

April 25, 2019

Municipality of the District of East Hants

Box 230, Suite 170

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Elmsdale, NS B2S 3K5

ATTENTION: **Evan MacDougall**
Manager of Parks Development and Operations

RE: Walton Lighthouse Move

A site visit to the lighthouse was completed on April 05, 2019, during which time the building and its components were measured so that the weight of the building could be calculated to determine requirements for moving the structure. A representative of the lighthouse was on site at the time of the inspection with a micro inspection camera that was to be used to view the underside of the building through existing openings in the stone foundation, however, the camera was not functioning at that time. Only limited information could be gleaned looking through the available small openings and some assumptions were made based on these observations. Also, since the building is a Heritage Property, internal finishes could not be removed to check framing sizes and only sizes of exposed members could be confirmed. Following the site visit, methods of moving the lighthouse were evaluated and cost estimates were prepared for moving and for a new foundation comprised of concrete walls on strip footings.



The base of the lighthouse is approximately 4.37 x 4.37 metres out to out of the cedar shingle cladding, with an approximate overall height of 8.80 metres, not including the top vent. The lighthouse has three levels including the top floor lantern room. The side of the lighthouse with the entrance door, as shown in the photograph above, is considered the east side for the purposes of this report. Floor joists for all levels run in the east/west direction. A 230 mm (9") wide timber sill plate sits on top of the stone foundation around the perimeter of the building. Height of the plate could not be confirmed. The bottom floor joists are 250 mm (10") deep with unknown width. It is assumed that the bottom floor joists are notched to sit on or in the sill plate on the east and west foundation walls. This will have to be confirmed prior to the move by removing foundation stones as required for access to view the existing construction details.

Lighthouse Move

The total approximate weight of the building was calculated based on site measurements and was estimated to be in the order of 10 tons, including the lantern but excluding all interior items that are not attached to the building. These items will need to be removed prior to moving the structure.

The Municipality's preferred area to relocate the lighthouse is approximately 32 metres (105 ft) to the east of its current location, where an existing gazebo is located as shown in the photograph below.



Two options were considered for moving the building, including: 1) placing steel beams under the floor structure and sliding or skidding it to the new location and 2) placing steel lifting beams under the floor structure, lifting with a crane and swinging over to the new location.

The biggest challenge with moving the lighthouse will be placing the lifting or skidding beams under the existing structure. As can be seen in the photograph below, the height of the exposed

foundation wall on the north side of the lighthouse varies from 25 to 115 mm and the ground slopes up away from the building. Since the floor joists run east to west and the load bearing walls are on the east and west sides, the skidding or lifting beams will need to be installed oriented in the north-south direction. Due to the varying height between existing grade and the underside of the floor framing, excavation will be required to fit the beams under the building structure. To accommodate placement of the lighthouse on new concrete foundation walls, the beams will have to be located in from the edge of the building farther than the thickness of the new foundation wall. A combination of machine and hand excavation will likely be required, with the existing foundation stones removed in small sections to allow for the installation of temporary supports under the sill plate and joists. A trench will be required on the north side of the lighthouse at each beam location, where the ground slopes up from the foundation, so that the beams can be slid into place under the structure following excavation. Once the beams are installed, they will also require temporary support prior to the move.



Due to the ground slope and required excavation to fit the beams under the floor framing, skidding the building would require further excavation of the site to create a slope suitable to pull the building up and out of the low area on which it is located. Further levelling of the path to the new location would also likely be required.

A representative of Irving Equipment was consulted to determine costs associated with the lifting option. It was determined that a 110 Ton crane could be set-up to swing the lighthouse to a new location up to 33.5 m (110') from its existing location. The cost for the crane including transportation to and from the site, based on a 12 hour work day, would be in the order of plus HST.

The cost for supply and installation of lifting beams is not included in the above craneage cost. Lifting beam size required will be W310x31, with an approximate fabrication cost of , including lifting plates.

To place the lighthouse on a new concrete foundation, slots will be required in the foundation walls to accommodate the lifting or skidding beams. Assuming the door of the lighthouse is to be located

facing west toward the property, the foundation wall slots would be located in the north and south foundation walls. To skid the building to the new location, it would need to be moved northward towards the north side of the property and then dragged in a 180° arc and down to the new proposed location.

Based on the required site work for each option and more flexibility provided by the crane lift, it is recommended that the lifting option be used for the lighthouse move. Also, the risk of damage to the lighthouse would be less with lifting.

Required preparations prior to the move are summarized below:

- Removal of entrance ramp.
- Removal of stone foundation at east and west sides of building and installation of temporary sill and joist support.
- Excavation of trenches and installation of lifting beams.
- Removal of all interior furnishings and other materials that are not part of the building system.

Following the lighthouse relocation, the existing lighthouse foundation will be removed and the site will be levelled and new top soil applied.

New Foundation

Since the lighthouse is a 146 year old heritage building, moving the structure to a new concrete foundation is not aesthetically viable, however, concrete foundation/frost walls can still be used by installing a stone veneer on the exposed areas of the concrete. This can be achieved by forming a ledge or inset around the perimeter of the foundation, located just below finished grade. It is recommended that the ledge and corresponding thickness of veneer be a minimum of 100 mm. Local stone to match the existing stone foundation could be used. After cutting to the required thickness, the stones would be mortared and anchored in place. Since grade at the present location of the lighthouse is not level, the existing exposed height of stone foundation varies around the perimeter of the building from approximately 25 mm to 400 mm. When constructing the new building foundation, the site should be levelled so that the exposed foundation wall will be the same height around the building perimeter. For the foundation cost estimate, a constant exposed height

of 200 mm was assumed. In the photograph below showing the south elevation, the stone height at the corner of the building is about 200 mm.



By placing the relocated lighthouse on a new foundation with concrete foundation walls, a crawl space will be created, although with only 200 mm between grade and the underside of the floor framing, the space will not be of sufficient height for access. The National Building Code of Canada (NBC) provides requirements for crawl spaces and these requirements for unheated crawl spaces are as follows:

- An access opening is required having the minimum dimensions of not less than 550 mm by 900 mm.
- The access opening shall be fitted with a door or hatch.
- The space shall be ventilated by natural or mechanical means. For ventilation be natural by natural means, the minimum area of unobstructed vent area shall be not less than 0.1 m² for every 50 m² of floor area. The vents shall be uniformly distributed on opposite sides of the building.
- A ground cover in the crawl space shall consist of one of the following:
 - a minimum of 50 mm asphalt
 - 100 mm concrete
 - Type S roll roofing
 - 0.10 mm polyethylene

With regards to the addition of an access hatch, an opening would need to be cut in the existing bottom level floor boards and a joist cut with new header joists added. Since the Municipality of East Hants is the Authority Having Jurisdiction and is responsible for issuing building permits, consideration should be given for waiving this requirement on the grounds that it does not adversely affect the safety of the building occupancy and will damage the heritage property.

The total required area of ventilation openings would be in the order of 0.03 m² (0.32 ft²) and this could be accomplished with small opening in the foundation walls. Joints in the stone veneer could be located at the openings and left un-mortared. A polyethylene sheet could be installed to provide ground cover.

To accommodate lowering of the building onto the new foundation, slots will have to be left in the top of the foundation walls to fit the lifting beams as discussed previously. Once the building is in the correct position, the lifting beams will be pulled out from one side of the building. To anchor the building to the new foundation, one leg of steel clip angles can be bolted to the underside of the sill plate that will be left exposed before installation of the stone veneer. The other leg will be bolted to the concrete foundation wall. The angles will be hidden when the stone veneer is installed. The holes left in the foundation walls for the lifting beams will be filled with concrete and covered with stone veneer.

For the new foundation cost estimate, a 250 mm thick concrete wall on strip footing founded 1,200 mm below grade was used, with 100 mm thick by 300 mm high inset at top for stone veneer. Grading and topsoil was included. The estimated cost for the new foundation system will be in the order of plus HST. Cost of electrical trenching is not included.

A summary of estimated costs for moving the lighthouse to the proposed new location is as follows:

- Crane for single lift:
- Lifting beams:
- Excavation and lifting beam installation:
- Removal of existing foundations, add topsoil:
- New foundation:



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