MENLOUGH CASTLE

CONSERVATION METHOD STATEMENT

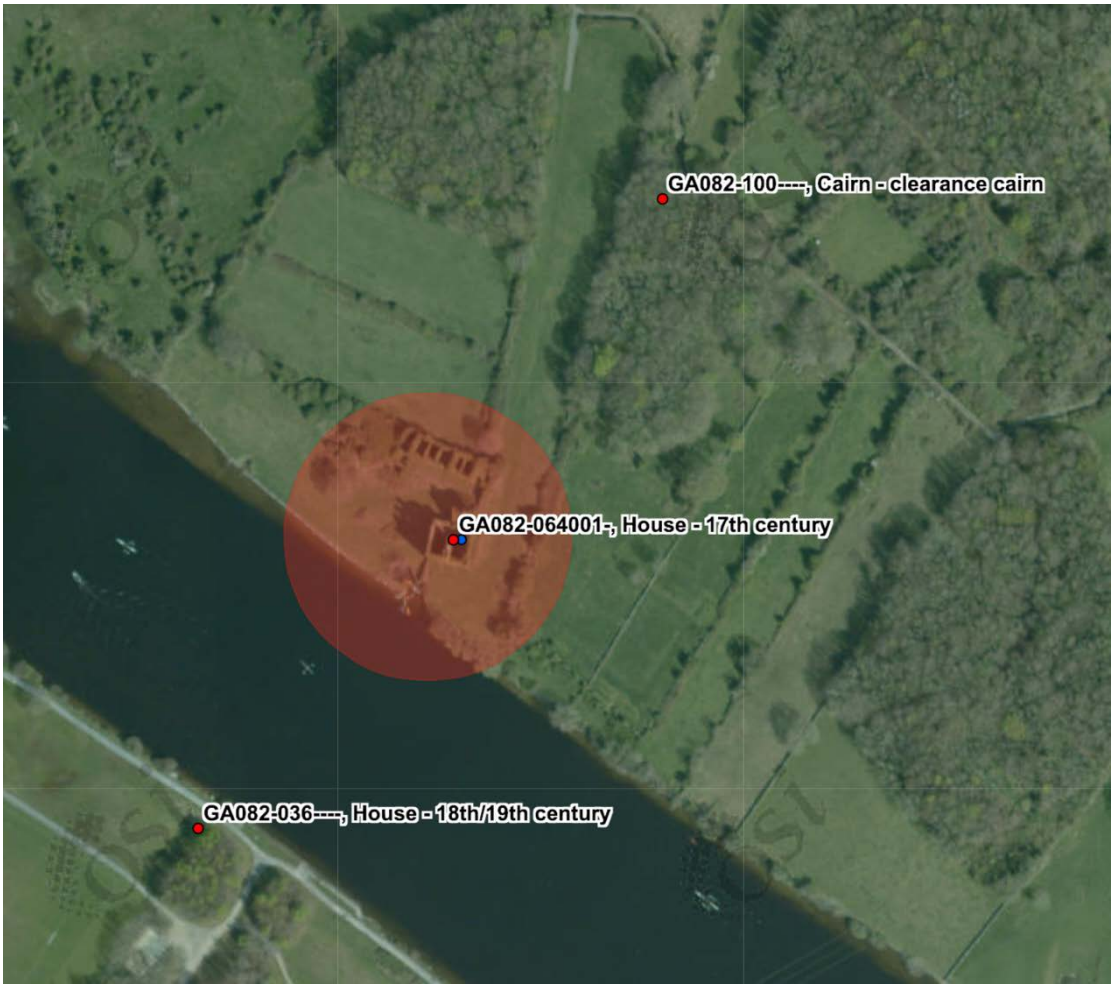
GA082-064-----; Consent: C001030 | MAY 2025

7L ARCHITECTS

1. PREAMBLE

This report is prepared in support of the fifth phase of conservation repairs to the ruined multi-phase castle at Menlough set along the eastern bank of the river Corrib on the outskirts of Galway city. It follows the recommendations of the Conservation Management Plan for the site prepared in 2015. Previous phases of works were funded under the Community Monuments Fund under Stream 1.

Location	Menlough, Co Galway
Grid Coordinates	528437, 727901
Local Authority	Galway City Council
Statutory Protection	SMR ref: GA082-064----
Rating	Regional
Special Interest	Architectural, Archaeological, Artistic, Social
Principal Dimensions	17m (E-W) 22.7m (N-S)
Inspection Dates	April 2025
Prepared by	Fergal Mc Namara
Report Issued	May 2025



Work phases 1-4 for essential structural repairs to ensure the stability of the monument were carried out under S14 ministerial consent C001030, as extended. Last year, Phase 4 was supported by CMF 2024 Stream 1 grant, and GCC were successful in obtaining a grant for Phase 2 & 3 in previous years. The scope and methodology outlined in the application for funding has not substantially changed, with further detail now provided.

A description of Menlough, its archaeological significance and its historic background is provided in the accompanying report prepared by Martin Fitzpatrick IAI of Through Time Ltd. Drawings and specifications for the proposed works have been prepared by CORA Consulting Engineers.

2. Condition

Menlough Castle is a large, multi-phase residence dating from the sixteenth to the nineteenth century which suffered a catastrophic fire in 1910, which resulted in a fatality and after which the house was never used again. Following the removal of a thick covering of ivy in 2021, its phasing is more clearly observed than at any time in recent decades. Its north end consists of a tower house, which was opened up to its south side and extended with a gabled fortified house with corner bartizans and exceptionally tall windows to the east in the seventeenth century. A further large residential wing with distinctive gabled chimneys and slate weatherings was added to the west in the eighteenth century with ornate pinnacles along the parapet.

Later alterations included the addition of a belvedere in the form of a castellated parapet and stone room high up on the spine wall between the west and east ranges in the nineteenth century, installed to enjoy exceptional views up and down the river. The house remains a well-loved landmark for the city and was recorded in numerous topographic views down the centuries. It is also known as a habitat for snowy owl in recent years on the west wall, and annually as a summer roost for long-eared bats who reside in the east side of the spine wall. Jackdaws also nest in former fireplaces on the west wing.

The castle has suffered regular instances of vandalism including deliberate disturbance of the wildlife. Having lost its roof and floors, and due to gradual rotting out of lintels, the castle is in a concerning state. Its walls, while still standing tall for the most part, are at risk of complete collapse, aside from occasional loss of stone from its openings and tops which put visitors at risk of injury. Heaps of stone and debris from earlier collapses are likely to survive underfoot as the ground is very uneven internally.

3. PREVIOUS PHASES

In 2021, under ministerial consent C001030, ivy clearance followed the installation of a temporary perimeter fence to secure the castle from unauthorised access. A limited programme of essential structural repairs was also undertaken including the installation of steel supports and consolidation of voids at low level to provide support to the walls.

We required the clearance of ivy to make a proper assessment of the castle walls, especially at high level. Thankfully, the ivy came from the walls without disturbing the underlying stonework. Where this remained a risk, ivy roots were cut back and left in place. The design team undertook a visual survey of the entire structure from a hoist, and the building was recorded using photogrammetry.

The assessment of the condition of the castle identified priority areas. Intervention will be required to all parts of the castle to make it safe for visitors, and that this will require significant capital investment that will require an extended phased approach. Our objective would be to conserve Menlough Castle as a stabilised roofless ruin, like nearby Tirellan Castle that was repaired under CMF 2021 Stream 1.

Phase 2: North End & Spine Wall

In 2022, the existing contract was extended to address the structural stability of the former tower house to the north end, along with the junctions with the east and west ranges. The west shoulder had fallen close to first floor height, so that there was little support in this corner. On the opposite side, a long crack was repaired using stainless steel sock anchors from ground to high level where the two phases were at risk of separating over time.

At high level, the wall tops were relatively sound, and the drainage stones along the parapet were found to be very well preserved. Openings to the walls and flues were at risk of collapse and were strengthened to ensure their stability. Some additional salvaged stone was added to ensure that the lintels over the surviving openings were properly loaded and stable. Fortunately, much of the external render has survived, so that there was little repointing required to these surfaces. Repointing was required to the internal wall surface to strengthen walls where mortar has washed out over time. Brickwork to the bartizan was found to be in fair condition, and it was decided not to proceed with a lime shelter coat.

At the spine wall, the works were confined to the east side to minimise disturbance of the summer roost of the long-eared bat. Of most concern in this location was the loss of the structural support to the belvedere, the small stone room set at parapet level. The cut stone arch that supported its west wall has lost its bearing end, so was at immediate risk of collapse. A new stone corbel carved by Galway Stone Design was installed to support this arch without the necessity of it being taken down or using permanent steelwork. Adjacent pinnacles, chimneys and wall tops were choked with ivy and were cappings were re-seated where loose and open joints repointed. Due to additional funding we were able to repair some adjacent areas to the south and west walls at high level.

Phase 3: West Wall

A CFT was published by GCC in March 2023 for design team services for the next phase of conservation and public realm works to the 3 Castles. The team led by 7L were appointed on 16 May.

In 2023, works continued to the west range, as given its height and the extent of flues, it is at greater risk of loss than the east range. Pre-tender estimates provided by Austin Reddy scoped out a phase of work just under €200,000 ex.VAT, which allowed us to progress with an invited tender, as required by GCC.

7L issued an extension application for C001030 Ministerial Consent on 30 May based on the agreed scope of works, response from NMS received 15 August. Frank Coyne of Aegis Archaeology withdrew from the project on 12 June due to prior commitments, and Martin Fitzpatrick joined the team. Sherlock Archaeology were also not available.

Works were tendered to five selected firms on 2 August 2023 with the return 18 August, when only one was returned. Cunningham Civil & Marine (CCM) were the contractor on the two previous phases of work on the castle and returned a tender €191,671.00 ex.VAT. After reviewing the tender, we recommended proceeding with CCM on 21 August. Due to changes in personnel, there was a considerable delay in the issue of the Letter of Acceptance, which was issued on September 13.

During the month of September, MKO team ecologists, in liaison with the NPWS, carried out several night-time surveys in the castle to try to identify whether the pair of barn owls using the castle had nested, if there was a brood and its location, and whether these had fledged or were ready to do so. Decision to allow the works to proceed was given on 28 September.

A pre-works meeting was carried out on site on 3 October. Further visits were undertaken by 7L Architects on 17, 26 October and 8, 20 November, with CORA visiting independently on 15 November. Martin Fitzpatrick oversaw the sorting of stone piles to the east range during the course of the works. Works were substantially complete by 24 November, except for the fireplace at ground level which was difficult to access with the scaffold in place.

Enlarged openings were strengthened with new lintels and jambs where necessary, and damaged or cracked lintels repaired. Large cracks to the chimneys were stitched with stainless steel ties, retrofitting to those installed in the last phase. The distinctive slate wall coverings to the upper levels were checked for loose slates and were re-bedded in quicklime mortar after raking out loose or

unsuitable bedding to ensure good adhesion. Sound slates were left in place. Works will proceed so as not to disturb nesting birds or their nests. During this phase, suitable stone was retrieved from piles in the east range under archaeological supervision where it fell following the fire in 1910, for use in the consolidation of the openings and pinnacles. Unfortunately, very little stone cappings for the pinnacles were identified, perhaps having been taken off site following the fire.

Repairs were carried out using lime mortars and specialist masonry repair techniques by CCM and Galway Stone Design who have extensive experience in working in historic masonry structures in their repair, especially where they are in poor condition or unstable. Rough racking and stone pinning of exposed wall tops and wall core progressed in areas. Flaunching of the ruined, uneven wall heads along the wall tops using small flat stones and lime mortar (NHL3.5) to weather the top surface in these more exposed locations.

Consolidation of voids was necessary to the walls at each level, and repair of displaced or loose stone, especially around the openings. Much of the work involved the Installation of limestone lintels to windows and fireplaces, using precast concrete lintels where required for wider spans, set between limestone lintels to exposed faces. This has made this tallest of the walls of the castle with the

largest number of flues to be far more stable. The consolidation of the slate weatherings progressed well. Slates were retrieved from the ground nearby, and along with any loose slates, were used to support the edges of surviving slates, all using lime mortar. Given the extent of loose render, there will continue to be losses over time, but there were concerns that to continue to remove loose plaster by hand would open up areas that there was no time to address.

Phase 4 (2024)

In January 2024, the design team led by 7L Architects provided a method statement and outline works requirements to support a grant application under the Community Monuments Fund Stream 1 in 2024. This was confirmed in April, with €100,000 awarded for conservation works to the south façade of the castle.

Further to the design team appointment following OGP guidelines in 2023, GCC officers sought a meeting with 7L Architects on 22 July at their offices to agree the scope and procurement procedures. GCC then confirmed that they wished to proceed with the works in 2024.

7L arranged for the necessary approvals and the tender requirements to be developed by the design team.

Works proceeded after the breeding season so as not to disturb resident birds or bats and their nests. A dusk emergence survey was carried out by MKO on 13 August. Identified were several species of bat, barn owls and kestrels. A derogation licence was sought in advance of the works commencing. MKO provided an AASR and briefing note following their survey. The licence was obtained on 23 October, with a condition that a breach in the temporary palisade fence installed in 2020 be repaired with improved security.

Marin Fitzpatrick issued an extension application for C001030 Ministerial Consent in late August based on the agreed scope of works, response from NMS received 4 October. The activity numbers are: W000765 for the conservation works and, E005312 for archaeological monitoring and artefact registration.

Works were tendered on the GCC e-tenders portal on 29 August 2024, with returns due 16 September. Only one was returned, the tender submitted by the contractor on the three previous phases Cunningham Civil & Marine being too late to be considered.

Triur Construction (TC) provided a tender of €248,600.00 ex.VAT, €11K below the pre-tender estimate provided by the team QS Austin Reddy. After reviewing the tender, the design team recommended GCC proceed with TC on 26 September. TC provided further detail on health and safety procedures and insurances, and GCC issued the Letter of Acceptance on 9 October.

A pre-works meeting was carried out on site on 10 October, where it was agreed that works would commence on the measuring up and fabrication of the stonework off site, with site works starting properly on 3 November. MKO followed up on the NPWS derogation licence. GCC sought an extension of the deadline for recoupment of the grant to allow the works to proceed with full completion due mid-December. It was discussed that an interim certificate for conservation works to the value of €100K, including VAT and fees could be issued in late November, should sufficient progress be made.

Martin Fitzpatrick oversaw the sorting of stone piles to the east range during the works. During this phase, it was proposed to retrieve suitable dressed stone from the river bank under archaeological supervision of Martin Fitzpatrick and guidance from Dr Jim Higgins and any carved stone set aside on pallets following the fire damage where its original context can be identified. However, the ground conditions made this too risky given their weight so this was postponed. It was also decided to install steel security gates to the widest opening in the stable wing opposite the castle, and that this would be used to store carved stone retrieved under archaeological supervision that had been disturbed by individuals who had been accessing the castle without permission and setting fires that were a risk to the wildlife and the built heritage.

Further visits were undertaken by the design team on 7, 19, 27 November and 3 December. Works in accordance with the conservation method statement continued to the west range and the riverside facade, to include the east range which contains some of the earliest built fabric.

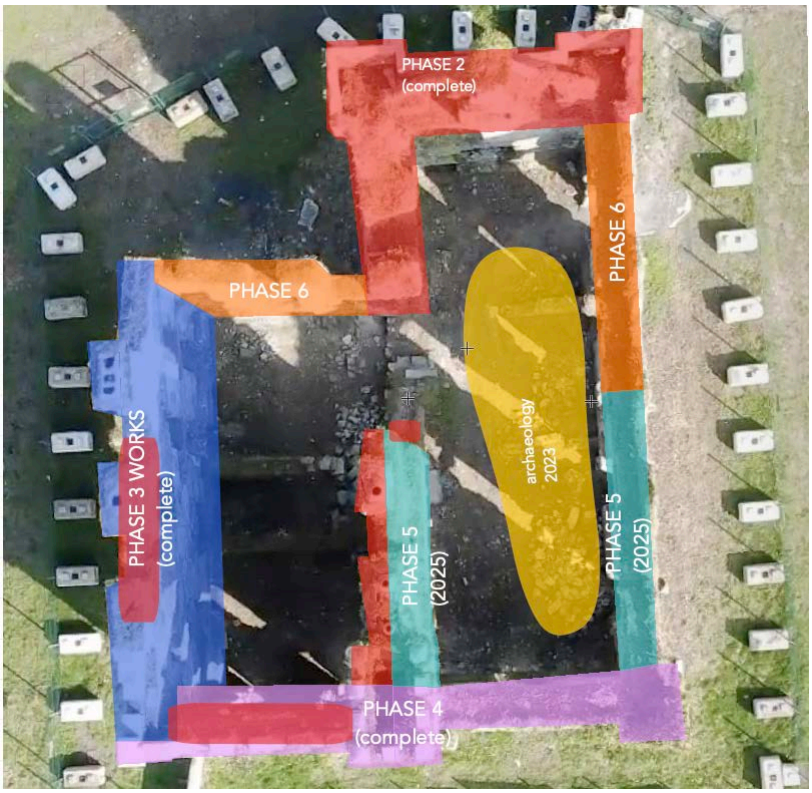
This façade was 'gothicised' in the nineteenth century with the addition of a castellated parapet and belvedere facing out over the river, and the installation of carved stone windows and hood mouldings. While this unified the river façade, it remains incongruous. Its medieval doorway remains intact to the east side. There was extensive damage to the stone during the fire of 1910 and much has lost any integrity and will need to be replaced. For the stability of the façade and the presentation of this important landmark, it was proposed to replace the stone window surrounds with new Irish Blue Limestone replicas. These were carried out to an exceptional standard by Galway Stone Design who had worked on all previous phases.

Openings where lintels have rotted out will be strengthened with new stone and concrete lintels and jambs, and damaged or cracked lintels repaired. Surviving wall plaster was left undisturbed. Rough racking and stone pinning of exposed wall tops and wall core was carried out. Removal of vegetation along the parapet exposed the beautifully detailed drip stones. Flaunching of the wall heads and parapets using small flat stones and lime mortar (NHL3.5) weathered the top surface in these more exposed locations. Exposed ledges were weathered with lime mortar to ensure rainwater is disposed without entering the wall core. Where stones were shattered by the fire and exposure, cracks were stitched using stainless steel dowels. Some stones were far too cracked to be salvageable and were replaced with Irish Blue Limestone replicas to ensure the consolidation of the wall. Loose or missing joints were raked out, pinned and pointed using NHL2 lime and sand mortar or quicklime batched with NHL3.5.

Phase 5 (2025)

In 2025, works will continue to the east side of the spine wall, the interior of the chimney flue, and commence works on the east wall facing towards the city. Works will proceed so as not to disturb resident birds or bats and their nests, the former kitchen fireplace being intensively used as a habitat. The tall chimneys of the spine wall are poorly supported at mid-level where missing joists were burnt away. Lower down, an infilled fireplace is at immediate risk of collapse. Should this occur, there is a high risk that nesting sites below would be disturbed or destroyed. Openings where lintels have rotted out will be strengthened with new stone and precast concrete lintels and jambs where necessary, and damaged or cracked lintels repaired where possible. Large cracks are to be stitched with stainless steel pins. Wall tops are to be flaunched, and surviving lime render and mortars retained wherever they are found to be sound.

The works to the spine wall will allow the heavy galvanised steel beam supports and propping installed in Phase 1 (2021) as part of the Three Castles Project to be removed. These were essential to prevent this wall from collapse and allowed works to the upper areas to be carried out more safely. Their removal will improve the historic character of these areas. Accessing the upper levels of the chimney will require extensive amounts of scaffold. From our experience in previous phases, this will necessitate a wide scaffold base, which could be designed to address sections of the east wall in the vicinity. Due to the relative high costs of scaffold, the higher grant amount of €130,000 would be very beneficial. Each year, Galway City Council have more than matched the grant funding, continuing the work carried out during the Three Castles project (2020-2021). The intention is now to finish out the conservation structural repairs to the castle in two further phases, being complete in 2026.



4. Conservation Methodology

A summary of the necessary works in Phase 5 & Phase 6 is as follows:

- To protect and maintain the existing built and archaeological heritage of the monument and setting of Menlough Castle, ensuring repairs do not adversely impact on this heritage.
- Proposed works are to first obtain extension to existing consent C001030 from the National Monuments Service under Section 14 of the National Monuments Act.
- To carry out specialist repairs to the spine and east wall to assist in the preservation of the site and the safety of the public.
- Repairs to be overseen by a conservation structural engineer along with a RIAI Grade 1 Conservation Architect and monitored by a licensed archaeologist.
- Repairs to be carried out using lime mortars and specialist masonry repair techniques by contractors who have extensive experience in working in historic masonry structures in their repair, especially where they are in poor condition or unstable.
- Encroachment of ivy has advanced to a stage that there is little option other than its removal without risking further losses of historic fabric and risking the safety of the public.
- Stones left around the wall base, in the river and to the interior to be used for this purpose, identified by the archaeologist in association with the design team, to ensure that there is no further loss or obscuring of archaeological heritage.
- Scaffold to be designed to be free-standing and not reliant on the historic structure for support.
- Surviving wall plaster to be protected for the duration of the works.
- Rough racking and stone pinning of exposed wall tops and wall core.

- Flaunching of the ruined, uneven wall heads along the wall tops using small flat stones and lime mortar (NHL3.5) to weather the top surface in these more exposed locations.
- Weathering of exposed ledges with lime mortar to ensure rainwater is disposed without entering the wall core.
- Consolidation of voids evident to the walls at each level, and repair of displaced or loose stone.
- Installation of limestone lintels to windows and fireplaces, using precast concrete lintels where required for wider spans, set between limestone lintels to exposed faces.
- Repair of surviving stone window surrounds, using salvaged stone (where appropriate) and stone grafts to provide necessary stability.
- Loose or missing joints are to be raked out, pinned and pointed using NHL2 lime and sand mortar or quicklime batched with NHL3.5. Cement joints to be removed where this can be achieved without damaging stone surrounds.
- Stitching of cracks using stainless steel ties.

5. Specifications

Protection of Historic Fabric

- Site access should be controlled, and the site area secured for the duration of the works.
- Vehicular access is along existing haul road through field gate at the end of the public road.
- Access into the site is through the gates set in the temporary palisade fence installed for this purpose.
- Road users and the public are to be warned of the construction works and the necessity for safety and security.
- All precautions taken to prevent unauthorized access into the site area for the duration of the works.
- Care must be taken to ensure that adjacent historic fabric is protected from accidental damage, fenced off or boxed out in plywood as necessary.
- Design of scaffolding or access will be designed so as to avoid damage to historic fabric.
- Works involving retrieval of stone to be carried out under archaeological supervision. No excavation is planned or necessary for the works in hand.
- Removals of unstable masonry from ivy encroachment are to be carefully sequenced, after assessment of the risk of consequential damage, rather than pulled out using mechanical means.
- Taking down of loose or unstable masonry (where unavoidable) must only be carried out under archaeological supervision. Prior recording and labelling will be necessary in some instances, especially where stone forms part of an architectural feature.
- Contractor to limit access to areas undergoing works and protect the ground from contamination by builder's refuse or from damage.
- Any damage to the ground shall be repaired and the site cleared and made good to the satisfaction of the CA at the expense of the contractor prior to handover.
- The method statement for the specific design and construction of the protection must be agreed with the CA.
- The perimeter of the castle secured by the palisade fence is available for use as a site compound, with the necessary protection measures in place.
- The form, construction and materials used must be sufficiently robust to protect historic features from falling items/debris from above.
- Under no circumstances shall the protection or access measures fix into the historic fabric.
- The contactor shall facilitate the opening and closing of hoarding/protection as directed by the CA for the purposes of inspection.
- Protection measures are to be inspected by the site supervisor daily and maintained/repaired as necessary.

Samples

Trial testing shall be carried out in 1sqm panels in locations to be agreed with the CA. Prior to commencing works the following site trials will be carried out for the approval of the conservation architect:

- Raking-out of joints
- Repointing using lime-based mortar – to exposed wall core rubble and facing stone
- Lime plaster consolidation
- Lime shelter coat
- Flaunching of wall cappings

Removal of Ivy & Treatment of Woody Stem Growth

- Clearance of plant growth around the structure should include both ground cover, shrubs and embedded ivy that would impede the repair works.
- All vegetation cutting / removal should occur within the period 1st September to 28th February (dates inclusive) to comply with the Wildlife Act 1976 (Amendment) 2000.
- All the plant growth growing from the sides or top of the walls should be clipped back hard. The vegetation may be mechanically trimmed initially but then carefully cut close to the wall by hand. Tendrils shall be removed by hand and using a soft bristled brush. Particular care must be taken not to damage carved areas or friable stone during removal of ivy.
- All vegetation waste should be chipped on site and a place for disposal preferably in the nearby vicinity agreed with the Council. Note waste must be disposed of correctly and in accordance with the Waste Management Acts 1996 to 2008, under which parties disposing of the waste must be licensed.
- Extreme care must be taken when removing plant growth at high levels to reduce the risk of injury from falling masonry. The operatives removing the plant growth should work in pairs and make an assessment as to what sort of access may be required.
- Leave all growth in place and spray apply several coats of a root killer. This should be left for as long as possible – approximately two weeks- before any removal of growth. This will serve to kill all embedded root systems deep in the fabric of the masonry. It may be necessary to repeat the injection of biocide on a regular basis until the plantlife has died.
- After removal of plant growth, by hand, the entire structure should be sprayed with a suitable biocide (Funcosil Algae Rem) in conjunction with a turbo and nozzle steam wash. This will kill and remove all small surface growth and also remove all soil from the joints.
- Pre-drill all areas of open joints where there are heavy roots present. Insert copper piping at a 90-degree angle into the pre-drilled hole as far as possible. Attach ¾ inch clear heavy-duty flexible tubing onto the copper pipe and fill with a very strong solution of a specialist root killer.
- The tubing will act as a reservoir to allow the solution to slowly penetrate deeply into the fabric of the stonework where it can work over a period of time to kill and eradicate all root systems. Return at intervals to top up reservoirs as required.

Wall Repairs

At the outset of the project, with the benefit of scaffold access where required, the masonry walls should be inspected by the design team in detail in order that the full scope of the repairs are agreed and any adjustment on the schedules made in advance of work being put in hand. Scope of repairs to be assessed include – extent of raking out; extent of re-pointing; lime mortar repairs; consolidation of stone; crack repairs.

Stone should only be replaced where it has lost its structural integrity due to erosion causing serious fracture or spalling, or where it is no longer performing the weathering function for which it was designed and is putting surrounding areas of the exterior and interior at risk.

Repointing should also be carried out where mortar has been lost, leaving open or deeply recessed joints that are vulnerable to further water penetration. This will introduce moisture into the walls causing damage to historic finishes, and also cause damage to surrounding stonework due to freeze/thaw action, or provide opportunities for plant growth that can cause mechanical damage to the stone walls or prevent them from drying out sufficiently.

Other areas of concern are where the joints are soft having lost their structural integrity, or where hard cement repointing is cracked and causing damage to surrounding stones. These are to be carefully raked or cut out using hand tools to prepare them for repointing.

Prior to commencement, trial works for each stage will be satisfactorily executed in the presence of the design team. All specified areas will be carried out to the same standard as the agreed trial panels.

Raking Out of Joints

- The raking out of joints must be carried out using small manual hand tools (pointed masonry chisels/quirk). The diameter of the part of the chisel which enters the joint is to be less than the width of the joint.
- Fine joints will be raked out with a narrow instrument such as a hacksaw blade. Under no circumstances must the use of power tools be permitted for use of raking out joints.
- Raking out will commence mid-joint and work outward toward the arises.
- Joints shall be raked out to a minimum depth of 25 mm or 2 times the width of the joint, whichever is greater.
- All debris and dust are to be removed from the raked joints using compressed air or a stiff bristled brush (ferrous metal brushes must not be used under any circumstances).
- All joints must be squared and not 'V'-shaped to ensure a good contact between the re-pointing mortar and surrounding stone.

Re-pointing of Open Joints

- The bedding and pointing mortar shall be a 3:1 sand: lime NHL 2 mix for larger joints and a lime putty for finer joints.
- The aggregate shall be one third the joint size (normally 1mm down to dust) quartz sand free of - soil, organic matter, soluble salts and other impurities.
- The colour of the new mortar shall be approved by the Design Team. It will be necessary to colour match some mortars for use in particular circumstances.
- The lime will be a hydrated lime free from any impurities and which meets the relevant Irish or European Standards.

Mortar

- The use of Portland Cement shall not be permitted for this work. All mortars for repairs to the historic masonry including rebuilding of new sections of traditionally constructed walls will be lime and sand mixes as specified in this section.
- Lime for structural repairs should be Naturally Hydraulic Lime NHL or indigenous quicklime.
- There may be instances such as work in areas where a quick set is desirable because of the inherent wet conditions and the need to work in times outside of the ideal temperatures for lime because of the programme.
- Prompt Natural Cement may be sourced for these situations with the approval of the CA.
- Metastar 501 pozzolan will be permitted for situations such as exposed wall tops.
- Hot Mixed Lime mortars using indigenous quicklime as manufactured by Clogrennane, Co. Carlow should be considered for rebuilding. For masonry wall re-building it is proving a much quicker, more robust way of rebuilding rubble stone masonry.
- All lime mortars should be prepared and mixed as recommended in manufacturer's printed guidelines.
- Bags of lime hydrate, natural cement, etc. must be stored off the ground in a clean, dry place and not used outside of the dates recommended on the bags.
- Quicklime should be stored in weatherproof airtight bags/containers.

Mix Proportions

Hydraulic Mortar: For wall tops
Mix proportions may need to vary depending on the lime + sand but are to be in the range:

- Structural repairs: 1 part NHL 3.5 lime to 2.5 - 3.0 parts graded sharp sand.
- Wall tops and slopes as above but gauge the NHL3.5 with Metastar according to manufacturer's instructions

Gauged Hot Mix Mortar: For exposed wall core face work such as rebuilding sections of stonework, repointing and for pouring into voids

- 1 part Hydraulic lime (NHL5 St Astier or NHL3.5 Roundtower grey):
  1 part quicklime (Clogrennane kibbled or powder):
- 5 parts coarse sand (If a silica sand as opposed to a calcareous sand is to be used then substitute 0.5 part for limestone dust). Gauging by (level) bucket including addition of up to 10% 10mm aggregate pebble

Mixing

- The mix shall be prepared using a mortar mill however a conventional cement mixer may be used.
- Measuring of material must always be with a gauging box or bucket.
- Start with an empty mixer, add the dry materials and mix for at least five minutes.
- After five minutes slowly add water until the desired consistency is reached. It is very important not to drown the mix by adding too much water.
- Once the desired consistency is reached, mix for a further 20 minutes. In general lime mortar requires a longer mixing time than cement-based counterparts.
- The mix, to begin with, shall appear rather dry but as mixing time increases the render will become much 'fattier' – the desired mix shall be stiff but workable. If too much water is added the risk of shrinkage will increase and the final strength reduced. Keep the aggregate dry to ensure accurate control of water.
- The use of plasticisers will not be permitted.
- The mortar must be used within two hours, but can be 'knocked back' for re-use.

Re-pointing

- All debris and dust are to be removed from the raked joints immediately prior to re-pointing using compressed air. Brushing out shall commence at the top of the elevation and work down.
- All raked joints shall be dampened prior to re-pointing using hand sprays. Care shall be taken to dampen the mortar joints not the stone face. A relatively small amount of water is needed for fine joints.
- Where the masonry becomes too wet, then wait until this has sufficiently dried. In warm weather it may be necessary to constantly damped joints as work progresses using hessian sheets as necessary to provide shelter from the elements.
- Masking tape shall be applied over the joint to prevent staining of the masonry for ashlar work. The joint shall then be slit open with a knife before application of the mortar.
- The re-pointing mortar is to be well compacted into the joints using a suitably fine pointing iron of a flat plastering

hawk (the blade of a knife may be used for particularly fine joints).
- The joint is to be finished flush, to agreed sample.
- After a period of time (ranging from a few hours to a day depending on the lime and environmental conditions) the joint shall be beaten with a stiff bristled brush to consolidate the mortar (closing any shrinkage cracks).
- The masking tape is to be removed when the mortar has hardened sufficiently and the faces of the stone shall be left clean and free from any mortar or cement stains. No traces of mortar shall be left anywhere on the exterior of the stone and the mortar shall not exhibit any signs of shrinkage or cracking.

Protection & Aftercare of Lime

- The area/s must be covered with hessian and allowed to dry out slowly over a period of three weeks. The drying temperature shall be controlled and drying must not be forced by introducing excessive heating.
- In hot weather it will be necessary to regularly re-wet the sacking.
- Lime products must not be used in temperatures of 5 degrees or falling.
- Once opened the exposure to air will start to weaken the hydraulic set. Any opened bags left at the end of the day shall be carefully folded over at the top and put into a dry store. In this state the lime will remain useable for a further 2 or 3 days.
- All materials (lime/sand/aggregates) are to be stored in a clean, dry environment where there is no risk of contamination or damage.

Resin Repairs to Cracks/Fractures

- Fractures will be injected with an approved resin to seal these from the elements. Stone dust to match existing will be used to finish the repair. Under no circumstances must the resin be allowed to come into contact with the outer surfaces of the stone.
- The product shall be a proprietary epoxy resin approved by the CA.
- The surface to be treated is to be sound and free from dust, dirt, oil grease, free water and all other contaminants. The interior of the crack is to be cleaned using a blast of compressed air.
- Mixing of the resin shall be carried out in accordance with the manufacturer's instructions.
- Deep cracks shall be filled using a syringe with inert proprietary filler suitable for use with stone up to within 3-4 mm of the surface.
- Fill crack with crushed stone (to match existing) in epoxy. It will be the responsibility of the contractor to source appropriate matching stone for specific situations (limestone/sandstone etc.).

- When the resin has cured tone repair to match the colour of the surrounding stonework.
- No resin is to come into contact with the outer surfaces of the stone at any stage in the repair process. If this shall occur, then it is to be immediately removed and the area cleaned with an appropriate solvent.
- Finish the repair with crushed stone (to match existing) in epoxy.

Stone Replacement

Areas of damaged/weathered stone which have been identified shall be replaced as per the following.

- Replacement stone and mortars shall match in terms of species, colour and texture.
- Any variations in the inherent characteristics of the replacement stone or brick shall be brought to the attention of the CA, and samples demonstrating their range submitted for approval.
- The stone shall not contain inclusions, fissures or bedding structure that will cause excessive differential weathering or cracks to develop.
- Where cutting out is required, this is to be carried out to a depth of at least 100 mm for indents and to the total depth of the block for replacements. The cutting out of the edges may be required to provide an undercut/dovetail key for the repair. It may also be necessary to undercut pockets to provide additional key where the repair tapers.
- Adjacent surrounding stone or brick faces are to be protected from accidental damage.
- Cutting out starts at the centre of the defect and works out towards the edges.
- All original ferrous cramps are to be carefully removed.
- Replacement stonework shall comply with the relevant requirements of BS 5390, BS 8298, BS EN 711-1:2011.
- Stone replacements and indents are to be cut exactly to size off site allowing for a perfect match to the measurements of existing producing a fine interface joint (approximately 1mm). Stones shall be dry fitted and trimmed accordingly prior to installation.
- Replacement stone must faithfully replicate original detailing. Where the original surface was finished by hand chisels, this shall be replicated. Where saw cut blocks are to be used these shall be oversized to allow the face to be worked/dressed back by hand. Weathering of the surface can be achieved by gently rubbing clean sharp sand in a circular motion on the face of the stone.
- All stone faces shall be moistened prior to bedding and the mortar shall be laid evenly on the faces of the stonework.
- The position of the original block is to be maintained.
- The thickness of joint is to match that of adjacent blocks.
- The stone shall be orientated in the correct bedding planes.
- Joints are to be finished neatly to a flush finish with no mortar stains left on the faces of the stones or brick.

- Where the edges of stones are eroded, pointing should be stopped at the right location to ensure that the original joint width is maintained.

Delivery & Storage of Stone

- Where available, only stone that has been displaced and salvaged from the site should be used, after its original location and placement is identified. Dressed stone should be properly labelled and stored on pallets for identification.
- Where these are not available, or supply is short, suitable local stone should be sourced, or from the wider region. Imported stone should never be used.
- Where applicable stone is to be dispatched from the quarry or from the yard/ factory only when needed to reduce double handling.
- Stone shall be stored in clean, dry conditions. It shall be stored clear of the ground to prevent the leaching of soil salts and moisture staining.
- The pallets shall be loosely covered using polythene sheeting to protect the stone and brick from wet conditions. This shall be placed over the more normal coverings such as straw or hessian.
- Each stone shall be checked on delivery and marked off on a copy of the fixing schedule, carefully examined for damage and, if undamaged, stacked in the correct sequence for fixing and in such a manner that its identification letter and number are clearly visible.

Storage of Fragments

- Stone fragments shall be relocated to a suitable area of the site to be identified by the Design Team.
- Two separate areas shall be identified – 1) storage of worked/carved stone, 2) storage of unworked stone suitable for re-use in repair of the historic walls.
- The contractor shall allow for transportation of the fragments within the site (by hand and wheel barrow) and the laying of a weed suppressing membrane to receive the fragments.
- The contractor shall number carved stones using a water based medium as per a pre-agreed recorded system (tbc with the Design Team) and shall record these in simple excel spreadsheet.

TEMPORARY SCAFFOLD PERFORMANCE SPECIFICATION

General

Before starting work:

- Examine all available information.
- Survey the structure, site and surrounding area.
- Submit method statements to the Construction Manager covering any relevant matters raised in the design brief.
- Ensure that all statutory notices have been given and licenses obtained.
- Submit detailed proposals including drawings and calculations for all systems to the Contract Administrator, and resolve any amendments proposed.

Codes Of Practice

- Design scaffold in accordance with BS EN12811-1:2003
- Workmanship to be in accordance with BS EN12811-1:2003

Design loading

- Design wind loads to be in accordance with BS EN12811-1:2003
- Design scaffolding and working platforms for loading specified by the Engineer.
- Provide working platforms at each lift.
- Provide safe access and safe places of work in the scaffold for inspection and repair of damaged areas.
- Ensure that working platforms are suitably close the building so as not to allow material to accidentally fall from one level to the next.

Commencement

Before starting work, carry out a visual inspection of the site and note areas that look unstable and may require special care of operatives during erection of the scaffold. Another inspection should be carried out following the removal and disposal of the existing hoarding and the site secured at all times.

Maintenance of scaffolding

Regularly inspect and maintain scaffolding, making good ties, wedges, connections, corrosion protection, etc. as necessary.

Stability

- Design scaffolding to be self-supporting and not reliant on being tied to the building.
- Provide bracing to the exterior of the scaffold, so as not to inhibit any works.

Safety

- Operatives must be appropriately skilled and experienced for the type of work
- Site staff responsible for supervision and control of the work are to be experienced in the methods of erection and maintenance of support systems to be used
- Examine and note the contents of the pre-contract health and safety file before commencing the work.
- Prevent access of unauthorised persons onto scaffold. Leave safe outside working hours.

Mix Proportions

Hydraulic Mortar: For wall tops
Mix proportions may need to vary depending on the lime + sand but are to be in the range:

- Structural repairs: 1 part NHL 3.5 lime to 2.5 - 3.0 parts graded sharp sand.
- Wall tops and slopes as above but gauge the NHL3.5 with Metastar according to manufacturer's instructions

Gauged Hot Mix Mortar: For exposed wall core face work such as rebuilding sections of stonework, repointing and for pouring into voids

- 1 part Hydraulic lime (NHL5 St Astier or NHL3.5 Roundtower grey):
  1 part quicklime (Clogrennane kibbled or powder):
- 5 parts coarse sand (If a silica sand as opposed to a calcareous sand is to be used then substitute 0.5 part for limestone dust). Gauging by (level) bucket including addition of up to 10% 10mm aggregate pebble