

**SEMINOLE COUNTY GOVERNMENT
AGENDA MEMORANDUM**

SUBJECT: Willa Grove Subdivision Wall Contribution

DEPARTMENT: County Manager **DIVISION:** _____

AUTHORIZED BY: Cynthia A. Coto **CONTACT:** Donald S. Fisher **EXT.** 7212

Agenda Date <u>06/27/06</u>	Regular <input checked="" type="checkbox"/>	Consent <input type="checkbox"/>	Work Session <input type="checkbox"/>	Briefing <input type="checkbox"/>
	Public Hearing – 1:30 <input type="checkbox"/>	Public Hearing – 7:00 <input type="checkbox"/>		

MOTION/RECOMMENDATION:

1. Authorize a partnership with the residents of Willa Grove Subdivision for a contribution of 12.3% toward the cost of construction of a new 6' wall distributed as a reimbursement after completion of the wall or comparable guarantee that the wall will be constructed (staff recommendation); or
2. Authorize a partnership with the residents of Willa Grove Subdivision for a contribution of 25% toward the cost of construction of a new 6' wall distributed as a reimbursement after completion of the wall or comparable guarantee that the wall will be constructed; or
3. Authorize no participation.

District 1 – Commissioner Dallari

Donald Fisher, Deputy County Manager

BACKGROUND:

The subject pertains to Willa Grove Subdivision's 6' high brick wall that fell during Hurricane Charley in August of 2004.

Willa Grove has no homeowners' association. There are 12 different owners of the wall represented by the 12 different lots on which the wall sits. There is no easement, and therefore, there is no right of entry onto the properties for either the residents of the community or the County. Of note is a waiver granted in 1983 that allows a split rail fence and hedge be installed in lieu of a wall. Although the developer opted to install the wall, the waiver still stands.

Reviewed by:	_____
Co Atty:	_____
DFS:	_____
Other:	_____
DCM:	_____
CM:	<u>Coto</u>
File No.	<u>RCM 43</u>

Numerous residents of the subdivision assert that the primary causes for the wall failing are: 1) vibratory compaction that occurred during widening of Tuskawilla Road; 2) cutting and removal of a significant sidewalk segment on which the wall sits; and 3) the addition of one-foot of height to 135' of the wall.

However, County consultant Walter P. Moore Engineers attributes the fail of the wall to its poor construction in that the wall: 1) lacked steel reinforcement (no rebar); 2) the wall sat on top of the sidewalk and not attached to it; and 3) the lack of sufficient mortar. Further, the County Engineer adds that the wall was constructed with no expansion joints and the columns were spaced on 40' centers versus a more desirable spacing of 25' centers.

STAFF RECOMMENDATION

It is the opinion of the County Attorney's Office (CAO) that the County is not liable for the wall falling. The CAO states that the residents' entry for litigation passed and many of those asserting liability have no standing for they do not own a lot where the wall sits. This position is substantiated by the County's insurance carrier who denied a claim in 2003.

However, the County's consultant acknowledges that the addition of height to the wall made the wall's stability worse. In addition, the consultant found that the removal of the sidewalk contributed (although less than 5%) to the wall failing.

Based on the above findings, staff supports a partnership with the residents of Willa Grove Subdivision for a contribution of 12.3% toward the cost of construction of a new 6' wall. This reflects the ratio of 135' segment increased by one-foot to the overall length of the wall which is 1,100'. Further, for those segments not included in the 135', staff supports a contribution of 5% toward a new wall. This reflects the asserted impact caused by the sidewalk being cut.

Cost estimates to replace the wall were estimated at \$245,000 in May of 2005. By authorizing this contribution, the anticipated cost to the County would be approximately \$47,000. This is calculated based on the original estimate plus a 15% adjustment for increases in construction costs. Although not the sentiment of many residents, it is staff's position that its recommendation is reasonable as it is based on replacement of a new wall and not on a depreciated value of a 21 year old structure which would be the more typical contribution.

Finally, because the greater public purpose and benefit to this situation is in a new wall being built, a contribution should only take place after the wall is constructed, or at a minimum, after there is a guarantee that the wall will be built. This approach is in lieu of providing funding to individual lot owners which not only would not serve a wall being installed, but is also complicated by the fact that many lot owners received insurance checks for the damaged wall. In addition, there should be some acknowledgement from the homeowners that the County choosing to participate in no way means the County is accepting liability.

RESIDENTS CONCERNS

The residents argue that a more significant contribution should be made by the County. Dave Tolliver, a homeowner representative, questions the findings of the engineering reports commissioned by the County as well as the County's overall approach resolving the wall issue; his concerns are attached to this memorandum.

Should the Board concur with Mr. Tolliver and wish to contribute more significantly than what staff is recommending, a 25% contribution may be appropriate. This rate may bridge the gap between staff's recommendation and the desire of the homeowners; many of whom think the County should pay 100%. Further, this rate may also serve as a catalyst to the construction of a new wall. The anticipated contribution at this rate would be \$70,500. This also reflects a 15% adjustment for inflation in construction costs.

As recommended above, the distribution of payment should be made after the wall is built. Again, there should be some acknowledgement from the homeowners that the County's choosing to participate in no way means the County is accepting liability.

DETAILS OF ISSUE AND BACKGROUND

The following is not intended to be an all inclusive summary. It is intended to provide an overview of the history with regard to the Willa Grove Subdivision wall.

Wall Construction:

The Land Development Code requires double-frontage lots (lots that have a street in the front and a street in the back) to have a subdivision wall.

In the Willa Grove Subdivision, a 6' brick wall was constructed in 1984/1985 in association with site construction of the development.

No permit was issued for the wall as none were required at that time.

The wall was constructed with no rebar and was placed on top of the sidewalk with a thickened edge and was attached to it with only mortar.

Widening of Tuskawilla Road:

In the mid-1990's, the County contracted with Hubbard Construction to widen Tuskawilla Road to four lanes.

The road plans called for moving the sidewalk closer to the paved portion of the street. The sidewalk was cut and removed several inches away from the wall.

Several residents of the Willa Grove Subdivision advise that during construction, Hubbard utilized vibratory compaction equipment that caused the wall to lean. One resident (Ed Jarem) advises that the County and Hubbard were notified and Hubbard found that no significant damage occurred. County staff advises the same.

Further, Hubbard added one foot of height to 135' of the brick wall. It appears this was done to improve screening from Tuskawilla Road. A former employee authorized this change contrary to the direction of the County Engineer.

Wall Fails in Segments/First Community Meeting:

Prior to Hurricane Charley in 2004, a section of wall fell and the property owner was cited by Code Enforcement for not having properly maintained the wall per Land Development Code requirements. Subsequently, several other owners were cited by the Building Division because the wall was in distress and in danger of falling. An insurance claim was filed with the County in 2003. The County's carrier found no liability.

The original property owner cited by Code Enforcement contacted the Planning and Development Director's Office to complain about the citation. The Director and the County Building Official met the owner on-site to discuss the owner's concerns. After that meeting, the Director and Building Official walked the wall and found it to be distressed in several locations.

Knowing that there was no homeowners' association, County staff organized a community meeting to advise the residents of staff's findings and to discuss options, one of which being the possibility of an MSBU.

The purpose of the meeting was to provide an opportunity for the residents to learn the history of the wall and obtain a professional's evaluation of its current condition. The meeting was intended to offer a venue for the residents to have their questions answered regarding the County's and homeowners' liability for the wall as well as provide options for correcting the situation. Unfortunately, the meeting did not go well because the meeting's purpose was not clearly communicated. However, it did provide an opportunity for staff to hear the resident's concerns with the widening of Tuskawilla Road.

Hurricane Charley:

The wall fell during Hurricane Charley in August of 2004, shortly after the community meeting. Many residents claim this was not caused by the wind, but rather the vibration that occurred during road widening of Tuskawilla Road, the sidewalk being cut, and that the wall being increased in height.

County staff believes that the wall fell because it was poorly constructed with no rebar; that its foundation was the sidewalk to which the wall was not attached, that there were no expansion joints, and that columns were spaced too far apart.

Consultant Hired:

To help resolve the matter, the County secured a consultant, Walter P. Moore Engineers and Consultants, to assist. Three reports were issued, all of which are attached.

The first report found that the wall failed due to the lack of reinforcing steel and sufficient mortar in the wall. They also found that the additional bricks added to the wall exacerbated the condition. Because of this, County staff agreed to recommend a contribution of 12.3% toward the construction of a new wall. This reflects the percentage of the 135' of wall that was increased in height to the overall length of the wall.

The second report was commissioned at the request of several homeowners who questioned the affect of the sidewalk segment being cut away. Their concerns were included in a presentation that was forwarded to the consultant. This addendum to the original report affirmed the primary cause for the wall falling was the lack of steel reinforcement. The secondary cause was found as being the sidewalk being cut away, thereby, allowing some rotation in the sidewalk/foundation that remained.

The third report questioned the percentage that the sidewalk being cut contributed to the wall failing; the report indicates no more than 5%.

Second Community Meeting:

Staff organized a second community meeting in February 2005. The purpose of the meeting was to hear the concerns of the citizens and to discuss the possibility of establishing an MSBU as a means to get the wall constructed.

The citizens did file an application for an MSBU last year. The percentage of support was 34% causing the effort to fail.

To: Don Fisher, Deputy County Manager
From: Dave Tolliver

Subj: Willa Grove Subdivision Wall Questions

Dear Sir

Included below are questions and points pertaining to the Failed Wall at willa Grove Subdivision. We provide these questions and points in support of our request for assistance by Seminole County in getting our wall rebuilt. If you have any questions or would like additional information please contact me at Cell 407-492-2125, BlackBerry 407-470-2538 or work 407-384-3531.

Thank your for your assistance in this matter.

1. Why did the County allow the construction of a wall without engineering drawings being submitted by the Developer and approved by the County Engineering department prior to construction?
2. In the April 12 1983 Minutes the County requested that a wall be constructed “to be consistent with what exits”, without following up to make sure that it was or wasn’t built?
3. Why did the county not require that the Willa Grove Wall be brought up to the current code of 1996, when it was modified during the Tuskawilla Road Widening Project?
 - a. The Contractor removed the concrete sidewalk that was supporting the wall.
 - b. The Contractor raised portions of the wall without regard to the footer engineering.
 - i. There is no record of a permit being pulled for modification of the wall.
 - c. There were no codes per se when the wall was built but as a result of Hurricane Andrew in 1992 Statewide codes were put in place and known to the contractor, Hubbard Construction and the County Engineering Staff.
4. Why did the County allow the contractor to destroy Private Property by removing the concrete sidewalk outside the right of way?
5. Why were the homeowners were not contact prior to the removal and why were they not compensated?
6. If the County did not know that private property had been destroyed, they have failed in their fiduciary responsibility to protect the owner’s private property and rights.
 - a. Was there proper engineering oversight during the project?
 - b. Who was managing the project that did not protect the homeowner’s property and rights?

7. In 1996 when the wall at 1776 Willa Circle fell, after Tuskawilla road was widened, the county engineers and Hubbard construction were notified. Why did the county allow Hubbard construction to repair the wall without bring it up to code?
 - a. There is no record of a permit being pulled for the repair.
 - b. They rebuilt the wall on a footer that was only 10 inches wide which according engineering today was inadequate to support the wall. What changed between 1996 and now?
8. In 2004 prior to the Hurricanes the county engineers were notified by homeowners of problems with the wall leaning.
9. According the engineering reports provided by the County removal of sidewalk caused the wall to lean. The wall failed because it was leaning, because there was no vertical reinforcing bar, and insufficient mortar bonding.
 - a. Why is over 500 feet of the wall still standing?
 - b. Why did the section of the wall that was repaired by Hubbard Construction that has vertical reinforcing bar, fail?
 - c. Considering that the video tape recorded by Hubbard Construction prior to the start of the road widening project demonstrates that the then 10 year old wall had no significant problems and was not leaning. If the wall lasted for 10 years, how then, can poor mortar bonding be a cause of failure?
 - d. How was it determined that removing 150 tons of supporting mass, which admittedly caused the wall to lean, is only responsible for 5% of the failure?
10. When the homeowners met with the County for the first time to discuss the potential for an MSBU, Code Enforcement notified the homeowners that the only way a repair of the wall could satisfy the code requirements was completely demolish the existing wall and replace it. They also informed the owners that the wall would be required to be consistent from end to end. Why has the County change that position? What is the county's position?
 - a. Does the whole wall have to be demolished and reconstructed?
 - b. Can individual homeowners rebuild their part of the wall without regard to consistency of construction or appearance?
11. If the wall is to be repaired with consistent construction and appearance from end to end, how can anything except for a brick wall be authorized when two homes have no wall failure?

Comments

1. If the county had done the Tuskawilla Road Widening project correctly, the wall would have been replaced or brought up to code in 1996.
2. Since there is no record of a wall being approved by the county or that drawing were submitted for approval, had the County monitored the development of the Willa Grove Subdivision as they should, the wall may not have been built in the first place.

3. Had the County fulfilled it's fiduciary responsibilities they would not have allowed private property to be destroyed without compensating the homeowners.
4. If all the engineering reports are correct then why didn't the whole wall fall? Over 500 ft of the wall stayed up.
5. This is not about the hurricanes of 2004 it is about what was done to the wall in 1995 and 1996.
6. Code enforcement told the homeowners that they must destroy the full length of the wall and replace it with a to code wall. Some homeowners have wall still standing but according to code enforcement this needs to come down and be rebuilt. If this was your back yard how would you pay for the new wall?
7. Some people have had the bricks hauled off and put up wood privacy fence because the county led them to believe that this is ok. What is the County Official position? Money has been spent that can't be recovered.

August 31, 2005

Mr. Nick Mullins, AIC
Johns Eastern Company, Inc.
500 Winderley Place, Suite 315
Maitland, FL 32761

**Re: Review of Failed Privacy Wall
Willa Grove Subdivision
Winter Park, Florida**

Dear Mr. Mullins:

We have completed our review of the Willa Grove subdivision brick masonry privacy wall along Tuskawilla Road. Our review was based on a visual observation of the failed wall and past experience in similar matters. The following report text explains the findings of our site review and expresses our opinions regarding areas of structural concern that likely contributed to the failure.

We trust that the information provided herein will be sufficient to meet your present needs. Please contact our office with any questions you may have about the review.

Very truly yours,

WALTER P. MOORE AND ASSOCIATES, INC.



E. Webb Wright, P.E. (Florida) 8-31-05
Associate
Structural Diagnostic Services

Cc: Narendra K. Gosain, Phd, P.E.
Senior Principal
Executive Director
Structural Diagnostic Services

Introduction



Photo No. 1: Brick privacy wall at entrance to Willa Grove subdivisions.

Background

Objective

In accordance with your request, a representative of Walter P. Moore and Associates, Inc. performed a visual observation of the failed brick masonry privacy wall of the Willa Grove subdivision along Tuskawilla Road in Winter Park, Florida (Photo No. 1). The findings of our on-site observations, together with past experience on similar matters, were used to complete a structural review of the wall.

The primary objective of this review was to identify any structural conditions that may have contributed to the failure of the wall.

The following information was gathered from correspondence provided by your office. The privacy wall was built around 1985. Road construction on Tuskawilla Road utilizing vibratory compaction equipment took place adjacent to the Willa Grove subdivision in the mid to late 1990s. A section of the existing sidewalk on the east side of the wall was saw-cut and removed, a new sidewalk was constructed closer to the roadway, and brick masonry units were added to the top of the privacy wall during the roadway project. On June 23, 2003, a section of the wall behind the residence at 1776 Willa Circle collapsed during a storm. Then on August 13, 2004 an extensive failure of the wall occurred during passage of Hurricane Charley.

Observations



Photo No. 2: Partially collapsed section of wall.

Walter P. Moore and Associates visited the site on August 19, 2005 and August 26, 2005. We observed that a large percentage of the length of wall that faced Tuskawilla Road had collapsed (Photo No. 2). Brick was found laying in the back yards of the various properties along Tuskawilla Road, indicating that the wall had fallen to the west upon failure.

We observed that, with the exception of a section at the south end of the subdivision, the areas of the wall where failure occurred had not been constructed with reinforcing steel (Photo No. 3). Evidence suggests that the wall was built on top of the original sidewalk and that the original sidewalk was constructed with a thickened-edge footing to support the

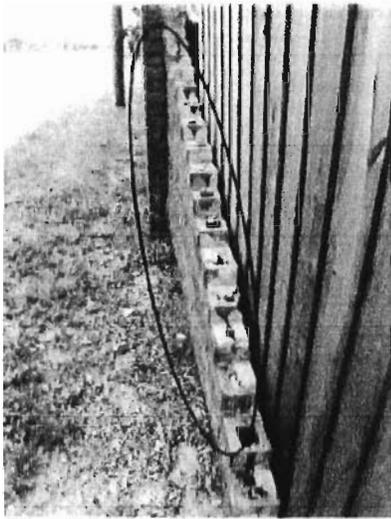


Photo No. 3: Photograph shows lack of vertical reinforcing steel in failed wall section. wall.

Conclusions

weight of the privacy wall. The edge where the original sidewalk had been saw-cut during the roadwork was readily apparent. We also observed that most of the still-standing sections of the wall did not contain vertical expansion joints to accommodate thermal and moisture expansion of the clay brick masonry.

Several sections of the wall that were still standing were leaning to the west. A 4-foot bubble level was used to quantify how much these sections were leaning. At one location, the wall was leaning to the west at an angle of about $2\frac{1}{2}$ degrees from vertical. An eight-inch bubble level was used to check the slope of the top surface of the wall footing at several locations. This effort revealed that the top of the footing sloped down to the west at some locations, down to the east at some locations, and at other locations the top of the footing was level. We also observed a location in the section of the wall that faces Dike Road where visual evidence indicates that cracking distress is related to settlement of the original sidewalk / wall footing.

Based on a visual review of the failed wall, it is our opinion that the failures that have occurred are directly related to the lack of reinforcing steel in the wall. Typically, free-standing masonry walls require vertical reinforcing steel to resist tensile stresses that are developed under high lateral load conditions. This is because concrete and brick masonry walls both have low tensile strength and therefore must be reinforced. A preliminary analysis of the wall based on current design codes indicated that the wall does not meet current code requirements for lateral wind resistance. Technical research of the masonry code in effect at the time the wall was constructed can be done as an Additional Service, but it is expected that the allowable flexural tension for brick walls in the earlier code is similar to the value in the current code. Addition of brick masonry units to the top of the original wall would have contributed to the lateral failure of the wall because it would have created more surface area over which wind pressures could develop on the wall. Please note that we were not able to visually confirm where bricks had been added as was stated in correspondence from others.

It is our experience that privacy walls of this type are often constructed without design engineering drawings and specifications. Without such documents prepared by a licensed engineer, the construction of these walls often does not conform to the structural requirements of the applicable building code. To-date we have not been provided with structural drawings of the wall to review.

The section of the wall at the south end of the subdivision that contained vertical reinforcing steel had also failed. In this section, the vertical steel still in-place extended only three to four feet above the footing. The wall varied in height but was typically between five and six feet tall.

Therefore, the reinforcing steel observed in this section would not have extended to the top of the wall. If this steel had not been lapped with an additional bar, the failure of the upper portion of this wall section was likely related to the fact that this portion was not reinforced. In addition, we note that this section was reinforced with one No. 5 reinforcing steel bar placed every eleven feet along the wall. Based on experience, the eleven-foot spacing of the reinforcing steel for this wall is questionable and may be excessive. In summary, more information regarding whether the vertical steel was lapped and extended to the top of the wall is needed to address this issue further. If this information is provided, we could develop a work scope to analyze this section of the wall further as an Additional Service under our Agreement.



Photo No. 4: Arrows highlight full bedding of mortar bonded to bottom course of masonry failure.

Another factor which may have contributed to the collapse was the bond strength of the mortar. For instance, at a few locations where the bottom course of masonry separated from the surface of the concrete footing, it was noted that little or no mortar remained adhered to the concrete (Photo No. 4). Instead the full bedding of mortar remained adhered to the masonry upon failure. This may be indicative of a poor bond between the mortar and concrete. Various factors influence the mortar bond strength that is achieved. These include the suction of the masonry unit, the time that elapses between placement of the mortar and laying the masonry unit, the water retentivity of the unit, and the pressure applied to the mortar joint during placement and tooling. Laboratory

testing of the mortar and brick can be done to evaluate the characteristics of the mortar and of the bond that was achieved during construction of the wall.

Correspondence provided to us states that "several locations along the wall were noticeably leaning" after the roadway construction in the 1990s. In order to address this issue, a significant amount of additional technical information is required. For example, specifications for the vibratory compaction equipment used during the roadwork as well as shallow soil data would be required. We would be pleased to evaluate the feasibility that the construction activities during the roadwork caused leaning and/or settlement of the privacy wall as an Additional Service. We note that the weight of a free-standing cantilevered wall contributes to the lateral load resistance of the wall by inducing a moment that resists overturning of the wall. When a free-standing wall is leaning, the overturning resistance is lessened or totally negated.

Limitations

This document is a summary of the observations made by Walter P. Moore and Associates, Inc. during the recently completed review of the failed brick privacy wall at the Willa Grove subdivision. It has been prepared to assist the client in identifying areas of structural concern that may have contributed to the failure.

Various other non-structural, cosmetic and/or structural conditions unrelated to this review may have been noted during our activities. These items may or may not have been included in this report and a detailed assessment of them was outside the scope of our observations. Comments in this report are not intended to be comprehensive but are representative of observed conditions.

Walter P. Moore has no direct knowledge of, and offers no warranty regarding the condition of concealed construction conditions beyond what was revealed in our investigation. Any comments regarding concealed construction are our professional opinion, based on

engineering experience and judgment, and derived in accordance with current standard of care and professional practice.

We have made every effort to accurately and completely present all areas of concern identified during our site visits. If there are perceived omissions or misstatements in this report regarding any aspect of those conditions associated with the wall, we ask that they be brought to our attention as soon as possible so that we have the opportunity to fully address them.

Willa Grove Subdivision
Failed Privacy Wall
Winter Park, Florida

Prepared for
Johns Eastern Company, Inc.

Prepared by
Walter P. Moore and Associates, Inc.
300 S. Orange Avenue, Suite 875
Orlando, Florida 32801

43-05130-01

October 19, 2005

WALTER P. MOORE

ENGINEERS + CONSULTANTS

HOUSTON
DALLAS
TAMPA
ATLANTA
ORLANDO
KANSAS CITY
AUSTIN
LOS ANGELES

October 19, 2005

Mr. Nick Mullins, AIC
Johns Eastern Company, Inc.
500 Winderley Place, Suite 315
Maitland, FL 32761

**Re: Report Addendum
Review of Failed Privacy Wall
Willa Grove Subdivision
Winter Park, Florida**

Dear Mr. Mullins:

We have reviewed the presentation regarding the privacy wall failure that you provided our office. This addendum to our original report addresses the claim made in the presentation that the cutting and removal of the original sidewalk compromised the structural integrity of the wall. In addition, the addendum discusses the likely contribution of the sidewalk modification to the ultimate collapse.

We trust that the information provided herein will be sufficient to meet your present needs. Please contact our office with any questions you may have about the review.

Very truly yours,

WALTER P. MOORE AND ASSOCIATES, INC.



E. Webb Wright, P.E. (Florida)
Associate
Structural Diagnostic Services

10-19-05

Cc: Narendra K. Gosain, Phd, P.E.
Senior Principal
Executive Director
Structural Diagnostic Services

Addendum

In accordance with your request, Walter P. Moore has reviewed the presentation we received from you regarding the Willa Grove subdivision privacy wall failure and is submitting this document as an addendum to our original report dated August 31, 2005. This addendum specifically addresses a claim made in the presentation that cutting and removal of the existing sidewalk during the road widening project in the 1990s compromised the structural integrity of the wall. The addendum also addresses what contribution the sidewalk modification made to the eventual failure of the wall.

Based on field observations, the original sidewalk was constructed with a thickened-edge footing that supported the weight of the wall. This was a monolithic concrete element as described in the referenced presentation. The brick wall was constructed on top of the sidewalk above the thickened-edge. As reported, our review indicated that portions of the original sidewalk had been saw-cut and removed. In these areas, the thickened-edge footing that the brick wall set on remained in-place while the slab portion of the monolithic element was removed.

One location near the south end of the wall provided access to observe the cross-section of the footing. At this location, the footing was approximately fifteen inches wide and the brick wall was approximately flush with the original outside edge of the sidewalk. Based on experience, free-standing walls typically require wider footings to resist overturning forces due to lateral wind loads. Rotation of a footing can occur when the footing is not wide enough to resist these forces. The original width of the sidewalk provided lateral stability against overturning. Cutting and removal of the slab portion of the sidewalk compromised the structural integrity of the wall by reducing its lateral stability.

Review of still-standing sections of the wall revealed that several sections were leaning to the west. This provides evidence that the wall footing in these areas has rotated slightly. Cutting and removal of the sidewalk was likely a contributing factor in this rotation. Furthermore, the rotation of the footing likely contributed to the extensive failure of the wall during passage of Hurricane Charley. This is because leaning of a free-standing wall reduces or may negate the overturning resistance provided by the weight of the wall.

As noted in the original report, the majority of the wall was constructed without reinforcing steel. Free-standing masonry walls generally require vertical reinforcing steel to resist tensile stresses that are developed under high lateral load conditions. Concrete and brick masonry walls both have low tensile strength and therefore must be reinforced. In its as-built condition, the wall lacked structural integrity due to the absence of reinforcement.

A preliminary structural analysis provided evidence that the lack of reinforcing steel contributed to the failure significantly more than did rotation of the footing. The effect of not reinforcing the wall and the effect of slight rotation of the footing were both studied. An un-reinforced cantilever wall has a considerably lower moment capacity than does a similar cantilever wall that is properly reinforced to meet the wind load criteria mandated by code. The reduction in resistance to overturning due to slight rotation was minimal relative to the reduction in overturning (moment) capacity due to omitting tensile reinforcement. Furthermore, the modes of failure observed are not unexpected for an under-reinforced free-standing wall subjected to large lateral forces.

There were two basic failure modes noted during our review. One involved separation of the bottom course of masonry from the concrete foundation (Photo 1). The other involved separation of the wall along one of the horizontal mortar joints located near the base of the wall (Photo 2). Without vertical reinforcing steel, the weight of the wall and the brick-to-brick and brick-to-concrete mortar bond had to resist the entire overturning moment induced in the wall by the wind loading. Failure of the mortar bond led to collapse in both failure modes. There was minimal to no rotation of the footing observed at these locations. This is consistent with the findings at still-standing wall sections that were leaning. Based on level readings, it is estimated that the footings at these sections had rotated less than two and a half degrees. Greater rotation of the footing and wall would be expected if the primary cause of the collapse was an unstable foundation.

We did observe one relatively short section of the footing where significant rotation had occurred at the south end of the privacy wall. Brick were not present along this section of the footing as was the case in the other collapse areas. Also, the footing was heavily damaged at one location in this area. This is where we were able to review the footing cross-section and document the footing width. Further investigation would be necessary to address why the rotation of the footing in this area was significantly greater than the rotation of the remaining length of the wall footing.

In closing, it is our opinion that the lack of vertical reinforcing steel was the primary cause of the wall failure based on the failure modes observed and structural analyses of the effects of the lack of reinforcing and of slight rotation of the footing. Modification of the sidewalk was a secondary contributing factor in the failure by making the footing susceptible to rotation, which reduced the overturning resistance provided by the weight of the wall.

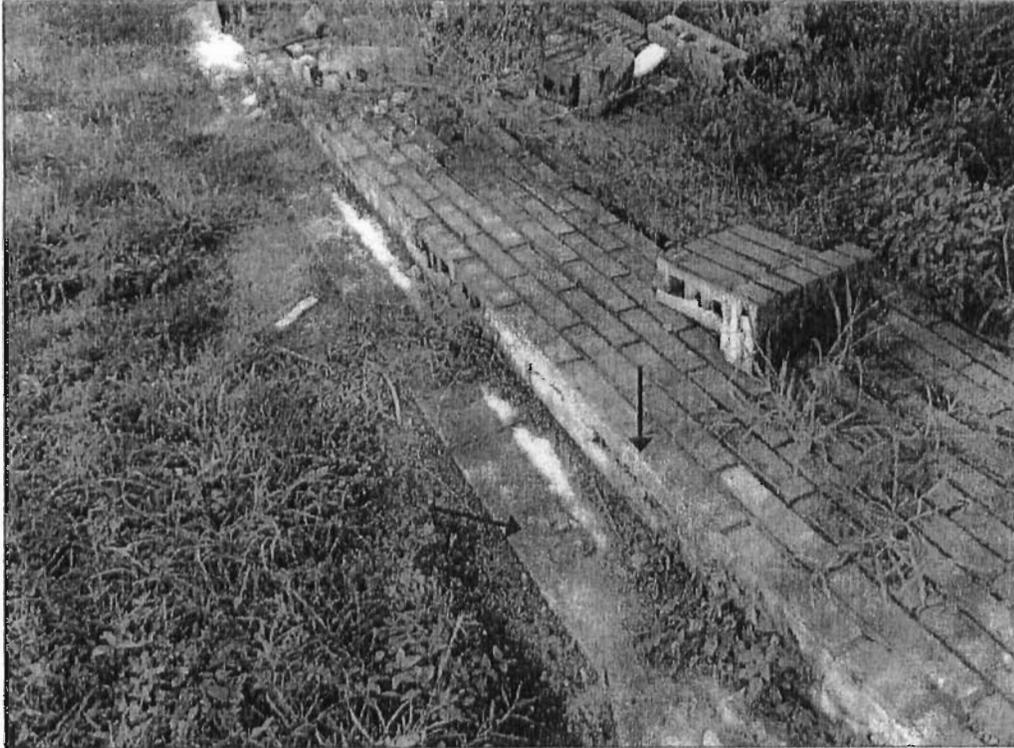


Photo 1: Collapsed section of privacy wall where base course of masonry (right arrow) separated from concrete footing (left arrow).

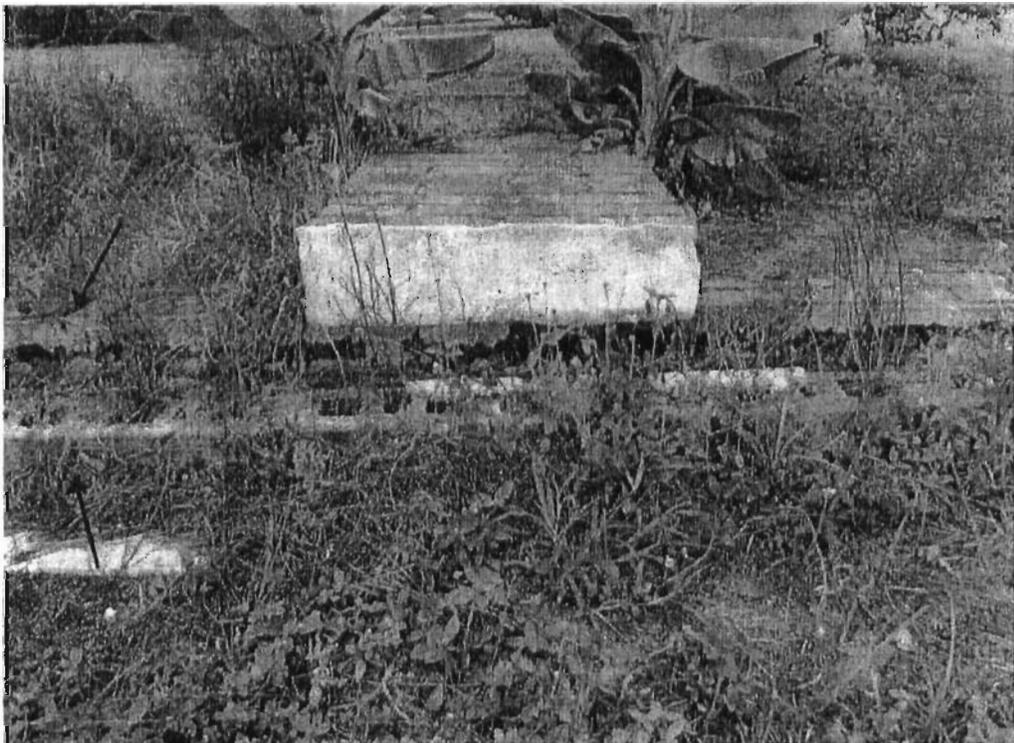


Photo 2: Another collapsed section of the privacy wall. Failure at this location occurred at the horizontal (bed) joint of the first (lower arrow) and second courses of masonry (upper arrow).

AUSTIN
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ORLANDO
KANSAS CITY
AUSTIN
LOS ANGELES

March 7, 2006

Mr. Nick Mullins, AIC
Johns Eastern Company, Inc.
500 Winderley Place, Suite 315
Maitland, FL 32761

**Re: Structural Evaluation – Privacy Wall Failure
Willa Grove Subdivision
Winter Park, Florida**

Dear Mr. Mullins:

Walter P. Moore has performed a structural evaluation to assist the County in understanding the primary conditions that contributed to the failure of the brick masonry privacy wall at the Willa Grove Subdivision. We studied the effect that the lack of vertical reinforcing steel and the effect that the rotation of the wall footing had on the moment capacity of the wall. This report follows our original report dated August 31, 2005 and an addendum dated October 19, 2005.

Our evaluation included an assessment of the size and spacing of the vertical reinforcing steel that would be required for a free-standing wall of the same size as the failed privacy wall. Using this information, the corresponding flexural tensile moment capacity of the wall was calculated. The procedures contained in ASCE 7 were followed to compute the design wind loading for a wall of the same size as the failed wall. Requirements contained in ACI 530 were followed to assess the vertical reinforcing steel required.

We also calculated the flexural tensile moment capacity of the privacy wall in its as-built, un-reinforced condition. The difference between the tensile moment capacities of a reinforced wall and the un-reinforced wall was computed.

The moment that acts to resist overturning of a free-standing wall due to the weight of the wall was calculated for two conditions. This resisting moment was calculated for a plumb condition, the condition assumed to exist immediately following original construction of the privacy wall. The resisting moment was also calculated for the out-of-plumb condition observed during our site review. The difference between these resisting moments was computed.

The total reduction in overturning capacity of the wall due to the lack of vertical reinforcement and due to the out-of-plumb condition was computed. The percentage of this total reduction attributable to the lack of reinforcement was greater than 95 percent. Accordingly, the percentage attributable to the out-of-plumb condition was less than 5 percent. As mentioned in the 10/19/05 addendum, the out-of-plumb condition is likely related to modifications to the original sidewalk.

This evaluation was performed to investigate the extent to which the lack of reinforcement and the rotation of the wall footing may have contributed to the failure of the privacy wall. The findings provide a general basis for understanding the effect of both of these conditions. Calculations were

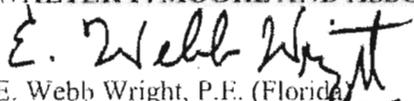
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based on general structural analysis and the requirements of recognized standards and codes as well as the readily assessable characteristics of the privacy wall. In addition, reasonable assumptions were made regarding material properties.

Please contact us should you have any questions about the evaluation.

Very truly yours,

WALTER P. MOORE AND ASSOCIATES, INC.


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