

October 31st, 2019

Mr. Tim Crutchley
Associate Vice President of Operations
Lindenwood University
209 South Kingshighway Street
Saint Charles, MO 63301

Re: Visual Structural Inspection of Brick Water Tower Located on Lindenwood University Campus
Near Cobbs Hall and the Spellman Center

Mr Crutchley,

At your request, I performed a visual structural inspection of the accessible and visible areas of the existing brick water tower located near Cobbs Hall and the Spellman Center on the Lindenwood Campus in Saint Charles, Missouri. The purposed of my inspection was to determine the overall structural condition of the existing water tower, if any safety concerns were observed, and if, in my opinion, it was economically feasible to repair the existing structure.

The existing water tower is a solid brick bearing wall structure that is approximately 136 years old. The tower was constructed with unreinforced brick masonry walls that are approximately 12" thick. The overall height of the tower is approximately 100 ft+/- . The exterior masonry tower walls surround a steel water storage tank that is not presently filled with water. A single steel door located on the north side of the tower allows access to the interior. Steel angle bracing attached to the interior surface of the brick walls provides lateral bracing of the interior water storage tank. The roof of the tower is constructed with wood planks. A wrought iron railing and platform extends around the perimeter of the top of the tower.

On Monday, October 28th, 2019, I performed a visual structural inspection of the accessible and visible areas of the existing brick water tower structure.

During my visual inspection, the following items were observed:

- Vertical cracks were observed around the exterior perimeter of the tower. The cracks were observed in mortar joints and bricks. Several of the observed vertical cracks had been previously tuckpointed.
- Lateral bowing was observed on the exterior surfaces of the brick walls around the perimeter of the structure. The bowing was most noticeable approximately 15 ft +/- above grade.
- Spalled concrete, damaged and missing bricks, and deteriorated mortar joints were observed around the perimeter of the base of the structure.



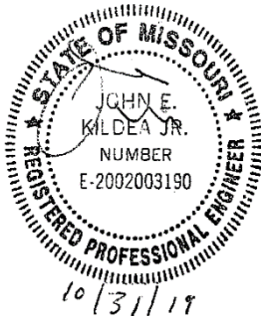
- Due to the poor condition of the structure, access to the interior was limited. The mortar on the interior surfaces of the brick walls was soft and in poor condition. Significant amounts of mortar were missing from the mortar joints on the interior surfaces of the walls. Lateral displacement and bulging of the brick walls was observed around the interior perimeter of the tower. Large voids were observed in the brick mortar joints on the interior surfaces of the tower.
- Corrosion was observed on the steel support angles and plates located on the interior of the tower. The amount of observed corrosion varied by location. The heaviest corrosion and section loss was observed in the vertical steel plate members attached to the base of the masonry walls.

Based upon on the items described above, the following actions are recommended:

- The existing tower structure is in poor overall condition. Considering that the exterior walls of the tower are constructed with deteriorated unreinforced masonry, the structure is highly susceptible to damage from wind and seismic forces. Due to the large physical dimensions of the water tower and its proximity to the Lindenwood University parking lots and the adjacent city water storage tanks, it is my opinion that the tower's current condition represents a potential safety hazard. Additionally, it is also my opinion that repair or rehabilitation of the existing structure would not be economically feasible due to the extent of the deterioration observed. I recommend hiring a demolition contractor to completely demolish the existing water tower.

I trust this is the information that you require. If you have any questions regarding this report, or require any additional information, please do not hesitate to contact me.

Sincerely,



John E. Kildea Jr., P.E.
Missouri P.E. License # E-2002003190

Attachments: Photographs #1 - #11



Photograph #1 – Photograph of vertical cracks on exterior surface of brick masonry around perimeter of water tower



Photograph #2 – Photograph of approximate location of lateral bowing observed in exterior masonry walls. The bowing was observed around the perimeter of the tower at approximately 15' +/- above grade



Photograph #3 – Photograph of spalled bricks and missing mortar on exterior surface of tower



Photograph #4 – Photograph of loose bricks at base of tower



Photograph #5 – Photograph of loose bricks at base of tower



Photograph #6 – Photograph of loose bricks at edge of door opening. The mortar on the interior surfaces of the tower walls was deteriorated and large voids between the bricks were observed



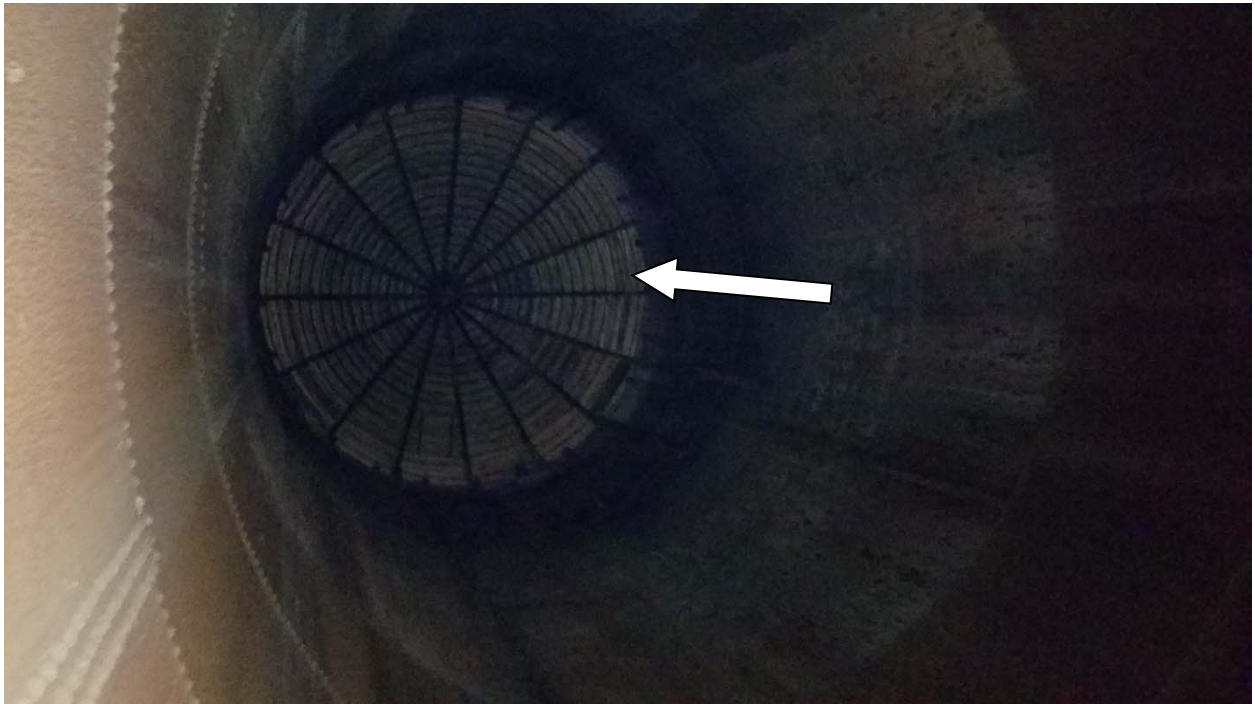
Photograph #7 – Photograph of deteriorated mortar joints on interior surface of tower wall. Lateral bowing was also observed at several locations on the interior surfaces of the tower wall



Photograph #8 – Photograph of loose bricks on interior surface of tower wall



Photograph #9 – Photograph of brick, wood, and metal debris on the floor of the steel water tank.



Photograph #10 – Photograph looking up at underside of wood roof deck viewed from inside of the steel water tank



Photograph #11 – Photograph of nails, nuts, bolts, and other metal hardware on ground outside of fence at base of tower. The hardware appeared to have fallen from the wrought iron handrail and platform located at the roof of the tower