



Icehouse interior – CORA 2019



Causeway between the two lakes – WM 2004

Report on Current Condition and advice on conservation based repair to:

The Historic Landscape Features

Structures associated with the two Lakes – Inlet, Causeway and Weir; Bridge over Mayne; Rock House and Icehouse at Belcamp Hall, Malahide Road, Dublin D17

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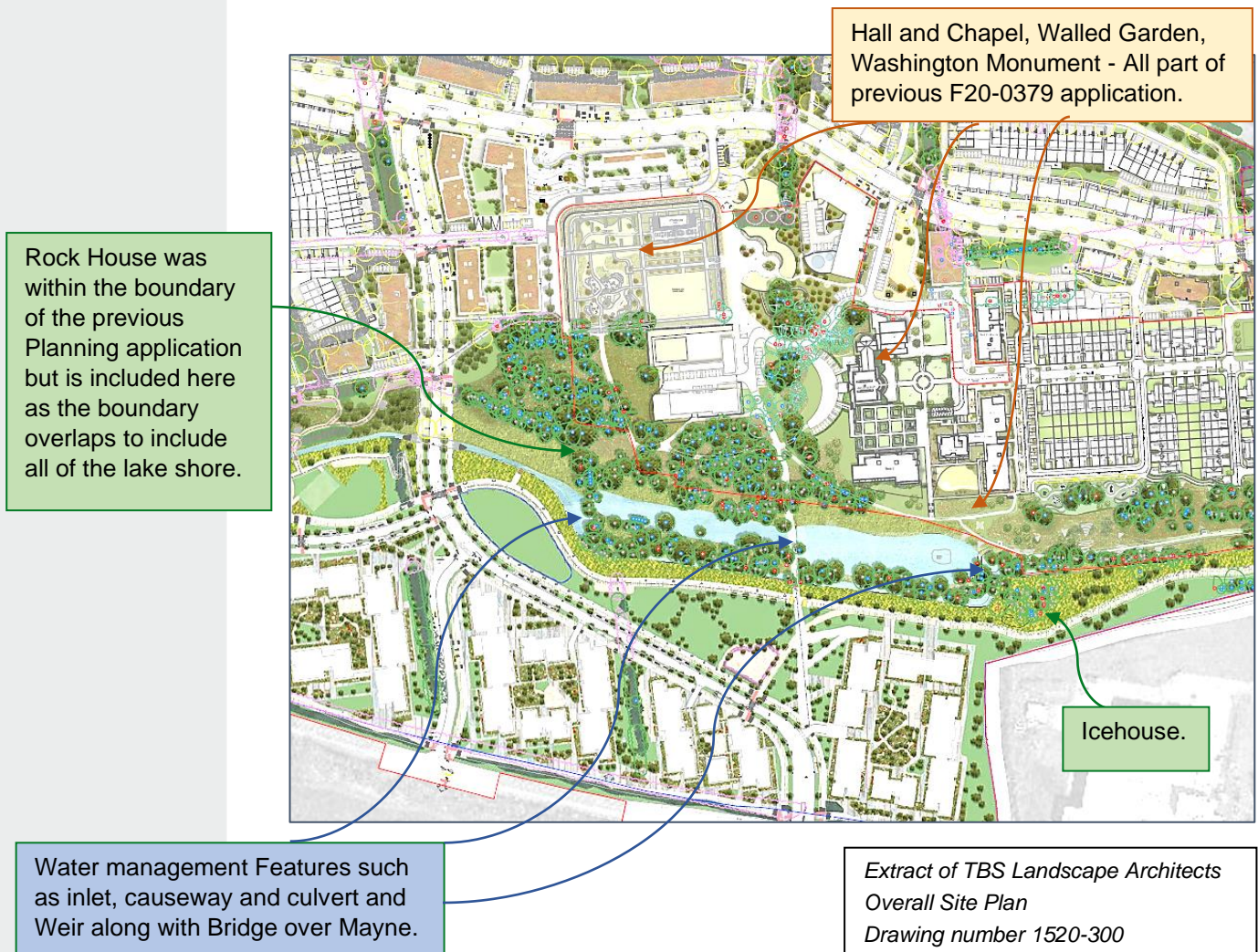
1 Introduction

1.1 Outline of brief and proposed works

CORA Consulting Engineers were asked by Gerard Gannon Properties to provide a structural appraisal and recommendations for the repair of the historic landscape features within the boundary of the demesne at Belcamp Hall along with an assessment and guidance on the reduction of impact of new interventions as part of the Strategic Housing Development application for the proposed new housing development application at Belcamp Hall, Malahide Road, Dublin D17.

This report is thus limited to the Structural Engineering appraisal and recommendations for repairs to the Rock House; Lake features including the Inlet, Causeway and Weir; Also the bridge over the Mayne and the Icehouse. Whilst other structures such as the Walled Garden; House and Chapel and the Washington Tower are referred to these are outside of the current SHD application as they formed part of the Phase 1 application F20-0379

For all other matters such as Architectural Conservation comment please refer to reports by others.



1.2 Defining the Protected Landscape Structures

The landscape structures are part of a formulated landscape that served the Hall providing a setting for the large house; food supply and pleasure gardens.

Belcamp Hall is recorded as a Protected Structure number 463 in the current Fingal County Council Development Plan 2017-2023 - Record of Protected Structures. The house is also in the NIAH as Reg. No. 11350024.

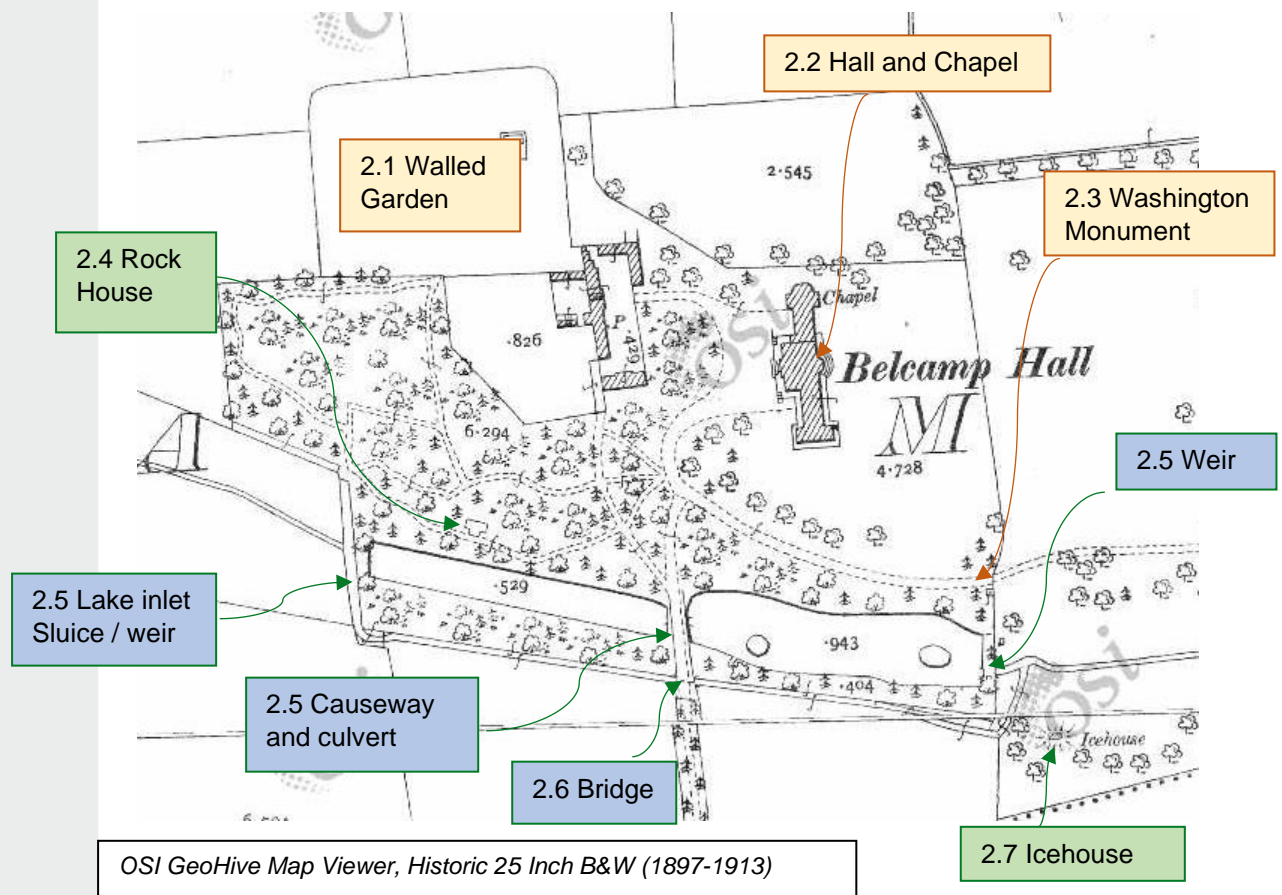
In accordance with Part IV of the Planning and Development Act “where a structure is protected, the protection includes the structure, its interior and the land within its curtilage and other structures within that curtilage. The listing reads: *“Former Belcamp College school complex (incl 18th century original house, Washington Monument, walled garden, bridge & early 20th century chapel)”*

We have interpreted the “Bridge” to mean the Causeway and Culvert between the two lakes and the Bridge to the south over the river Mayne.

We have also assumed that the whole water management system including the structures at the top and bottom of the lake system are included in the definition of “structures within the curtilage of”- thus the inlet sluice / weir at the west starting end of the water system and the weir to the east downstream end of the system should be recognised and assessed for value.

There are also two other structures that appear on the first edition OSI that are still in the landscape, and these are the Rock House and the Icehouse. Rock House is technically within the boundary of the previous Planning application but will be covered here as part of the SHD as it has not been previously addressed.

The structures therefore that we believe form part of the listing and therefore should be afforded protection are indicated and located below.



1.3 Method of Appraisal

The features have been visited a number of times over the last couple of years by Lisa Edden and Triona Byrne of CORA Consulting Engineers.

In addition Darragh Aiken, Waterman Moylan and James Canny, Vincent Needham and Mick Byrne of Gannon Homes have supplied assistance in the investigations and supplementary photographs etc.

The inspections have involved a walk around and in addition some localised excavations at the weir to determine depths of original structures.

Extensive ivy and other plant growth covers the rock house, and there is build-up of debris in the lakes that has and does obscure the lower parts of the cause way walls.

There is debris such as old heras fencing under the bridge which makes inspection difficult.

Therefore be noted that a certain level of additional findings are to be expected once the ivy has been cut back and controlled and debris and silt removed from the Causeway and weir; Icehouse and around the Rock House. Safe methods and appropriate times for carrying out such are contained in this report.

No invasive works were carried out, samples taken or tested in formulating this report.



Weir to downstream (east) end of lakes

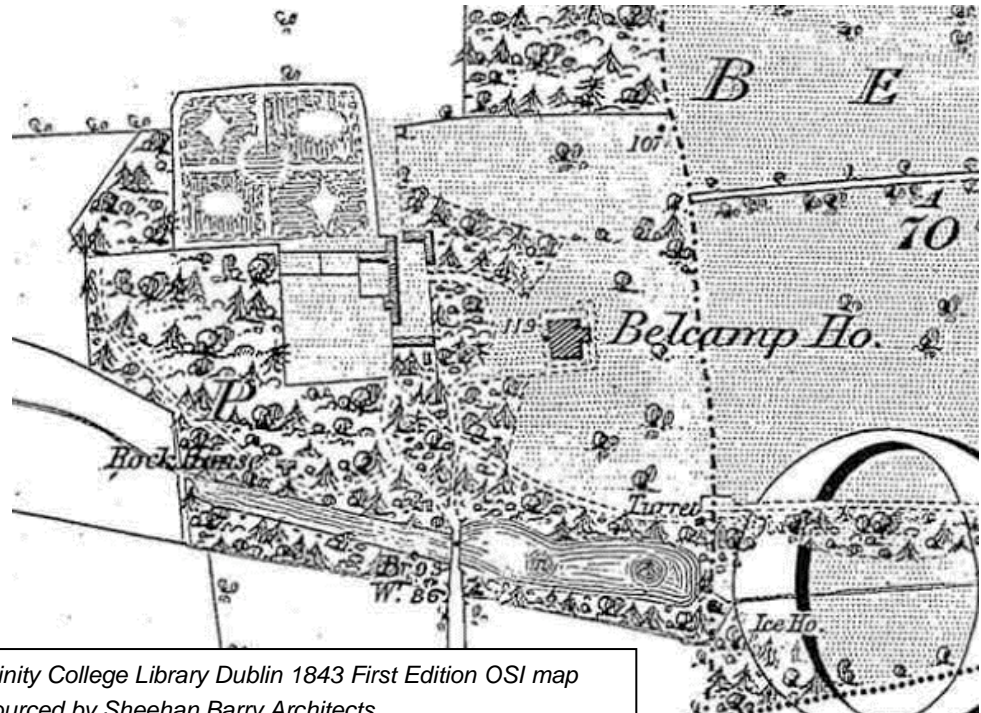


Bridge over river Mayne

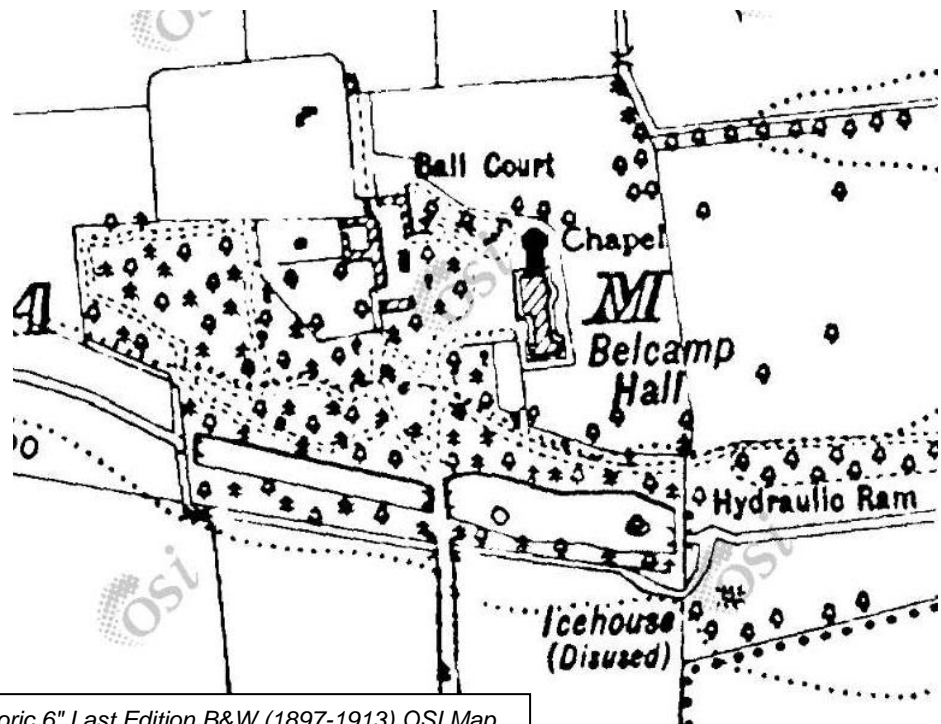
2 Observations

Mapping clearly shows the prominence of the historic features.

Over the time period 1840 to 1890 between the first edition and the last edition of the 6" OSI the addition of the chapel occurs; the fall into insignificance of the Rock House; the disuse of the icehouse and the introduction of a Hydraulic Ram. The Hydraulic Ram currently shows no trace on the ground, yet all the other features still remain in the landscape.



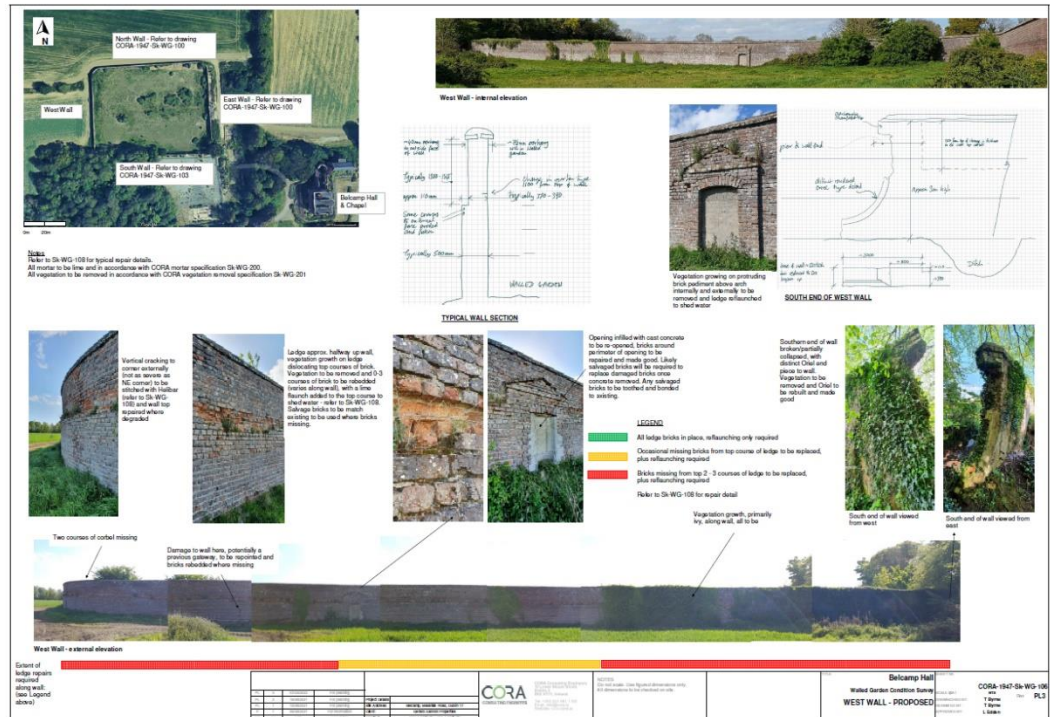
Trinity College Library Dublin 1843 First Edition OSI map
Sourced by Sheehan Barry Architects



Historic 6" Last Edition B&W (1897-1913) OSI Map
Sourced from online OSI Map Viewer

2.1 The Walled Garden

The large walled garden has very significant intact walls to three sides and remains of wall to the south side. The current condition and proposed repair of these has been thoroughly dealt with as part of the planning application (Reg. Ref. F22A/0136). Thus the Walled Garden does not form part of the SHD application.



Sample Drawing of Walled Garden set – showing proposed repairs to the West Wall, Drg no. SK-WG-106-PL3

It is covered by the following CORA drawings in the application Reg. Ref. F22A/0136.

-  1947 Belcamp Walled Garden - Drawing Register 2022-03-07
-  CORA 1947 Belcamp Sk-WG-100-PL3 East wall - Existing
-  CORA 1947 Belcamp Sk-WG-101-PL3 North wall - Existing
-  CORA 1947 Belcamp Sk-WG-102-PL3 West wall - Existing
-  CORA 1947 Belcamp Sk-WG-103-PL3 South wall - Existing
-  CORA 1947 Belcamp Sk-WG-104-PL3 East wall - Proposed
-  CORA 1947 Belcamp Sk-WG-105-PL3 North wall - Proposed
-  CORA 1947 Belcamp Sk-WG-106-PL3 West wall - Proposed
-  CORA 1947 Belcamp Sk-WG-107-PL3 South wall - Proposed
-  CORA 1947 Belcamp Sk-WG-108-PL3 Typical Repair Details
-  CORA 1947 Belcamp Sk-WG-200-PL3 Lime Mortar Specification
-  CORA 1947 Belcamp Sk-WG-201-PL3 Vegetation Removal Specification

2.2 Belcamp Hall and Chapel

The Belcamp Hall and Chapel were severely damaged by fire in 1920 and again in 2020. Repairs are underway covered by Section 5 planning exemptions with the reuse to be shortly covered by a separate planning application. The location of the Main Hall and Chapel means that they fall outside of this SHD but as they form the anchor Protected Structure are mentioned here.



Chapel Roof repairs underway March 2022 – CORA Main Hall on the left

2.3 The Washington Monument



Like the Hall and Chapel the Washington Monument is outside the current SHD boundary but it is on the north shore of the more easterly lake.

Constructed in 1778 by Sir Edward Newenham it was repaired in 1984 but requires further repair particularly the filler joist roof consisting of corroding ferrous metal joists and clinker concrete infill.

Further repairs will be formulated and applied for via a separate Section 5 application.

*The Washington Monument
2020-10 CORA*



2.4 The Rock House

The Rock House is located on the north bank of the westerly lake and would have looked onto the lake, reached by one of the woodland / lakeside walks

Vegetation and corrugated iron sheet proliferate the site and obscure understanding.

The remaining walls appear to be just a fragment of its former plan. The Ordnance survey maps show this structure to be nearly double the size of the Washington Monument at approximately 9m x 4m with a front outshot facing south towards the lakes.

It is suspected that the remnants are the front outshot and that the mound behind is the former bulk of the building.

The remains nonetheless are of interest containing daubed out masonry niches, in the very substantial thick masonry walls. The walls are extensively lime washed.

To properly assess the walls vegetation control needs to take place in the form of a hard haircut of all plant growth on the walls. There are more ecologically friendly times to carry this out such as between 1st Sept and 28th February. Refer to vegetation control specification in the Appendix.



The Rock house – only a small part of original stands



The Rock house, lime washed niches



OSI GeoHive Map Viewer, Historic 25 Inch B&W (1897-1913)
See comparative sizes of Rock House / Washington Tower / Icehouse

Icehouse

2.5 Lakes and water management Structures

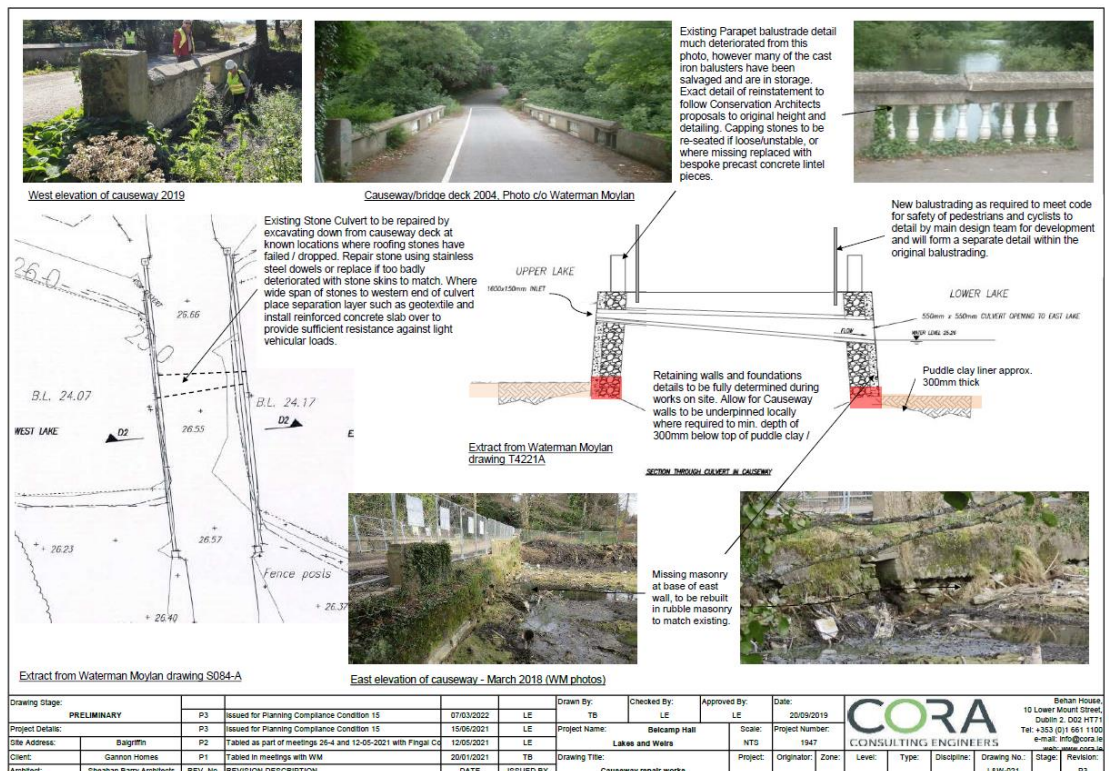
The two lakes and the water system they contain were very extensively engineered at initial concept and instigation. This system provided an extensive water storage system which likely provided fish farm, pleasure garden and water supply

The original puddle clay has been re-discovered and the inlet control system, midpoint throttle and downstream exit weir have all been mapped.

It is proposed to reuse the whole system to provide water attenuation and a landscape feature to the development. As such much of this will need to be repaired and to a large extent the repair to original form including re-insertion of puddle clay where damaged will be essential for it to function in its new role as water attenuation.

The most significant intervention will be the downstream hydro brake. Much discussion has occurred around this with a number of iterations being explored. The formulated proposal is to repair the downstream weir and then insert the new Hydrobrake within the lake upstream of, but not interfering with the original weir.

The information has already been issued as part of Planning compliance condition 15 on weirs under F15A/0609, May 2021 and consists of drawings from Waterman Moylan showing proposed water levels etc and CORA Consulting Engineers showing proposed repairs.



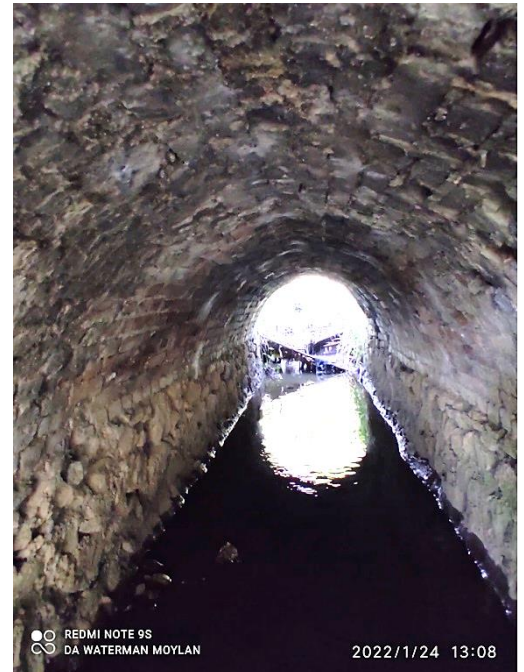
One of the proposed repair works drawings submitted for planning compliance F15A/0607. Including Location Drg 1947-L&W-015 and Repair works L&W 019 - 021

2.6 Bridge over River Mayne

The short span masonry arch bridge over the River Mayne was built in two phases. The original bridge seen to the right was of short span robust masonry semi circular arch. Likely wide enough for a single lane or two narrow small cart widths.

The development of the causeway possibly required the width to be revised and extended to the west with a flatter formed thin brick arch.

The condition of the masonry is generally reasonable albeit the upstream abutments will require stabilisation and the instream debris needs to be removed to ensure unimpeded flows..



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DA WATERMAN MOYLAN

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Original short span masonry arch bridge

Photo c/o Waterman Moylan.

Note extensive debris downstream

Later flatter, brick arch to upstream side in foreground. This later span is considered as inadequate for Vehicular loading.

Photo c/o Waterman Moylan



2.7 Icehouse

The Icehouse is located to the south of Belcamp House, on the far side of the River Mayne, in a wooded area. It is located within the functional area of Dublin City Council and outside the site of the planning application F20-0379.

The exterior is covered by earth and is somewhat overgrown. The interior is formed of an egg-shaped red clay brick vault with the wider circumference of the egg to the top and the point of the egg towards the base. There is certainly a drain to the base. The levels would likely put this level with or just above the typical adjacent river level.



Icehouse entrance

The entrance tunnel was possibly longer and more extended at one stage, but now the dome-shaped arch leads immediately to the interior. Under the earthen cover, the ice house is covered with slate. The structure remains intact generally and is in a good state of preservation albeit filled with rubbish.

*Icehouse main brick vaulting in egg shape red brick.
Note debris in base of vault*



Downstream side of the bridge

3 Recommendations & Conclusions

All works to protected structures requires approval either via being proclaimed exempted from Planning or through the Planning process. For legislation regarding the care and repair of such refer to reports by others.

The following should be considered outline only and will need a fuller set of approved documentation before any works on site commences

3.1 Clearance and understanding

Whilst a good understanding of most of the structures has been obtained there are a few where further clearance and investigation are required such as:

- The Rock House
- The Icehouse
- The inlet system to the top end of the Lakes
- The outlet system to the lakes – ie weir to east end of east Lake

To allow gain better knowledge of these features clearance and discovery needs to be made – ideally this Autumn immediately postdating 31st August to comply with the Wildlife Acts. Areas such as the icehouse are also likely to require a team trained in confined space access.

3.2 Repairs to The Rock House

- Careful control and removal of vegetation post 31st August 2022.
- Removal of all later roofing / camp construction materials.
- Careful excavation of mounds to reveal upstanding remains of other walls.
- Repair of all upstanding walls with matching masonry in lime mortar to stabilise (ensuring no conjecture or addition)
- Repair of wall tops with combination of lime mortar flaunching and soft tops.
- Integration of building with landscape pathways and vista of lake.

3.3 Repairs and integration of Lake structures

Full exploration and understanding of all the water management features, requiring excavation down to the puddle clay liner and in localised locations through the clay liner with repair and replacement of puddle clay liner immediately after.

Repair the water features as outlined in CORA Consulting Engineers drawings formulated for planning compliance F15A/0609

3.4 Bridge over Mayne River

Repair the water features as outlined in CORA Consulting Engineers drawings formulated for planning compliance F15A/0609.

3.5 Icehouse repairs

The icehouse needs clearing of debris from within and ivy cover form with out. After such a full assessment and set of repair specifications can be pulled together.

The longer term security also needs to be thought about with possibly a set of stainless steel security gates at both tunnel entrance and entrance to egg shaped brick vault.

3.6 Materials to be used in the repairs

All works to be preceded by exemplars refer to Mortar Specification in Appendix.

It is assumed that the extent of any patching or re-building will only necessitate the use of the bricks and stone on site that has previously fallen from the walls or being removed from other later demolished structures.

Extent of repairs should be limited to the extent of this stone rather than importing new stone which may confuse the historic record. The only supplement should be new (or salvage) red clay brick and natural slate and a selection of small wedge-shaped stone pieces for pinning masonry.


A typical lime mortar specification is appended for initial reference.

The mortar to be used for repairs to the weathering faces such as wall tops should be formulated to be weatherproof.

The mortar to be used for repairs to vertical faces should be less hard and more permeable than the masonry units it binds.

Careful selection of these lime-based mortars will need to be made. An indication of mixes is appended in the Lime Mortar Specification. The final selection will be based on exemplars produced on site by the chosen contractor and approved by the appointed conservation design team.

Prepared by;



Lisa Edden BEng CEng MStructE MIEI

for CORA Consulting Engineers.

4 Appendix - Specifications for repairs

4.1 Specification for Vegetation Removal

4.1.1 General

Before starting

Vegetation treatment / cutting / removal should ideally occur within the period 1st September to 28th February (dates inclusive) to comply with the Wildlife Act 1976 (Amendment) 2000. www.npws.ie/legislation

Although the removal of structure endangering plant growth outside of this period is not illegal, consultation with the National Parks and Wildlife Service is advised where substantial removal of vegetation is envisaged.

It is possible that bats are roosting in dense plant growth and cutting of the plant foliage should only occur after inspection by a qualified bat ecologist, who will recommend appropriate mitigation measures. All bat species are protected under the Wildlife Act and it is prohibited to interfere with their roosts.

Only very specific use of herbicides or biocides as mentioned below is to be deployed at any stage as the general policy is to reduce the plant growth immediately at the wall but not to the surrounding areas.

Access for works

Extreme care must be taken when removing plant growth from walls and at high levels to reduce the risk of injury from falls and from falling masonry.

The operatives removing the plant growth should work in pairs.

All work above 1.8 metres must be carried out from a safe access platform such as a mobile tower, scaffold or MEWP such as a small articulating boom lift hoist.

Machinery must be operated by personnel qualified to do such.

NB: IF IN DOUBT STOP WORK

Disposal of waste

All vegetation waste should be chipped on site and a place for disposal preferably in the nearby vicinity agreed with the client. Note waste must be disposed of correctly and in accordance with the Waste Management Acts 1996 to 2011.under which parties disposing of the waste must be licensed.

http://www.citizensinformation.ie/en/environment/waste_management_and_recycling/waste_management.html

4.1.2 Site Investigation Stage

Specification for containment of plant growth

Where NO masonry works are envisaged

For maintenance / control of growth and / or survey and assessment purposes where no immediate repair works are planned. This will allow more effective survey and also reduce windage on walls.

Cutting of plant growth on/in walls and at base of walls

All the plant growth growing from the sides or top of the walls and within 2m of any wall should be clipped back to reduce the canopy without interfering with the root system of the plants. This will reduce the demand of the root system and also reduce the risk of wind damage to the structure. Reduction of the vegetation also allows for better inspection of the wall for surveying and assessment of the structures.

The vegetation may be mechanically trimmed initially but then carefully cut close to the building by hand. Hedge trimmers and croppers are likely to be the appropriate tools for this job. It is extremely important not to pull any plants or roots away from the masonry walls as this will dislodge stones and mortar.

Removal of roots and vines attached to the walls should only happen alongside masonry repair works to the building at a later date. Under no circumstances should ivy that is growing up the walls be cut at the base as this only encourages development of the aerial roots and potential for much greater damage to the building in future years

There is to be no general herbicide treatment at this stage excepting that as below to woody stems

Woody stems growing out of sides; tops and bases of walls and within 1m of wall bases

Where woody stemmed plants / trees are found growing out of walls or within 1m of base of walls cut back root close to face of wall / ground and paint suitable root killer on cut stem within one hour of cutting.

All roots / stems over 30mm diameter to be treated with EcoPlug by Monsanto or similar approved, treatment to be carried out in accordance with manufacturers instructions.

Typically:- Treat within 2 days for optimum performance.

Using the prescribed drill bit make the appropriate number of holes in the living part of the stump just inside the bark. Each hole should be 25-30mm deep, 13mm wide.

Place an EcoPlug Max in each hole with the narrow end first. The top of the plug will protrude by about 10mm.

Tap each EcoPlug Max until the head is flush with the stump. This will force out the sides of the plug and release the glyphosate.

4.1.3 Construction Phase

Specification for containment of vegetation growth where Masonry works are being carried out

Prior and during repair works to masonry

Leave all growth in place and carefully weed wipe or very topically spray only those plants growing from foundations or walls with Glyphosate such as Round-up Pro Bioactive or similar approved. Apply according to manufacturer's instructions. <https://www.monsanto-ag.co.uk/documents/>. Extreme care must be taken to avoid any spraying in such close proximity to a water course

The herbicide should be applied as long as possible, at least 2 weeks, before any removal of growth. This will serve to kill embedded root systems deep in the fabric of the masonry.

Removal of vegetation

After a minimum of two weeks all the plant growth growing from the foundations; sides and tops of walls should be clipped back hard. The vegetation may be mechanically trimmed initially but then carefully cut close to the building by hand.

Hedge trimmers and croppers are likely to be the appropriate tools for this job.

It is extremely important not to pull any plants away from the masonry walls as this will dislodge stones and mortar.

Any large or deep-seated roots are to be left in place during trimming operation so that they can be further treated – see below.

Under no circumstances should ivy that is growing up the walls be cut at the base as this only encourages development of any aerial roots and potential for much greater damage to the building in future years. Once the aerial roots have been removed during masonry works the stem will then be removed by the masons as they re-point down the wall.

Apply according to manufacturer's instructions Roundup Pro Bioactive or similar approved, to the cut faces of large stumps within 48 hours of felling. A soluble die will help in identifying which stumps have been treated.

Proceed with masonry repairs

Dig out as much of root as is practicable as masonry works proceed, without dismantling large sections of currently stable masonry. If in doubt consult Engineer.

Where roots remain drill all roots over 30mm diameter root with 13mm diameter drill and insert EcoPlug by Monsanto. Treatment to be carried out in accordance with manufacturers instructions.

Typically:- Treat within 2 days of cutting for optimum performance.

Using the prescribed drill bit make the appropriate number of holes in the living part of the stump just inside the bark.

Each hole should be 25-30mm deep, 13mm wide.

Place an EcoPlug Max in each hole with the narrow end first. The top of the plug will protrude by about 10mm.

Tap each EcoPlug Max until the head is flush with the stump. This will force out the sides of the plug and release the glyphosate.



Useful References:-

“Ruins – The conservation and repair of masonry ruins” ISBN 978 1 4064 2445 4

Department of Culture Heritage and the Gaeltacht Architectural Advice series /

“ Bats, Birds, Buildings and You! The heritage Council

“Bats in Buildings” Guidance notes for planners, engineers, architects and developers

<https://www.batconservationireland.org/>

<http://invasivespeciesireland.com/>

“The Herbicide Handbook: Guidance on the use of herbicides on nature conservation sites”

Published by English Nature 2003 in association with FACT. ISBN 1 85716 746 5

4.2 Specification for Masonry Repairs using Lime Mortar

4.2.1 General

Note final mix designs to be a result of consultation with Lime suppliers; Conservation Engineer; Architect and appointed Contractor and will be based on exemplars and a more thorough understanding of the previous construction obtained during masonry works preparation.

Lime mortar works can be affected by excessive wind, rain, sun or low temperatures.

If these conditions prevail the working areas must be kept moist by spraying and protection using polythene or hessian sheets sprayed with water at regular intervals. Spray hoses can be used for large areas or for damping down hessian sheets but should be used with caution to avoid jet action of water washing out mortar or over saturating a wall. Thus a bottle spray, sprayer back pack or similar is an essential part of the equipment.

No works to be carried out if below 5 degree Celsius temperatures forecast within 48 hours unless temperature control methods such as tented enclosures deployed.

Full discussions regarding mortar mixes and methodologies to be undertaken with Engineer prior to commencing works. Exemplars will be required for each pointing / rebuilding type and are to be agreed with the design team before undertaking any work.

4.2.2 Stone Identification process - numbering and recording

Any part of a wall that is to be dismantled or stones that need to be removed must follow strict protocol.

All stones that form part of a specifically detailed element such as an arch, window reveal or pier to be numbered using removable chalk / paint; photographed and layout mapped using clear mona flex or similar before dismantling.

After dismantling apply same number in indelible ink / paint to hidden face and store stones in reverse order on scaffold or pallets etc ready for reassembly.

Note sections containing random rubble with no quoin details do not require numbering.



4.2.3 Mortar Binder

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 Engineer.

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 and the expansion during slaking will be inherently useful in tightening up the arch voussoirs. The document "Hot Lime Mortars - HLM Project - TECHNOLOGY TRANSFER & APPLIED RESEARCH" should be consulted (see references).

Naturally Hydraulic Lime; Metastar; Prompt and quick lime for hot mixing are all supplied by the following (not exclusive list)

Stoneware Studios, Youghal www.stonewarestudios.com

Traditional Lime Co., Carlow www.traditionallime.com

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 air tight bags/containers.

4.2.4 Sand

Sand shall be clean, coarse, well-graded sharp sand.

Particle sizes should range from 3mm to fine dust for any ashlar repointing and 5mm to fine dust for repointing larger joints in stonework.

The sand colour is important in achieving a good visual match to the existing mortar.

4.2.5 Mixing

Lime and sand should be carefully measured by volume, using batching boxes (shovels are not sufficiently accurate to be used). A conventional cement mixer may be used.

Add lime and sand dry and mix thoroughly. Lime hydrate and sand must be mixed dry in a mixer for a minimum of 20 minutes prior to the addition of water, to encourage air entrainment and improved workability.

Add water carefully until mixture starts to run. It should be a little dryer than a cement-sand mix. After water is added allow a full twenty minutes further mixing. The long mixing period helps improve workability.

The mortar should be damp but not too wet. Mortar for re-pointing needs to be dryer than that used for original bedding because it is being placed in small quantities in a vertical situation.

Use mixed mortar within a few hours and do not moisten to extend the working life. Mortar when mixed must be used within the time scale recommended by the manufacturer.

4.2.6 Exemplars of proposed works

Exemplars of all proposed works will be required at start of contract. This should include the following at minimum:

- i) Pointing of original facing stonework
- ii) Insertion of new facing stonework where structural repairs required
- iii) Sample wall top details



4.2.7 Mix Proportions

Mix proportions may need to vary depending on the lime + sand but are to be in the range:

Hydraulic mortar: For structural repairs, and wall tops

Structural repairs: 1 part NHL 3.5 lime to 2.5 – 3.0 parts graded sharp sand.

Sand should be minimum 5mm down with additional larger aggregate 3-6mm and 6-10mm supplied to site for gauging

Wall tops and slopes As above but gauge the NHL3.5 with Metastar according to manufacturers' instructions.

A typical Hot-mixed mortar: for repointing to vertical faces of wall

1 part quicklime (Clogrennane kibbled or powder):

3 parts coarse sharp sand 5mm down (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. Additional 3-6mm and 6-8mm aggregate may be required to create a good match where the joints are wide

Gauged Hot Mix Mortar - wall face work such as rebuilding sections of facing stones

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. Courser aggregate may be required as above.

Moisture resistant Mortar - works below ground level to wall bases

1 part Naturally Hydraulic Lime NHL3.5 (upper band width NHL3.5 spec)

1 part Prompt Natural Cement

2 parts 5mm down washed sharp sand + addition of up to 10% 10mm aggregate

Note. The Prompt Natural Cement in these ratios will give an initial set in approximately one hour of placing

without dramatically increasing brittleness or reducing longevity.

For details of Prompt refer to supply and also www.vicat.fr/en/Activities/Cement/Prompt-natural-cement

4.2.8 Re-laying Masonry

All loose stones / bricks are to be laid on a full bed of mortar, spread on a carefully cleaned and wetted upper surface of the underlying masonry. Slate or small stone pinnings may be used to level the stone and all horizontal and vertical joints are to be completely filled with mortar well packed in so that the loadings of the structure are distributed evenly.

Think of mortars as soft beds to provide cushions between stones. Lime does not glue things together or create a hard, impervious skin like cement-based mortars and coatings.

Where new stones or bricks are to be inserted, allow for “dry packing” joint over with barely wet mortar.

The new mortar joints of the rebuilt stone and brickwork are to match exactly the existing joint depth and are to be struck flush, brushed off diagonally across joint in both directions and sponged off carefully to match exactly the re-pointing works to the remainder of the masonry. Care must be taken to ensure that mortar or grout splashes do not stain the existing masonry faces. See also note below re: beating back of mortar once stiff.

4.2.9 Preparation for Re-pointing and initial build-out

Prepare areas for re-pointing using small hand-held tools and by removing all the very friable mortar saving any small stones (“gallets” or “pinnings”) that come loose for re-use.

Good preparation is essential for all lime works and a brush is an essential piece of equipment for cleaning out joints, wall surfaces and for brushing pointed joints.

Do not use large blobs of mortar to fill in voids or loose areas; build up with pieces of stone. If the voids are large, bed in the small filler stones in the normal way. If smaller then fill void with mortar and then drive in a stone wedging it in tightly to tighten up loose masonry.

4.2.10 Re-pointing

Carefully rake out joints to depth of twice the joint width. Face of raked out mortar to be cut back square and not sloped or V-shaped. Brush out joints to clear of all debris.

Wet down joints and adjoining masonry to be pointed thoroughly, on dry or windy days spraying may be needed several times and also occasionally during the pointing process and after the work is completed. The wetting is to stop the bed joints from drawing water out of the pointing mortar that would make it dehydrate and fail to set. Lay the pointing mortar on a hawk to a depth equal to the depth of the joint and square off the front edge. Using a pointing iron of similar depth to the joint, cut off thin strips of mortar and offering the hawk up to the joint press well in with the pointing iron.



Make sure the joint is well filled and the front face brushed off lightly once the mortar has become stiffer. Beating back the mortar with a churn brush (as supplied by lime supply companies above) once stiff also assists with compaction of the mortar into the joint and reduction in shrinkage cracks.

4.2.11 Protection & Follow up Work

All finished work must be protected by plastic sheeting or damp hessian sheeting to prevent the joints or coatings from drying out too quickly or conversely becoming saturated

Some slight cracking may occur to the joints and this should be pressed back by hand/churn brush. Brushing up of finished pointing is essential to roughen the finish and clean up drips and splashes from adjoining areas.

All masonry works should be carefully planned such that proper protection can be included or scheduled for the warmer months of the year.

Precautions of suspending operations until the temperature reaches 6^o C on a rising thermometer or 8^oC on a falling thermometer shall be strictly observed. Also frost protection and protection from saturation by rain is essential.

The horizontal surfaces of masonry are particularly vulnerable to saturation and thus frost damage in the weeks immediately following rebuilding/ pointing and should therefore be protected from excesses of water. The vertical elevations can be protected by draping with hessian

Consideration should be given to insulating and /or applying heat to wall faces if cold weather is forecast in the two months during or after masonry works are completed.

Care must also be taken to protect applied work from rapid drying conditions i.e. exposure to direct sunlight or drying winds. In these conditions it should be kept evenly damp for up to 30 days, depending on ambient conditions and the rate of set, by lightly spraying periodically with clean water. In areas exposed to direct sunlight, the possibility of a "greenhouse" effect must be avoided, either by shading the polythene or by substituting woven cloth materials.

Polythene, hessian or other approved sheeting that is used during curing should be arranged to hang clear of the face of the wall in such a way that it does not form a tunnel through which the wind could increase the evaporation of water. The polythene or hessian sheeting must not have intermittent contact with the pointing / render as this may cause a patchy appearance.

