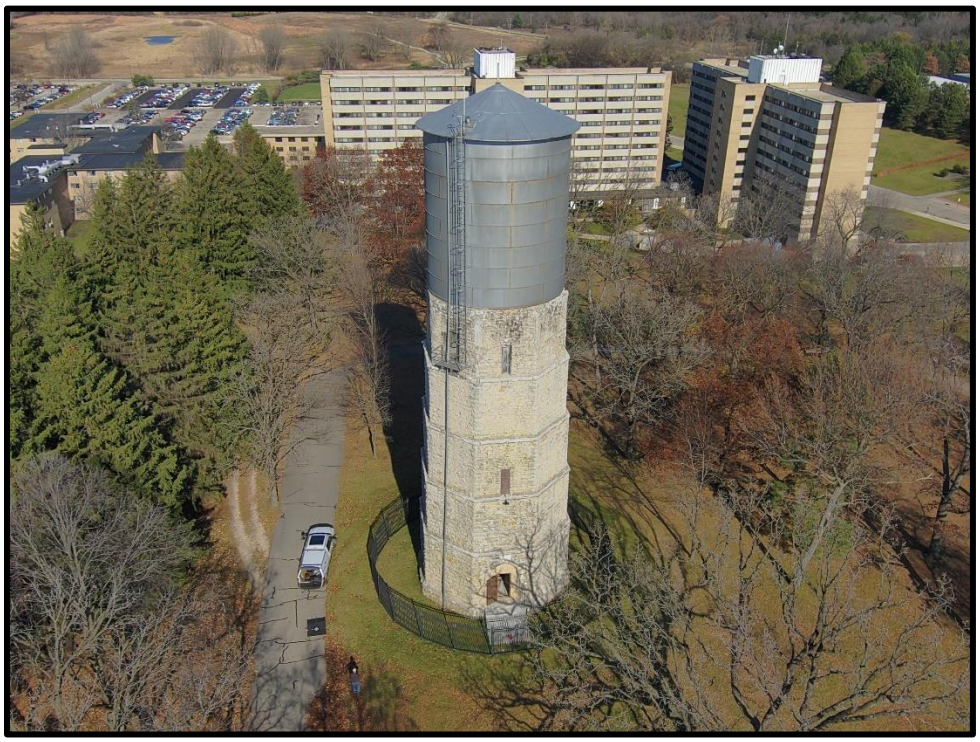

Starin Park Water Tower Structural Analysis Report

Project Address: 504 W. Starin Road
Whitewater, WI 53190

Prepared for: City of Whitewater
Department of Public Works
312 W. Whitewater Street
Whitewater, WI 53190

Prepared by: McEnroe Consulting Engineers, LLC
Eileen McEnroe Hankes, P.E.

Date: January 5, 2023

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Executive Summary

This analysis of the Starin Park Water Tower included a visual assessment of the exterior from the ground and the interior from a ladder. The exterior of the structure was documented with a camera on a UAV to create a photogrammetry model. The interior was scanned using LIDAR technology and that information has been integrated into the photogrammetry model as well.

The structure is an approximately 100 foot tall water tower with a 70 foot tall masonry base and a 30 foot tall steel tank. The tank has been decommissioned and water removed as of late 2022. The purpose of this study was to determine the current condition of the structure and provide opinions on the future of this structure, including whether it should be demolished or repaired.

The structure is in good condition with some elements in fair condition. The structure is safe in its current condition. The only concern at this time is the potential for stone falling and the fence around the perimeter is effective at keeping the public away from the building.

The masonry and steel structure is in need of maintenance and repair work to keep it in good condition for the long term. The work that is needed is typical for a structure of this age and type of construction. We see no reason to consider demolition at this time.

The primary issues that were identified in this study include the following items. The report provides more specific information about each issue and potential approaches to address them.

- Stone cracking and deterioration, primarily at the belt courses at each tier
- Cracked stone at the entry arch
- Deteriorated mortar joints at the exterior and interior
- Corroding steel at the base of the tank
- Other minor miscellaneous items that are covered in the report

We performed a high level structural analysis of the masonry and the loads at the base of the steel tank, taking into consideration that the water is being removed. This analysis found that the structure is stable in its current condition and with the water removed from the tank. Note that the connections between the tank and the masonry are not visible from below, so they were not analyzed. The repairs that are recommended will keep the structure in stable condition.

The rough order of magnitude construction costs to implement the repairs recommended are anticipated to be in the range of $950,000 to $1,100,000.

If funding is not available to perform the work all at once, a phased approach could be taken. We recommend considering the following phasing, although there may be good reasons to approach the work in a different way:

- Phase 1: Repair the steel buried in masonry at the top of the tower, while addressing the masonry at the top of the tower as well. Continue work down the exterior of the tower as funding allows. If we use a budget limit of $600,000 (which is the approximate estimated cost to demolish the tower), the top two levels of the tower would be repaired. Estimated cost: $590,000
- Phase 2: Repair the remainder of the exterior. Estimated cost: $420,000
- Phase 3: Repair interior of the tower. Estimated cost: $320,000

These costs are in 2023 dollars. The body of this report discusses potential increases based on inflation.

Introduction

The report presents the findings of a structural assessment and study of the Starin Park Water Tower in Whitewater Wisconsin. The study explores the current structural condition of the tower to identify potential concerns with the structure and recommends courses of action to guide the future of the structure.

Assessment Techniques

This project consists of a visual structural assessment of the existing conditions performed from the ground with binoculars, and from the interior access ladder and platform. We did not access the exterior platform and ladder or the steel tank during this assessment. To complement the in-person visual review, an unmanned aerial vehicle (UAV) equipped with a camera was used to photograph and document the exterior of the structure. A photogrammetry model was produced and is available for the City of Whitewater's use. This allowed us to perform a visual review of the elements of the masonry that were not accessible from the ground and to get a bird's-eye view of the structure. The interior of the tower was scanned using LIDAR technology. At the time of this report, the scan was partially complete. The information from the LIDAR scan will be included in the photogrammetry model as well.

Building Background

The structure is approximately 100 feet tall with a masonry base and steel tank (Photo 1). It was constructed in 1889 and has been a functioning water tank since that time. It was decommissioned in late 2022 and the water was removed from the tank as of December 14, 2022. The structure is comprised of a 70 foot tall masonry structure with a 30 foot tall, 185,000 gallon, cylindrical steel tank at the top.

The masonry structure has an octagonal footprint. The exterior has five tiers with a stone belt course and a step inward at each level. The structure is approximately 35 feet wide at the ground and 26.5 feet wide at the top level. The interior of the tower is a round shape with a diameter of roughly 18.5 feet at the base. There are 2 steps in the wall thickness on the interior that align with the lowest two steps on the exterior. The diameter at the top of the tower is roughly 20.5 feet. The wall thickness is approximately 7.5 to 9 feet at the base and 3 to 4 feet at the top. Appendix A includes some basic plan and elevation drawings of the structure. Please note that these are all rough dimensions due to the uneven surface of the wall and the limited access for measuring. Some dimensions have been determined based on direct field measurements and others have been taken from the photogrammetry model.

The steel tank is cylindrical with a cone-shaped roof. It appears to be comprised of steel plates attached to an interior frame. This assessment did not include accessing the interior of the tank, so this construction was not verified. Please note that while the term "steel" is used throughout this report, given the age of the construction, it may be iron. Depending on the repairs that are designed, this may be an important distinction. The composition of the material should be verified prior to doing repairs.

The steel tank is placed on a series of I beams spanning over the water tower and bearing on the masonry walls (Photo 2). There are two large plate girders that support the small beams (Photo 3). There is also a floor system below the plate girders that is comprised of steel beams and wood planks (Photos 4 and 5).

The structure is accessed by a ladder and cage on the interior wall that extends to the floor below the plate girders (Photo 6). There is a door through the masonry at that level that leads to a platform cantilevered off the masonry (Photo 7). A second steel ladder and cage run up the masonry and steel tank from the platform to the roof (Photos 8 and 9).

The masonry around the entry has been modified to add two concrete masonry unit (CMU) walls and a stone veneer (Photo 10 and 11).

Photo 1: Starin Park Water Tower

Photo 2: Steel beams below tank

Photo 3: Steel plate girder supports

Photo 4: Floor below tank at top of masonry tower

Photo 5: Floor and tank supports as viewed from below

Photo 6: Ladder inside masonry tower

Photo 7: Doorway to exterior platform and ladder

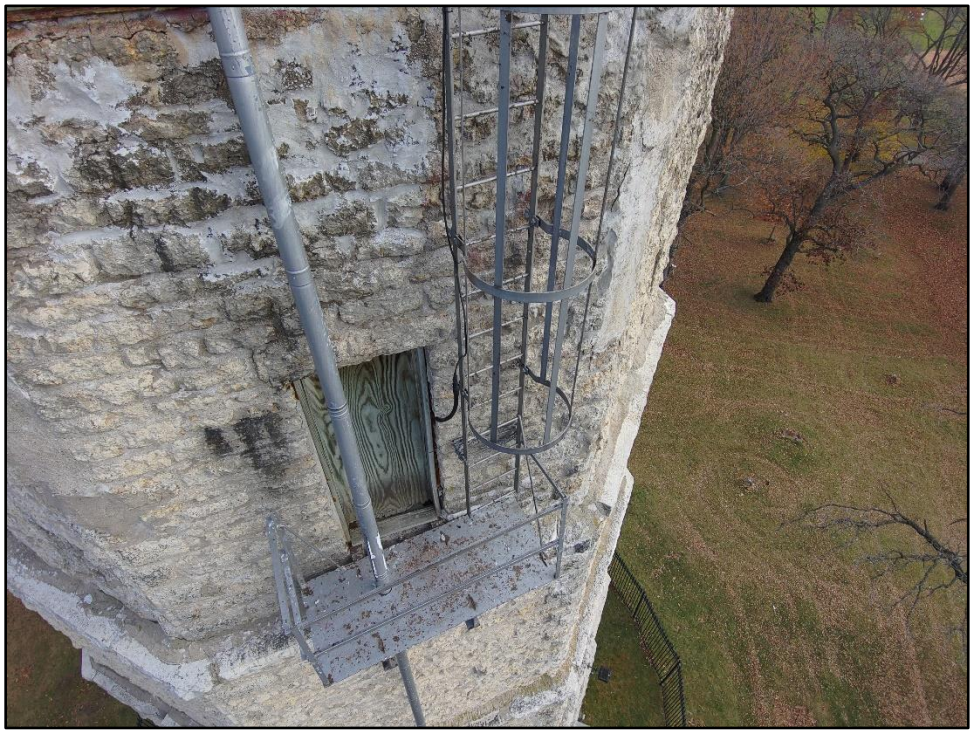

Photo 8: Exterior platform and ladder to tank

Photo 9: Exterior ladder to tank

Photo 10: Modified entry door/wall

Photo 11: Modified entry door/wall

Conditions Observed

The photos included in this report are representative of conditions found during this assessment. This report does not include a photo of every location of the conditions found.

Each condition includes a description of the issue, a conceptual approach for repair, and a priority level. The priority levels include high, medium, low and monitor. All of these conditions are important to address. However, with the understanding that typically restoration projects occur over the course of years, this information is included to assist in identifying which items to address first.

- High priority repairs will help to stop ongoing deterioration and stabilize the structure in its current condition.
- Medium priority repairs will restore the structure to a good condition. These repairs are important to keeping the structure long-term but are not the most critical at this time compared to the high priority items.
- Low priority repairs will also restore the structure to a good condition but are less likely to have an impact on other elements or systems.
- Monitor indicates that a condition is not currently a concern, but it has the possibility of worsening over time. These conditions do not require a repair at this time but should be monitored in the future in case they worsen.

Please note that this report is based on conditions of structural elements that were readily observable at the time of assessment and that no testing or invasive investigations were performed. All recommendations provided in this report are conceptual in nature and are not intended to be details or specifications for construction.

Condition #1: Deteriorated and Missing Stones at Belt Course

Description: Many of the stones at each belt course are in poor condition. There are stones that have fallen out or have been removed (Photo 12). Many stones that remain in place are cracked, spalled or delaminated (Photo 13 to 15).

These horizontal projections are natural places for water to enter the wall. This condition is likely due to decades of water and ice buildup along the ledges. There are mortar washes that have been installed to help shed water, but the deterioration has continued.

This condition is particularly bad at the top of the wall (Photos 16 and 17). There is more exposed masonry here that can take on water. Also, the embedded steel tank supports are corroding and likely causing additional damage to the masonry. See Condition #7 for more discussion of the steel corrosion.

Repair: Replace stones that are missing as well as any that are severely deteriorated and have lots of cracking. For any stones that have minor cracking but are otherwise in generally good condition, consider pinning across the crack, or adhering the stone pieces with epoxy.

Consider adding a coping or flashing at the horizontal surfaces, particularly at the top of the wall. Keeping water out of the wall in the future will be critical to maintaining this structure. This approach comes with downsides as well though as creating a system that would be effective and also not change the appearance of the structure would be challenging. This is an architectural issue to consider during the design of repairs.

Priority Level: High

Photo 12: Missing stone

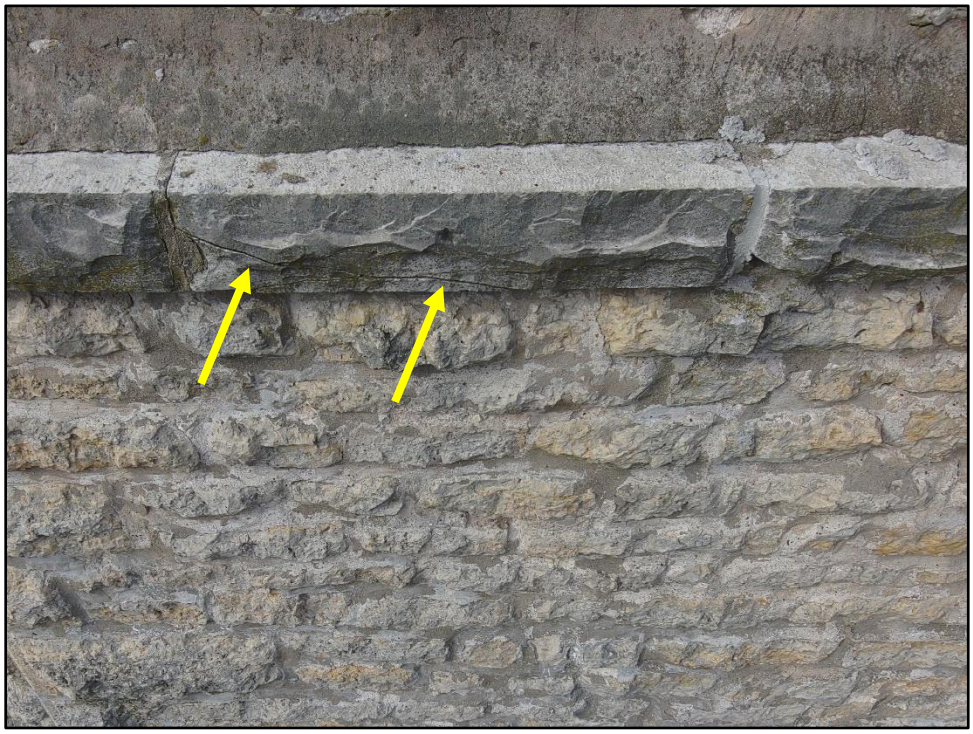

Photo 13: Horizontal cracks in stone

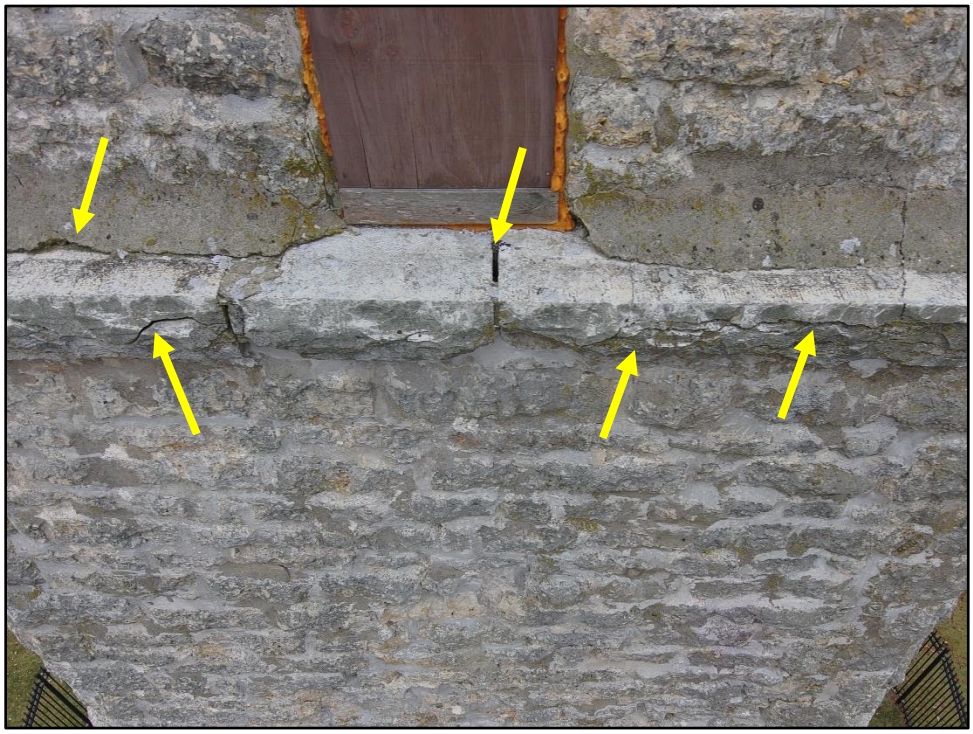

Photo 14: Cracked stones, missing mortar, deteriorating mortar wash

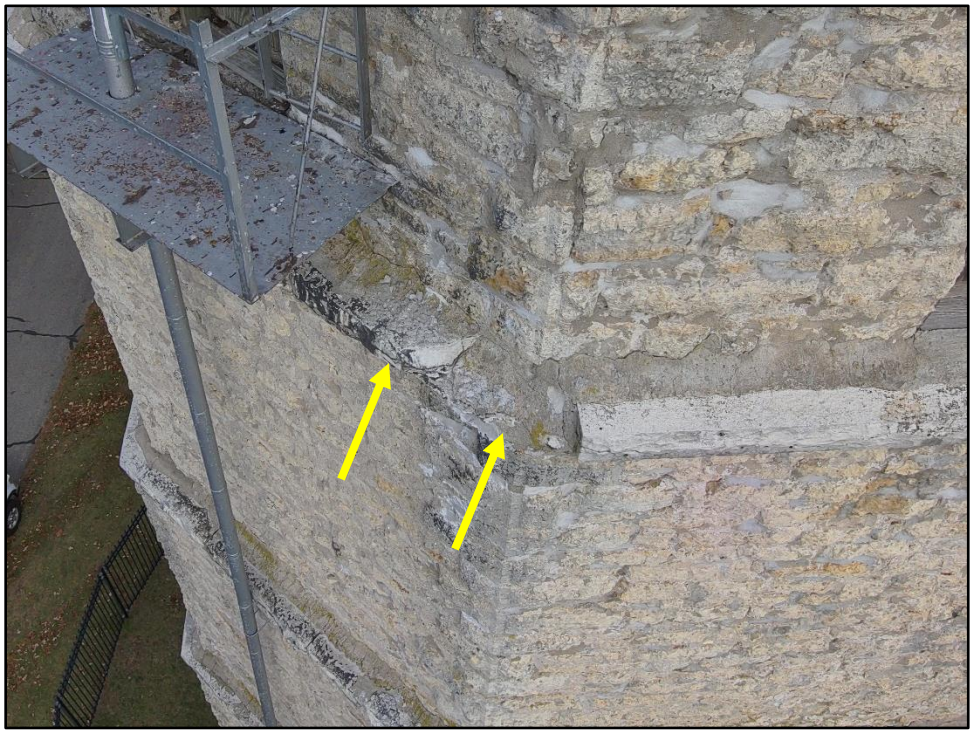

Photo 15: Missing stone, cracked stone, deteriorating mortar wash

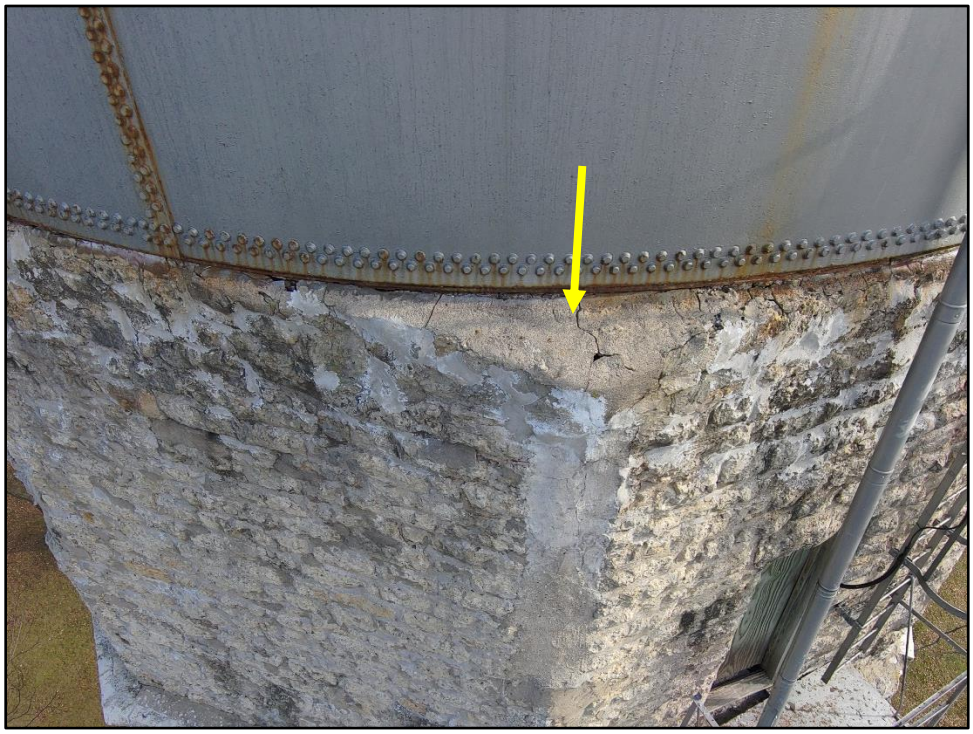

Photo 16: Deteriorating mortar wash at top of wall

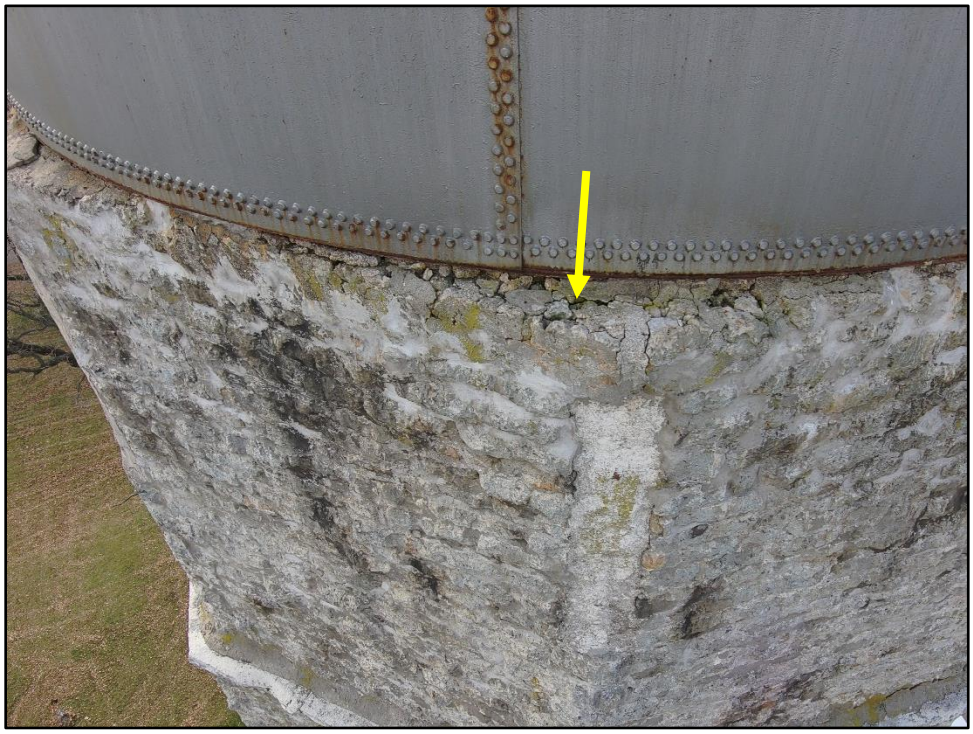

Photo 17: Deteriorating masonry at top of wall

Condition #2: Deteriorated and Spalled Stone away from Belt Course

Description: There are some isolated locations where stone has spalled and broken away from the structure (Photo 18). The sides of the wall openings have some spalling (Photo 19). Only one location was easily visible during this assessment, but we would expect to find conditions like this at other openings as well. One area at the top tier has a larger area that has spalled away (Photo 20). There is also some deterioration of stone near the base of the wall (Photo 21).

Repair: Areas with isolated spalled stones do not need to be repaired at this time. If a full restoration of the building is undertaken, it may be decided whether or not these locations should be addressed.

The sides of the wall openings could be address on a case by case basis when access is available to those areas. The one area visible during this investigation did not appear to be in dire condition and can wait until a repair plan is executed

Deterioration at the base of the wall can be address during a full repair as well. It is not so significant as to require repairs at this time. This is an easily monitored condition due to the location on the building.

The large spall area shown in Photo 20 should be investigated up close in more detail. There is a possibility that the stones around this area are unstable and would require remediation. If the stone is loose at all, it could be pinned into place. Alternately, the missing/spalled stones could be replaced/repaired which would stabilize this area of the wall.

Priority Level: High – Pinning area around large spall

Medium to Low – All other conditions

Photo 18: Isolated locations of stone spalls

Photo 19: Spalled stone on "door" walls

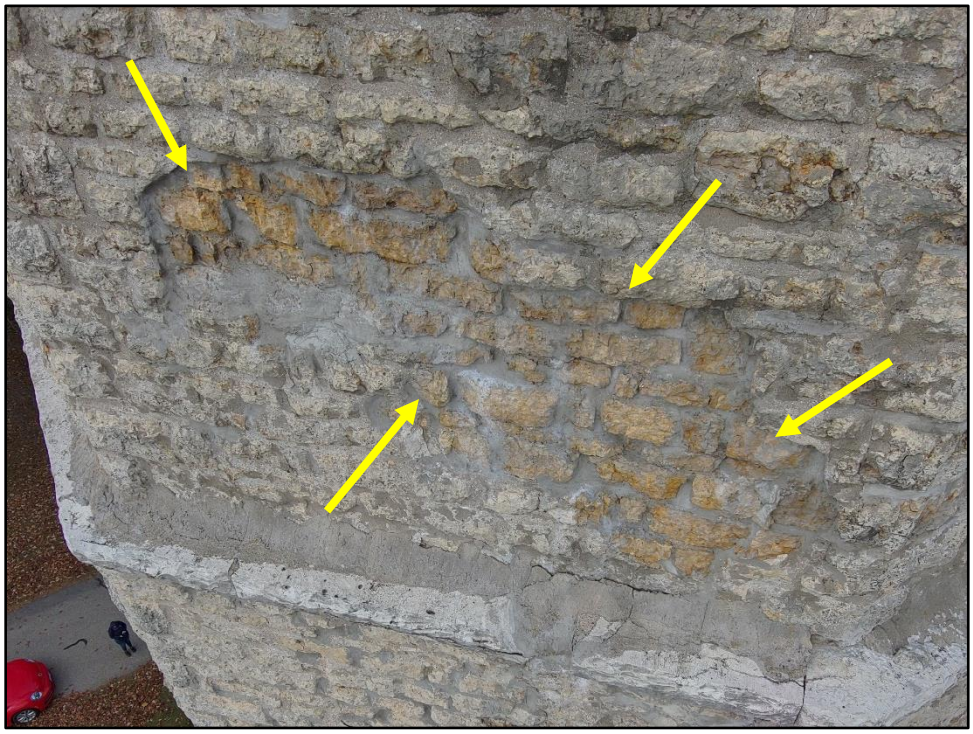

Photo 20: Area of spalled stone – top tier, southeast elevation

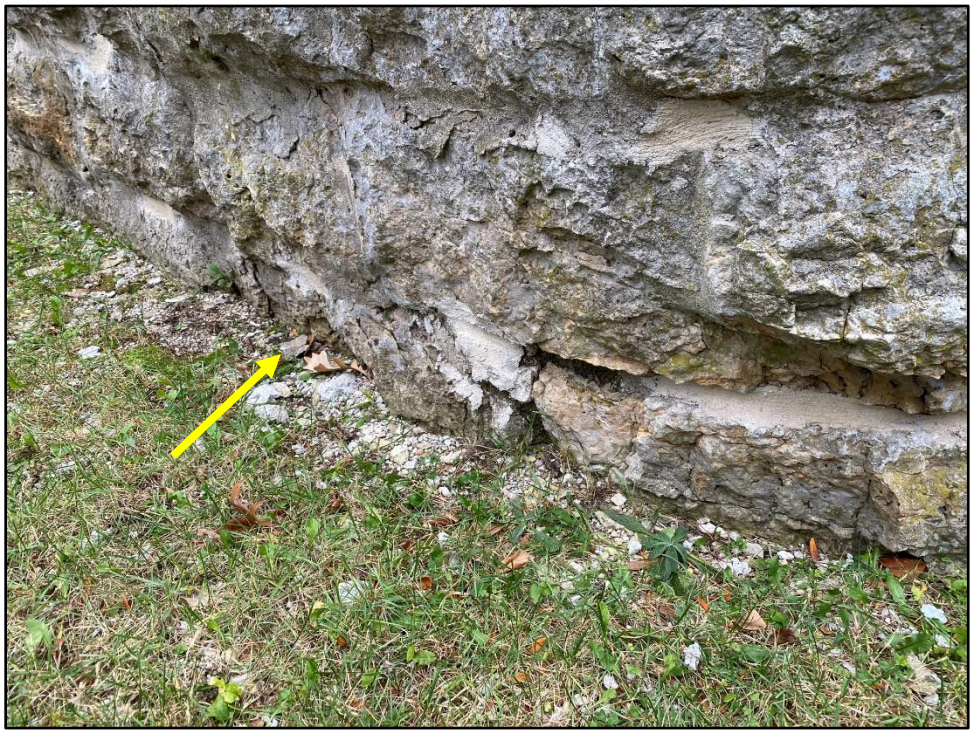

Photo 21: Stone deterioration at base of wall

Condition #3: Cracked Stone

Description: Stones in some locations have significant cracking. This is particularly prevalent in the arched stones at the entryway (Photos 22 and 23). Also see Condition #1 for cracking in stones at the belt courses.

Repair: For a long-term repair, these stones should be replaced. The cracking is too extensive for an in-place repair to be effective.

Priority Level: High

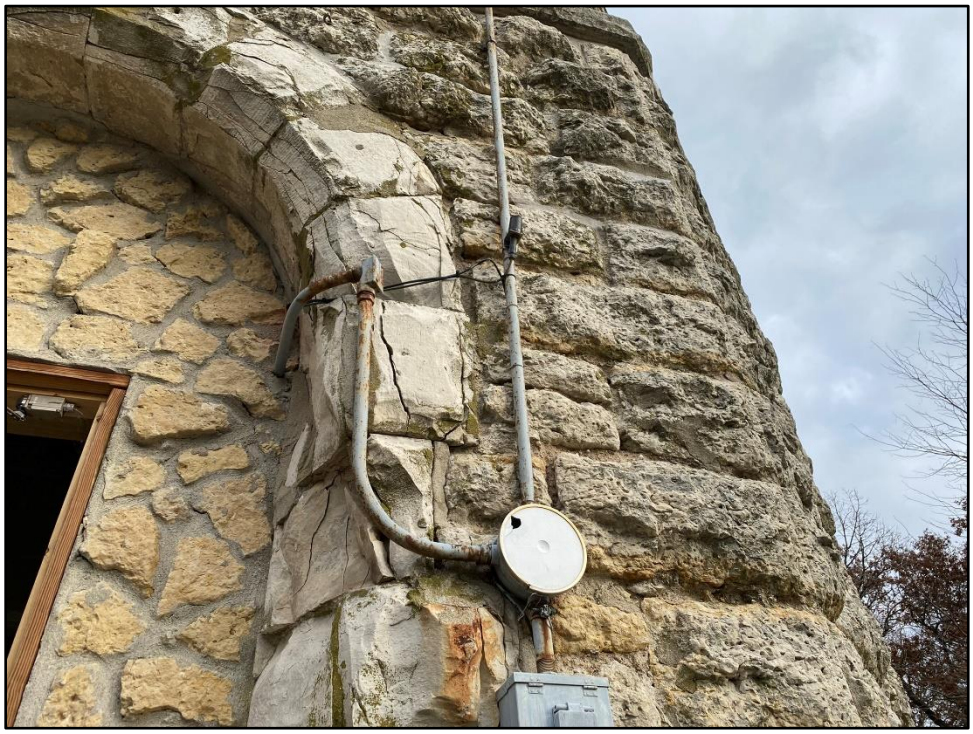

Photo 22: Cracked stone in entryway arch

Photo 23: Cracked stone in entryway arch

Condition #4: Deteriorated Mortar Joints

Description: The mortar joints are in various stages of deterioration.

The exterior wall joints have had a lot of spot repointing in the past (Photos 24 to 27), which is to be expected for most structures. It does appear that some of the previous mortar may be harder than appropriate, which may be the cause of some of the isolated stone spalling and cracking.

The interior wall joints are very loose and mortar is falling out of the joints and collecting on the floor (Photo 28).

Keeping mortar joints in good condition is key to the longevity of this structure. Given the age of the structure, we would anticipate that the original lime mortar used would be deteriorating and reverting to a sandy material. This is not necessarily an issue near the center of the wall as long as it is kept in place by the mortar on the wall faces.

Repair: Repoint loose mortar joints. The joints on the exterior should have a higher priority than those on the interior. Repointing can be performed in sections throughout the building over time, or when access is available. For the purpose of planning, it would be appropriate to assume that 5% to 10% of the building will need to be repointed. While most of the building is in good condition at this time, the joints will continue to deteriorate while planning progresses and if repairs are staged over time.

The mortar should be matched to the original mortar. Prior to performing any repair work on this building, the mortar should be analyzed to determine the composition of the appropriate repair mortar.

Priority Level: Medium

Photo 24: Different types of mortar

Photo 25: Different mortar at entry arch

Photo 26: Repointed joints at mid-height of tower

Photo 27: Repointing mortar at top of tower

Photo 28: Deteriorated joints on interior – dust on floor is deteriorated mortar

Condition #5: Crack in Wall

Description: A crack was noted on the interior of the structure above an opening on the north wall (Photo 29).

Repair: Repoint cracked mortar joints and epoxy or pin across cracks in the stone.

Priority Level: Monitor until interior repointing is performed, or unless additional movement occurs.

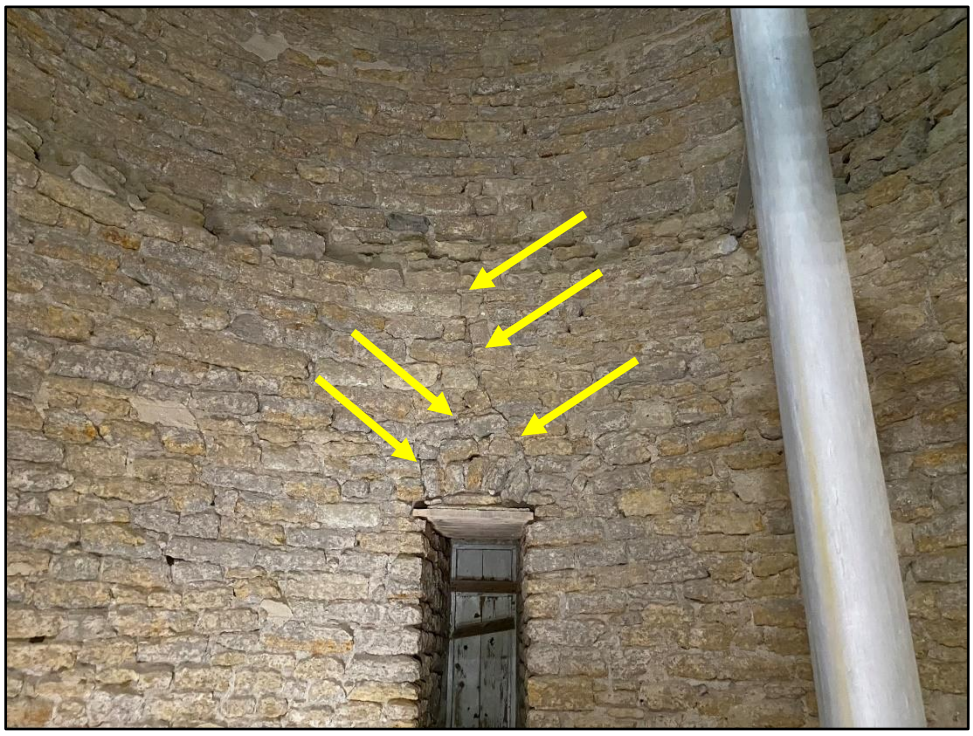

Photo 29: Crack on interior of tower

Condition #6: Concrete/Mortar Wash Missing and Cracked

Description: There has been a concrete or mortar wash placed at the base of the wall. It has fallen off in many locations and is cracked in other locations (Photo 30). The use of concrete or a hard mortar is not appropriate for this building.

Repair: When belt courses discussed in Condition #1 are being addressed, repair this as well. There may need to be stones replaced where they are cracked or spalled. Mortar joints should be replaced. If there is still a need for water deflection at this location, consider installing a mortar wash with a material matching the original building mortar, but anticipate that it will need to be maintained on a regular basis.

Priority Level: High – coordinate repairs with belt course repairs.

Photo 30: Cracked and missing concrete/mortar wash

Condition #7: Corroded Steel

Description: The steel beams and plate girders holding the tank have light corrosion, particularly near the masonry walls (Photos 31 to 33). The beams that form the floor below the tank also have corrosion at the exterior walls (Photos 34 and 35).

The tank has some signs of corrosion on the exterior at the joints (Photo 36).

The ladder on the interior of the structure has corrosion at the base and at some of the wall connections (Photos 37 and 38)

Repair: Perform some exploratory openings at locations where beams are bearing on walls. Exposing the steel members will determine whether repairs are needed. If repairs are needed it will likely involve welding new steel plates/angles/etc to the existing steel to replace the lost steel capacity.

At a minimum, exposed steel members should be primed and painted to extend the life of the structure.

Once water is removed from the tank, the interior should be inspected by a tank inspector to determine whether the tank itself, or its connections to the base, require repairs.

The interior ladder's base and connections to the wall should be reinforced with new steel elements. The exterior platform and ladder should be inspected in greater detail when access is available, or when repairs begin.

For all steel repairs, the weldability of the material should be determined by testing prior to implementing any repairs. Some steel of this age is not weldable. There is also a chance that some of the material is iron rather than steel.

Priority Level: High – beams and girders that are bearing on masonry. These are a higher priority because their condition will impact the longevity of any masonry repairs.

High – Ladders or other access points

Medium – All other locations

Photo 31: General light corrosion on support structure

Photo 32: Close up of tank supports at wall
There is a steel plate on top of the masonry that is corroding as well as the base of the tank

Photo 33: General surface corrosion of tank support beams with an increase near walls

Photo 34: Signs of floor beam corrosion at walls

Photo 35: Corroding floor beam at exit to exterior platform

Photo 36: Rust staining on exterior of tank

Photo 37: Corroded ladder connections at wall

Photo 38: Base of interior ladder – corrosion on all pieces

Condition #8: Rotting Wood

Description: The wood panels over the access openings are rotting (Photo 39). This is not a significant concern in the overall scope of this structure. However, we recommend addressing it when there is access and when the surrounding masonry is being addressed.

Repair: Replace deteriorating wood in kind.

Priority Level: Low/Monitor

Photo 39: Minor wood deterioration at access panels

Structural Analysis

We performed a high level structural analysis of the tower with a focus on two main items. The first focus was on whether the masonry walls are close to their capacity. This analysis gives an indication about how much room there is for deterioration before there are global structural issues. The second focus was on the effects of removing the water from the tank. This analysis gives an indication of whether reinforcing would be necessary for the structure due to removing the water.

The results of both analyses were positive.

The masonry walls have plenty of capacity to undergo some deterioration before having global structural concerns. The current amount of deterioration to the masonry walls is not having a significant structural effect. Relatively speaking, if there is 2” of mortar loss in an 8 foot thick wall, that is equivalent to just over an 1/8” of mortar loss in a 12” brick wall. At the top of the tower, that same 2” mortar loss in a 3 foot thick wall is equivalent to 2/3” of mortar loss in a 12” brick wall. It becomes more important as the wall gets thinner, but neither of these mortar losses would cause a global structural concern in a standard building wall. The current amount of mortar loss is more of a concern with loosening stones than for the structure as a whole.

> *Recommendation: Maintain the mortar joints, particularly on the exterior faces, to keep the compression capacity of the structure. Keeping the old, loose mortar from falling out of the joints is the best way to keep the structure in good structural condition.*

The second part of this analysis showed that it is acceptable to remove the water from the tank. There is no tension in the masonry portion of the structure even with the water removed from the tank. This is important because the deteriorating stone mortar joints have no capacity to withstand tension. As long as the structure stays in compression and the joints are maintained, the removal of the water will not have a deleterious effect.

The analysis does show a small amount of tension occurring at the base of the steel tank where it connects to the masonry under high wind conditions. Because any connections at the tank are only visible from the interior of the tank, we could not ascertain the strength of those connections. However, the beams and girders that support the tank are built into the masonry walls. The weight of the masonry surrounding these elements, particularly the girders, will provide some additional hold-down support for the tank.

> *Recommendation: After the water is removed from the tank, have the interior of the tank inspected for severe corrosion and to ensure that there are connections between the tank and the support structure.*

Recommendation

We recommend repairing this building using historically appropriate methods. The structure is stable and generally in good condition, with some elements in fair condition. The conditions discussed previously are all typical situations that are anticipated in a structure of this age and construction. In our opinion, there is no reason to demolish this structure at this time. There is certainly no reason to consider demolishing and then rebuilding the structure in kind.

The structure is safe at this time. The biggest hazard would be the potential for falling stones. The fence around the exterior protects the public from this potential hazard. While it's not possible to see into the future to determine when the structure would deteriorate to a point of larger scale hazard, it is not close to that state at this time. It will be important to address the high priority issues in the next few years, and the longer the work is postponed, the more extensive, and therefore expensive, it will be.

Opinion of Probable Construction Cost

The anticipated budget for performing the repair work described in this report is in the range of $950,000 to $1,100,000. This budget assumes that all of the work is performed at one time, during one project. Additional discussion of phasing and associated costs is provided in the next section.

This estimate has been provided by Structurewerks. They are a concrete and masonry restoration company located in southeast Wisconsin with significant experience in doing this sort of work.

McEnroe Consulting Engineers has been asked to provide an opinion on the potential cost for demolishing the tower to be used for funding discussions. The anticipated cost for demolition is in the range of $600,000. This cost was developed using the RS Means Building Construction Cost Data book.

A more detailed description of each cost estimate is found in Appendix B.

Phasing Discussion

Often funding is not available to address all the issues in a building at the same time. In order to plan a phased approach to repairing this structure, we are recommending the following segments of work as a potential path forward. It may be that a different strategy is taken in the end, and that is fine. There are many ways to approach this, and there may be good reasons to choose something other than what is proposed here.

In a structure such as this, the access available to perform repairs will often drive the approach taken. If the structure was accessible from an aerial lift, it would be more feasible to break the repairs down into smaller phases. However, given the slope of the ground, particularly on the north and east sides, prohibit using a lift to access much of the tower. Also, repair work that involves removing stones would be nearly impossible from a lift due to weight limitations. Scaffolding would be the more effective means to access the exterior of the structure. Scaffolding will have a relatively high first cost. Once it is in place, it will typically make the most sense to repair all items in that area.

If spot repairs were needed in the interior of the tower, a small atrium style lift would work well for that. However, since the entire interior is in need of repointing, it would likely be more effective to build scaffolding on the interior.

The following phasing has been developed with the goal of determining the extent of work that can likely be completed for $600,000 to match the estimated cost to demolish the building. Work that will not be able to be performed within that initial $600,000 is then phased to spread out the cost over multiple years.

Note that the total cost of this phased approach is estimated to be $1,330,000 which is roughly 30% higher than the cost to perform the project all at one time.

Phase 1

First, address the corroded steel at the platform below the tank. To do this, a contractor would access the interior of the tower with an atrium style lift to address any issues with the steel floor beams. Starting with this work will allow this platform to be used during construction for repairs at the top of the tower.

Second, repair and rebuild masonry at the top of the wall. Do this work in segments as to not destabilize the tank. Remove deteriorated masonry, expose corroded steel, clean and paint steel (augmenting if needed with new steel or welding plates), rebuild masonry with original stones and supplemental stones as needed using mortar and stones matched to the original.

Third, perform other masonry repairs on the exterior of the tower, starting at the top and continuing down as far as the budget allows. Based on the cost estimated performed as part of this study, it is anticipated that the top two levels of the exterior would be addressed as part of this phase. The scope of work could be adjusted to include more or less of the exterior based on budget available and the conditions found during construction.

Estimated cost of Phase 1: $590,000.

Phase 2

Continue down the exterior of the building to perform the masonry repairs at the lower three levels of the tower. This would include addressing cracked stones and repointing mortar joints.

Estimated cost of Phase 2: $420,000.

Phase 3

Repoint mortar joints on the interior. Address rotting wood doors and other miscellaneous items that can be accessed from the interior.

This can be performed in stages if desired however the costs will increase to create access to the interior for each phase. Another consideration may be that this interior work could be performed in the winter months when masons and scaffolding companies are less busy than the summer months. This could potentially allow for a reduction in cost.

Prior to performing the interior work, investigate the interior humidity levels under the new conditions with the decommissioned tank. If there is a major condensation issue on the interior, this may add to the joints failing prematurely. If this is the case, consider ways to add passive ventilation.

Estimated cost of Phase 3: $320,000.

Ongoing Maintenance

There will also be ongoing maintenance costs for the building. For a building such as this, maintenance will typically consist of periodic repointing of mortar joints and addressing cracking stone. The cost of performing this work is highly dependent on the access needed. For work on the west and south sides of the building, it can be performed from an aerial lift and most of the costs will be for the labor and materials needed to perform the work. On the north and west sides of the tower, scaffolding will be needed to perform any work. This will greatly increase the cost of doing that work.

A building that has been repointed with good craftsmanship and materials should be able to last 30 to 40 years without repointing. Due to the high cost of accessing the structure, it is going to be very important to do a comprehensive repair of stone and mortar during the Phase 1 and Phase 2 repairs so that the length of time until repointing is needed is extended as long as possible.

Estimated cost for repointing 5% of mortar joints on west/south half of the exterior: $30,000
Estimated cost for repointing 5% of mortar joints on east/north half of the exterior: $80,000

Future Costs

All of the costs provided above are based on 2023 pricing. Obviously as work is phased into the future, inflation will increase the costs. Here is an example of how this might affect these costs, using a 5% per year increase for inflation:

Phase 1 performed in 2024:	$620,000
Phase 2 performed in 2026:	$486,000
Phase 3 performed in 2028:	$408,000
Total overall cost:	$1,514,000

Ongoing Maintenance performed in 2040:

West/south sides:	$70,000
North/east sides:	$183,000

Recommendations for next steps

We recommend the following items as next steps in the process of repairing and restoring this structure:

1. Engage a tank inspector to review the conditions inside the tank after it has been emptied.

2. Perform some material testing including mortar analysis and steel sampling. This will provide information critical to performing the repairs needed.

3. Explore whether there would be historic tax credits or other programs available to assist in funding repairs for this structure.

4. Perform some investigation openings in the top of the masonry structure. This will allow a view of the steel condition within the masonry as well as getting a better look at the overall mortar condition near the top of the wall. These two conditions have the most assumptions associated with the costs and overall impact on a repair project. Confirming these conditions early in the process would provide more confidence in the cost impacts of Phase 1 work. Given the high cost of access to the top of the tower that would be needed to perform ongoing maintenance, performing a comprehensive repair to the top levels during Phase 1 will lower the long term costs of maintaining this structure.

5. Use the findings of these steps to develop a long-term plan for preservation or restoration of the structure, then move into design for the first phase of work.

Limitations

This report is based on conditions of structural elements that were readily observable at the time of investigation. No testing or inspections were performed. McEnroe Consulting Engineers does not accept responsibility for structural deficiencies not evident during an investigation of this type. All recommendations provided in this report are conceptual in nature and are not intended to be full details or specifications for construction.

All conditions discussed in this report are subject to change and are anticipated to change over time. As additional exploration is performed, the recommendations in this report may change based on newly available information.

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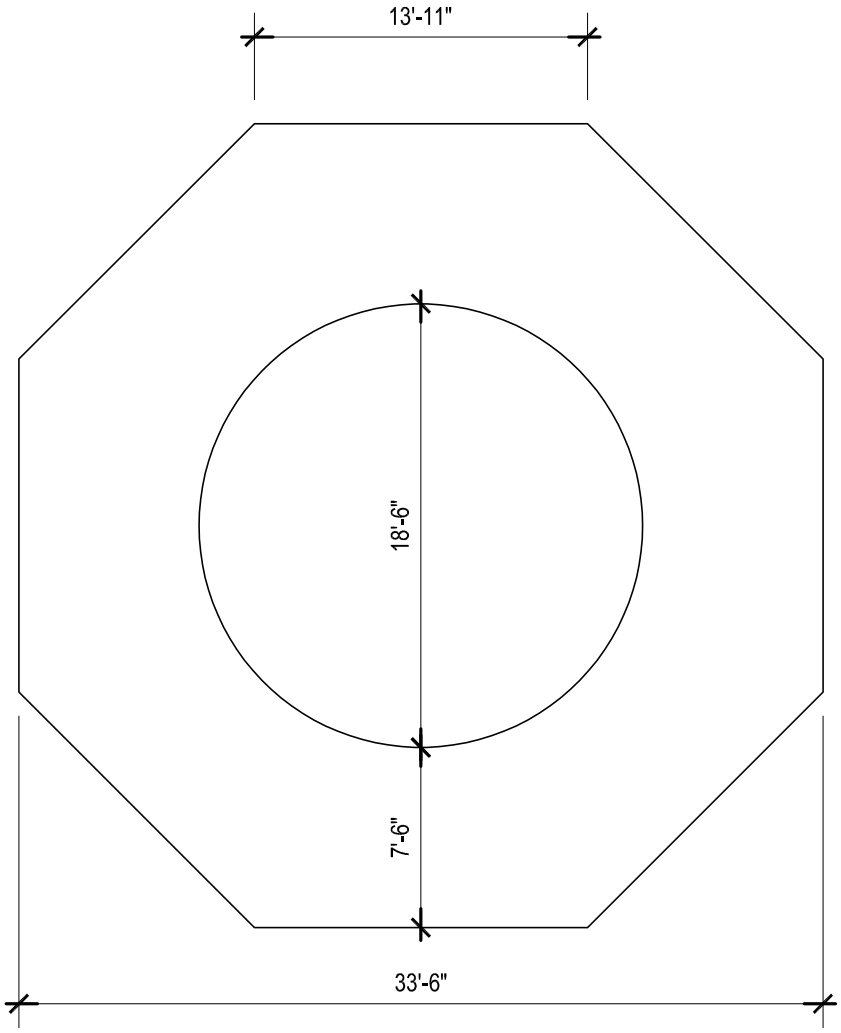
Appendix A

Level 1 (base)



NOTE THAT ALL DIMENSIONS ARE ROUGH ESTIMATES. EXACT MEASUREMENTS SHOULD BE COLLECTED FOR ANY CONSTRUCTION WORK.

ISSUE DATE: 12/02/22

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

SHEET NAME:

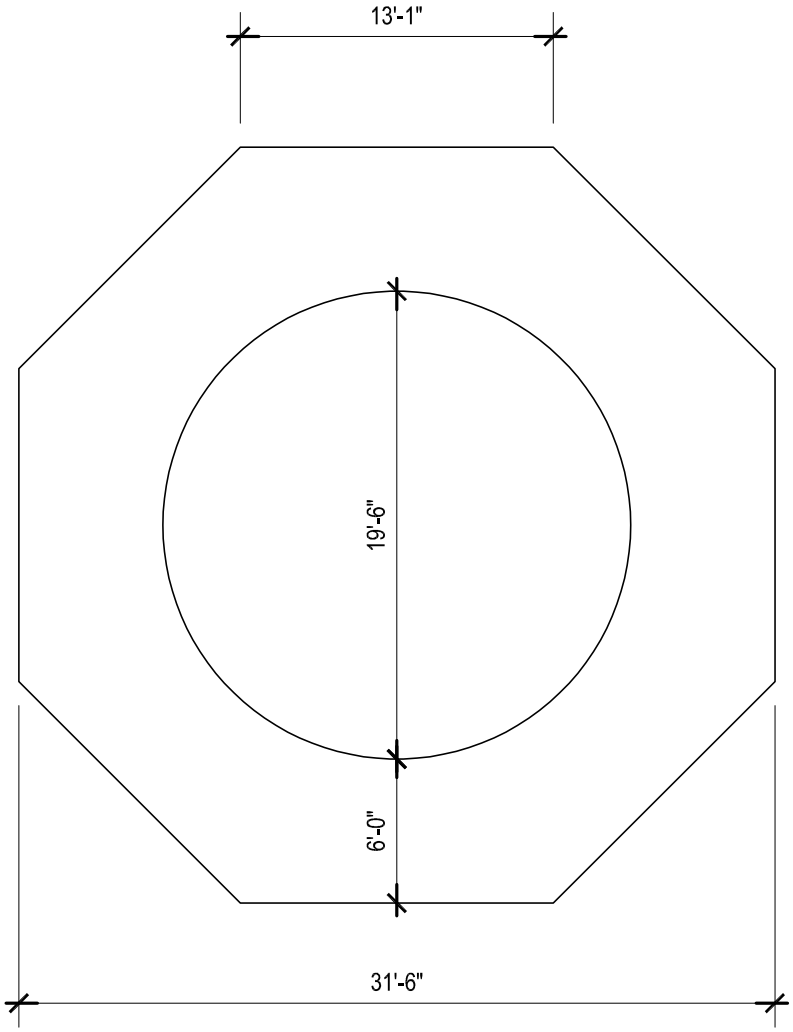
LEVEL 1 PLAN

SHEET NO:

S1

MCE PROJ NO: 22-37

Level 2



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ISSUE DATE: 12/02/22

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

SHEET NAME:

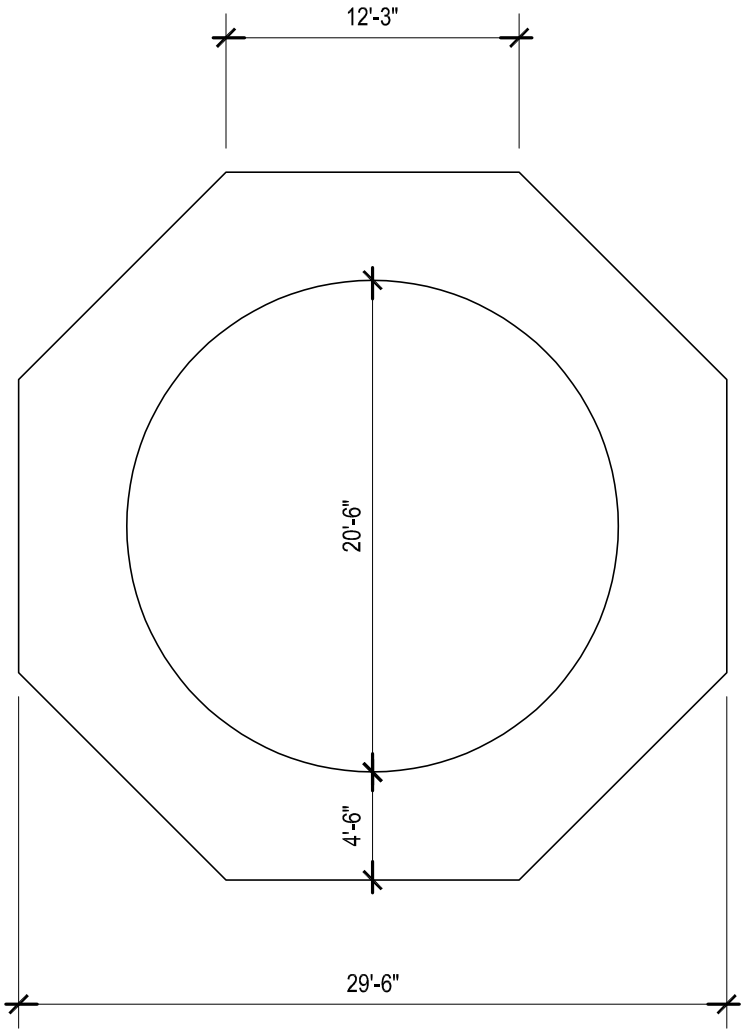
LEVEL 2 PLAN

SHEET NO:

S2

MCE PROJ NO: 22-37

Level 3



NOTE THAT ALL DIMENSIONS ARE ROUGH ESTIMATES. EXACT MEASUREMENTS SHOULD BE COLLECTED FOR ANY CONSTRUCTION WORK.

ISSUE DATE: 12/02/22

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

SHEET NAME:

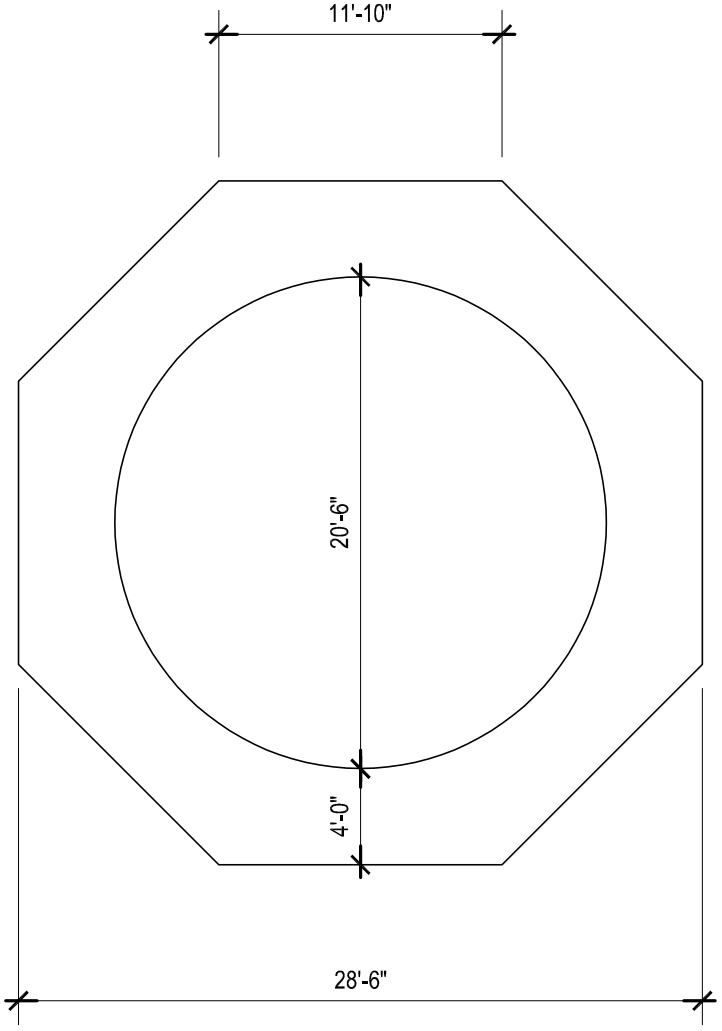
LEVEL 3 PLAN

SHEET NO:

S3

MCE PROJ NO: 22-37

Level 4



NOTE THAT ALL DIMENSIONS ARE ROUGH ESTIMATES. EXACT MEASUREMENTS SHOULD BE COLLECTED FOR ANY CONSTRUCTION WORK.

ISSUE DATE: 12/02/22

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

SHEET NAME:

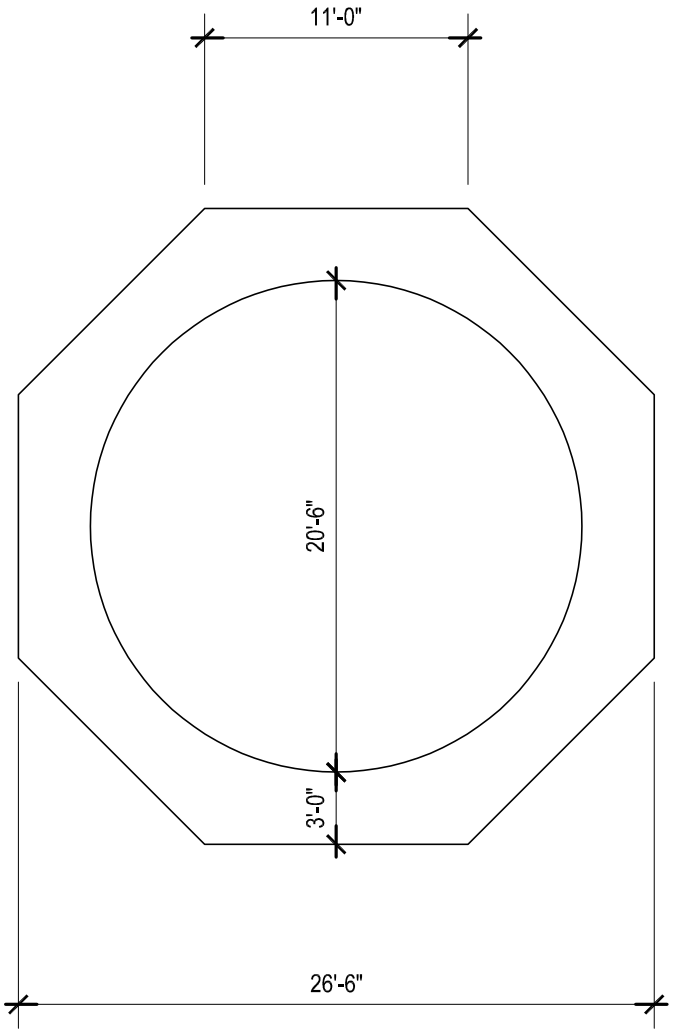
LEVEL 4 PLAN

SHEET NO:

S4

MCE PROJ NO: 22-37

Level 5



NOTE THAT ALL DIMENSIONS ARE ROUGH ESTIMATES. EXACT MEASUREMENTS SHOULD BE COLLECTED FOR ANY CONSTRUCTION WORK.

ISSUE DATE: 12/02/22

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

SHEET NAME:

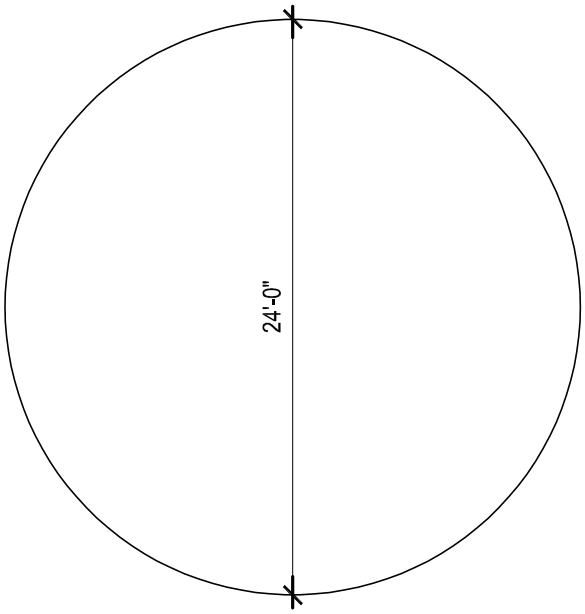
LEVEL 5 PLAN

SHEET NO:

S5

MCE PROJ NO: 22-37

Steel Tank



NOTE THAT ALL DIMENSIONS ARE ROUGH ESTIMATES. EXACT MEASUREMENTS SHOULD BE COLLECTED FOR ANY CONSTRUCTION WORK.

ISSUE DATE: 12/02/22

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

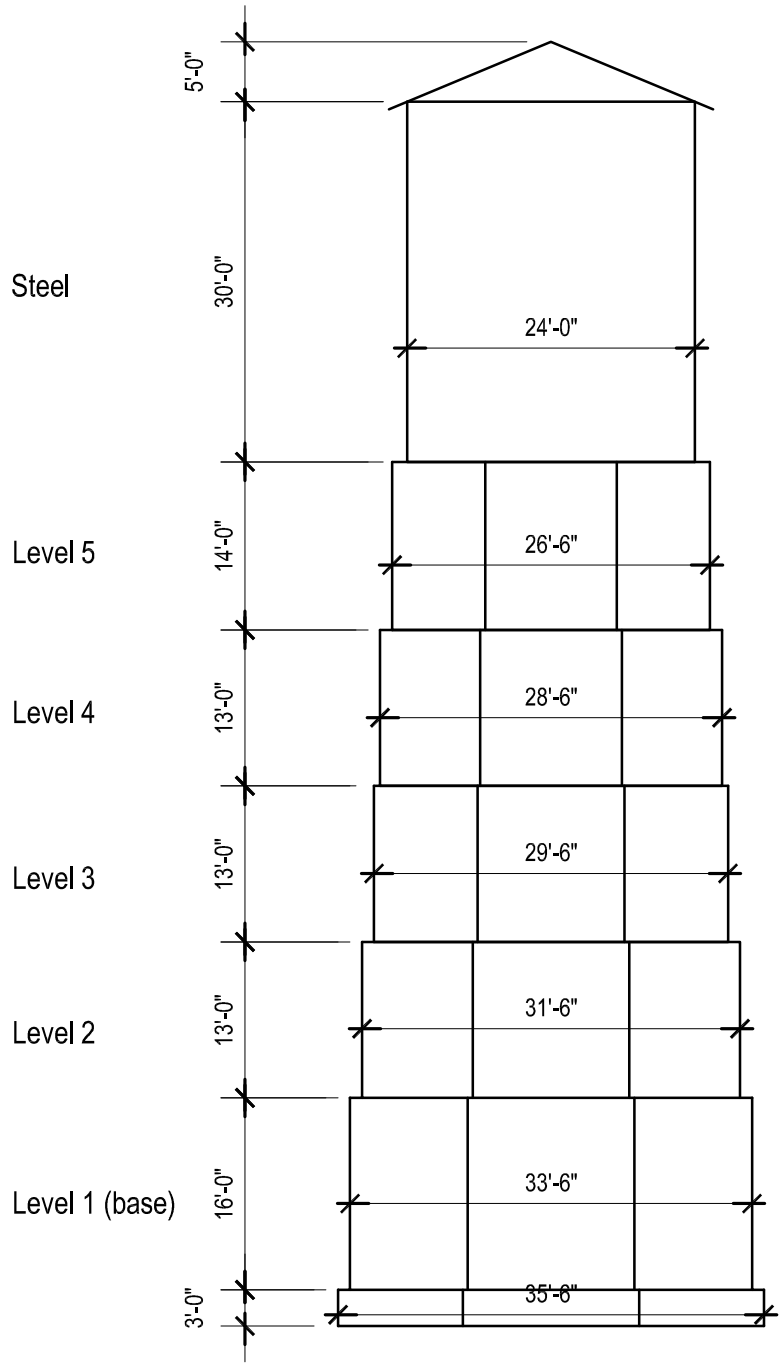
SHEET NAME:

STEEL TANK

SHEET NO:

S6

MCE PROJ NO: 22-37



NOTE THAT ALL DIMENSIONS ARE ROUGH ESTIMATES. EXACT MEASUREMENTS SHOULD BE COLLECTED FOR ANY CONSTRUCTION WORK.

ISSUE DATE: 12/02/22

McEnroe Consulting Engineers

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

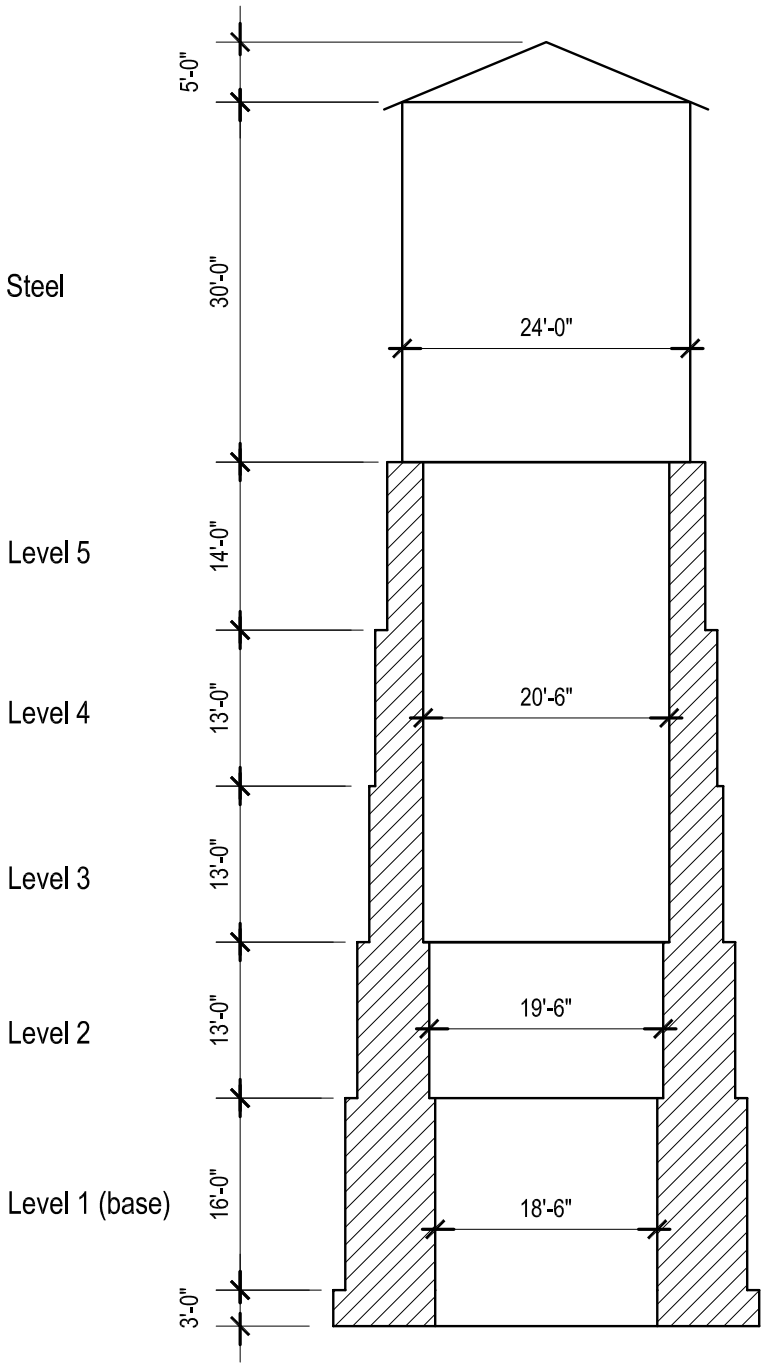
SHEET NAME:

ELEVATION

SHEET NO:

S7

MCE PROJ NO: 22-37



NOTE THAT ALL DIMENSIONS ARE ROUGH ESTIMATES. EXACT MEASUREMENTS SHOULD BE COLLECTED FOR ANY CONSTRUCTION WORK.

ISSUE DATE: 12/29/22

McEnroe Consulting Engineers

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STARIN PARK WATER TOWER

WHITEWATER, WISCONSIN

SHEET NAME:

SECTION

SHEET NO:

S8

MCE PROJ NO: 22-37

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Appendix B

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December 12, 2022

Ms. Eileen McEnroe Hankes, PE
McEnroe Consulting Engineers
7251 W. North Ave. Suite 1
Wauwatosa, WI 53213

eileen@mcenroe-eng.com

RE: **Starin Tower Rehabilitation**

Dear Eileen:

Thank you for the opportunity to provide budgetary figures for the masonry restoration of the tower in Whitewater, WI. Structurewerks will provide the following scope of work per the engineers reports and estimated quantities of repairs:

SCOPE OF WORK:

- Exterior/Interior masonry restoration including the following:
  - Stone belt course replacement (82 each)
  - Masonry cleaning exterior
  - Replace mortar wash (504 LF)
  - Rebuild top of wall (320 SF)
  - Stone unit replacements not in belt course (29)
  - Arch stones (23)
  - Repointing of exterior joints (863 LF)
  - Repointing joints on interior (4,300 SF)
  - Crack repointing (15 LF)
  - Epoxy stone (14 locations)
  - Mortar wash at base of wall (120 LF)
  - Various steel repairs
  - Ladder repairs (10 locations)
  - Door replacements (5 locations)

The above work budget would be between $950,000 - $1,100,000.

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Notes:

1. Scaffold access is included in our budget proposal. Rental of 4 months included.
2. Stone replacements are based on sourcing an approved similar type locally.
3. Budgets were assembled using estimated 2023 spring pricing. Costs and availability of products are subject to change. We reserve the right to reevaluate costs at the time of contracting.
4. Certain assumptions were made about size, depth of stone replacements. If it varies significantly, owner shall be contacted to review any cost implications.
5. Basic breakdown of costs would be as follows: Scaffold access 35%, interior restoration/steel repair/doors 20%, exterior restoration 45%.

If you have any questions, please contact me at (262) 408-3960.

Thank you for your continued interest in Structurewerks.

Sincerely,

Eric Johnson

Eric Johnson
VP Sales and Operations

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building confidence.

January 4, 2023

Ms. Eileen McEnroe Hankes, PE
McEnroe Consulting Engineers
7251 W. North Ave. Suite 1
Wauwatosa, WI 53213

eileen@mcenroe-eng.com

RE: **Starin Tower Rehabilitation – REV 1.4.22**

Dear Eileen:

Thank you for the opportunity to provide budgetary figures for the masonry restoration of the tower in Whitewater, WI. Structurewerks will provide the following scope of work per the engineers reports and estimated quantities of repairs:

Phase 1 – Levels 4-5 only
SCOPE OF WORK:

- Exterior/Interior masonry restoration including the following:
  - Stone belt course replacement (19 each)
  - Masonry cleaning exterior
  - Replace mortar wash (161 LF)
  - Rebuild top of wall (320 SF)
  - Stone unit replacements not in belt course (29)
  - Repointing of exterior joints (800 LF total in phase 1 and 2)
  - Various steel repairs
  - Door replacements (3 locations)

The above work budget would be approximately $590,000.

Phase 2 – Levels 1-3

SCOPE OF WORK:

- Exterior/Interior masonry restoration including the following:
  - Stone belt course replacement (63 each)
  - Arch stones (23)
  - Repointing of exterior joints
  - Crack repointing (15 LF)
  - Epoxy stone (14 locations)
  - Mortar wash at base of wall (120 LF)
  - Ladder repairs (10 locations)
  - Door replacements (2 locations)

The above work budget would be approximately $420,000.

Phase 3 – Interior Work

SCOPE OF WORK:

- Interior masonry restoration including the following:
  - Repointing joints on interior (4,300 SF)

The above work budget would be approximately $320,000.

Notes:

1. Scaffold access is included in our budget proposal. Rental of 4 months included.
2. Stone replacements are based on sourcing an approved similar type locally.
3. Budgets were assembled using estimated 2023 spring pricing. Costs and availability of products are subject to change. We reserve the right to reevaluate costs at the time of contracting.
4. Certain assumptions were made about size, depth of stone replacements. If it varies significantly, owner shall be contacted to review any cost implications.
5. Basic breakdown of costs would be as follows: Scaffold access 35%, interior restoration/steel repair/doors 20%, exterior restoration 45% for all phases of the project. The first phase scaffold budget is $195,000, the second phase is $50,000 and the third phase is $80,000.

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6. Exterior cleaning of the masonry would prefer to be completed in the first phase to be able to match mortar and stone samples properly. This represents about $25,000 of the first phase allocation.
7. If separated into 3 phases over a 5-year period, many of the cost estimates are guesses beyond the first year. Uncompleted work could continue to cause larger quantities to be completed, labor and material costs are unknown that far in advance.
8. For future preservation efforts after the initial restoration, I would have a contractor perform a cursory review from the ground every 2 - 5 years and provide any recommendations. It would be recommended that maybe budgeting $50,000 within the first 5 years would be prudent in case something is noticed and needs to be addressed.

If you have any questions, please contact me at (262) 408-3960.

Thank you for your continued interest in Structurewerks.

Sincerely,

Eric Johnson

Eric Johnson
VP Sales and Operations

Starin Park Water Tower - Demolition

Engineer's Opinion of Probable Construction Cost

Project: Starin Park Water Tower Assessment
Date: 12/29/2022

Item	Description	Unit Cost	Quantity	Unit	Cost
1	Dumpster for Misc (40 CY - 10 ton capacity)	$850.00	6	Week	$5,100
2	Building Demo	$2.13	67,000	CF	$142,710
3	Foundation Demo	$15.20	444	SF	$6,749
4	Foundation Backfill	$16.55	263	CY	$4,354
5	Salvage Masonry - clean and stack on pallet	$3.76	12,500	Each	$47,000
6	Loading and Hauling up to 5 miles	$15.50	2,500	CY	$38,750
7	Dump Fees - 10% of masonry materials	$81.00	300	Tons	$24,300
8	40 Ton Crane Use	$3,500.00	20	Days	$70,000
9	Fence Removal	$4.81	2,400	LF	$11,544
10	Site Restoration (topsoil & seed)	$24.25	667	SY	$16,167
				Subtotal:	$366,674
	General Conditions (gen req, bond, etc)			25%	$92,000
	GC Overhead & Profit			10%	$46,000
	A/E Design and Oversight			5%	$23,000
	Contingency			15%	$80,000
				Total:	**$610,000**

* All totals and subtotals are rounded up based on the level of detail in the design