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CONSULTING CIVIL & STRUCTURAL ENGINEERS

Conservation Methodology Report

Cashel City Walls 2014 Defects at Section A (Roselawn Close), Cashel, Co. Tipperary.



**Client:
Cashel Town Council,
Town Hall,
Friar Street,
Cashel,
Co. Tipperary.**

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1.0 Introduction & Background:

Dennany Reidy Associates have been engaged by Tipperary County Council in relation to defects visible to a section of Cashel City Walls, Cashel, Co. Tipperary. The section of wall with the visible defects is located at Roselawn Close, Cashel, which is designated as Section A (Roselawn Close) in the Cashel City Walls Management Plan, 2008. The visible defects are located at the North and the South ends of this section of wall. Please see Figure 1 below and drawing C181-02 attached in Appendix A of this report.

Our brief can be summarised as follows:

- Examine the two areas of concern of Wall Section A.
- Propose remedial conservation works to be undertaken and/or further investigative works where required.

Cashel Town Walls are a National Monument (SMR TS061-025023) in local authority ownership. Any works to the walls are to be only carried out under full supervision of a licensed Archaeologist and the grant of Ministerial Consent.

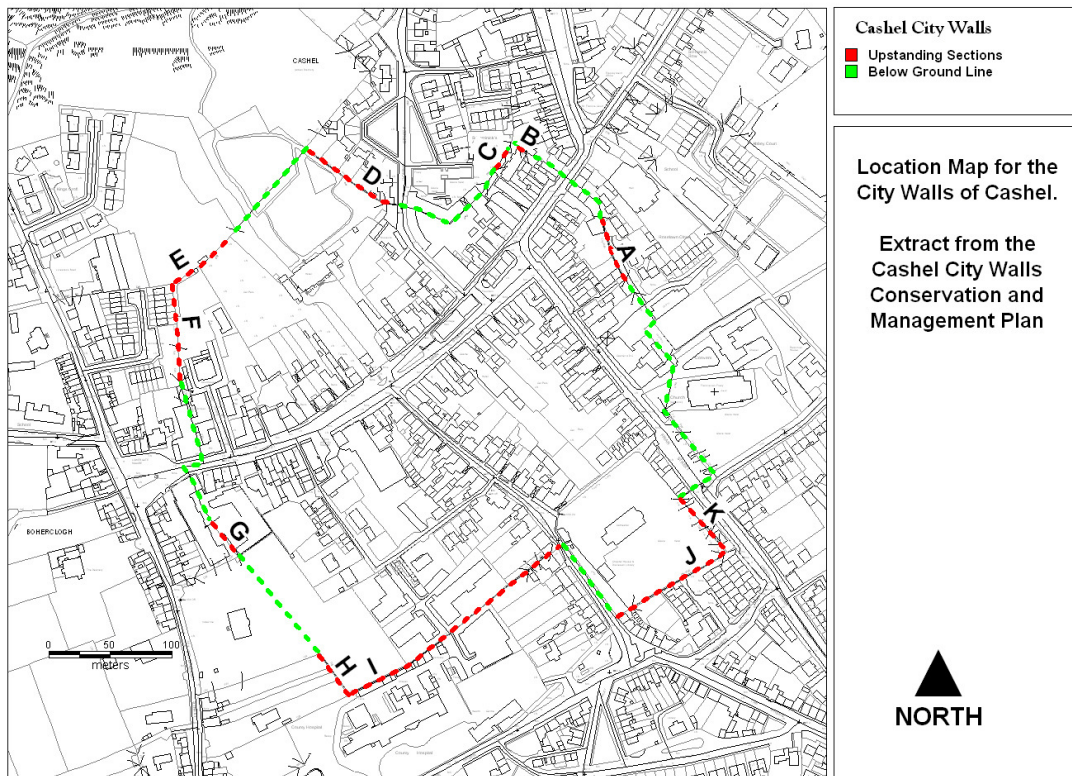


Figure 1

2.0 Summary:

2.1 Areas showing defects.

The areas of wall in Zone A of Cashel City Walls at Roselawn Close are located at the North end and South end of this section of wall. For the purposes of this report the area at the South end shall be referred to as Area 1 and the area at the North end as Area 2.

2.2 Area 1

2.2.1 Internal Face

Area 1 is located at the southern end of wall Section A, at Roselawn Close, Cashel. At the time of our inspection we gained access to the internal face of the wall through O'Dwyer's Drapery Shop on Friar St. This section of the Cashel City Wall forms the rear wall of a double height external storage shed used by O'Dwyer's Drapery Shop. This storage shed has been subdivided into four smaller single-storey storage units.

The wall as measured in the southern most internal storage shed is 4.65 metres high. The timber roof joists span onto the city wall. The wall is constructed with rubble masonry. There appears to be a change in the size of stone used at approximately 3.5 metres high in this section. There are open joints and voids apparent in the internal section of this wall. There is vertical cracking at the junction of the rear wall and the internal, single-storey division wall also.

The rear wall of the next two storage units have a sand and cement render finish internally. One unit has a step in the wall while the other has projections at the base of the wall which may have been used as horse feeders.

The last, and most northerly, of the four storage units in this building has a masonry block wall constructed internally in front of the Cashel City Wall.

It is worth noting that there is a significant lean outwards in the front wall of this building and deterioration of a number of the door and window opes. Any future movement of this wall has the potential to cause damage to the rear Cashel City Wall as the walls are tied by the roof rafters.

2.2.2 External Face

The external face of Area 1 is 4.5 metres high to the top of the storage building roof. There is a pressed metal fascia at the top of the wall and a concrete capping. This section of wall tapers inwards from the bottom to the top.

There are stones missing from the outer leaf of an area of wall located 2.5 metres from the southern corner. The area affected is 2 metres long by 1.5 metres high. The joints in the stone over, for a height of approximately 0.75 metres, have opened up with slippage of stones also.

Sections of concrete are evident where the wall was patched in the past inappropriately. Voids were measured in this section of wall up to 0.6 metres deep. There appears to be a cement based render at the top sections of the wall in this location also.

2.2.3 Proposed Remedial Works/Required Further Investigative Works

The internal face of Area 1 is in a reasonably good condition. Any cementitious material should be carefully removed by hand from the wall, unless otherwise agreed by the supervising consultant, and the wall re-pointed with a lime based mortar, specification of which to be provided by Tipperary County Council based on their previous repair projects on the wall.

Voiding in this section of wall does not appear to be extensive however, prior to remedial works being undertaken, it would be prudent to remove a number of stones in locations to be confirmed to identify if grouting would be required.

The roof of the storage building provides some lateral restraint to the top of the wall, however, it also poses a danger to the wall as it ties it to the out-of-plumb front wall of the building. Options to reduce this danger include:

- Insertion of a beam to transfer the load from the roof onto the side walls of the building rather than the rear Cashel City Wall.
- Insertion of roof bracing on the underside of the roof joists to transfer any lateral force into the side walls of the building rather than having it transferred directly into the rear Cashel City Wall.

The external face of Area 1 obviously needs urgent attention. It appears as if the stones have been deliberately removed, possibly due to the ease of which they could be removed.

In the immediate term, as 'emergency works', we recommend inserting timber sole plates and headers into the existing void, with timber posts between, to support the stone work over the void. Plywood sheathing should then be erected to protect the timber supports and the remaining loose stones.

Following the above 'emergency works', local stone should be sourced of a similar size, texture and colour but un-weathered. This stone should be geologically compatible with the stone in the wall and constructed with a lime based mortar, specification of which should be obtained from Tipperary County Council further to their previous repair projects.

As with the internal façade, we would recommend removing a number of pre-selected stones to allow inspection of the core of the wall so an informed decision can be made as to whether grouting in this location of the wall is merited.

A detailed photographic record should be made prior to, and following, the remedial works. If the budget allows, we would also recommend carrying out a 3D Point Cloud Survey of the entire section of wall. As mentioned previously, all works will require Ministerial Consent and supervision by a Licenced Archaeologist.

2.3 Area 2

2.3.1 Internal Face

Area 2 is located at the northern end of wall Section A, at Roselawn Close, Cashel. When viewed from the external face, the area of concern extends approximately for 10 metres South of the Lamp Standard. At the time of our inspection we gained access to the internal face of the wall through D'Arcy's Hardware Shop on Friar St. This section of the Cashel City Wall forms the rear wall of a private car park.

The wall on this façade is 3.6 metres high stepping up to 4.8 metres towards the northern end. There was a step in the wall located approximately 2.2 metres off the ground. This section of wall appears to be out of plumb, leaning inwards. There was a storage shed built to the North of Area 2. Immediately South of this building there were three openings in the Cashel City Wall which were filled in the past with stone rubble masonry and brick. Timber lintels over these openings are significantly decayed and forming voids.

There are significant open joints in the majority of the masonry in this Area. There is a curved section of the wall at high level and significant dead ivy growth. It is apparent that there are significant voids in this section of wall based on the extent of ivy growth out of the wall evident. There are some areas with cement based mortar and others with lime mortar intact. A section of wall as shown in the photos was patched in the past with concrete. There is a vertical crack in the wall in this location also.

There is live ivy growth to the South of Area 2 and the wall in the garden to the South of the car-park appears to be out-of-plumb and containing significant open joints, although access was not gained to this area.

2.3.2 External Face

The external face of Area 2 faces on to Roselawn Close. There is a significant taper/lean in the wall in this location leaning inwards into the car-park on the internal side of the wall.

At the base of this wall there are loose stone units. There are extensive areas of dead ivy also with stems up to 50 millimetres in diameter a common occurrence.

There are areas with a cement based render and there is a concrete capping in location of this wall also.

There is voiding of this area of wall in locations up to measured depths of 1 metre.

2.3.3 Proposed Remedial Works/Required Further Investigative Works

There are extensive amounts of woody Ivy stems present in the wall at Area 2. It is assumed that there is significant voiding in this section of wall as a result. This casts a doubt over the short term stability of the wall in this location. Furthermore, it was difficult to ascertain the scale of 'plumbness', or otherwise, of the wall from the ground during our visual inspection. This, along with the wall thickness, will be required to try ascertain the overall stability of the wall. This information can be attained in a number of ways as follows:

- Provision of access to the top of the wall by means of scaffolding to allow the use of a plumb line. Scaffolding should be provided rather than a hoist as accurate measurements with a plumb line are weather dependant and therefore a scaffolding in place allows flexibility with the day they are to be taken. Also, scaffolding allows for a platform to carry out opening up works to determine the extent of grouting required to fill the voids in the wall core.
- A 3D Point Cloud Survey can be undertaken on both sides of the wall. From this, sections can be generated to give the different thicknesses of the wall and identify areas where the wall may be significantly out-of-plumb. This is an expensive service however and does not have the advantage of providing a platform for investigative opening up works.

The dead ivy stems should be carefully removed by hand. The remaining live ivy should be cut at approximately 0.6 metres from the ground for a distance of 0.3 metres and allowed to die. Access should be gained to ascertain the condition of the wall in the private rear gardens on the internal face of Section A of the wall also.

A rounded hydraulic lime mortar capping should be cast on top of the wall and the areas of concrete capping carefully removed. A similar capping could be provided at the step location also to stop the water penetrating into the core of the wall.

Following determination of the stability of the wall with regard to 'plumbness', the wall will need to be either grouted and consolidated or re-constructed.

The requirement for grouting shall follow the specification below with stones removed at approximately 1 metre centres vertically and horizontally to allow access to grout by gravity. Specific stones to be removed should be identified by a suitably qualified consultant.

If it is found that reconstruction is necessary, a detailed survey of the existing shall be required and a full method statement to include procedures for removal of stones, identification of stones with water based paint, appropriate identification and storage arrangements, records taken of pinning and coursing, etc. Reconstruction should be a last resort however.

2.4 Outline Grouting Specification

Scaffold and secure fencing to be erected. Scaffold to be free standing with no ties into wall.

Each individual stone to be carefully selected in conjunction with the structural engineer. The centre of the mortar joints to be broken using a sharp cold chisel or, if the mortar is found to be particularly dense, a non-percussive mechanical tool such as a diamond tipped oscillating tool or similar. Once the mortar joint has been broken the remaining mortar shall be carefully removed using hand tools only, taking particular care at the edges of the stones. Remaining mortar behind the surface of the joint shall be raked out using an appropriately sized 'small tool'.

Note that mechanical tools should only be used by operatives who have demonstrated to the Engineer their ability to use that specific tool with an acceptable level of skill.

The utmost care to be taken to avoid any damage to stonework.

Temporary supports in the form of wooden plates, struts and folding wedges are to be used in openings formed by removal of stonework where there is any risk of movement in the stones above.

All stones, pinnings and the like shall be laid aside ready for building back in once grouting is complete.

Grout to be based on NHL 3.5 and well graded washed sharp. Specification to be finalised by consultant prior to grouting following review of previous grout analysis results.

Grout shall be mixed using a whisk (1500/2000 revs per minute) to ensure full and proper mixing.

No grouting shall be carried out unless the Contract Administrator/ Engineer is in attendance.

Grouting should be started from the lowest point of the wall.

Grout shall be carried out by gravity feed from a galvanised steel grout pan supported in a timber cradle held sufficiently above the grout site to create adequate 'head'. A rubber hose to be connected to the grout pan at one end and the other end of the hose to be fitted to a galvanised steel nozzle with stopcock. The nozzle to be inserted into the void to be grouted.

The grout to be fed evenly ensuring that there is no spillage on the face of the wall. The stonework around and below the insertion point should be closely monitored and grouting should cease immediately if there is any evidence of leakage onto the wall surface.

Grout should be allowed to set for a minimum period of 24 hours before grouting above the initial level.

Precise records shall be kept of the volume of grout used at each insertion point.

On completion the removed stones should be built back into the wall using the same lime mortar specification as used on the previous repair project. Specification to be obtained from Tipperary Council.

Appendix A
Site Layout Plan

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Appendix B

Photos



Area 1 – Internal Face – Taken 24/10/14



Area 1 – Internal face – Change of Stone – Taken 24/10/14



Area 1 – Internal Face – Open Joints and Void in Wall - Taken 24/10/14



Area 1 – Internal Face – Open Joints and Void in Wall - Taken 24/10/14



Area 1 – Internal Face – Cracking at Junction with Internal Division Wall - Taken 24/10/14



Area 1 - Internal Face – Note Step in Wall & Cement Render – Taken 24/10/14



Area 1 - Internal Face – Note Cement Render & Projection in Wall – Taken 24/10/14



Area 1 - Internal Face – Note Internal block Wall – Taken 24/10/14



Area 1 – Front Wall of Adjoining Storage Building – Taken 24/10/14



Area 1 – External Face – Taken 24/10/14



Area 1 – External Face – Note Concrete Capping and Metal Fascia - Taken 24/10/14



Area 1 – External Face – Taken 24/10/14



Area 1 – External Face – Note Open Joints Over Void Section - Taken 24/10/14



Area 1 – External Face – Note Previous Attempts to Fill Void with Concrete - Taken 24/10/14



Area 2 – Internal Face – Note Dead Ivy Stems - Taken 24/10/14



Area 2 – Internal Face – Note Dead Plant Growth Along Step - Taken 24/10/14



Area 2 – Internal Face – Note Concrete patching to Left of Staff - Taken 24/10/14



Area 2 – Internal Face – Note Ivy Growth and Proximity of Tree - Taken 24/10/14



Area 2 – Internal Face – Note Filled Openings and Downpipe - Taken 24/10/14



Area 2 – Internal Face – Note Filled Openings and Timber Lintel - Taken 24/10/14



Area 2 – Internal Face – Note Curved Section of Wall and Dead Ivy - Taken 24/10/14



Area 2 – Internal Face – Note Curved Section of Wall and Dead Ivy - Taken 24/10/14



Area 2 – Internal Face – Note Curved Section of Wall and Dead Ivy - Taken 24/10/14



Area 2 – Internal Face – Note Woody Ivy Stem & Open Joints - Taken 24/10/14



Area 2 – Internal Face – Note Woody Ivy Stems & Open Joints - Taken 24/10/14



Area 2 – Internal Face – View of Wall in Garden to South of Carpark - Taken 24/10/14



Area 2 – Internal Face – View of Wall to South of Area 2 – Note Open Joints - Taken 24/10/14



Area 2 – External Face - Taken 24/10/14



Area 2 – External Face – Note Step in Wall and Possible Previous Opening – Taken 24/10/14



Area 2 – External Face – Note Taper/Lean in Wall – Taken 24/10/14



Area 2 – External Face – Note Significant Ivy Stem in Wall – Taken 24/10/14



Area 2 – External Face – Note Significant Ivy Stem in Wall – Taken 24/10/14



Area 2 – External Face – Note Significant Ivy Stem in Wall – Taken 24/10/14



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