North Pier Light Diorama Journal

By: Jerry Longo

2022

BACKGROUND

The Erie Harbor North Pier Light is also known as the Presque Isle North Pier Light and the Presque Isle North Pierhead Light.

The light, situated at the far eastern end of Presque Isle, helps mariners as they traverse the narrow inlet between Lake Erie and Presque Isle Bay.

Originally constructed as a wooden tower in 1830, it was destroyed when hit by a schooner in 1857. The United States Coast Guard which operates the beacon, changed its fixed red beam to an automated red flashing light in 1995, at which time the 4th order Fresnel lens was removed and sent to the Erie Maritime Museum where it currently resides.

History of North Pier Light at Presque Isle Erie

by: Bill Nesgoda

Intro: The present white tower with its distinctive black horizontal band is located on the outer end of the North pier forming the entrance to Presque Isle Bay and Erie Harbor and has been guiding mariners since 1857. Known as Presque Isle North Pierhead Lighthouse or Erie Harbor Pierhead Light, the beacon has a design that is unique among surviving U.S. lighthouses. The lighthouse exhibited a fixed red light until 1995, when its fourth-order Fresnel lens was removed, and a modern flashing red light was installed in its place. The classic Fresnel lens can now be seen at the Erie Maritime Museum.

The current architectural design is a two-story, square pyramidal-type with heavy steel plates (1940) secured to its cast iron skeleton frame using carriage bolts and square nut fasteners. Atop the skeleton structure is the hexagonally shaped lantern room that houses the U.S. Coast Guard's current aid to navigation beacon powered by a solar panel and batteries. The beacon which is mounted on a cast iron pedestal stands 5 ft above the lantern room floor and has a focal plane of 43 ft above the lake level.

Details: The base of the 13 ft square skeleton frame is bolted to a 14 ft square x 2 ft high, concrete pad located near the end of the north pier at coordinates 42°09′24.12″N 80°04′14.16″W. This structure is relatively unchanged since 1940 when the light was moved to the end of the newly modified pier and fitted up with its current heavy steel plates.

The tower stands approx. 35 ft tall from its base to the top of the lantern room's peaked roof. The first story stands 19 ft 8 inches high from the base. The 9 ft square second story stands 8 ft high atop the pyramidal first floor.

The hexagonally shaped lantern room is 6 ft tall (inside dimensions) and 6 ft wide (across the flats of the hex shape). The lantern room has 3 ft high windows on the upper half of its 6 sides. Ventilation into the lantern room uses a small rotating disc on each hex side located below the windows. The lantern room is accessed from the second-floor ceiling via a curved trapezoidal shaped hatch. The 10 ft square steel viewing platform around the lantern room is guarded by 3 ft high cross pattern-type fencing. The viewing tower platform is accessed through the lantern room's ½ door below the north window. A fixed steel ladder is used to access the 2nd floor and lantern room.

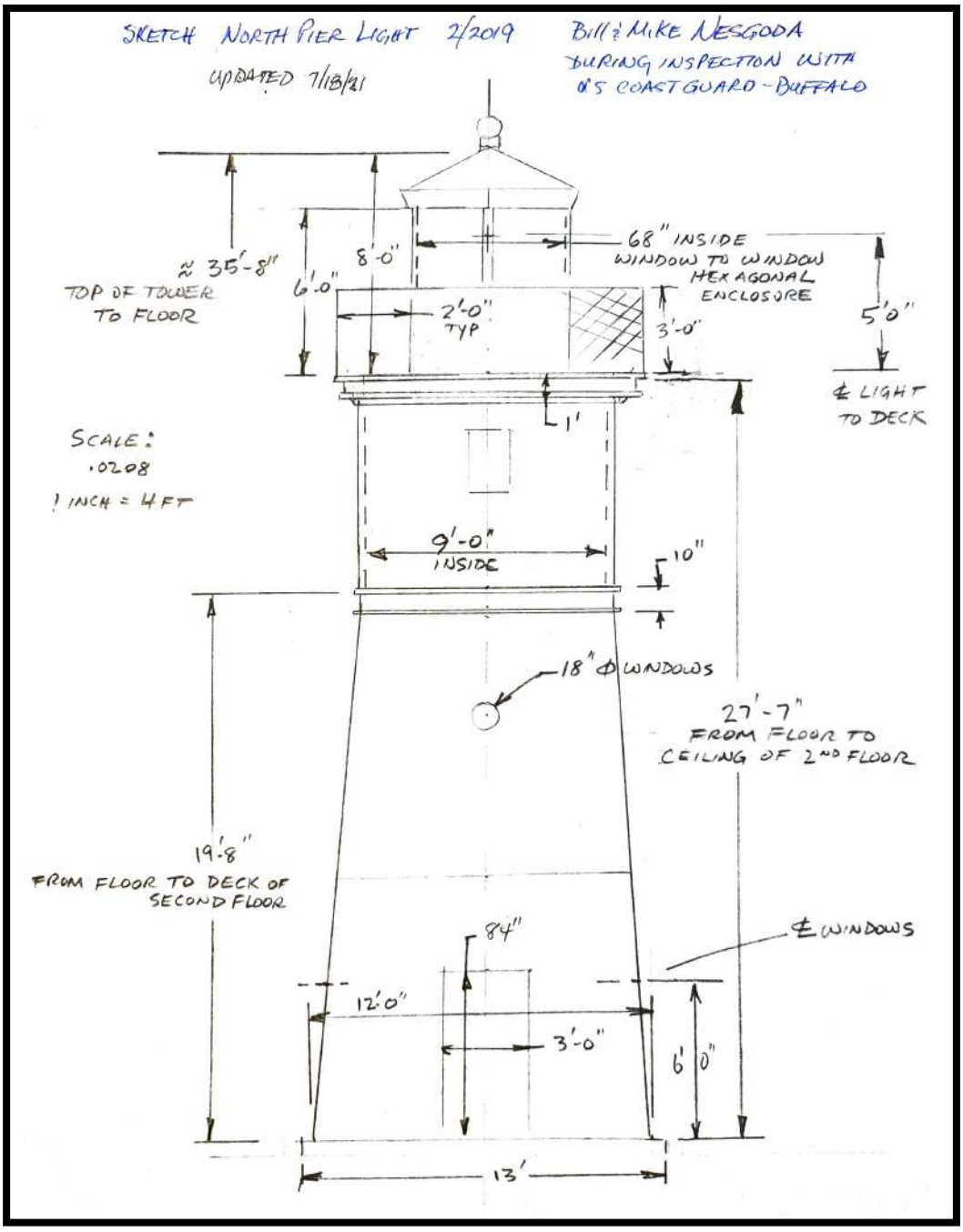
The first and second floors have circular 18-inch diameter portal windows on each of it's 4 sides. The second floor has two rectangular shaped windows. The entrance to the tower (from the West) is through a 7 ft high x 3 ft wide marine type steel door.

Details and Dimensions taken by Bill and Mike Nesgoda in Feb 2019 during inspection of North Pier light with U.S. Coast Guard - Buffalo Office.

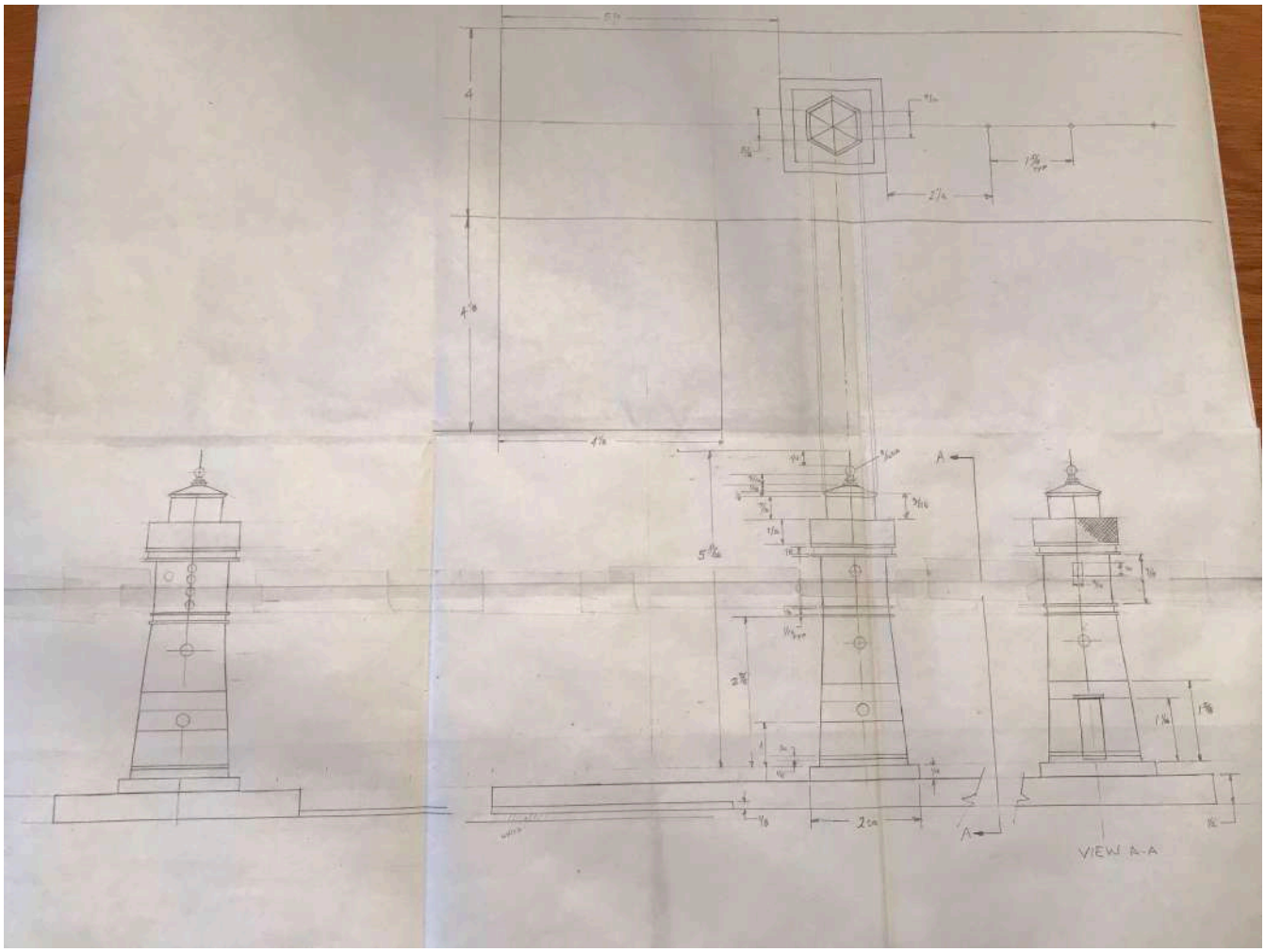
DIORAMA DESIGN

The diorama is built to 1:87 scale. The diorama features the North Pier Light structure, the pier side pad and a portion of the main pier. The diorama is interactive. A momentary switch controls a red beacon in the lantern and another momentary switch controls the green beacon on a buoy in the channel. By pushing either switch, the respective beacon will flash until the switch is released.

The following sketch was prepared by Bill Nesgoda. Dimensions shown in the sketch are actual dimensions he recorded during one of his visits to the North Pier Light with Buffalo Coast Guard representatives.



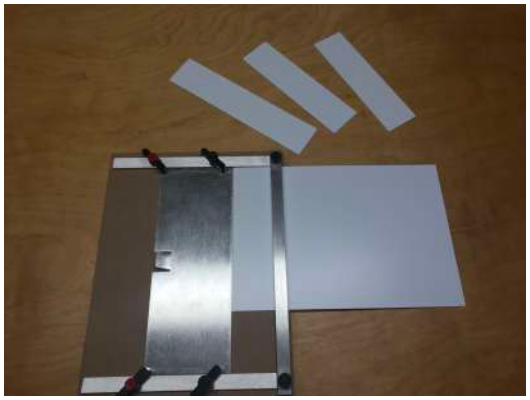
Picture of a reference full size scale layout I made is shown below. This layout was used to confirm 1:87 scale dimensional details of the light structure and pier.



CONSTRUCTION DETAILS

1st and 2nd Level Side Panels:

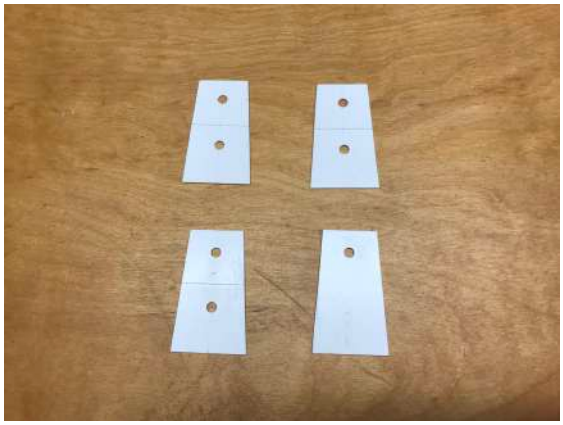
The 1st level and 2nd level side panels for the structure are cut from .040 inch thick polystyrene sheet. Cutting fixture shown below from Micro-Mark was used along with a utility knife to cut each panel section.



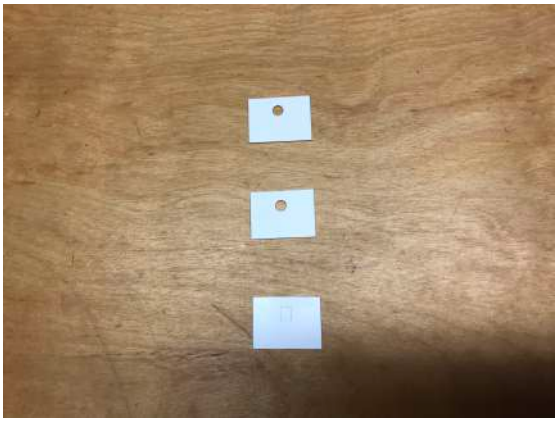
Cutting 1st level panel taper

Port holes in the side panels were drilled using a drill press and fixtures shown below.

Drilled side panels are shown below. The 2nd level side panel shown in the picture on the right without a port hole will eventually have a rectangular window. This side panel is located above the 1st level side panel which has the access door.

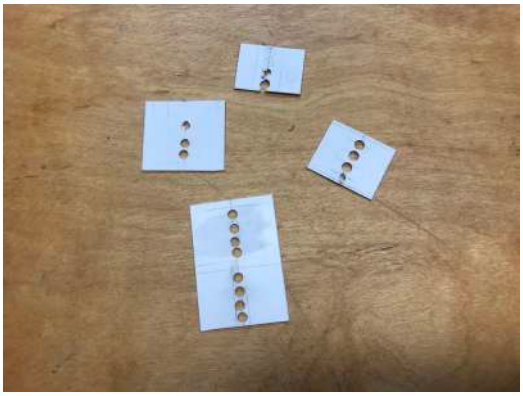


1st level side panels

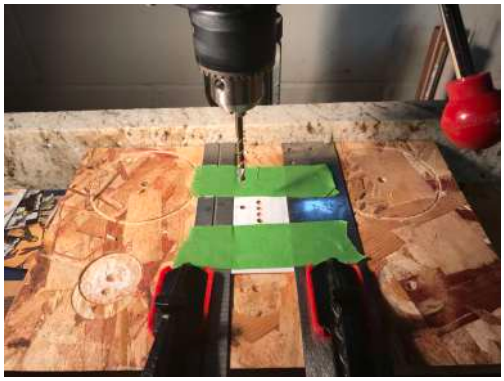


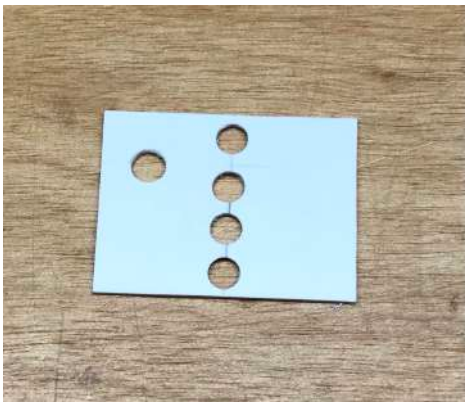
2nd level side panels

The 2nd level panel which faces North has 4 very closely spaced port holes as shown in a picture of the actual lighthouse on the left. Several attempts to drill the port holes using a fixture similar to that shown above were made with unsuccessful results as seen in the picture on the right.



The picture below on the left shows a different approach to a fixed mounted drill fixture. This fixture provided better control to drill the port holes without damaging the polystyrene panel. However, more accuracy was needed to control placement of the port hole pattern for an acceptable finished piece. This fixture was used to make a template which had the holes evenly spaced on centerline of the panel without damaging the polystyrene.





Template

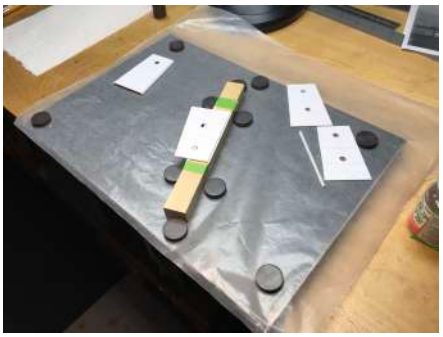
To achieve precise control over placement of the drilled holes, the drill fixture shown in the pictures below was built. This fixture consists of an HO scale model railroad track module and HO scale flat car. C-clamps were used to hold the track module in place on the drill press table. A block of wood as back up for drilling was secured with tape to the HO scale flat car.

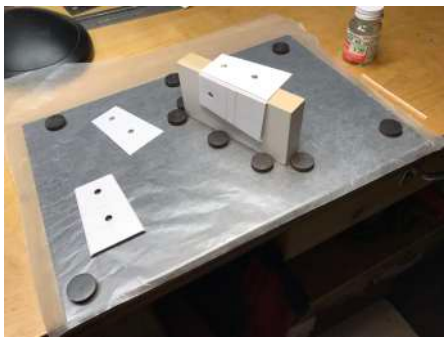
The template shown above was taped to the top of new blank panel which was then taped to the top of the wood block on the flat car. The track module and flat car was adjusted to achieve perfect alignment of the holes in the template with the drill bit. Once this was achieved, it was very easy to reposition the template and drill each hole by moving the flat car along the track aligning the drill bit with template hole.

After the 4 hole patten was drilled correctly, the template was repositioned to drill the one offset hole as shown below.

1st Level Assembly:

A prototype 1st level assembly was built to prove out the design and construction methods. The side panels were bonded together using strait edges and magnets on a steel plate as shown below.

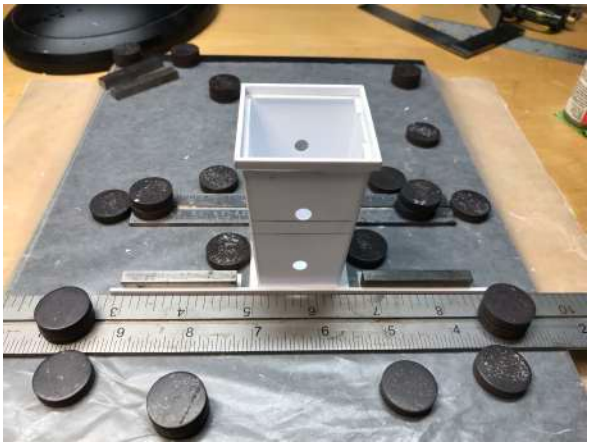


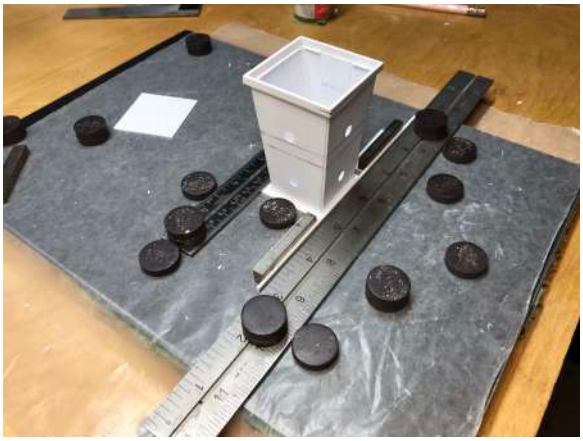


The final version of the 1st level structure built for the diorama was constructed using strategically placed magnets to assure the panels were properly aligned with each other at the angle. Fixtures shown above were also used to assure the panel assembly was square at the base.

A .060inch x .060 inch angle was bonded at the top inside of each base strip to provide a surface for bonding the base strip. This construction method assured the base strip was securely bonded and vertical.

A .060 inch x .060 inch angle was bonded to the outside top edge of each panel. This angle is used to bond to the transition plate. This construction design is very similar to the actual structure.

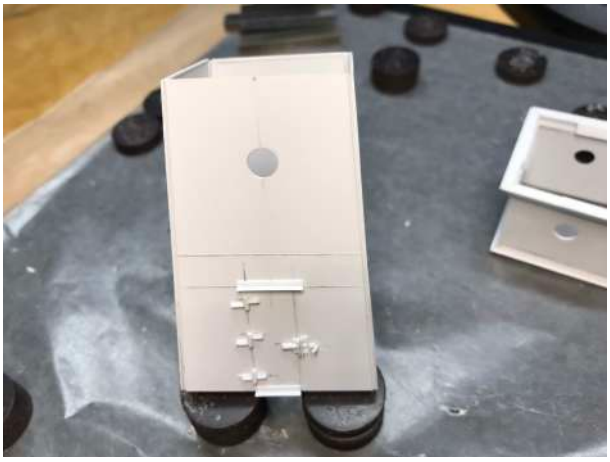




Door Installation:

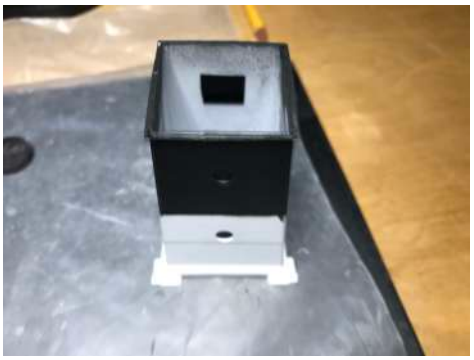
An access door opening was cut into the 1st level panel. A backup plate is bonded to the inside of the 1st level panel as shown in the following picture on the left. A door was cut and bonded to the backup plate so the door was flush with the 1st level panel. This build process produced a very fine "gap" around the door which is very typical to the actual structure. After the door was bonded in place, hinges, door latch, as well as the top and bottom drip edge were installed as shown in the following picture on the right.

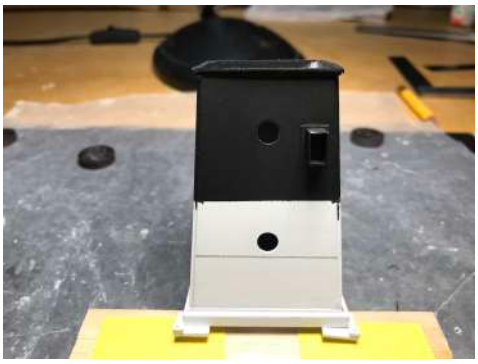
Final Paint and Window Installation:



After completion of the 1st level assembly, it was spray painted Rustoleum flat white then masked off to paint the upper section Rustoleum flat black. Many pictures of the lighthouse structure have indications the black paint had "run" down the outside corners after the many years of exposure to the elements. So I intentionally "weathered" the black painted areas to simulate this condition.

After the painting was completed, porthole window treatment shown in the picture on the left was bonded to the inside covering each panel porthole to give the appearance of blackened out glass which is similar to the actual structure. Notice these pictures show anchor bolt and anchor plates, which are discussed below, have been installed.



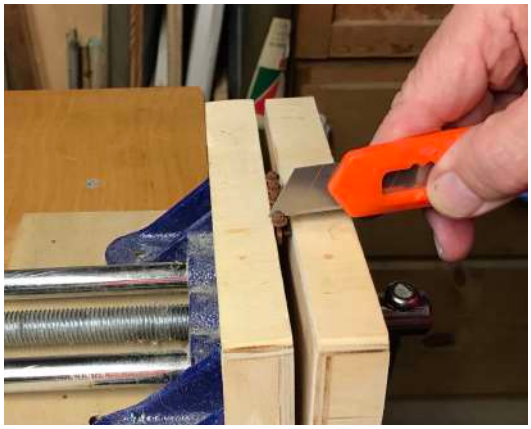


Anchor Plate Construction and Installation:

The actual lighthouse has four anchor plates used to mount the lighthouse to a concrete pad. The following pictures show how the HO scale version of the anchor nut and anchor plate was made.

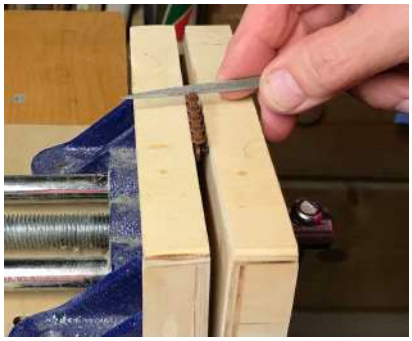
The purchased scale anchor nuts, shown below, were molded with a washer and stem which had to be removed.

Removal of the washer and stem and refinement of the size of the anchor nut was a very tedious process. The following pictures show how modifications to the anchor nut were made.

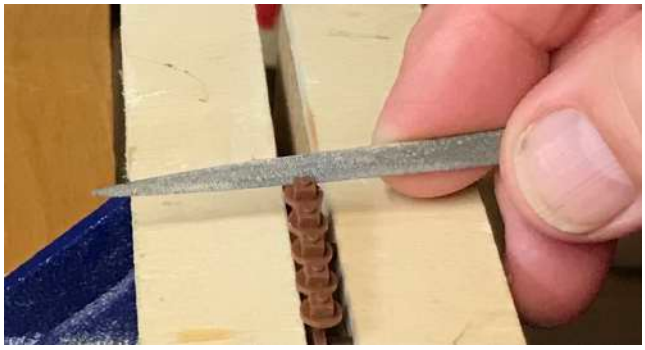


Washer removal

Close-up washer removal

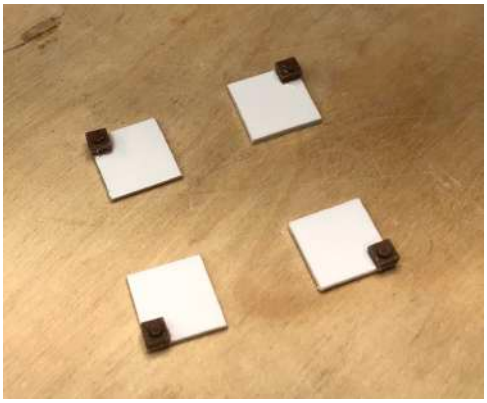


Sizing anchor nut



Close-up sizing anchor nut

After the purchased anchor nuts were modified, each one was bonded to an anchor plate as shown in the following picture. I photographed the assembly in this phase of completion so you could see the anchor nut detail prior to painting.



Stem removal

The next steps involved finish sanding and painting of the anchor nut and anchor plate bonded assemblies. After this was accomplished, the anchor plate assemblies were bonded to the base of the 1st level structure as shown below.

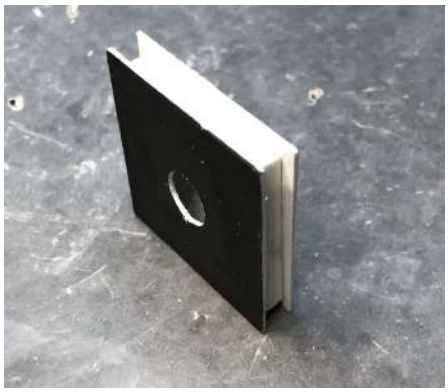
1st Level to 2nd Level Transition Spacer:

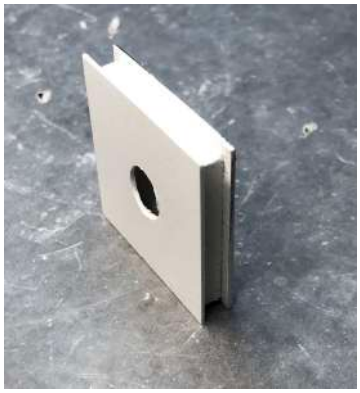
Between the 1st and 2nd level is a transition spacer with a plate on the top and bottom of the spacer.

The transition spacer was constructed using four pieces of .066 inch x .135 inch polystyrene strip. A right angle square was used to assure the strip pieces were perpendicular to each other and formed a perfect square.

Top and bottom plates were cut from a sheet of .030 inch thick polystyrene. The spacer was centered and bonded on one of the transition plates first. Then the other transition plate was bond to the spacer using a combination of right angle squares to assure the edges of the plates were aligned.

The assembled transition spacer is shown below. The black transition plate will face the 1st level. A clearance hole for the lantern beacon wiring was drilled each transition plate.



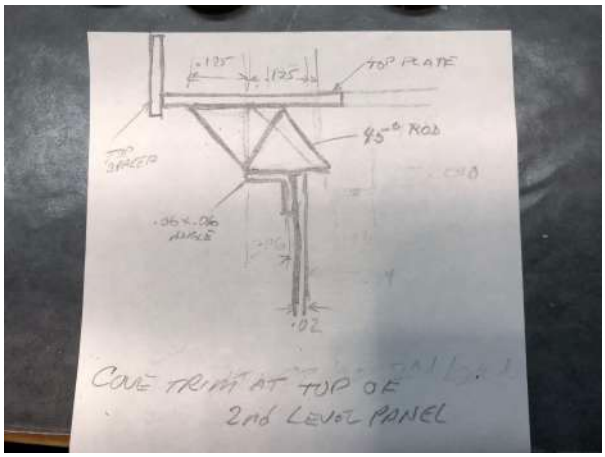


2nd Level Assembly:

The 2nd level is a square structure. The panel above the door of the 1st level has a small window. The panel facing Lake Erie has 4 small portholes which are sealed over from inside the structure. The other two panels have a small porthole.

At the top of the 2nd level is cove molding which transitions into the bottom of the transition plate to the Lantern Gallery (Lantern base plate). The cove molding was made out out of 45 deg triangular rod polystyrene.

This was a difficult piece to build because the 45 deg angle to join the pieces at each corner had to be cut so the triangular rod could be assembled with the point facing down. A backup piece of triangular rod had to be positioned behind the front piece to provide a surface to bond to. The following hand illustration is a cross-sectional view of the assembly. The transition spacer above the 2nd level has a very slight reveal over the transition plate as shown below …. more on this later

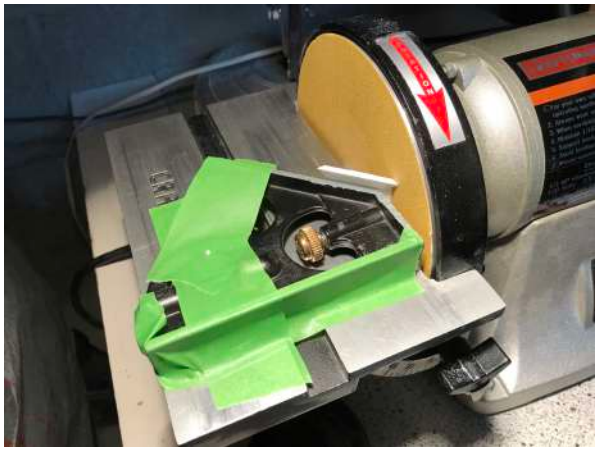


The following pictures show how the cove molding sections were constructed on a steel plate. A small piece of triangular rod was used as a support to hold the backup triangular rod section in place while it was being bonded to outside section of triangular rod.

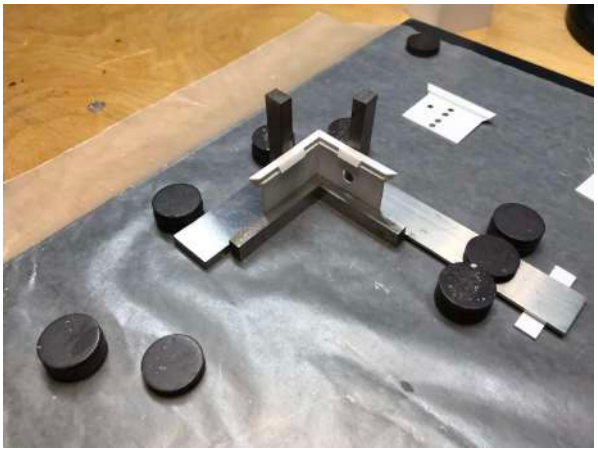
A .060 inch x .060 inch angle was bonded to the bottom and top of each 2nd level panel. These angles are structural bonding surfaces for the bottom and top transition plates. The picture below shows the grinding fixture used to cut a 45 deg angle on each end of the angle sections. This grinding fixture arrangement was used to cut 45 deg angle on all .060 x .060 angles which were bonded on the 1st and 2nd level panels.

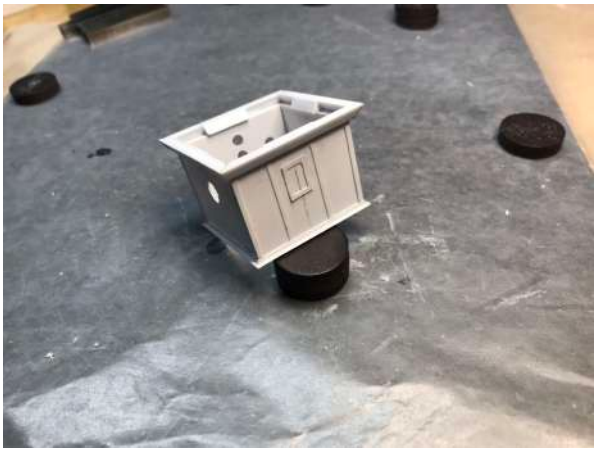
After the triangular rod cove molding sub-assemblies were built, each section was bonded to the top of each 2nd level panel. The sub-assemblies extended beyond the vertical edge of each panel to allow sufficient material to cut a 45 deg angle so the panels can be assembled in a square shape.

The pictures below show the grinding fixtures used to obtain a precise 45 deg angle at each end of the cove molding to obtain the precise length required for a perfect fit at the corners.

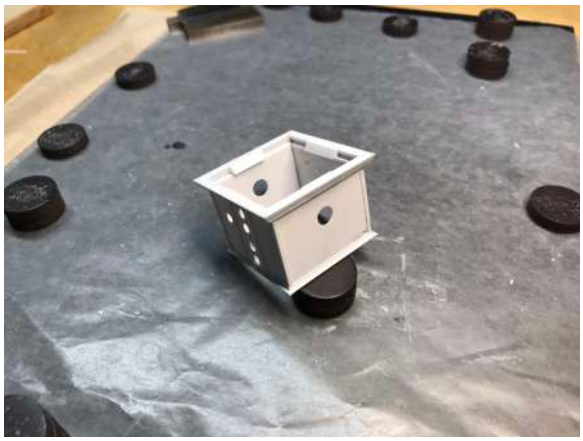


The following pictures show the sequence of assembly to build the complete 2nd level structure. As usual, a combination of squares, straight edges and magnets were used on a steel plate to assure accurate placement of each panel assembly to form a precise square shape. Outside corner molding and vertical stiffening members were added as shown below.





After the 2nd level assembly was completed it was spray painted Rustoleum flat white as shown below.

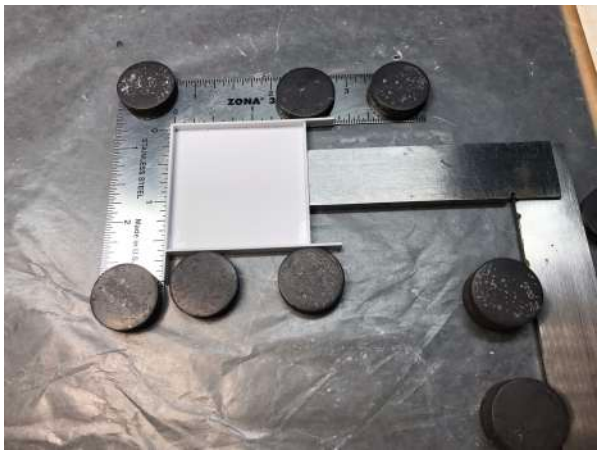


The entire 2nd level was then masked off to spray paint the window Rustoleum flat black (with rough edges) as it actually appears on the structure.

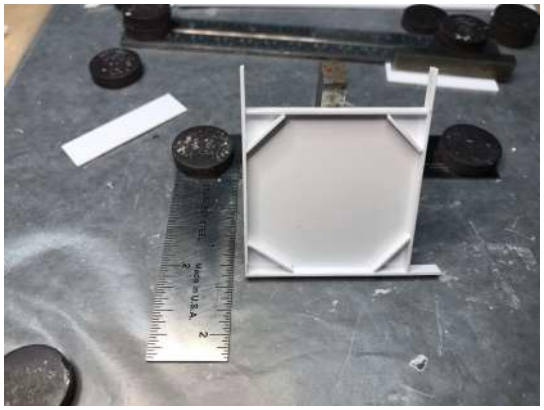
2nd Level to Lantern Transition Spacer

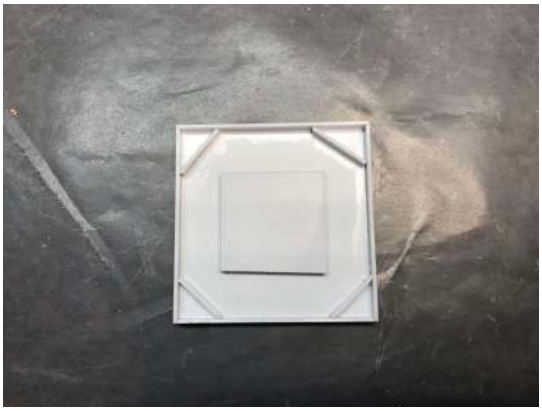
This transition spacer has a very slight reveal on the underside. This feature made construction of the transition spacer assembly more complicated than the previous transition spacer.

Spacers (.020 inch thick) were used to obtain the very slight reveal feature. Internal shims were used to provide structural rigidity and maintain the slight reveal. The following pictures show the construction and assembly process.



The picture on the left shows installation of corner angle braces to maintain squareness of the bonded assembly. Picture on the right shows the internal shims for structural rigidity.





The picture below shows how the top transition plate was aligned while bonding to the above pictured sub-assembly. Clearance holes for the lantern beacon wires were drilled in the above sub-assembly and top transition plate before final assembly bonding shown below.

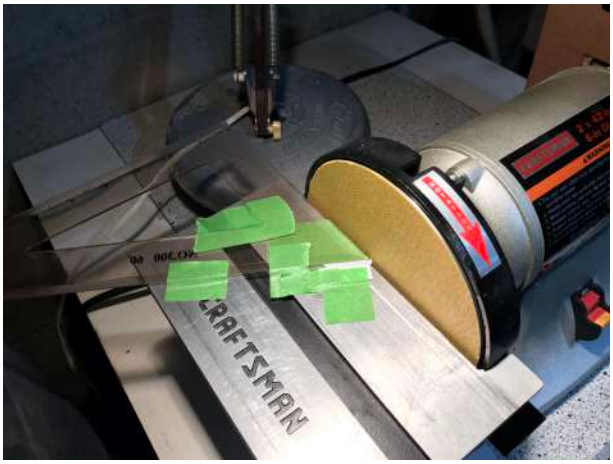
The top transition plate of this spacer assembly is the lantern gallery. This plate is painted Rustoleum flat black and has lantern locating blocks painted red and black bonded to the surface as shown below. The purpose of these lantern locating blocks will be discussed in the following lantern Construction section.

Lantern Design and Construction

The hexagonal lantern is made up of the following:

- 6 lower panels
- 2 “H” beams (1 each on the bottom and top of each lower panel)
- 6 lower panel outside corner molding pieces
- 6 panes of glass, 6 “U” channels (1 each on top of each glass pane)
- 6 outside glass pane corner molding pieces
- 6 piece cove molding under the roof
- 6 triangular roof section pieces
- 1 internal roof apex support
- 1 ventilator ball support
- 1 ventilator ball
- 1 lightening rod
- 1 orientation locator
- 1 beacon pedestal assembly (4 components)
- 1 flashing beacon
- TOTAL 66 pieces.

The lantern is the most complex section of the overall lighthouse structure. Many of the components are very small and required precise grinding of 60 deg angles to achieve proper fit of each piece. Grinding fixtures shown below consisting of 30-60-90 triangles accurately taped to the grinding wheel table were key to achieving precise 60 deg angles.



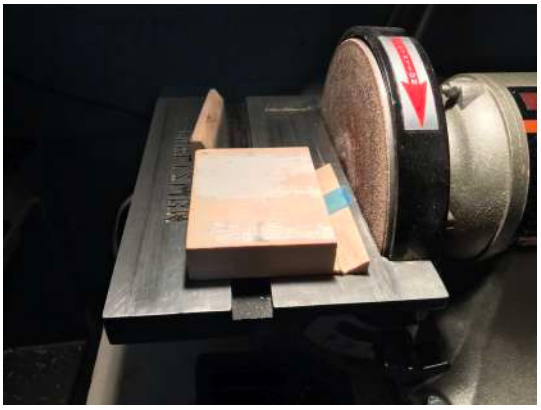
Lantern Design:

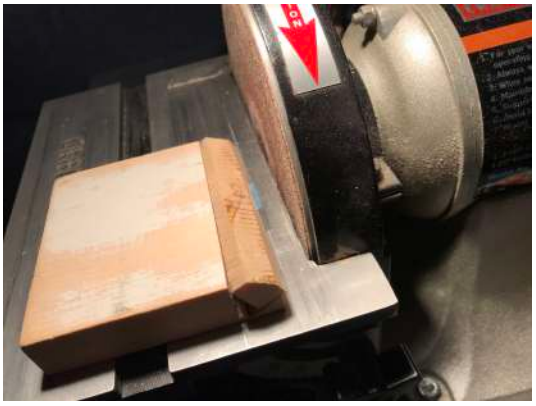
The lantern is designed and constructed to be removable to provide easy access to the lantern beacon just in case the beacon needs to be replaced. If the lantern is removed, special location blocks on the galley and in the lantern assure precise replacement of the lantern in the correct orientation. Details of how to remove and replace the lantern will be discussed later.

A special lamp pedestal and lamp has been designed in the lantern. The lamp is a slow flash red LED controlled by a momentary on/off switch located at the front of the diorama. More on the details of this feature later in the journal.

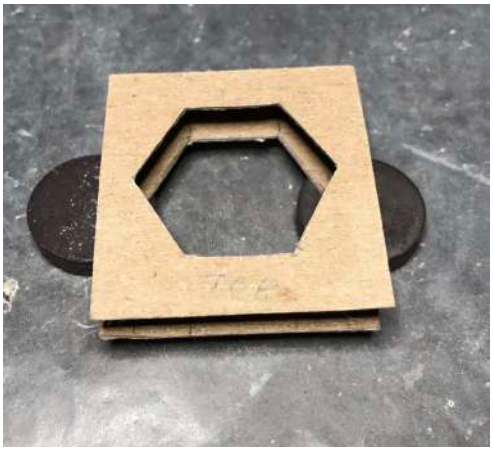
Lantern Construction:

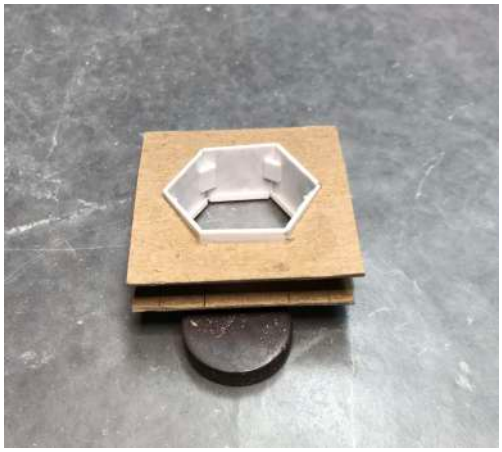
Each bottom side panel and glass pane in the lantern was cut to size using Micro-Mark Duplicate-it cutting tool. A special grinding fixture, shown below, was made to add a 60 deg angle to vertical edge of each base panel and glass pane.



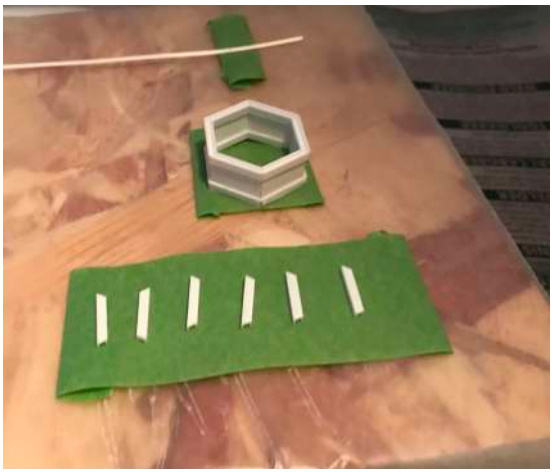


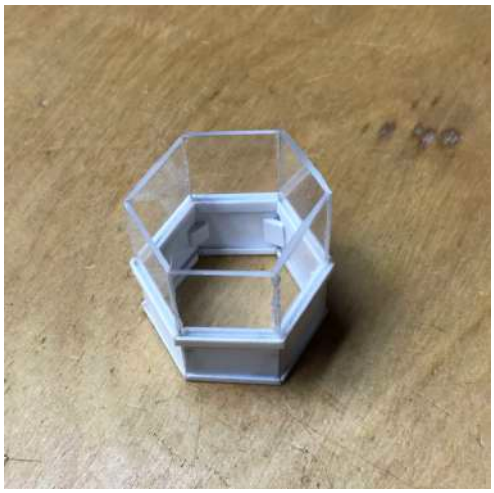
A hexagon template made out of cardboard, as shown below, was used to assemble the lantern room side panels.



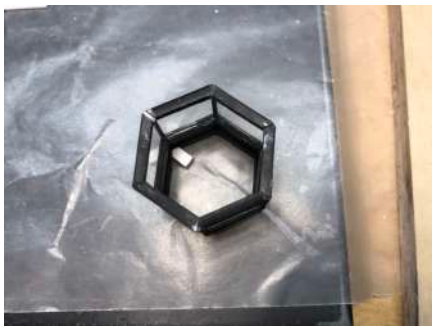


A prototype lantern base with glass panes installed is shown below. This prototype was built to prove out the process making the final assembly for use in the diorama. The assembly used for the diorama looked very similar to the prototype except “H” channel beams were used on the bottom of the lower panels and inside corner braces were not needed. The small channel pieces on the green tape were used on top of each glass pane.





The following pictures show the lantern painted flat black with the locator pin installed. This locator pin (originally white then painted red) assures accurate placement and orientation of the lantern on the gallery.



The top plate of the transition spacer between the 2nd level and bottom of the lantern is the lantern gallery. This plate is painted Rustoleum flat black and has lantern positional locating blocks bonded to the surface as shown in the pictures on the left and right. The lantern is correctly placed on the lantern gallery when the red lantern pin fits between the two red lantern gallery blocks as shown in the bottom picture.

Lantern galley

Lantern correctly placed on lantern gallery

Cove Molding:

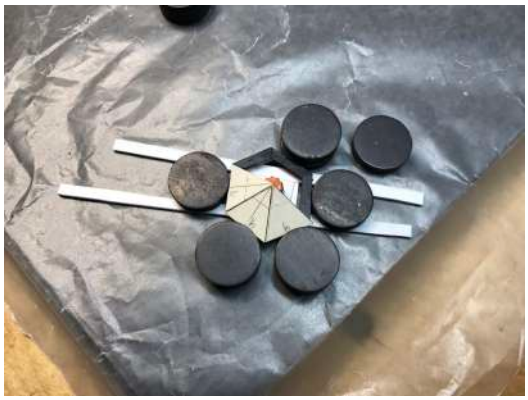
The cove molding between the top of glass panes and underside of the roof is made of 6 pieces of triangular rod. The following pictures show how the prototype and final cove molding for the diorama was assembled. An alignment fixture was constructed as shown below to accurately form the hexagon shape during bonding.

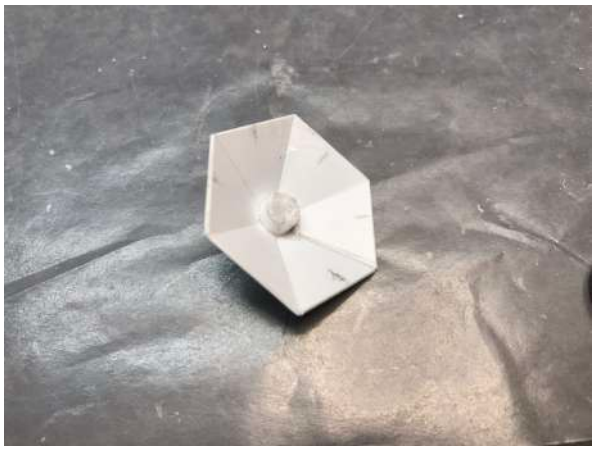
Prototype

Lantern Roof Assembly:

The lantern roof is made up of 6 individual triangular sections. A paper template of one triangular section of the roof was used to trace the shape on a piece of .020 inch thick polyethylene. The first polyurethane triangular roof section was used as a template for the remainder of the roof sections.

The process to build the lantern roof is shown below. An alignment fixture was made consisting of a center height control pin, the cove molding, and a number of magnets to position all the roof sections for bonding. An apex support was bonded to underside of the roof apex. This support provides stability for the roof assembly and a surface for bonding the ventilator support.





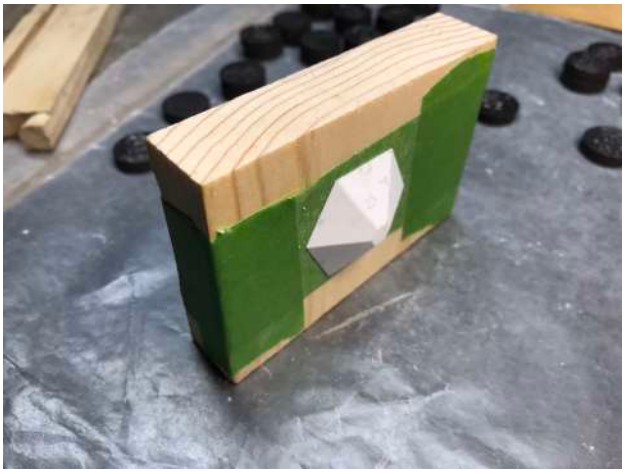
Ventilator Ball Support

The ventilator ball support was made using 1/4 inch diameter polyethylene rod. Instead of using a horizontal lathe (because I don't have one), the 1/4 inch rod was placed in a drill press as shown in the pictures below. Several miniature files were used to shade the support. After completing the "lathe" process, hand drilling as shown in the picture below was used to create a cup shape into the top of the support. This cup shape is used to support the ventilator ball.

Drilling cup to fit ventilator ball

Installation of Ventilator Ball Support; Ventilator Ball & Lightening Rod on Roof:

A flat surface 1/4 inch diameter had to be created on the outside apex of the roof to mount the ventilator ball support. To accomplish this the roof was attached to a piece of masking tape on a vertical support as shown below. A vertical sanding board was then used to create the 1/4 inch diameter flat surface for attachment of the ventilator support.



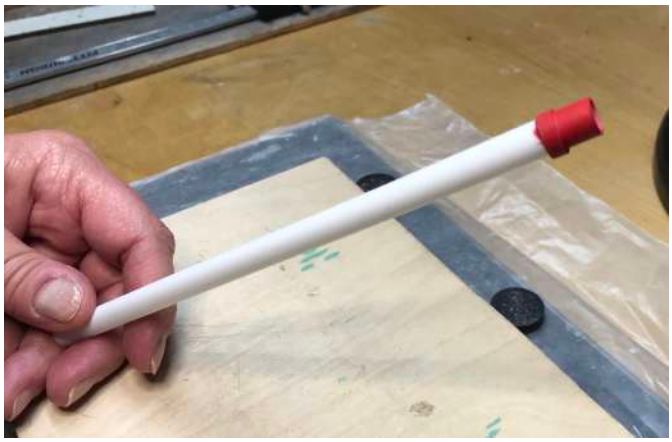
The ventilator support, ventilator ball and lightening rod are shown below attached to the apex of the lantern roof. The lantern roof and ventilator support were painted Rustoleum flat black to improve visibility of the parts for accurate placement of the ventilator ball and lightening rod. The ventilator ball and lightening rod is a hat pin which my wife Emily found in her sewing basket and it just happened to be the exact shape and size needed. The completed roof assembly painted Rustoleum flat black is shown on the right.

Lantern Pedestal and Beacon:

The lantern pedestal is designed for easy installation and replacement of the beacon if necessary.

The pedestal construction includes a 5/16 inch diameter polystyrene tube with a positioning collar at the base and a 1/4 inch diameter tube with a platform for the beacon. The beacon is mounted to the platform on the 1/4 inch tube which slides into the 5/16 inch diameter tube. The following pictures show how the pedestal is assembled.

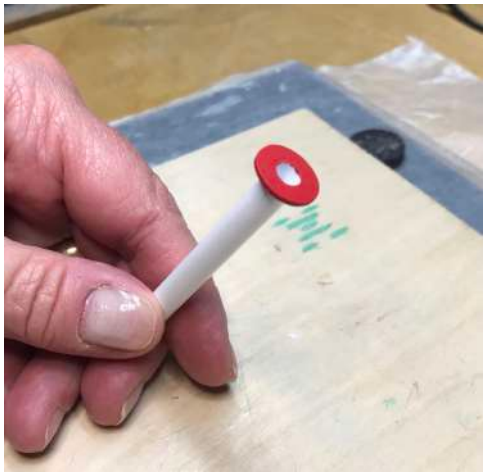
The pedestal main tube which functions as a wire way through the lighthouse structure to protect the beacon electrical wires is shown below. The close up picture shows the positioning collar which controls the pedestal height when assembled to the lantern gallery.



Pedestal tube and positioning collar

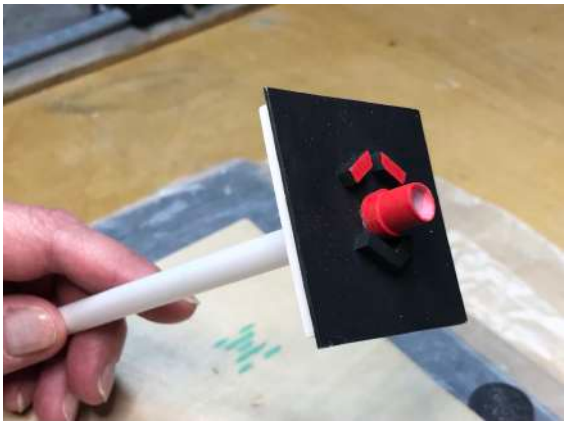
Close-up

The beacon tube and platform assembly shown below was constructed by making the platform in the shape of a flat washer cut from a .020 inch thick of polystyrene then bonded in place on the end of the tube

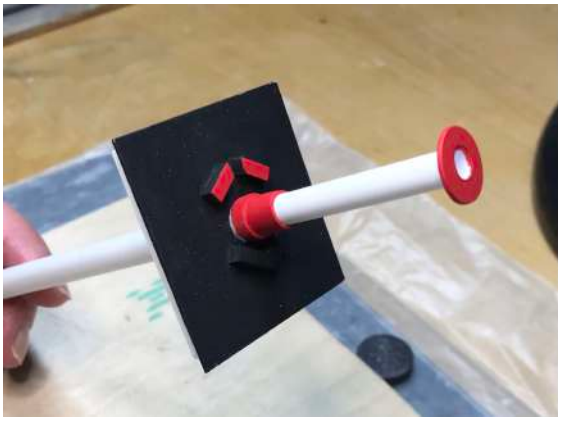


Beacon platform tube assembly

The picture on the left shows the lantern pedestal assembled to the lantern gallery. Notice how the positioning collar controls the pedestal height above the gallery. The picture on the right shows how the beacon platform tube assembly fits inside the pedestal

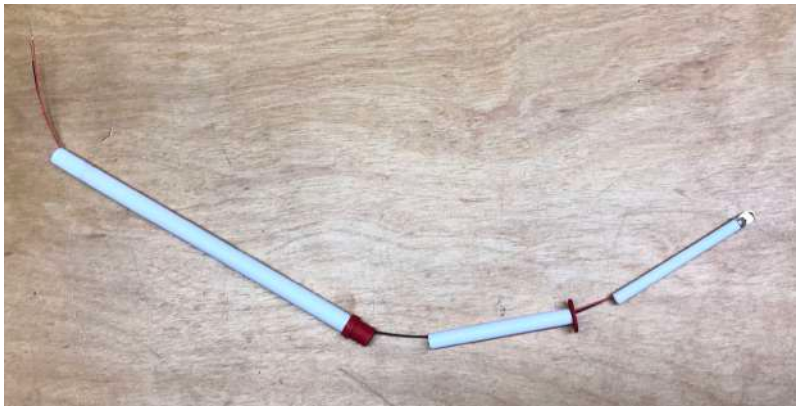


Pedestal main tube assembled to lantern gallery

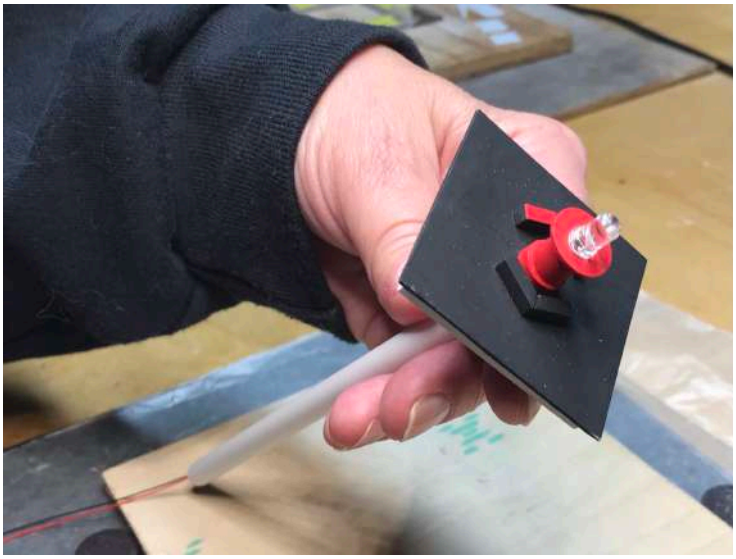


Beacon platform tube fit into pedestal main tube

Beacon assembly into the platform tube is shown below. A special wax is used to hold the beacon in place in its support tube.



The picture below shows the beacon fully inserted in the platform tube and seated on top of the platform. If necessary, the beacon can be replaced by disconnecting the beacon lead wires, pulling the platform tube assembly with beacon out of the pedestal, then removing the beacon.

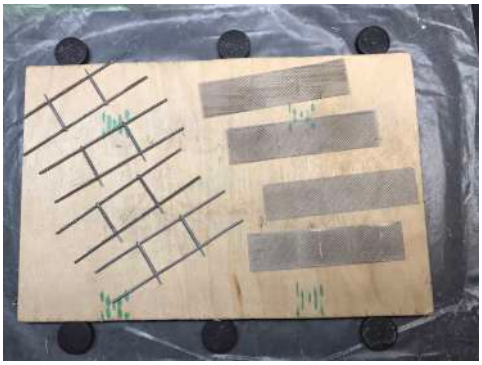


Beacon fully seated on pedestal platform

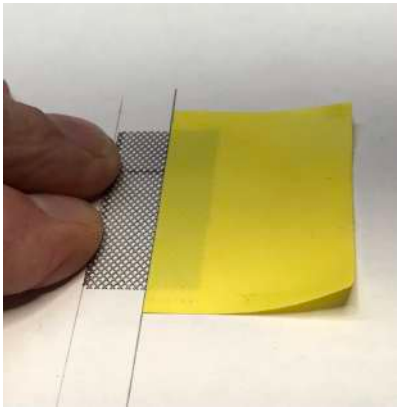
Lantern Gallery Fence

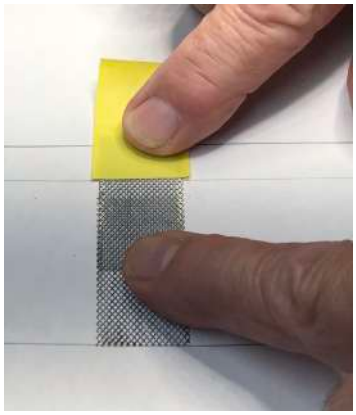
Woodland Scenics HO scale cyclone fence kit shown below was selected to make the lantern gallery fence. This is an excellent kit with very fine detail. The cyclone fence is nearly identical to the actual fence on the lantern gallery.

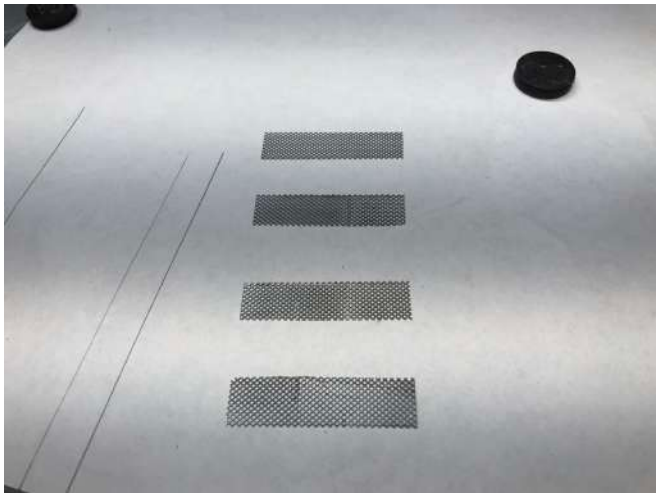
A craft knife with flexible blade and a retractable craft knife were used to cut the fence away from the pipe frame as shown below



A measurement template was used to accurately cut the fence to diorama dimensions of 1 3/4 inch long x 7/16 inch high. Tape was used as guide while cutting the fence with tin snips.

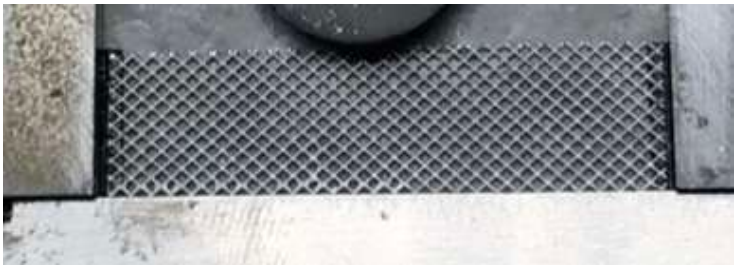






Finish cut screens to size

A length of .045 inch polystyrene angle was bonded to each end of the fence section. An alignment fixture made with right angle squares and straight edges and magnets on a metal base was used to assure the corner angles were properly located as shown in the following pictures. Application of glue had to be carefully applied to contain the glue only on the edge of the .045 inch angle.



Close up of fence with corner angles on each end

First two fence sections bonded

Second two fence sections bonded

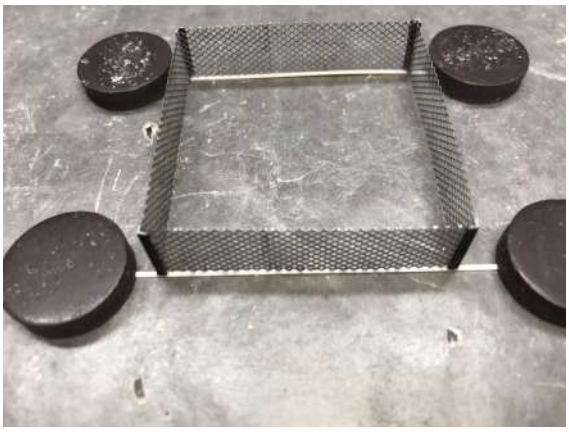
Third corner bonded

Fourth corner bonded which completes the fence perimeter

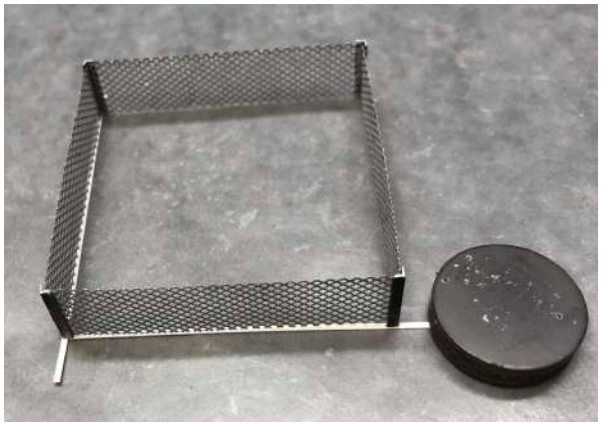
Next step was to bond a top and bottom rail to each fence section. A strip of polystyrene.011 inch thick x .033 inch wide (HO scale 1x3) is used as the top and bottom rail. Application of glue had to be very controlled so only a small amount of glue was applied. Bonding of the top and bottom rails is shown in the following pictures.

A piece of HO scale 1x3 is placed under the back section of fence (in the picture on the left) as a spacer to level the overall fence while the forward section of fence is bonded. Magnets are used to hold the rails in place while being bonded. Extended ends of all the rails used to hold rails in place while being bonded will be trimmed off using a craft knife.

Bonded second top rail to the fence as shown in the picture on the right. This rail is butted up against the first rail for a precise fit.



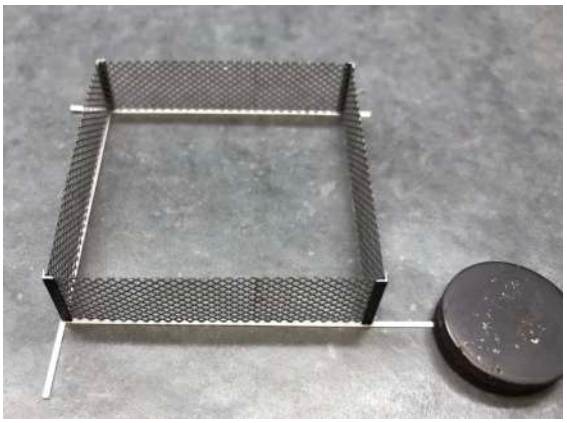
First section of top rail bonded to fence



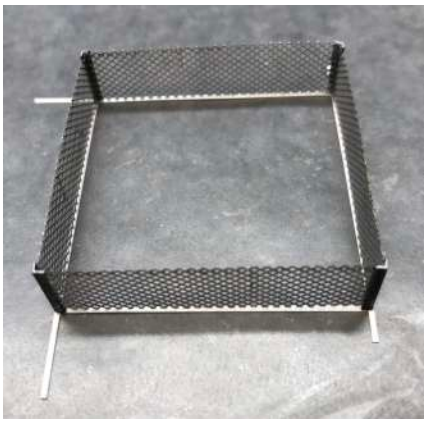
Second section of top rail boded to fence

Third section of top rail bonded to the fence as shown below in picture on the left. Same process as above for the second rial is used.

Fourth section of top rail bonded to the fence as shown in picture on the right. The rail was cut to exact length for a perfect fit between the first and third rails.

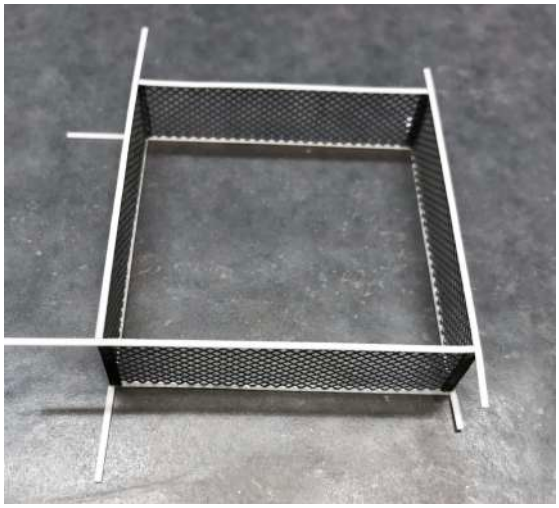


Third section of top rail bonded to fence

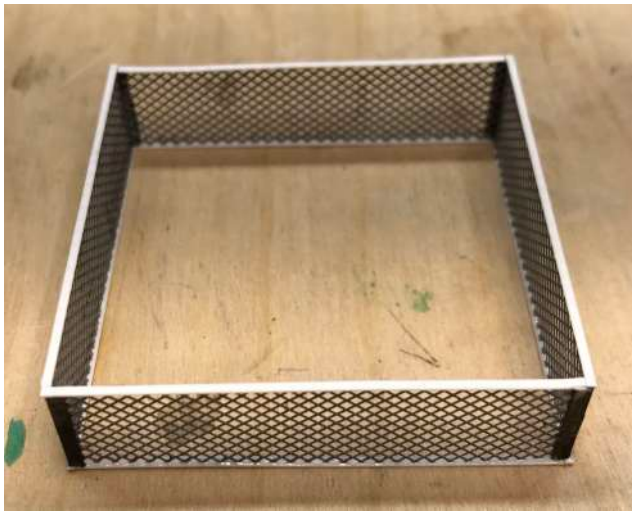


Fourth section of top rail bonded to fence

Bonded all four bottom rail sections to fence as shown in the picture on the left below using the same processes as described above for the top rail sections. Picture on the right shows extended ends of all rails trimmed flush with corner angle.

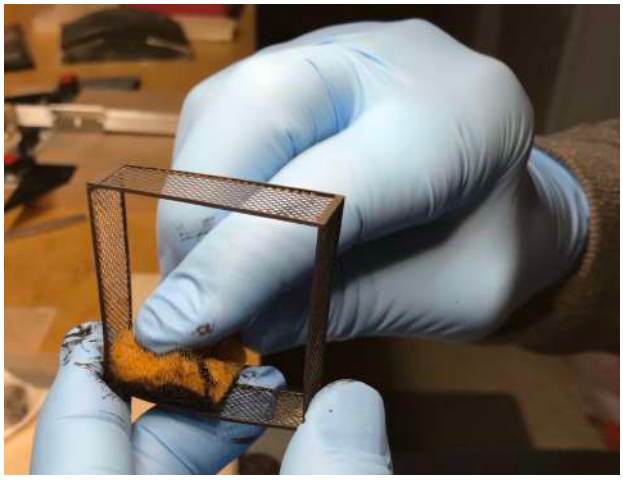


Four bottom rail sections bonded to fence

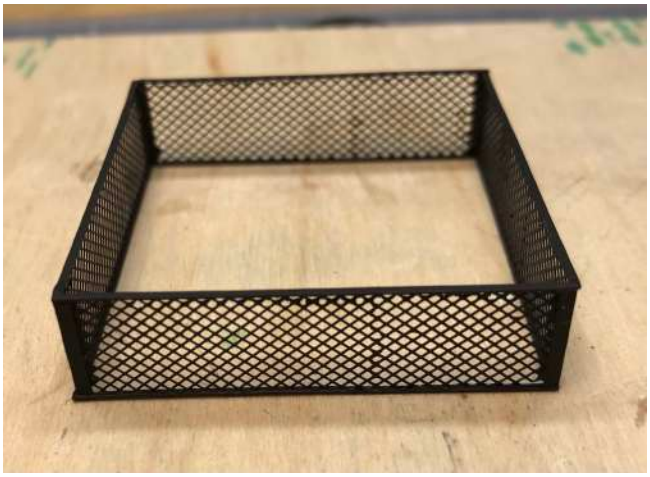


Top and bottom rail extensions trimmed flush with corner angle

Fence sections were painted with Apple Barrel flat black acrylic craft paint. A soft sponge cut from a surgical hand scrub pad was used to apply the paint as shown in the picture below on the left. A "dry sponge" similar to a "dry brush" was used to apply only a small amount of paint so the holes in the fence did not fill in with paint. Finished painted fence is shown in the picture on the right.



"Dry sponge" paint application



Finish paint

Just as a point of reference, a picture of the actual lantern gallery fence is shown below. At 1/87 HO scale, the pattern of the gallery fence would be practically undistinguishable. The painted 1/87 HO scale fence shown above on the right is almost identical to and a reasonable representation of the actual lantern gallery fence.

Actual lantern gallery fence

Pier Design and Construction

Pier height in the diorama above water level is based on actual pier measurements taken in August 2021. According to the Army Corps of Engineers, Lake Erie in August 2021 is above its long term monthly mean water level.

Key features for functional integration of the light have been designed into the pier. Un-assembled components of the light structure will be used for fit check during the pier design and construction.

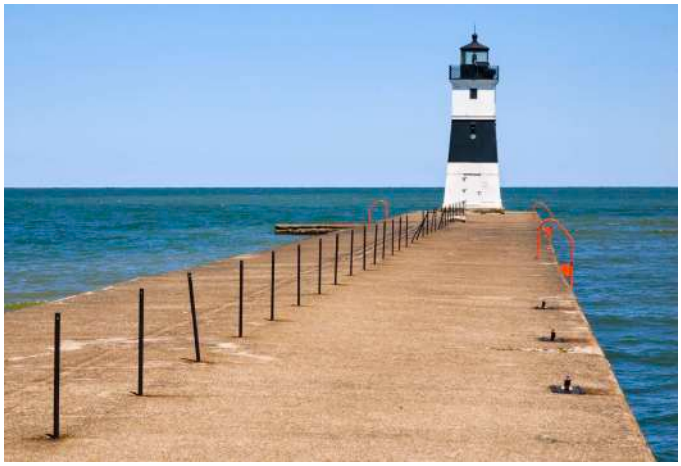
The pier is a casting made from Perfect Cast casting material. Minwax Polycrylic Clear Satin was used to seal all the castings after removal from the mold. The pier is cast in three sections listed below which will be joined together in the diorama:

1. light structure foundation pad
2. side pad at end of pier
3. main pier

Wax paper is wrapped around the mold frame components and covers the mold base. This will prevent the casting material from sticking to to the mold and make it easy to remove the mold from the casting.

To simulate an approximation to actual pier appearance, shown below, each casting is covered with Presque Isle Beach 10 sand. Pictures of this process will be shown later.

Close-up of actual pier surface

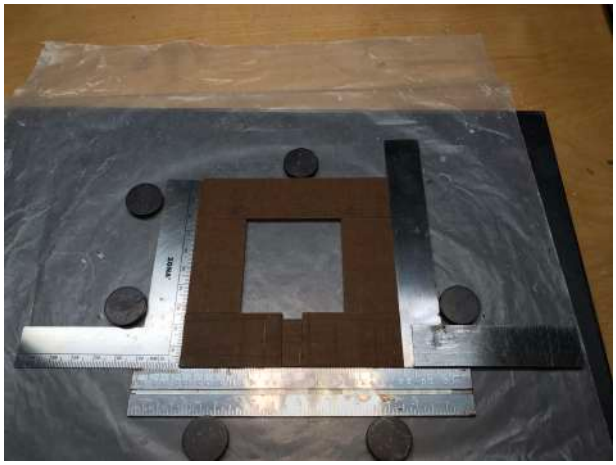


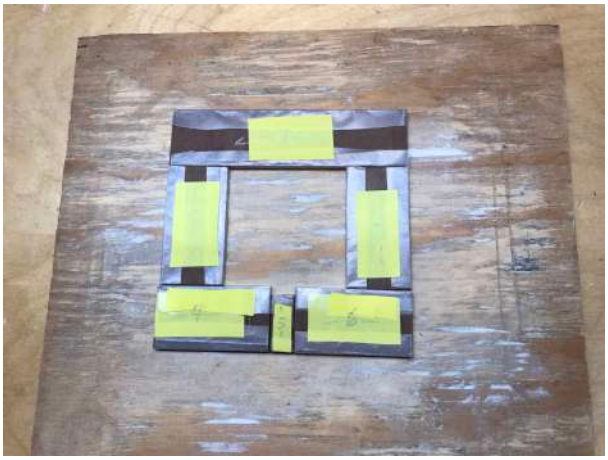
Light Structure Foundation Pad:

The casting mold is made from pieces of wall board and plywood as shown in the pictures below.

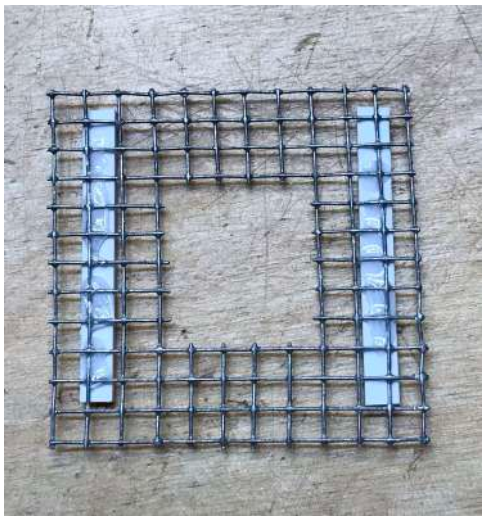
Actual measured thickness of the foundation pad is 9 to 10 inches. Finished casting is 1/8 inch thick which equates to approximately 10 inches full scale.

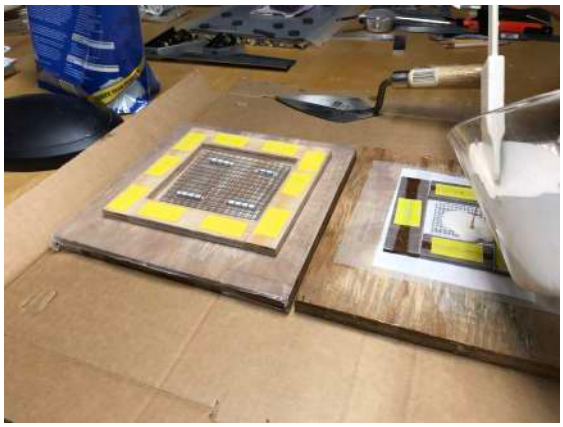
Mold frame pieces are bonded to the wax paper which covers the base to secure them in place. Tape is used to help hold the mold frame pieces down on the base.



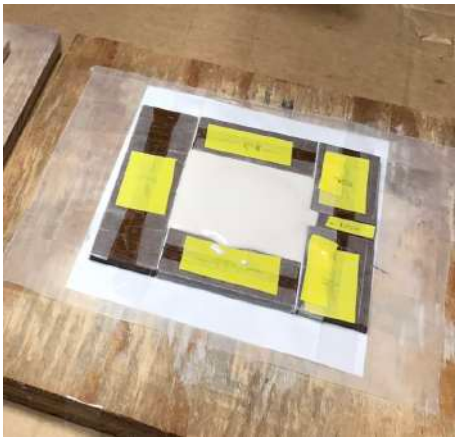


Since the casting is very thin, approximately 1/8 inch thick, wire reinforcement, shown on the left, was added to the mold shown on right. Spacers were bonded to the reinforcement wire to place it at mid-thickness of the casting. Double sided tape is used to hold the reinforcement wire in place. Mold is ready for casting material.





Pouring cast material

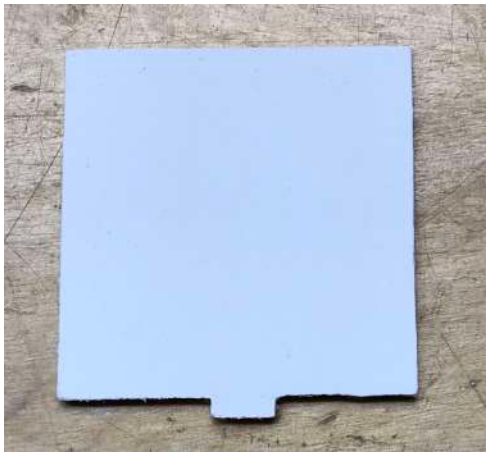


Poured casting

The actual light structure foundation pad shown in the picture on the left, has an integrated step at the front door. The small rectangular section, shown in the following picture on the right, at the bottom of the diorama foundation casting, is an integrated step which simulates the actual foundation pad design.

Wax paper removed from mold

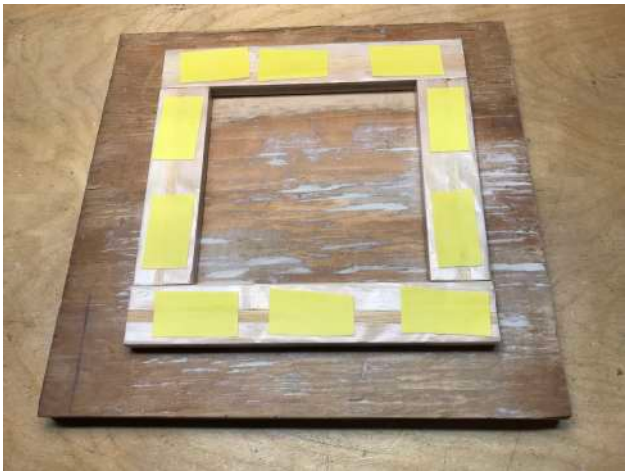
The casting top surface was sanded flat while in the mold. Finished sanded casting removed from the mold is shown below.



Side Pad at End of Pier

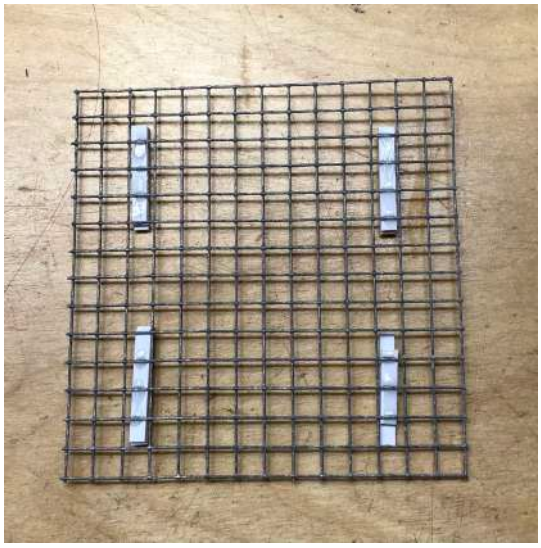
The casting mold is made from pieces of plywood as shown below to produce a casting 5/16 inch thick.

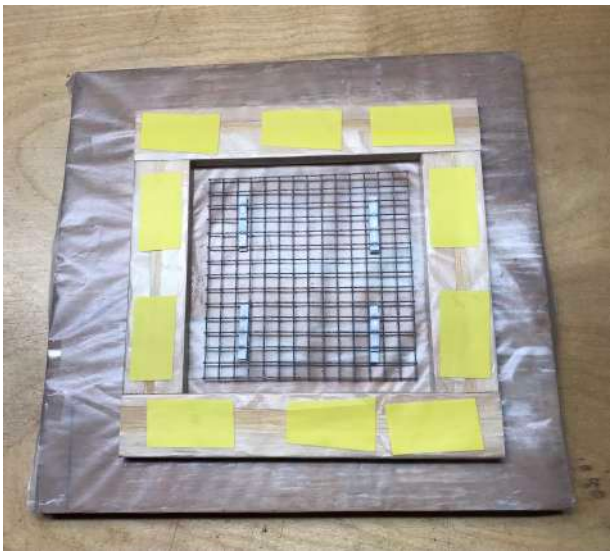
Actual measured height of the pad above water level is approximately 12 inches . Mold frame pieces are 5/16 inch thick equates to approximately 27 inches full scale. Water depth in the diorama is approximately 5/32 inch deep which equates to 14 inches full scale. Resulting height of the cast pier above water level is 13 inches which is a very close representation of actual pier measurement.



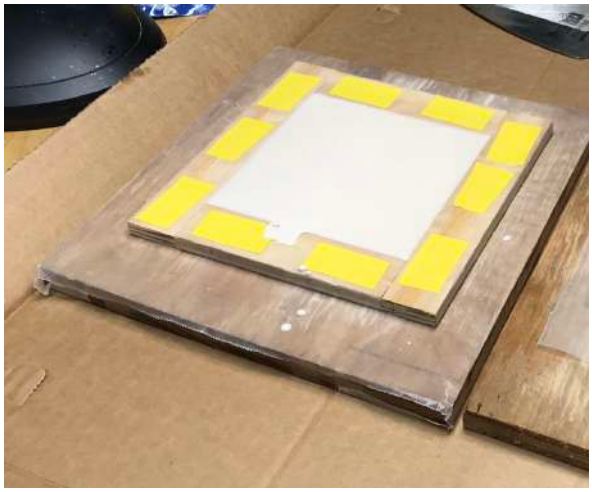
Picture on left shows mold frame pieces held in place with right angle squares while being bonded to base which is covered in wax paper. Picture on right shows mold ready for casting material.

The casting is only approximately 5/16 inch thick, so wire reinforcement, shown on the left, was added to the mold shown on right. Spacers were bonded to the reinforcement wire to place it at mid-thickness of the casting. Doubled sided tape is used to hold the reinforcement wire in place. Mold is ready for casting material.





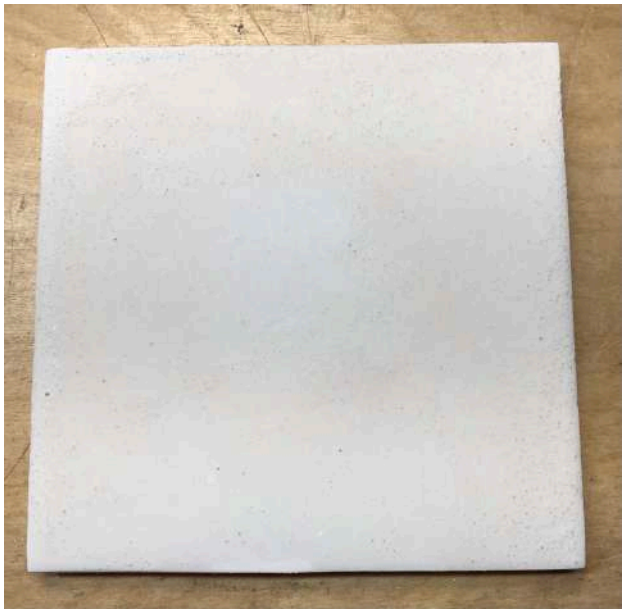
Pouring the casting



poured casting

wax paper removed from mold

Picture of the finished casting out of the mold is shown below. The casting top surface was nearly perfect right out of the mold. Minwax Polycrylic Clear Satin was used to seal the casting.



Main Pier

The following measurements of the actual pier were taken on site:
- pier width: 29 feet which equates to HO scale diorama measurement of 4 inches
- pier height above water level: 3 feet which equates to HO scale measurement of 7/16 inch

Overall length of the pier in the diorama is 16.5 inches which equates to 119.6 feet full scale. Actual full scale length of the pier is estimated to be approximately 600 feet.

The pier is designed to be positioned on a 10 deg angle in the diorama. This position was chosen to accommodate installation of the buoy while not making the diorama excessively large

The mold is designed to be easily disassembled to remove the pier casting after the casting material is cured. This design feature created complications to screw the cast frame members together. The first attempt to drill the cast frame members was not successful due to unacceptable variations in drilled hole locations. The drilled casting frame members were scrapped and new pieces were cut.

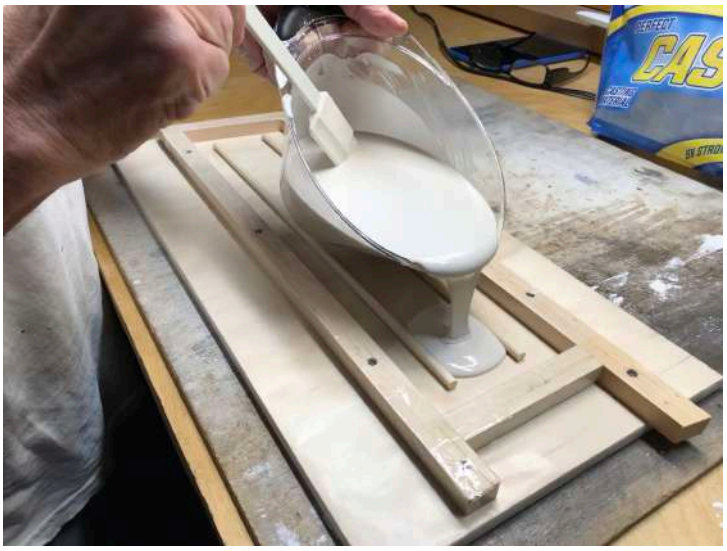
To assure accurate drilling of the casting frame members, the cast frame was assembled and clamped as shown in the following picture. Right angle squares were used to assure parallelism and perpendicularity. A spacer was used near the 10 degree angle end of the frame to help maintain parallelism of the side frame members.

Drilled casting frame members while clamped to workbench as shown below.

To secure the cast frame to the base, holes for screws were drilled in the cast frame members and base as shown below.

After drilling the cast frame members, each frame member and the base were wrapped in wax paper. The casting frame and base were then fastened together with flat head countersunk screws as shown below. Screw heads were covered with tape to prevent casting material from filling in the phillips head cross recess.

Pier casting is approximately 16.5 inches long x 9/16 inches thick which calculates to a thickness-to-length ratio of 0.0379. This is a possible indication the casting may be marginally thin in relationship to its length and susceptible to cracking. Therefore two reinforcement rods, held in place with doubled sided tape, were added to the mold as shown below.



Pouring casting - pic 1

Pouring casting - pic 2

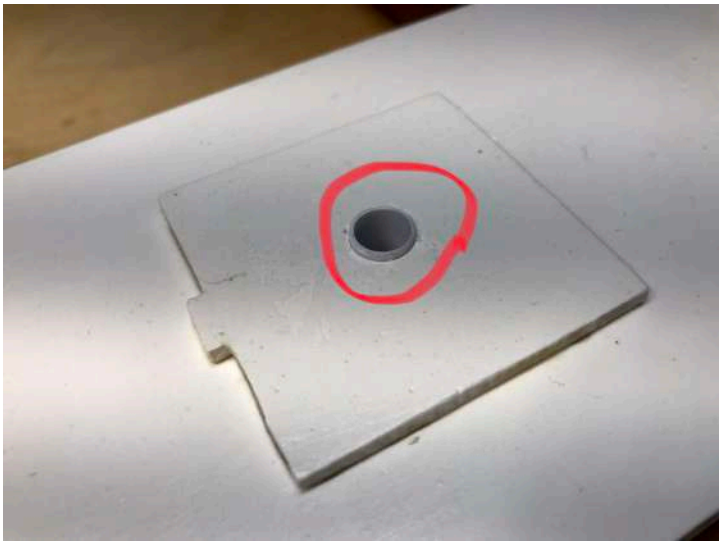
Pouring casting - pic 3

Finish pour - pic 4

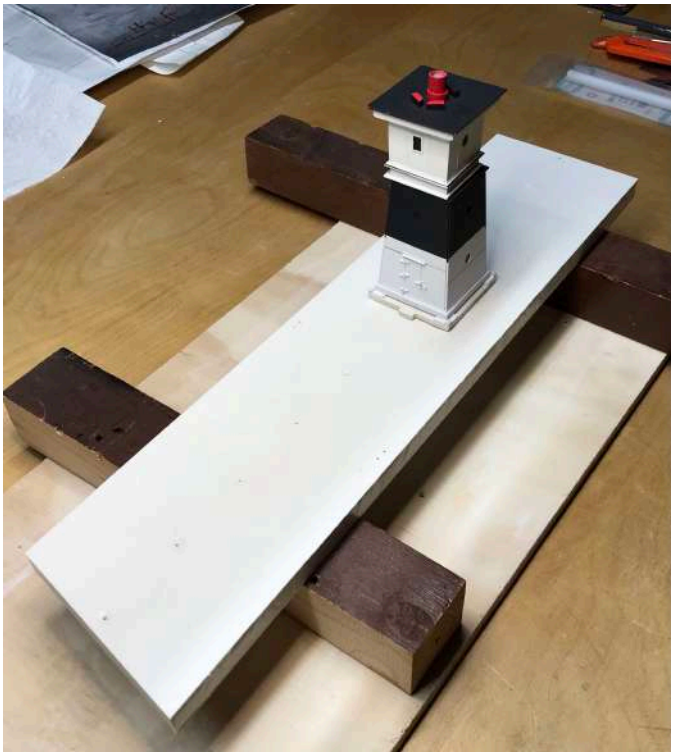
The casting top surface sanded flat while in the mold is shown below. Casting remained in the mold when the beacon wire tube pass through hole shown below and mounting holes for the pier stairs were drilled on a drill press.

Wax paper removed from mold

Placement of lighthouse foundation on the pier is shown below. Foundation was bonded to the pier using Titebond translucent adhesive. A hole for the beacon wire tube to pass through was drilled in the center of the foundation as shown below.

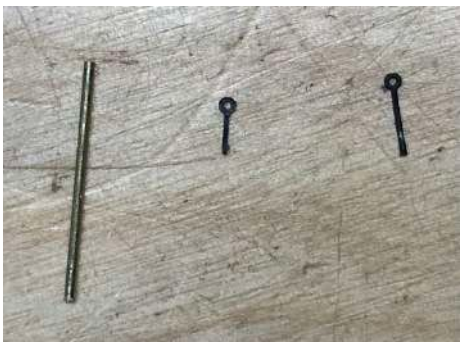


Fit check of lighthouse to pier confirms lighthouse structure is centered on the foundation and the beacon wire tube shown in lower left picture is properly aligned with pass through hole in pier. A short tube liner shown in the picture above was inserted into the foundation for the fit check.

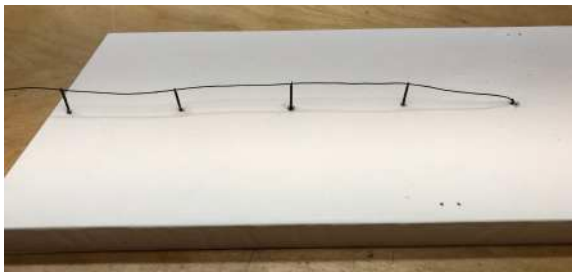


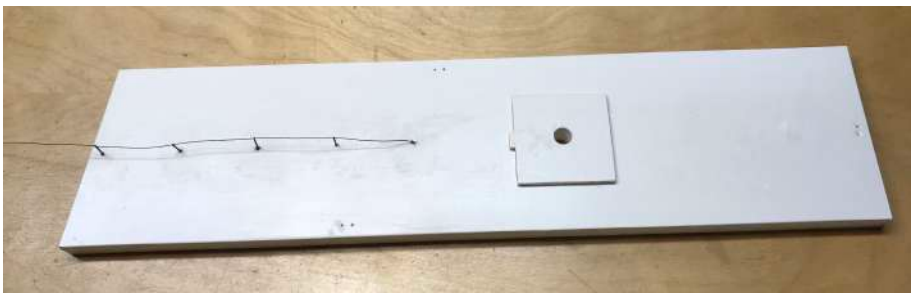
Beacon wire tube passing through pier

Components and assembly of the pier rope/chain poles is shown below. The rope/chain pole is 1/32 inch diameter brass tube. Poles were cut to length using a micro-saw and gage. A polystyrene eye bolt was inserted in the top of each pole.



The following pictures show the rope/chain poles mounted to the pier. Sewing thread is used to simulate the chain or rope used on the actual pier. The end of rope/chain (on the right) is attached to an eye bolt mounted in the pier.





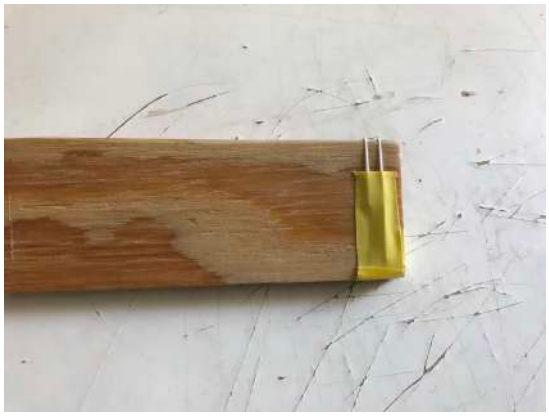
Pier Ladder Construction

The following pictures show how the pier ladders were constructed.

Railing form - front

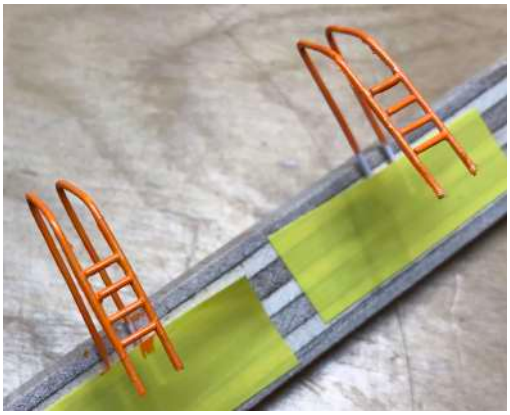
Railing form - back

Shaped front of rail



Shaped back of rail

Ladder rungs assembled to rails



Painted “pumpkin orange”

Final assembly of ladders is shown below. Structure at the bottom of ladder is for mounting the ladder to the side of the pier below water level.

Application of top coating to the pier

Sand is used to simulate a natural concrete appearance. Presque Isle Budny Beach (Beach 10) sand was bonded to the pier and pier side pad using Woodland Scenics Matte Medium scenery adhesive. The sand was sifted through an antique tea strainer as shown below to obtain a covering which closely approximates the texture of the actual concrete pier.

Pier side pad.

Antique tea strainer was used to sift and spread sand on the pier side pad and main pier to obtain a light uniform coating. Pictures of the finished sand coated pier side pad and main pier are shown below.

Application of adhesive

Sifting application of sand

Finished coated

Main pier.

Locator pins shown below are used to prevent sand from filling the pier ladder mounting holes during application of the sand.

The following pictures show test fit of the pier ladders before final application of the surface sand.

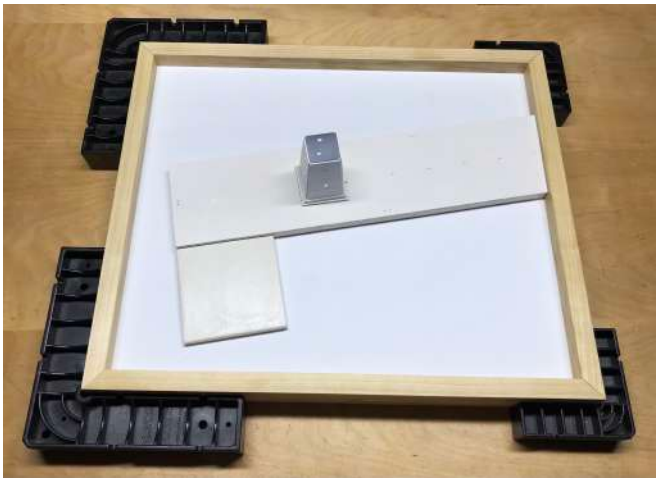
Finished sand coating on main pier and side pad with pier ladders installed.

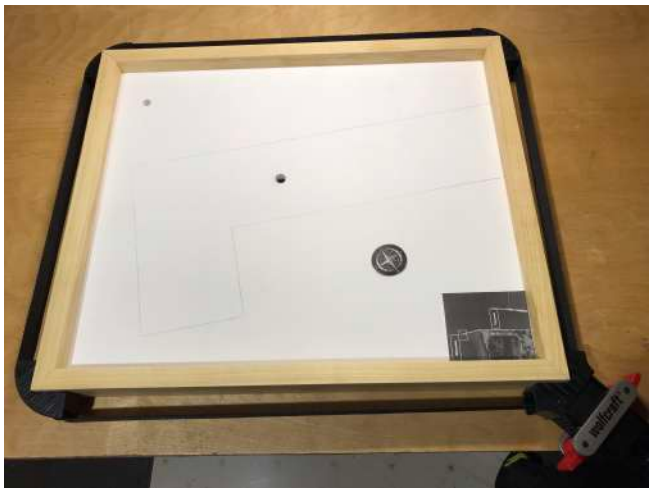
Frame and Base

The frame is made from ¾ inch maple and the base of the diorama is made from ½ inch thick gator board. Frame members and gator board were cut to size on a table saw. A router was used to cut the dados for the gator board and rabbit for the bottom cover.

Fit check of the frame assembly, gator board and pier, prior to application of sand is shown below.

Picture frame strap used to hold the frame members in place as shown. Squares were used to verify proper fit of the corner miters. Location of the pier (shown above) was traced on the gator board for reference. Location for the compass rose is shown for reference.

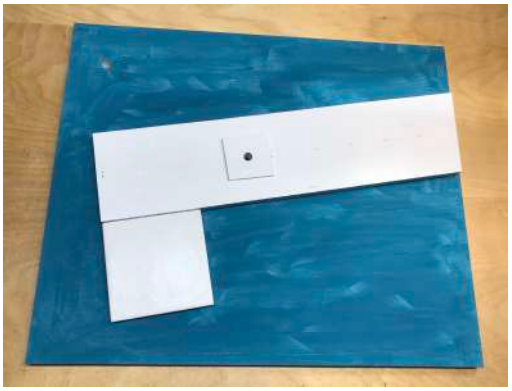




Location of the switch controls for these lamps is established at this time of the build since wire pass through holes need to be drilled in alignment through the frame and switch control boxes. Wire holes were drilled through the frame and switch control boxes before the frame is assembled to assure correct alignment of the holes.

Arrangement of the switch control boxes on the front shelf is shown below. A clamp fixture is used to hold all the components securely in place. The frame is located near the edge of the workbench to provide access to use a hand power drill to drill through the frame into the switch control boxes.

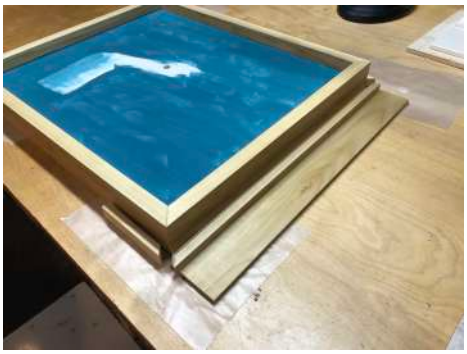
Gator board was painted with Apple Barrel Tuscan Teal flat acrylic paint as shown in the following pictures before assembly in the frame. Brush strokes and color are intended to give the illusion of moving water on a sunny day.



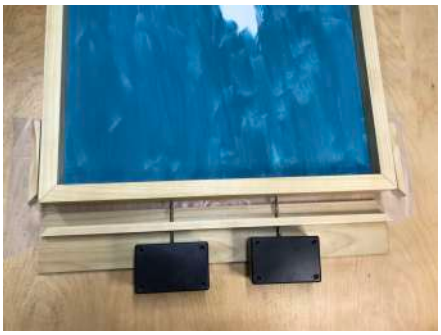
Fit check with pier

Assembly of the frame, gator board base, switch box shelf and cover front support is shown in the following pictures.

Cover support alignment with drilled holes

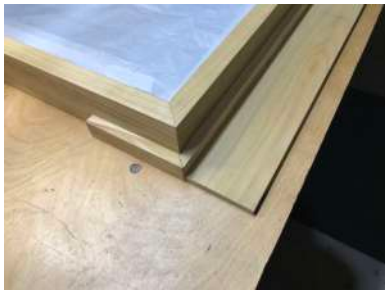


Alignment of switch boxes with drilled holes is shown below.



Finished bonding of switch box shelf and cover supports shown below.

Shelf and cover support



Left cover support

Right cover support

Drilling holes for attachment of bottom cover.

Channel Buoy

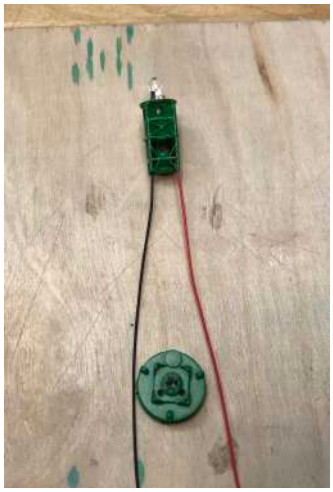
A green channel buoy with a green blinking light, similar to the actual buoy in the channel, is included in the diorama. What is the significance of a green buoy with a green light? A green buoy should be on your left (port) side when you enter the channel from Lake Erie. The light in the green buoy in the diorama is controlled by a momentary switch.

The buoy was modified as shown below to install the green LED light.

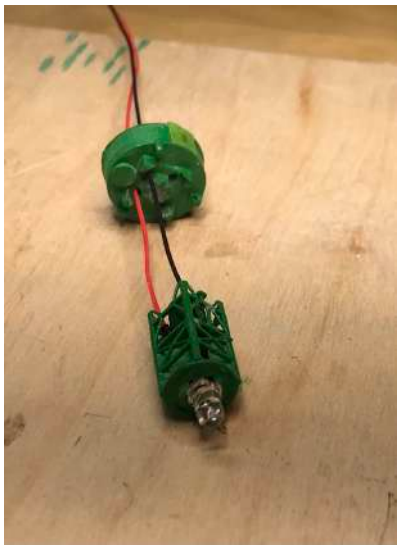
As purchased

Top removed to add LED

Top removed from base to install LED



LED installed



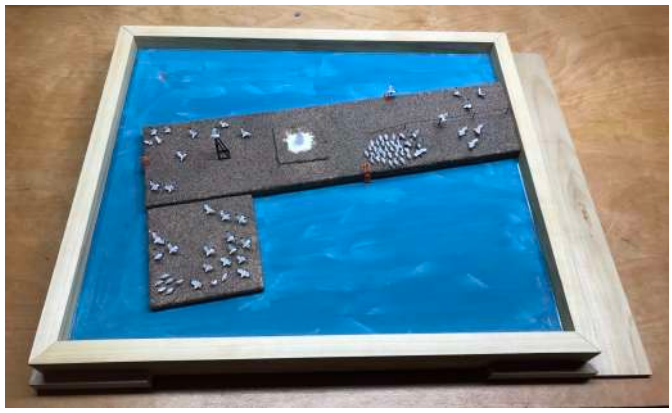
Wires fed through base

Buoy re-assembled

Buoy installed in diorama

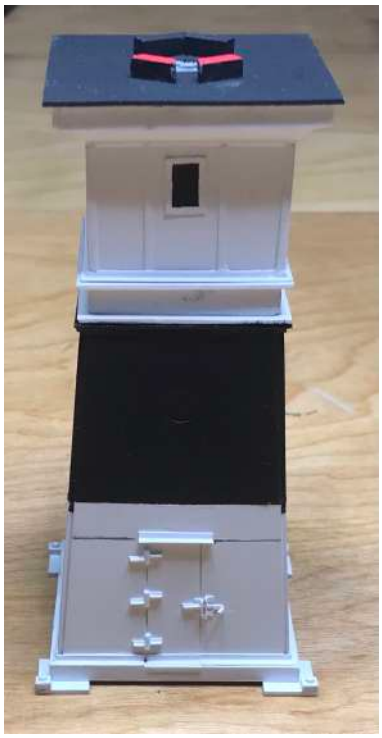
The gulls

The North Pier is a natural location for gulls to gather and they do. The diorama has 95 gulls which I hand painted. They can be found in various locations on the pier, on the water and on structures as shown in the following pictures.



A “SLOW NO WAKE” sign is located on the end of the pier which is typical of an actual sign which was on the pier at one time.

Pier Light final assembly



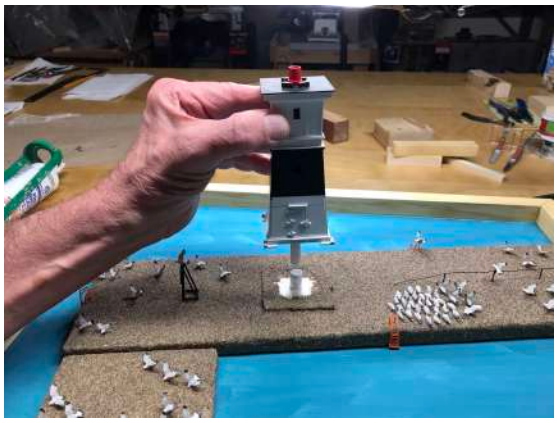
Base structure

Lantern sub-assembly

Lantern final assembly

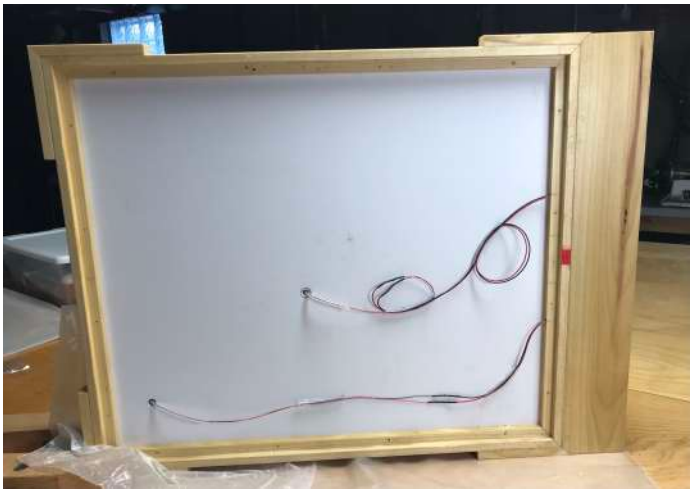
Final assembly

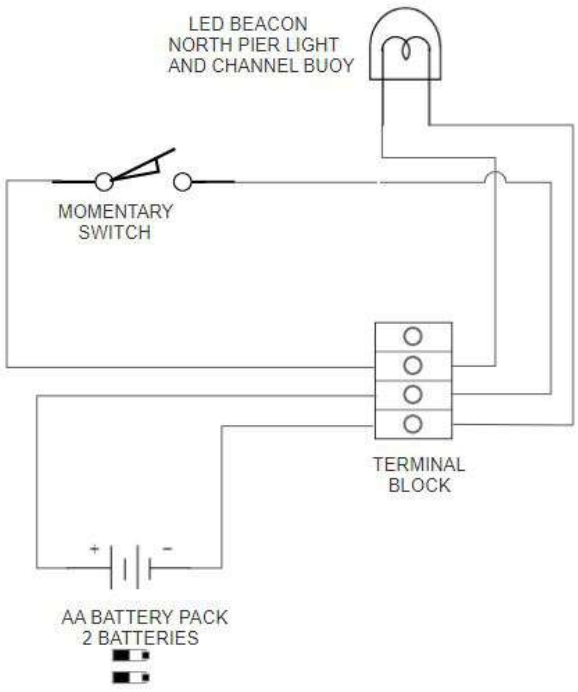
Placement of light structure on pier foundation.



Electrical Wiring

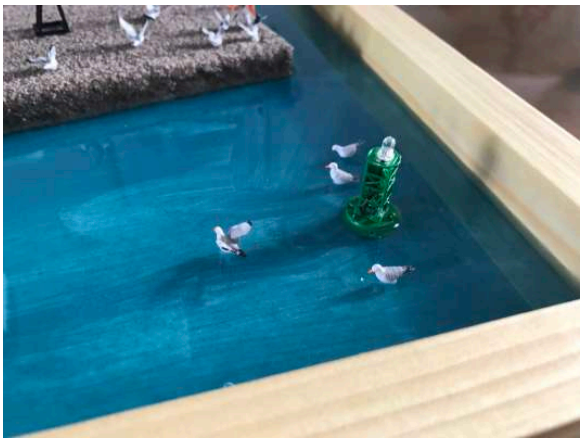
Underside of diorama pictured below show wire routing for the lighthouse LED beacon and the channel LED light.





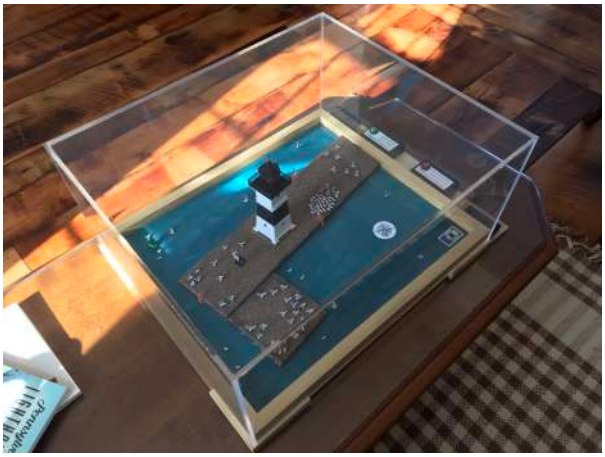
Electrical schematic

Placement of compass rose, U.S. Lighthouse commemorative stamp and channel buoy shown below.



Compass rose and U.S. Lighthouse commemorative postage stamp

Finished diorama. Acrylic cover made by Erie Industrial Plastics.



About the modeler …..

Jerry Longo, a retired Mechanical Engineer has an interest in antique and classic automobiles and model railroading. Jerry has built a countless number of model airplanes, model cars, as well as an HO scale model railroad. In addition to the Presque Isle Boathouse and Pier diorama, he built a Presque Isle Fog Signal Station diorama and made additions to the Presque Isle Lighthouse diorama. Jerry was born and raised in Erie, Pa and resides in Fairview, Pa.

END