseed oil carrier) rather than an applied organic paint coating.

This was commonly utilized in ship hulls and maritime construction from this period. Samples of the coating will be taken during renovation for analysis of properties and compatability. The implications of this affect renovation material selection as a traditional coating would likely trap moisture against the metal surface promoting oxidation.

Minor punctures from removal of equipment will be repaired, there appear to be no other patches, repairs or deterioration in the orignal roof surface (Photo 4). Proposed improvements will include a thorough cleaning and new coating to match the original finish.

2. ROOFING ELEMENTS:

A. Projections:

The original weather vane and ball ventilator on the Lantern cupola as well as the ornamental metal ridge comb on the Engine Room clerestory are intact and require only minor finish repairs. Modern additions of weather monitoring guages wil be removed or relocated.

In 1939, a Radio Becon was installed. These modfications included a freestanding 65 foot high steel pole erected at the northeast corner of the platform with an antenna array spanning to the Lantern platform. Insulators, guys and cabling for the antennawere anchored to the building wall and parts of the roof. Further modifications to this system were made in 1941, all of which were subsequently removed at a later date. These points of attachment and related damage will be repaired during renovation (Photo 4).

B. Galvanic Action:

There are no visible signs of galvanic corrosion from dissimilar metals. Surface oxidation at the edges of the flat steel sheet, battens and rivets will be thoroughly cleaned and refinished.

C. Cornice:

Cast iron trim covering the roof edge termination at the masonry wall line is largely intact and in excellant conditon. One missing trim piece at the northeast corner of the Engine Room will be repaired or replaced (Photo 5).

D. Underside of Roof:

The entire underside of the steel roof is visible from within the structure and shows no evidence of moisture intrusion. Paint/coating in the watchroom has deteriorated and will require removal (Photos 30 and 31). The unpainted surface in the Engine Room attic shows minor surface oxidation charateristic of iron silicate contained in wrought iron. Modern steel sheets added to cover the original clerestory windows have extensive oxidation and will be

removed. Further tests will be conducted on the original sheet roofing during renovation work to determine appropriate finishing options.

E. Flashing:

Wall flashing appears to be intact and functioning, limited roof access prevents close inspection at the termination of the lower roof over the Engine Room. Condition to be confirmed during renovation. Evidence of water penetration in the Engine Room office suggests some localized through-wall moisture penetration requiring further investigation. This is most likely at the edge of roof termination, possibly a loose batten or fastener.

F. Gutters and Leaders:

Gutters are intact, leaders have been removed or, in a few places, replaced with sections of pvc pipe. These will be removed and new leaders installed fabricated in zinc coated steel with a paint finish to match original.

3. EXTERIOR WALL MATERIAL:

A. Masonry and Mortar:

Structurally, the building is two joined systems with a shared basement and foundation wall. The single story Engine Room has load bearing masonry exterior walls with beams supporting the Attic floor framing into a central steel girder supported on steel columns on the long axis of the building. The three story Tower is constructed of an unbraced steel frame with perimeter columns made up with riveted steel "S" shapes carrying steel girders and the same beam and girder design supporting the floor system.

There is a 12" diameter cast iron center column extending from the Basement to the Lantern Room floor, housing the counterweight assembly which provided the rotational force to operate the original beacon and its turntable (Photo 6). All columns bear on cast iron base plates set into the Basement floor slab bearing on concrete grade beams. Lateral force resistance is provided by the exterior masonry envelope acting as shear walls.

Basement perimeter walls are 19" thick (5 wythes), constructed of common brick with limestone facing extending 3 feet above grade. The original lime wash interior finish has mostly dissolved at the building perimeter from moisture intrusion. Interior mortar joints remain in good condition (Photo 7). Corners of the archway entries into the storage vaults at each end show stress fractures and damage, although horizontal joint alignment do not indicate any vertical displacement that would indicate settling (Photo 8). Some areas of perimeter wall along the northwest side beneath the Engine Room show evidence of lateral displacement into the room. This is consistent with freeze thaw damage at the inner masonry wythe, although there is a possiblity this may be related to external pressure from Lake ice. Further investigation is warranted.

Repairs done in 1989 included a new concrete deck over the platform utilizing elastomeric joint seals that are failing. There is also a substantial gap at the perimeter of the building with no expansion joint filler (Photo 9). Both conditions are primary contributing factors to uncontrolled water entry into the basement. New remedial joint sealants and deck coating will be included in the scope of renovation work.

The face brick are a buff color that may contain some manganese, a small sample was retrieved for analysis and color match. All external corners and jamb openings are half bullnose shapes with a full bullnose shape used as rowlock units to define the arches. Interior brick appear to be a common molded red clay brick widely used in the region. It has been suggested these were of local manufacture, perhaps from the Ohio Brick Company

formerly located on Consaul Street (founded 1902) in East Toledo and this is currently being researched.

The exterior masonry incorporates a limestone water table base projecting 2" beyond the wall ine and extending 3' above the platform elevation. At the Tower, brick masonry pilasters wrap the columns with the infill walls (16-3/4" thick, 4 wythe) set back 2", terminating in a horizontal band at the Third Floor window sills set off with two courses of brick corbeling and capped with a limestone sill and belt course. Above the belt course, projected brick masonry arches spring between pilasters framing the Third Floor windows with an additional corbelled band at the roof cornice. Window openings have projected limestone sills and shallow arches at the head composed of a soldier course topped with a rowlock bullnose shape.

Some carbonation of the limestone is observed, but there is only slight degradation (peeling) of a few units and no exfoliation. There is physical damage to the face, corners and underside on a few of the window sills that will require patching (Photo 10), but for the most part the stone is in excellent condition. The limsestone cornice belting exhibits signs of greater wear from exposure with some visible cracks and displacement of previous repairs (Photo 11). These will be properly addressed during the renovation.

B. Previous Renovation

The existing mortar has not been sampled, this will be undertaken as part of the masonry renovation work. From the building's age, we know lime putty mortar was orginally used, but the extensive repair work done in 1989 appears to incorporate a portland cement based mortar in the tuck pointing.of all exterior joints. This has held up well, with a few caveats.

Attempts to locate construction records for the 1989 repairs and estabish contact with the responsible professionals have been unsuccessful. We were able to obtain one photocopy of a single elevation drawing from this work that includes phoptographic documentation of the exterior masonry condition at the time of renovation. There were multiple parallel continuous vertical cracks running through all courses at all faces of the original brick masonry pilasters. The extent of damage was such that all but one pilaster was replaced with new extruded brick which is a close match in shape, but not texture or color. Remnants of this damage above the limestone belt coursing were repaired with pointing mortar and are visible in the photos (Photo 12). There is limited stair step cracking in mortar joints in a few previously repaired infill wall areas.

There is notable brick deterioration found in the top course of the infill wall on each face of the Tower beneath the corbeling. This condition is indiscernable in the 1989 document. Displacement and compression damage has destroyed the exterior face of the brick along the infill wall this location and the remnants of this course are displaced in a bowed manner with the ends of the brick restrained at the pilasters (Photo 13).

Cracked brick generally are caused by excessive compressive forces related to expansion or movement. In the lighthouse envelope, this could result from one or a combination of several factors.

Thermal Expansion

Contemporary masonry constructon guidelines for our region (Climate Zone 5) suggest masonry control joint spacing at a maximum of 12'-0" horizontally at exposed exterior walls, located near building corners and at openings with provisions for lintel bearing to minimize stresses . This is more critical for veneer and frame construction, but also applies

to load bearing wall conditions. The Tower dimensions slightly exceed of 28 feet per side and overall length of the structure is 60'-8" at the Basement and First Floor.

Structural Movement

We were fortunate in being able to locate construction photographs that show the structure and masonry work in progress prior to completing the Tower. The steel frame that is visible does not have an provisions for lateral force bracing common in current building practice. This is to be expected as the building was constructed several years before the establishment of the American Institute for Steel Construction (AISC) and the subsequent adoption of standardized design specifications.

The attached photo shows a large vertical fracture at the base of the pilaster at the northeast corner of the main building entrance (Photo 14). This is the only stone in the building perimeter which exhibits this type of damage. The split is adjacent to previous repair work done in 1989. It is of interest that displacement is perpendicular to the wall plane with no dislocation vertically or parallel to the wall plane. This unique condition occurs at the point where the steel framed Tower abuts the load bearing masonry Engine Room.

The absence of similar damage on the opposite side of the structure indicates the wall opening at the entrance may be a contributing factor. A review of the drawings confirms no perimeter steel framing at the first floor line, which further suggests the crack may result from stress relief due to differential movement between the Tower and Engine Room, and not the consequence of a thermal, freeze/thaw or weathering process. There is also a pattern of hairline cracks in the replacement brick pilaster above the fracture that are not visible in the photographs. These are similar to the damaged original pilasters and further indicate some stresses from flexure or movement at this location.

Corrosion

Another common area of masonry fracture is from expansion pressure caused by oxidation from orcorrosion of structural or embedded steel. There is no visible staining found on masonry surfaces that is a normal sign of this type of derterioration, but it remains a candidate for investigation during renovation.

Portland Cement Repair Mortar

The degradation to the face of the top course of brick beneath the corbelling supporting the limestone cornice belt is classic spalling. The pattern and depth of dislocation appears to be more severe than would be expected from expansion cused by internal corrosion. The damage to the brick face is consistant with a hard portland cement mortar intefering with normal expansion and contraction cycles.

The steel frame members werepriginally protected with a bituminous coating that is still visible at the exposed first floor beam in the stairwell between between the Second and Third Floor. This factor and the absence of any signs of ferrous oxide stains within the masonry wall suggest that moisture penetration and resulting internal corrosion is not related to the degradation of brick.

An alternative cause of the compression failure in the upper course of masonry would be differential building movement. The roof structure and steel plate cladding act as unit similar to an inverted boat hull. Under extreme weather events, imposed lateral forces acting oblique to the wall plane would not be restrained by the masonry shear wall action, falling outside the intended load path. Any resulting unrestrained forces could easily cause the type of compression cracking at the floor line combined with tension fractures in the pilasters which have been observed. The harder portland cement mortar would likely concentrate

pressure on the brick face that would normally be absorbed in the wall construction. This will be investigated and repaired during renovation.

Should corrosion be found in the steel members within the wall construction, a flexible through-wall masonry flashing membrane will be installed. The limited opportunity for structural modification will likely require creation of flexible sealant control joints vertically where pilasters return to the infill wall and horizontally beneath the corbelled stone cornice by cutting out the porland cement mortar that has been added and providing an elastomeric sealant and backer rod. Additionally, crack monitor guages will be installed at strategic points to record building movement and assist with developing a long term remedial maintenance program.

4. EXTERIOR FINISHES:

A. Painting:

With the exception of the removed windows, steel roof and lantern cladding, there are no exterior painted surfaces.

B. Decorative Elements:

The only purely decorative elements were the weather vane at the peak of the Lantern Roof and the ridge of the ngine Room cupola, both of which are intact and complete.

5. FENESTRATION:

A. Doors:

The building has three exterior entrances. The main entrance doors are recessed on the southeast face of the structure with a cast iron stairs leading to the First floor level. The risers were originally glazed with 3/8" sheet glass that has been covered with sheet metal.

The pair of glazed wood doors remain intact in their original location, although the wall opening has been sealed up with concrete masonry (Photo 15). These will be restored to their original condition at the date of construction (1902). A protective storm door or overhead coiling grille will need to be added for security and to protect the restored millwork. The bottom tread is cracked and will be repaired (filled or welded-Photo 16). The cast iron sill at the Engine Room doubel door is also cracked. All cast iron will be cleaned, repaired and refinished.

Access to the Engine Room is through a single personnel at the northeast and a pair of doors on the southeast. The orignal construction utilized a wood frame and panel style door with exterior wood storm doors. In 1913, the wood storm doors were replaced with the current steel plate doors that remain in place (Photos 17 and 18). The southeast pair of interior doors into the Engine Room were removed during the construction of a Radio Room in 1941. The status of the single personnel door on the northwest wall is no tknown as this is concealed behind a frame wall.

B. Windows:

The original windows were wood double-hung sash with pulley style balance mechanism. Each window had an exterior wooden shutter and a hinged interior glazed storm sash. The drawings do not show the shutters in elevation, but they appear to be a frame and panel style in undated historic photographs. The original plan drawings show the shutters to be face mounted to the widnow frames, although there are remnants of propellor-style steel shutter dogs on the face of masonry suggesting an offset hinge design.

There is a modern replacement window (double hung painted wood with spiral sash balance mechanism) in one opening on the northeast side of the Engine Room that has been filled on the exterior with concrete masonry. There is a single original window with storm shutter intact and damaged sash in the Engine Room Office in an opening that has also been filled (Photo 19). This will be removed and restored for display purposes.

All historic glazing in the Lantern Room has been replaced with acrylic. Most of the bronze and brass muntins and glazing bars are in tact and serviceable. Portholes in the Watchroom are in excellant working order with the orignal glass and hardware fully functional, requiring only replacement gaskets. (Photos 32-36)

C. Roof Hatches:

The original hatch covers were hinged steel fabrications of a bifold design set flush with the concrete deck. These have been removed and replaced with modern curb mounted steel lift-off type hatch covers that are leaking and in generally poor condition (Photo 20). These will need to be replaced.

6. EXTERIOR CEILINGS AND DECKS:

The plaster soffit at the recessed main building entrance is deteriorated and will require a new plaster finish on the existing clay tile surface (Photo 21).

7. GROUNDS:

The original concrete platform was covered with a wood deck, later abandoned. The concrete has a contemporary top slab added during the 1989 repairs that is in good condition. The orginal post and chain safety rail was removed in 1989, patterns for the stanchions have been located and will be used to replicate the railing (Photos 22 and 23).

8. INTERIOR INSPECTION:

A. Load Bearing Masonry Wall:

Above grade walls are in very good condition, basement walls as noted above. Interior masonry walls are generally in good repair with the exception of physical damage during previous modifications to mechanical systems, probably in the post Second World War period of use prior to 1989.

B. Cast-in-Place Concrete Wall:

All Masonry construction. One wall in the basement vault area has a shear crack where it abuts the perimeter crib. This wall is indicated to be plaster on brick masonry in the drawings, visual inspection appears to be cast-in-place concrete (Photo 24).

C. Steel Beams/Concrete Deck:

Based on date of construction and compiled mill records of member sizes, we believe at this time the material used in the steel framing was rolled by Carnegie mills and may possibly have been supplied by the recently founded U. S. Steel mill located in Lorain, Ohio (1901). This may be confirmed during renovation from mill marks on the exposed member in the Basement stairwell. All visible steel above grade is in excellent condition. Encased steel members in the basement are in good condition with the exception of vault supportrs at each end which show signs of significant deterioration from oxidation due to excessive water intrusion (Photos 25 and 26).

D. Floors

Original floors in the Tower were tongue and groove wood appllied over the concrete structure. Floors in the two Bathrooms were raised 6 inches (based on 1951 as-built drawing notation). Subsequent modifcations removed the raised subfloor in these areas and Vinyl Asbestos Tile finish was added (Photo 37). Floors in the Engine Room, Basement and other utilit areas is the orignal finished concrete.

E. Interior Wall Finishes

Engine room and other utility spaces are painted brick. Occupied rooms in the Tower are smooth plaster on wood or metal lath. Paint is peeling, but substantially in tact, original colors can be identified and matched (Photo 38). Kitchen and Bathrooms have original beaded wood wainscot. Physical amage to the interior plaster is found in a few areas, water damage is present in the Office (Room 107) in the Engine Room (visible in Photo 19).

F. Ceiling Finishes

Ceilings in occupied rooms is cement plaster applied directly to the concrete structure. Ceilings in the Basement are npainted vaulted concrete, in the Engine room exposed attic wood floor has been painted with aluminum paint (probably asphalt fibrated).

G. Stairs

Stairways were all cast iron treads and risers with ornamental iron balusters and wood rails. The railings are in excellent condition, requiring only cleaning and refinishing of the wood surfaces. The cast iron treads and risers require cleaning and refinishing. There remains only one ornamental iron baluster panel which will be used as a pattern for reporoduction together with the original drawings (Photos 27-29).

H. Interior Doors and Wood Trim

All interior door openings are in original condition with glass transoms and trim intact. These require cleaning and refinishing only. Where required for function, new doors will be made to match the original.

I. Interior Windows and Wood Trim

No interior windows. Wood interior trim at existing exterior windows is all original and requires only cleaning and refinishing.

J. Kitchen Cabinets and Counters

All casework and shelving have been removed.

9. MECHANICAL AND ELECTRICAL:

A. Electrical:

A few panels and one single modern dry transformer remain fiollowing service disconnection when the beacon was solarized in the 1990's by the coast Guard. The underwater electrical cable feed was abandoned at that time. Power and lighting in the original structure was not indicated on the construction drawings. Surface mounted conduit and electrical device locations are visible on the painted plaster interior walls, although most of this has been removed. A few ceiling fixtures remain with sufficient trim for identification (Photo 37).

B. Plumbing and Mechanical Systems:

All original soil and vent piping remain as constructed and are in good working order (Photo 38). The original water storage tank at the Fourth Floor level (Watchroom) has been removed. Supply lines routed in the concrete floors and masonry walls remain in place.

The orginal furnace and all distribution ductwork have been previously removed. Flue stacks in masonry chases remain in place.

C. Fire Protection Systems:

There is no Fire Protection system.

10. ATTIC:

All steel framing and the interior surface of steel roof panels are visible and in excellant. Most areas of interior roof coating (fibrated aluminum paint or hi-build paint coating?) have deteriorated beyond a slavageable point.

PHOTOGRAPHS

Photo 1 Engine Room and Tower in construction (undated, 1903?)

Photo 2 Engine room roof and cupola (1902-3)

Photo 3
Lantern roof frame (1903?)

Photo 4
Engine roof at return to Tower pilaster

Photo 5 Engine Room cornice repair (NE)

Photo 6 Counterweight at center column (Basement)

Photo 7 Basement Masonry Walls

Photo 8 Basement Wall at Vault Room

Photo 9 Base of Limestone Water Table

Photo 10 Limestone Sill damage

Photo 11 Limestone cornice repair (1989)

Photo 12 Pilaster damage repair (1989)

Photo 13 Brick compression below Limestone Cornice

Photo 14 Limestone Fracture at Pilaster base

Photo 15 Main Entrance Interior view

Photo 16 Entrance steps

Photo 17 Engine Room storm doors (SE)

Photo 18 Engine room storm door (NW)

Photo 19 Office 107 – Original Window

Photo 20 Hatch cover

Photo 21 Soffit at Entry

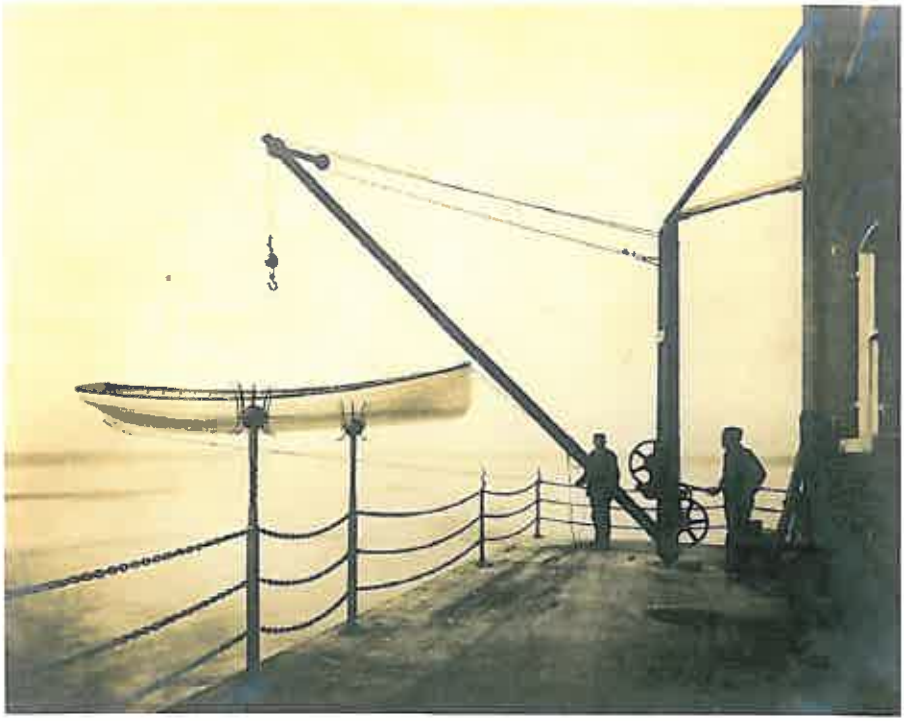

Photo 22
Safety railing
(undated)

Photo 23 Large Stanchion recovered during 1989 repair

Photo 24 Interior vault wall (Basement)

Photo 27 Basement Stair (No.2)

Photo 28 Stair No. 1 (Basement)

Photo 29 Stair No. 1 (Third floor)

Photo 30 Engine Room Attic

Photo 31 Watchroom

Photo 32 Lantern cupola

Photo 33 Lantern

Photo 34 Lantern (above door)

Photo 35 Lantern (inside)

Photo 36 Watchroom port

Photo 37 Lampholder (Third Floor stairway)

Photo 38 Plumbing Stack (Basement)

revised 3-5-2010

LAKE ERIE PROTECTION FUND

SMALL GRANT - FINAL ACCOUNTING

Grant Number: 346-08

v2008

Budget Categories	Orignal Budget	Funds Spent	Current Balance	Matching Funds
A. Salaries & Wages				
B. Fringe Benefits				
C. Total Salaries & Benefits (A+B)	$0.00	$0.00	$0.00	$0.00
D. Non-expendable Equipment				
E. Expendable Materials & Supplies				
F. Travel				
G. Services or Consultants				
Duket Architects	14900	$14900	0	36660
H. Computer Costs				
I. Publications/Presentations				
J. All other direct costs				
K. Total Direct Costs (C thru J)	$14,900.00	$14,900.00	$0.00	$36,660.00
L. Indirect Costs				
Total Costs (K + L)	$14,900.00	$14,900.00	$0.00	$36,660.00

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I certify that the grant expenitures listed and descriptions of the charges are true and accurate to the best of my knowledge. These expenditures represent approved grant costs that have been previously paid for and for which complete documentation is on file.

		Date
Project Director		3-10-2010
Authorizing Agent		3.10.2010
Fiscal Agent		