

January 31, 2024

Iowa Department of Administrative Services
Attn: James Trower, Owners Representative
109 SE 13th Street
Des Moines, IA 50319

Re: Terrace Hill Terrace Road Retaining Walls Repair
DAS Project No.: 9373.00

Dear Mr. Trower,

Executive Summary

The southern approximately 75' of the brick retaining wall along Terrace Road on the east side of the Terrace Hill Governor's mansion is deteriorated and shows signs of partial failure. It is our recommendation that the State consider repairs including removal and replacement of this section of wall due to the potential for full failure occurring at any time. In the meantime, until this permanent repair can be accomplished, temporary protection and barriers should be constructed along the southern portion of the wall to reduce the risk of injury or property damage if the wall were to collapse onto the adjacent public street.

Retaining Wall Investigation

Structural and Civil Engineers from Shive-Hattery have completed a site review and evaluation of the retaining wall along Terrace Road on the east side of the Terrace Hill Governor's Mansion. The purpose of this report was to complete a visual structural review of the existing brick retaining wall which recently had a small amount of bricks fall out near the bottom of a section of the wall. We identified that the wall system, which is immediately adjacent to the back of curb of the city street, is made of a few different sections which are of various materials, types, and age. The primary building material is brick. The brick has a contoured finish on its exposed surface and appears to be very old. The age is unknown to us, but we would estimate it to be in excess of 50 years. The wall is two or three bricks thick and has a poured concrete cap on it. It is approximately 360 feet long extending south along Terrace Road from the brick gate pillars at the intersection of Grand Avenue. The height of the wall varies from only a couple feet at the ends to approximately 8'. The purpose of the wall is to retain soil on the Terrace Hill property including adjacent site improvements of a north access drive, perimeter fencing (recently installed), and numerous trees.

We observed along the northern portion of the wall that some restoration and/or height addition was made to the wall at some point in time. The matching of the brickwork was very good, and it would be difficult for the casual observer to even notice the brick change. There is one section in approximately the middle of the wall's length where some pilasters are located. We believe there may have been some stairs located at this section, but it is now fully bricked in.



We also observed, at a couple locations, what appeared to be remnants of a potential limestone retaining wall located immediately behind the current brick wall. It is unclear on the extents of any limestone material that may exist behind the current brick wall and if that was part of an older wall section that existed prior to the brick wall or just part of the current wall construction. The investigation of the extent and function of any limestone behind the current brick wall will require further investigation and should be incorporated into future repair or replacement designs for the wall.

It is our understanding that the State is currently working on completing a cultural resource review of the wall including requesting SHPO consultation and guidance for future repairs and improvements. For the purposes of recommendations in this report we have assumed that any repairs or replacements will be required to match the current location and appearance of the brick wall. This assumption will need to be verified once input and guidance is received from SHPO. It will also need to be verified if similar matching bricks can be sourced for any repairs or replacement sections or if the existing bricks will need to be salvaged and reused.

The wall is overall in generally good condition for its age. The overall wall is due for some routine maintenance, cleaning, and tuckpointing but generally is structurally sound. However, near the south end there is a section with some deterioration and areas in need of repair or restoration. This area of deterioration extends approximately 50' from the south end of the wall to a location near a tree located approximately 3' above the wall. Refer to the attached photos at the end of this report. In our opinion, the age of the wall along with the root growth of this tree has likely affected the structural integrity of this wall in a negative manner. Normal soil and ground water loading behind the wall in addition to root growth and weight of the adjacent tree has likely contributed to pushing a portion of the wall outward. There has also been a shear failure in the horizontal mortar to brick interface at one brick above the base of the wall. The movement has been significant, we estimate up to $\frac{3}{4}$ of the brick depth (as much as 3" at some locations).

In this same vicinity, there is an area of the wall where the brick mortar has deteriorated resulting in bricks falling out near the bottom of the wall. It is an area about 5'-0" long and 2'-0" high. Several bricks are missing, we counted 7 or 8 bricks missing. At this hole location, rubble from behind the wall is eroding out as well as chunks of concrete and limestone. Upon closer investigation, we could see through this area of missing bricks beyond the brick face. It appears there may be an old limestone wall behind the brick wall. We however did not observe any evidence of soil erosion or a larger void behind the wall as it appeared the backing limestone was containing additional erosion and failure in the immediate area of the missing bricks.

In our opinion, the southern approximate 75' of wall including the area of missing bricks has the potential to fail (collapse) at any time with a spontaneous collapse into the public roadway. This failure has a higher potential of failure during a period of wet weather when the adjacent retained soil has a higher saturation and increased levels of localized ground water. We recommend proactive steps be taken to cordon off the area adjacent to the wall from pedestrian, road maintenance (snow removal), and vehicle traffic until such time more permanent restoration can be implemented. This area is from about 15'-0" to 20'-0" north of the tree and extends to the south end of the wall. Additional temporary shoring or bracing may also be considered but we are currently not recommending this due to the anticipated cost and the fact that there is no anticipated collateral damage to additional structures above the wall except for a fence and trees if the retaining wall would fail.

Temporary Solution Recommendation

The State/Terrace Hill staff should monitor the wall on an ongoing basis until permanent repairs can be made to identify any changes to the current wall conditions such as additional cracking, additional bricks falling out, or other signs of movement. We recommend, at a minimum, monthly visual reviews be completed by facility staff with additional reviews following periods of heavy rain or snow melt.

Recommendations for temporary protection along the wall would be to place traffic cones/delineators along the section of wall, at a minimum, with more substantial concrete jersey barriers being recommended if the permanent wall repairs will be delayed. The State should coordinate any temporary improvements with the City of Des Moines to confirm extents and requirements for any barriers and associated street signage that should be placed.

The State should also consider removal of the deciduous tree located immediately above the wall in the area of the partial failure. This tree appears to be in poor health and partially hollow at the base.

Permanent Solution Recommendation

It is our recommendation that the southern portion of the wall which has slid (shear failure) at its base and includes the section with missing bricks should be removed and reconstructed. We anticipate that the most cost effective repair solution to achieve a long term stable retaining wall is to replace the southern section of wall with a cast-in-place concrete wall covered with the existing brick, or new brick, as a veneer. An alternative cost saving option, if approved by SHPO, the State could consider utilizing new brick materials with the same appearance as the existing bricks. The new concrete wall would be completely unseen and carry the entire earth load and the brick veneer would have no loading on it. It is for looks only.

The design of this wall will require coordination and approval from the City as portions of the adjacent City Street would likely require removal and replacement and to accommodate construction of the new wall within the City's right-of-way. A detailed topographic survey will be needed to identify existing utilities which may be impacted by the proposed construction. It is also likely that the adjacent Terrace Hill perimeter fence would require temporary removal and replacement to accommodate necessary wall foundation excavations. Adjacent trees will need to be reviewed and either protected with potential shoring or removed and replaced. Alternative wall designs will need to be reviewed and considered to identify constructability restraints and cost benefits to limit potential impacts to adjacent site and street improvements.

If you want to discuss further or have any questions about our opinions or findings, please do not hesitate to contact us.

Sincerely,



Chris Marvin, P.E.
Structural Engineer



Chris Bauer, P.E.
Civil Engineer

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.	
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	Signature	Date
	Name	Christopher R. Marvin
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	License Number	19737
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Photos



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24



Photo 25



Photo 26



Photo 27



Photo 28



Photo 29



Photo 30



Photo 31