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[redacted]

Descriptive and photographic report

on

Ballynahinch Tower House

and adjoining structure

with mortar analysis

Ballynahinch,

Recess,

Connemara,

Co. Galway

CLIENT : Yelsea Ltd.,
c/o de Blacam and Meagher Architects,
4 St. Catherine's Lane West,
Dublin 4.

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1. INTRODUCTION

Ballynahinch Castle is situated on a small island, Castle Island, in the eastern part of Ballynahinch Lake near Recess in Connemara, Co. Galway. The main N59 Galway to Clifden road runs along the northern shore of the lake while the Ballynahinch Castle Hotel is located near the southern side of the lake. There are two conjoined standing structures on the island, a late medieval tower house on the southern side and a late eighteenth or very early nineteenth century structure known as the 'fishing lodge' attached to the northern side of the tower house. This is in fact an industrial building. A stony band around the circumference of the island may be associated with an island enclosure.

The tower house is a three-storey structure at present and no evidence was found to prove it was originally higher. Although some of the walls are partly rendered, several small cracks, crevices and other holes are present throughout the building. No roofs or ceilings remain and there was extensive ivy growth with several small bushes present on the tops of the walls.

The adjoining industrial building is a two-storey building which is also roofless. There are two kilns in its interior in separate rooms on the western side of the site.

1.1 GENERAL INTRODUCTION TO STRUCTURAL ISSUES

Ballynahinch Castle is a mid-16th century tower house of local coursed, rough-cut stone. A ruined structure of this type and age typically presents a number of structural weaknesses which need to be addressed to preserve the structure and make it safe.

- Vegetation removal (tower house and 18th century industrial building)

- Masonry walls (tower house): Typically the walls will require coping, selective rebuilding, deep maintenance pointing and grouting. Deterioration of masonry is related to the moisture profile of walls and grouting is necessary in horizontal bands below cappings, sills and exposed surfaces and on both the internal and external face of the masonry;

- Plaster: Internal plaster with historic graffiti will be temporarily secured while consolidation options are investigated. Failing this, preservation by record will be used as a final option.

- Collapsing lintel (tower house): to be replaced in selected limestone laid in lime mortar

2. CONSERVATION POLICY

2.1 CONSERVATION PHILOSOPHY

1. Protect the special historical character of the tower house and fishing lodge;
2. To respect and conserve historic fabric on the site;
3. Minimum intervention: To avoid any unnecessary interventions to the historic fabric of the site;
4. Where restoration works are required that these works be carried out on a like-for- like basis involving experienced and qualified crafts professionals under the supervision of a suitably qualified conservation professional;
5. Archaeology: To protect the potential sub-surface remains of the earliest development of the site (possible island enclosure or ringfort-cashel)
6. Ensure the ongoing delivery of a tourism experience, whereby the building and its visitors are protected.

The following general principals of conservation have been adopted in this document, and have resulted in a proposed conservation policy for the masonry walls, as follows:-

2.2 PRESERVATION:

The primary intention is to halt any further decay of the structure and make it safe for occasional visitors. It is the intention of the owner to preserve the tower house in a state comparable to its existing state, by retaining the original ruined character of the walls in so far as is reasonably practicable with due regard to public safety. These proposals to repair the building where it has deteriorated, using a policy of minimum intervention have been informed by international best practice standards.

2.3 RESTORATION:

This applies to the 18th century industrial building **only**. A minimalistic approach has been adopted whereby the structure may be re-roofed using scholarly research to ascertain the form of the original roof. There are no proposals to provide services on the island and restoration works will be of a lightweight minimal nature to reroof the structure, restore doors and windows where appropriate and provide a flood resistant floor surface internally. These proposals will be subject to agreement from the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht and the local planning authority, Galway County Council. Consultation with these bodies will take place in advance of any proposed re-roofing works.

2.4 RECORDING:

There are several universally agreed principals of conservation; the first is that no conservation work should be carried out on the building, without a thorough recording of the building fabric and material to be conserved. The importance of recording the Castle is obvious, due to its historical and architectural merit. An archaeological report has been provided and further research and on-site monitoring will be provided by archaeologist, Florence Hurley. A full set of record photos should be taken during the work in addition to updating current measured drawings as the contract proceeds.

In order to better understand the two structures and get a more complete picture of their structural condition, permission was given by the National Monument Service (NMS), the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht and Galway County Council to cut back the vegetation.

It was agreed by the NMS; the architects de Blacam and Meagher; the client and Southgate and Associates, conservation engineers that a detailed descriptive and photographic survey of the tower house, the industrial building, the decorative plasterwork within the tower house and the historic graffiti within the tower house be undertaken to inform any future works on the site.

This is particularly important for the plasterwork as this is in a relatively poor condition due to the effects of weathering and the impact of vegetation. A considerable amount has been lost already, particularly in the western and southern walls of the entrance lobby and the eastern and southern walls of the main ground floor chamber.

3. METHODOLOGY

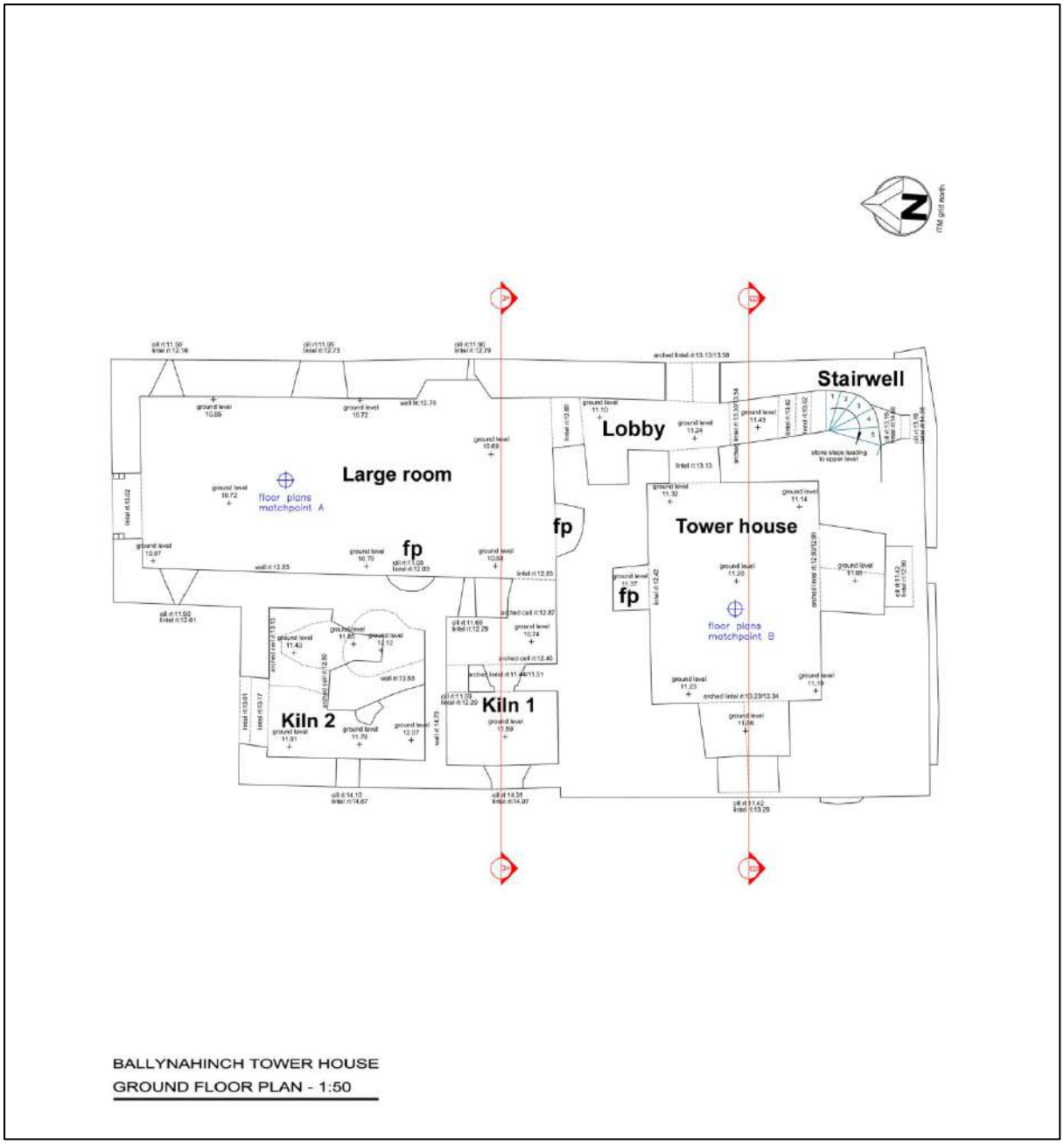
A detailed photographic record of all accessible parts of the interior and exterior of the structure was compiled. A written record was also undertaken with measured survey of selected features carried out as well.

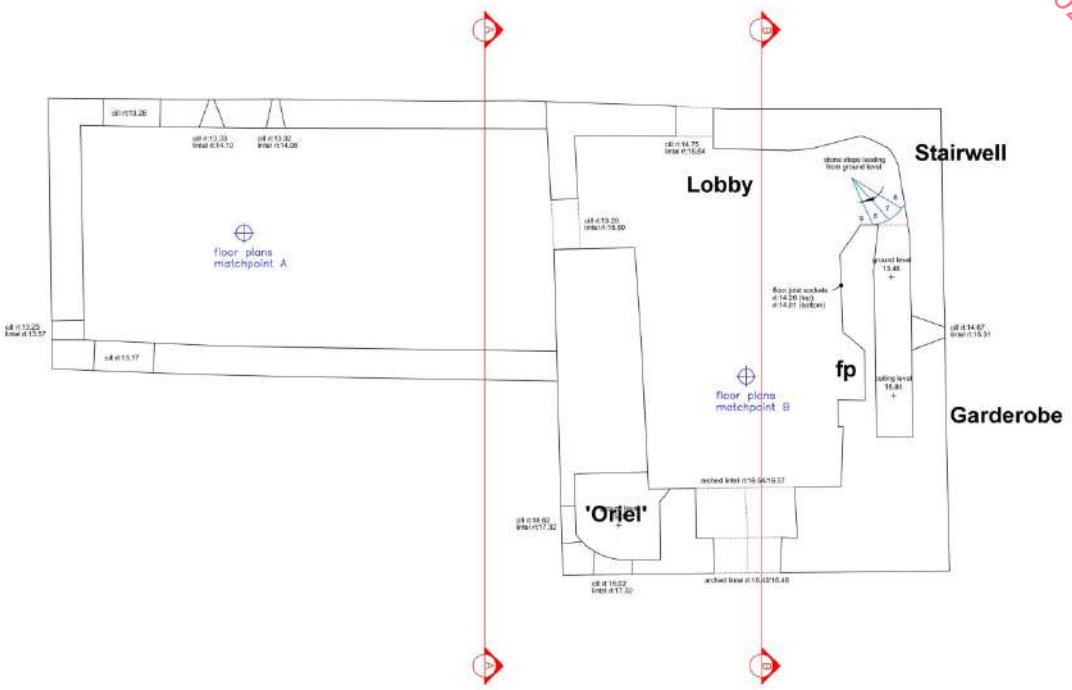
It should be noted that the scaffolding erected to allow for inspection and recording of the site and for vegetation removal does impact on photography in the site. It is generally more difficult to see fully or appreciate features when they are partially obscured by scaffolding. This is particularly the case within the tower house where the scaffolding levels do not respect the original floor levels. An example of this is that the first scaffolding level on the ground floor is approximately 1.25m below the original ground floor ceiling level.

The presence of the scaffolding while making access to certain areas much easier also obscured other parts of the site. These included the lowest parts of the southern, eastern and western elevations where the scaffolding floor level was particularly close to the water level or ground surface. While it was possible to survey most of the ground floor of the eastern room of the industrial building, the scaffolding floor present there hampered a

more detailed examination of the ground surface. Photographic evidence from prior to the erection of the scaffolding does not show any features here. Scaffolding did not extend right up to the walls enabling recording of the doors, window openings and fireplaces. The presence of the scaffolding over the two kilns made getting an overall impression of these structures more challenging while the presence of soil and loose stone also did not help matters.

The tower house is described first with the exterior and then the interior being treated in that order. This is followed by a description of the industrial building externally and internally.





BALLYNAHINCH TOWER HOUSE
FIRST FLOOR PLAN - 1:50

0 5 10 Metres

4. THE TOWER HOUSE

The tower house on Castle Island at Ballynahinch is in generally good condition. The walls are solid, there are no significant cracks present and what deterioration is present seems to be related to the effects of weathering primarily with some other minor structural issues. These relate to the condition of the tops of the walls, the heads of windows and the loss of mortar from the wall surfaces. Of more pressing need of attention are the lintels over the door between the tower house and the industrial building to the north and the head of the ground floor window on the southern side.

One aspect of the tower house that is under more immediate threat is the decorative plasterwork in the entrance lobby and main ground floor chamber. Much of this has already fallen due to the constant exposure to moisture and the effects of vegetation. All of this plasterwork has been recorded as part of the present conservation and repair scheme.

Another aspect of the site that forms part of its story is the graffiti present exclusively in the tower house. All of this lies on or has been cut into the wall plaster and some of it is under the same threats from moisture that faces the decorative coving. Fortunately much of this is in areas of the tower house that are relatively sheltered from the elements. A detailed survey of this material has also been undertaken.

5. DESCRIPTION - THE EXTERIOR

5.1 GROUND PLAN

The tower house is a rectangular structure orientated with its longer axis east-west. A narrow plinth is present on the western, southern and part of the eastern sides. The walls vary slightly in thickness. The western and northern walls are 2.30m deep; the southern wall is 2.10m thick while the eastern wall is 2m in thickness.

5.2 EASTERN ELEVATION

This elevation of the tower house contains the only door leading into the building directly from the outside. It has a single window at first floor level. The northern part of the elevation has been removed in the past to leave a level, horizontal break. The wall at second floor level on the southern side is original. The top of the wall is slightly higher towards its centre which may be an indication that this wall was also gabled like the western side.

The wall is built of roughly coursed random rubble. Many of the stones are naturally square or rectangular but in places there is a mixture of all shapes and sizes. There are very occasional small patches of mortar present on the wall face. A greater density of these mortar or plaster patches is found between the main door and the first floor window.

The doorway is tall and round-headed with a segmental arch of stones overhead. There is no cut stone evident in the doorway. The internal plaster finish is not present at the exterior side of the wall reveal which indicates that the door frame was fitted almost flush with the outer face of the wall. This may have had a fanlight overhead which would have allowed in more light to the entrance lobby or else a timber panel.

On the first floor level, directly over the doorway is a tall window. Examination of this shows that the wall thickness on the southern side of the opening is greater than that on the other side, this being part of the area that was rebuilt in the late eighteenth or early nineteenth century. The lower part of the window opening has been infilled with masonry to a depth of 0.50m. The original appearance of this feature would have been narrow and long. This almost appears to be door-like in its design but there is no indication of any external feature on the outside elevation.

A curious feature is located at first floor level near the south-eastern corner of the tower house. This is two rectangular stones, one above the other which protrudes slightly from the wall face and are aligned vertically as opposed to the masonry which is horizontal. These stones measure 0.55m high and 0.15m wide. They are set back 0.80m from the corner of the tower. It is possible that these stones block a slit window which lit the stairs behind. The wall thickness of the southern wall here is *c*.0.65m so it would be possible to have an opening in this position. The interior of the stairwell is completely plastered over and no trace of this feature was seen internally.

As noted much of the northern side of this elevation of the tower house has been rebuilt. This is certainly the case from the first floor upwards. The masonry below this level, north of the doorway is quite poor in quality with several large voids present and poor coursing of the stonework. This has affected the wall plaster in the interior, much of which has collapsed. When the industrial building was constructed against the norther wall of the tower house the masonry was tied in in the lower part of the joint only and there is a clear break between the two buildings approximately half way up the wall. It could be that the area between the doorway and the new building to the north was refaced when the latter was constructed resulting in the poor quality of the masonry.

Where the corner of the tower house was removed the wall was made level. It had a rough stone cornice built at the top of the wall. This area has some vegetation growing on top of it at the moment but it appears that it had a capping of small stones and mortar.

Pl. 1 Top of tower house, eastern side.

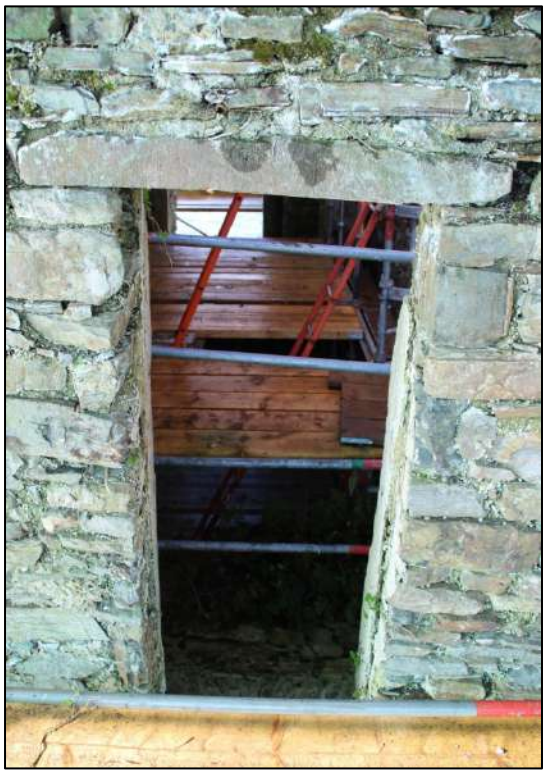
Pl. 2 Main entrance with doorway to ground floor chamber behind.

Pl. 3 Arched top of main doorway.

Pl. 4 Southern side of doorway.

Pl. 5 Northern side of doorway. Note void.

Pl. 6 Eastern elevation. Division between Masonry of the tower house on top and at left and industrial building on right.



Pl. 7 Large window, first floor level, eastern elevation.

Pl. 9 Infilled area at base of window

Pl. 10 Eastern elevation, first floor level.

Pl. 11 Unusual bedding of stones may mark a blocked ope on the upper part of the stairs.

Pl. 12 The altered north-east corner of the tower house. The wall in section is also part of the rebuilding phase.

5.3 NORTHERN ELEVATION

This is one of the most complex elevations of the tower house. Against this wall was built a structure serving an unclear industrial purpose. This resulted in significant changes occurring to this side of the tower house.

Features associated with the industrial building will be described under that heading and noted here.

This side of the building contains a fireplace and doorway at ground level; another doorway at first floor level; a possible chimney; a window and a possible drain or slop chute.

The fireplace is located towards the north-east side of the structure. It appears to have been mined out of the wall as the back of the fireplace is uneven and varies in depth. Adjacent to the east side of this a doorway was inserted which gave access to the entrance lobby of the tower house. This has a flat-head using two stone lintels. The masonry over this has lost much of its mortar and both lintels are barely bonded into the surrounding wall on the eastern side.

The doorway at first floor level gave access to the first floor of the industrial building. It entered the corridor or lobby and does not appear to have led directly into the main room at that level. As noted under the description of the entrance lobby the lower part of the doorway was below the level of the decorative coving of the lobby. The doorway is straight-sided. The lintel overhead has fractured and partially collapsed and is in a dangerous condition. The western side of the doorway is formed by the chimney breast on this side of the tower house. The wall over the head of the doorway appears to have very little bonding with the chimney which may have contributed to the failure of the lintel.

It should be noted that much of the eastern side of this elevation appears to have been rebuilt as was the case with much of the northeast corner of the tower house. Here too the wall was reduced to a horizontal level, in this case lower than that of the eastern wall by 0.40m. The masonry break at this junction was poorly done, being ragged with no effort made to make an even finish. The top of the lower wall here also has a stone cornice, projecting *c.*0.08m from the wall face.

There is very poor bonding between the rebuilt section of the north-east corner and the original tower house wall in the north-west corner with several voids present. These may also be associated with the chimney flue from the fireplaces on the ground floor of the tower house and industrial building.

On the western side of the elevation, near the corner at first floor level is a rectangular window. This has an unusual semi-circular stone hood over the top of it, which extends down the eastern side of the window narrowing and getting shallower as it descends down to a point approximately two thirds of the way down the opening. This in effect appears like a reversed comma. This projects out from the wall face 0.35m at its maximum extent with the hood being 0.55m high. The whole feature has a maximum width of 1.90m. A single large stone lintel forms the base of the hood and the head of the window. Otherwise

smaller stones are used to form the shape. An identical hood but reversed in shape was located over the window around the corner on the western elevation. The two features were not linked to each other. When seen from a distance this would have given these windows much more emphasis and they would have appeared to project beyond the wall face, almost in the manner of a bartizan. Only the base of the hood survives, all the other stones are no longer present.

It should be noted here that the roof line of the kiln structure located below this area would have cut across the lower part of the window. There is no trace of any blocking material ever having been present. If one assumes that the kiln was a later feature than the window(s) it is unclear why the lower part of the window was not filled in to accommodate the roof line. It is unlikely that an open area was left behind the roof. One possible solution would be if a wooden blocking or filling piece was used which would leave no trace today.

Below this window there is a square stone projecting from the wall face 0.66m below the window level. Dimensionally it appears to be similar in size to several of the stone corbels noted on the interior and exterior of the tower house with the exception that the front is no longer curved but is now flattened. This stone is located within the attic space over kiln 1, an area that is plastered. There is no evidence that this stone was a corbel nor is there any evidence that connects or links to any feature of the kiln or the northern wall of the tower house.

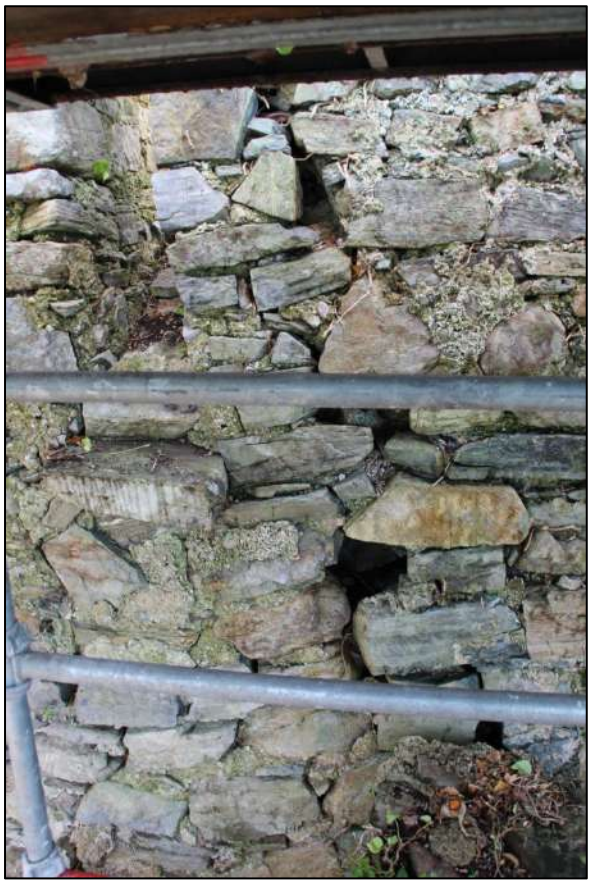
Immediately adjacent to the eastern side of the window hood is a rectangular brick structure 0.75m wide by 0.30m deep and 0.64m high. This is built of seven courses of handmade red brick. It sits on two stone corbels, that on the east being slightly more rectangular than the other. This feature is open at the bottom and top. What appears to be an opening towards the bottom on the face of the tower house is just where a stone has come loose. In appearance this looks like a chimney flue but there is no trace of soot or burning or of any opening leading into or out of the feature. Its purpose is unclear although a decorative one could not be ruled out.

As the feature has no openings or physical connections to the tower house, it could be the case that it was part of the kiln structure, not part of the kiln itself but perhaps associated with whatever process went on in the attic space over the kiln. This space was used as it is plastered and has a large window present.

The final feature on this elevation is a rectangular opening at second floor level. This is described under the floor heading as part of the interior description. In form it is a rectangular opening 1.14m high and 0.34m wide. The stone that forms the base of this projects beyond the wall face and slopes towards the exterior of the tower house. While aspects of this feature such as its base and width suggest it was designed to remove liquid from the upper part of the tower house, it is quite large for this purpose when a smaller opening would have sufficed.

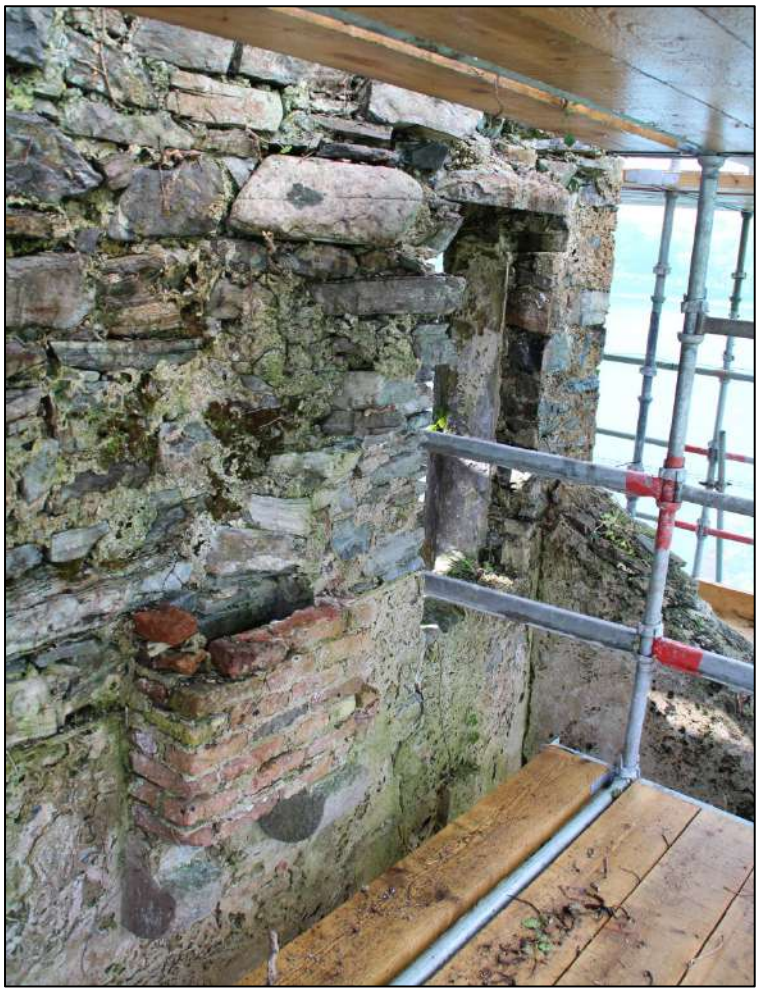
Pl. 13 The northern face of the tower house. The masonry on the left is all from the later rebuilding. Note the cornice at the top of the walls on left and the possible roof line or weatherslating at centre.

Pl. 14 Poor bonding between the original fabric of the tower house on right and later masonry on left.



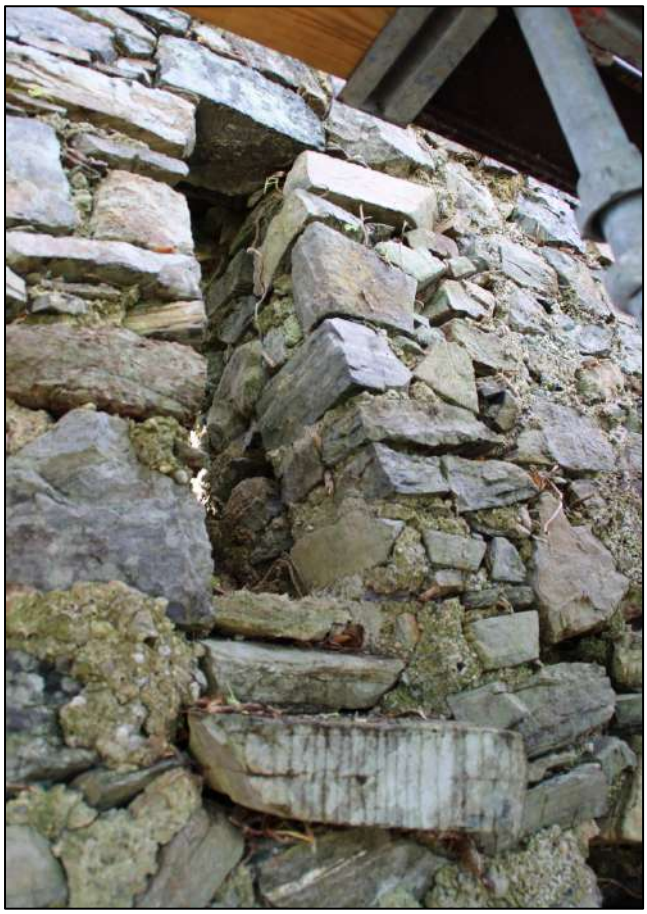
Pl. 15 Large void on northern side of tower house.

Pl. 16 The thicker wall visible on the left is from the tower house, the thinner wall above is from the later rebuilding in the north-east corner.



Pl. 17 The window is one of the two in the 'oriel' chamber. Much of the elaborate stone hood has disappeared. The brick chimney-like feature rests on two corbels. It is not have any connection to a flue and is not a chimney or waste chute.

Pl. 18 Detail of the brick feature.



Pl. 19 A possible waste or rain gutter on second floor level, northern elevation.

5.4 WESTERN ELEVATION

This is the highest elevation that is in the tower house with the remains of a gable being present. This has lost some of its masonry to take on a more rounded appearance but still is 1.15m higher than the remaining walls. There are five identifiable features on the side of the building. These are windows on the ground and first floors with another window near the northern corner of the first floor; a corbel below this window and a blocked ope beneath the gable at second floor level.

The window on the ground floor had a camber-headed segmental arch made of rough stone voussoirs. There are holes on either side immediately below the arch which do not extend out to the wall face. These may have held a narrow timber lintel to support the arch. The window opening is rectangular is shape, measuring 1.25m wide and 2m high.

The window on the first floor is similar in shape and construction. The third window on the face is a mirror counterpart of that found at the same level on the northern elevation. Both of these are located in the 'oriel' chamber. The window hood on this side is in better condition with the descending side section, here on the southern side of the window has lost many of its stones leaving a scar visible.

A perfect example of a corbel is present below this window. Its function is unknown as it appears to be in isolation with no signs of any other corbels on this side of the tower house or of any slots for timbers or stones. There is no evidence that it supported any sort of oriel style structure on the outside of this window. It may be simply reused as a decorative feature, one that suggests the presence of a feature no longer there and makes the unusual window head above all the more intriguing.

Below the apex of the gable at second floor level is the only clearly *in situ* medieval stone feature in the tower house. This is a narrow ope made of four worked stones, this is 0.60m high by 0.17m wide. The stones have a simple chamfer around the window. Traces of plaster are present in small patches, mostly on the southern side of the elevation.

Pl. 20 The northern side of the western gable prior to final trimming of vegetation.

Pl. 21 This blocked window ope was hidden by ivy. It has the only recorded medieval dressed stone in the building.

Pl. 22 The head of the large window on the western side of the first floor. This later held a wooden sash window.

Pl. 23 The two windows in the 'oriel' chamber. When intact and viewed from a distance they would have looked imposing, giving the impression of a single larger feature.

Pl. 24 The hood over the window on the north-western corner is the most intact.

Pl. 25 Another view of the same hood. The unusual narrowing 'tail' still survives here.

Pl. 26 A more complete view of the 'oriel' window on the western side of the tower house. Note the corbel below the window.

Pl. 27 Side view of the 'oriel' window on the western elevation.

Pl. 28 Detail of the corbel.

Pl. 29 A thin render coating is present on parts of the tower house.

Pl. 30 The western elevation at first floor level.

Pl. 31 The clear difference in the masonry of the central part of the wall marks the location of the first kiln erected on the site, kiln 1. The tower house is on the right and kiln 2 on the left.

5.5 SOUTHERN ELEVATION

On this elevation there are six features of note, four windows and two openings. The largest feature is the window centrally located on the ground floor. As with the other windows on the ground, first and second floors the windows are set in embrasures. In this case the form of the window is identical to that on the western side of this level and on the floor above. Much of the arch over the window has collapsed exposing the intramural passageway of the garderobe above, but it is likely that it had a camber-headed segmental arch originally. Damage to the tops of the reveals mean that it cannot be ascertained if a timber lintel was present or not.

Directly below this window and just above the surface level of the water was an opening or rather where several facing stones had come loose. This was noted in previous site work but due to the presence of the scaffolding is not accessible and was not recorded in this survey. A base batter is present on this side as well as on the eastern and western sides.

The second window on this elevation is in the eastern side where it provides light to the stairs. Internally this is an arched, splayed opening; externally it is a flat-headed rectangular window. There is a second window or opening on the stairwell. This is rectangular in shape internally but externally shows itself as a small sub-rectangular opening 3m over the other stairs window. Stones on the upper outer part of this feature reduce its size considerably.

Another ope of similar size is that directly over the ground floor window, in the centre of the elevation. This measures 0.21m by 0.20m externally but splays out considerably on the interior and also rises in height. This gives light and ventilation to the garderobe while also being capable of serving a defensive purpose.

The final feature is located towards the upper western side of the tower house. This is a roughly square shaped opening that extends to the interior of the tower. It is 0.55m wide by 0.50m high. It is quite rough in appearance.

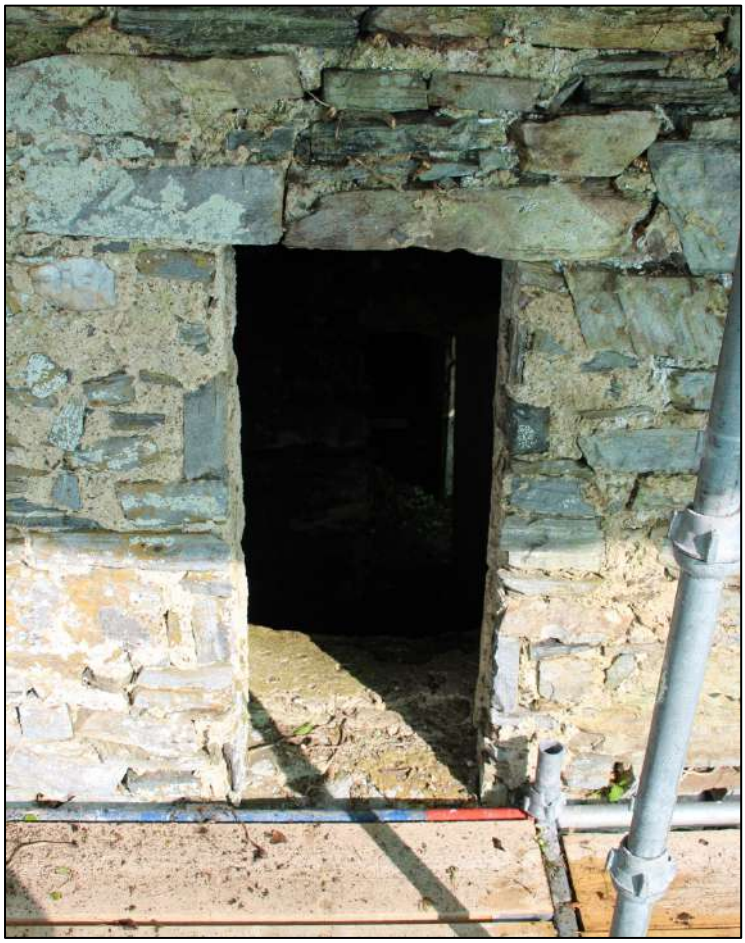
The greatest amount of exterior plaster is found on this side, mostly over the larger stairs window. It does not form a solid coat but rather the plaster patches are more concentrated at this level.

Pl. 32 This is the ground floor window on the southern side of the tower house. The collapse of the masonry head has resulted in a small hole appearing in the floor of the garderobe passageway.

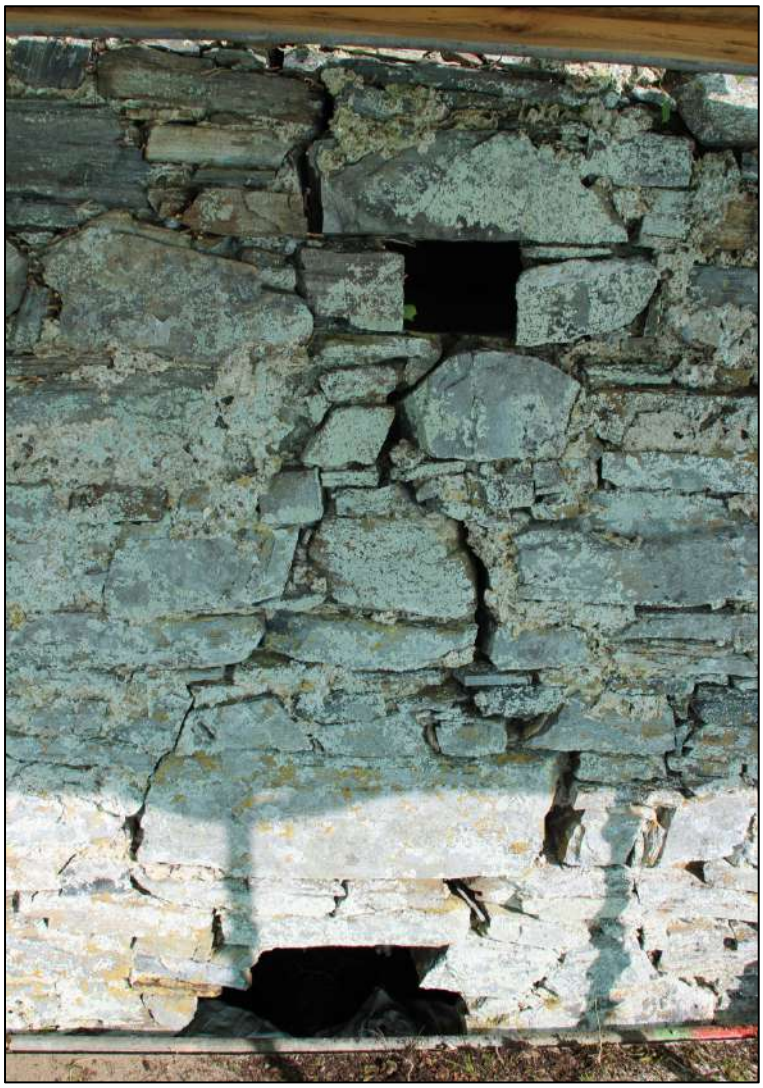
Pl. 33 The western side of the southern window, ground floor.

Pl. 34 The hole over the window head. Very little mortar is present.

Pl. 35 The sill of the southern window.



Pl. 36 This window lights the stairs and the entrance lobby. Southern elevation.



Pl. 37 The lower opening is where the masonry over the window head has collapsed. The small opening at the higher level is the window in the garderobe passageway. Note the cracks.

Pl. 38 This irregular opening belongs to a rectangular window high on the stairwell. It is larger internally.

Pl. 39 The upper part of the southern elevation. Note the remnants of the external mortar finish

Pl. 40 Base batter on the southern side of the tower house.

Pl. 41 Remnants of the mortar finish by the stairs window, southern elevation.

Pl. 42 Small irregular opening at second floor level, southern side of the tower house.

6. THE INTERIOR - DESCRIPTION

7. THE ENTRANCE LOBBY

This is a long rectangular chamber which gives access to the spiral stairs leading to the upper floor on its southern side, on the northern side is a short passageway leading to a recessed storage cupboard and a doorway leading to the later building attached to the northern side of the tower house. Directly opposite the main entrance to the tower is a doorway leading to the main chamber on the ground floor.

The interior of the main doorway is plain. The edges of this had a thin wooden corner bead present. There is no trace of any holes or recesses which would have facilitated a lock, bolt or drawbar. Any such locking mechanism must have been attached to the door frame. The doorway is not splayed. The doorway here could have had a fanlight overhead but it is also possible that it had a plain timber panel; certainly a fanlight here would have given extra illumination to this area.

A plastered arch leads to the stairwell. There is a large amount of graffiti present on the southern part of the lobby with only a single piece present on the northern side.

A decorative plaster coving was placed around the eastern and northern sides of the lobby **(see separate decorative moulding survey for a description of this)**. No trace of this is present on the western side where it appears to have collapsed. The wall here did not extend higher than floor level of the first floor. The ceiling of the lobby was wooden at its northern end but comprised of stone slabs at its southern end where the spiral stairs led up to a small corridor at first floor level. The top of this internal wall has become covered with light vegetation and humic material over time which has caused severe damage to the moulding on the inner (main chamber) side of the wall. Some smaller stones have fallen from the uppermost part of this wall face. There is no plaster surviving at the top of the wall on the southern end of the lobby but it is likely that the coving was present here also but has since fallen.

The coving is best preserved in the north-east corner of the lobby despite some light vegetation growing on top of it. The general condition of the wall plaster here is poor. Much of this is attributable to the large voids within the wall allowing moisture penetration resulting in the collapse of a large area of plaster and the bulging of some of the remaining plaster. Only the lower part of the moulding survives on the northern wall. On the eastern wall the coving has disappeared completely over the main doorway and to the south of this feature.

The entrance to the main chamber of the ground floor is directly opposite the main entrance. It has a virtually flat segmental arch overhead. There is a slight splay on the southern side only. There are two recessed areas one above the other on the southern side of the doorway possibly associated with some form of securing mechanism.

The northern side of the lobby appears to have undergone considerable changes and may have been substantially rebuilt when the north-east corner of the tower house was removed. This work may have been carried out simultaneously with the construction of the industrial building onto the northern side of the tower house or they could be separate events.

The only feature in the northern side of the lobby is the large wall cupboard on the western wall. This measures 0.72m deep by 0.90m wide and extends to floor level. It is plastered internally and the impression of two shelves is present in the plaster. The ceiling of this cupboard consists of a single flat stone lintel which covers approximately half the cupboard. The masonry of the wall above and behind the feature is stepped back to allow for the insertion of a doorway leading from the first floor of the industrial building to the chamber on the first floor of the tower house. The threshold of this doorway is lower than the coving level by *c*. 0.80m and the exact means of access is unclear. There may have been wooden steps but there is no evidence whatsoever for anything more permanent.

A doorway was also created at ground floor level from the entrance lobby into the industrial building. This is flat headed and is currently in a very poor condition as the masonry above the lintel is loose.

The ceiling of the lobby was of plaster supported on timber joists with the joist holes present on the northern and southern walls. The original floor surface is covered with soil and is not visible.

Pl. 43 The entrance lobby looking northwards. The doorway on the left leads to the main chamber of the ground floor; that on the right leads outside.

Pl. 44 The stairs on the southern side of the entrance lobby. Many of the examples of graffiti on the site are on the left hand wall.

Pl. 45 The inside of the main doorway. Note the mark left by the timber edge beading.

Pl. 46 The cupboard on the northern side of the entrance lobby. Note the marks left by the wooden shelving.

Pl. 47 This is the structurally weak lintel over the door leading from the entrance lobby of the tower house into the industrial building. The wall overhead was rebuilt when the north-east corner was altered.

8. THE MAIN CHAMBER OF THE GROUND FLOOR

This is rectangular in shape measuring 4.80m east-west by 3.70m north-south. It has two large window embrasures on the southern and western walls and a fireplace in the northern wall.

The southern embrasure is 1.84m wide and 1.95m high above the present floor level. The eastern side of this is splayed with none on the other side. The window opening has been altered in the past to create a rectangular opening 1.30m wide and *c.*1.45m high. There are narrow returns on both sides measuring 0.32m and 0.15m on the eastern and western sides respectively. The head of the window has collapsed but it appears to have been flat-headed when last in use. The soffit of the embrasure comprises a very shallow camber-headed arch made of stones set on edge. These can be seen where part of the window head has collapsed.

The western embrasure is similar in style to its southern counterpart. It is 1.90m wide and 2.40m high. Only the northern side is splayed. The rebates on either side of the window are 0.26m (north) and 0.28m (south) respectively. The window opening is 1.25m wide. The head of the embrasure is identical to the southern one. On the northern and southern sides of the head small areas of the plaster have fallen to reveal the impression of wickerwork centring. The largest example is on the northern side. This measures 0. 34m in length by 0.11m in width. The other piece is less distinct and is covered by remnants of plaster and mould. It measures 0.21m long by 0.08m wide.

Both embrasures have evidence of timber corner beading on the outer edges of the embrasure and on the inner returns. This was generally triangular in section.

In the northern wall is a fireplace. This is 0.92m wide by 0.77m high. It has a flat-head consisting of two stone lintels. The back of the fireplace steps in on either side by 0.20m. Where the plaster has fallen from the wall on the eastern side of the fireplace a single stone set on edge like a voussoir can be seen. This indicates that the feature has been altered in the past and that a segmental arch may have been present originally.

One of the distinguishing features of this chamber is the presence of decorative coving **(see separate decorative moulding survey for a description of this)**. It was present on all four walls originally but has disappeared almost completely from the eastern wall and much of the southern wall. Part of the plaster finish of the western wall has fallen exposing the render undercoat. This has a prominent cross-hatched scratch coat which is also found on a raised band acting as a foundation for the coving. This can be seen on the western and southern walls where the moulded detail is no longer present.

A wooden floor separated the ground and first floors while the building has no evidence of vaults being present. The floor to ceiling height is *c.* 3.20m.

Pl. 48 The interior of the southern window embrasure, ground floor.

Pl. 49 The underside of the window head, western window, ground floor. This has lost much of its mortar bonding.

Pl. 50 The doorway leading to the entrance lobby from the main chamber of the ground floor.

Pl. 51 Much of the plaster coat has fallen off the eastern and southern walls of the main room of the ground floor revealing a prominent scratch coat.

Pl. 52 Scar of the corner beading on the outer edge of the western embrasure on the ground floor

Pl. 53 The western window embrasure. Impressions of the wickerwork centring for the head of the embrasure survives in each upper corner.

Pl. 54 Detail of the northern side of the embrasure. The centring impression is at the upper right.

Pl. 55 Wickerwork impression.

Pl. 56 The fireplace in the northern wall of the main chamber of the tower house.

Pl. 57 Close up of the fireplace. Note the two voussoirs of the arch that spanned the feature.

Pl. 58 The ceiling level is marked by the lower edge of the band crossing the centre of the photograph. This is where a shallow lip held the joists of the floor. A small part of the decorative moulding can be seen on the left. It has collapsed in the middle and right of the picture.

9. THE STAIRWELL

The only stairway in the tower house is in the south-east corner. This is a spiral stairs of eleven or possibly twelve steps ascending clockwise. The lowest step of the stairs is partly obscured by soil. It does not complete a full spiral as it turns into what may have been a small landing or corridor on the eastern side of the first floor main chamber. The stairs is 0.84m wide. The steps are all of stone and have a rough appearance, all being roughly shaped to fit or lightly dressed.

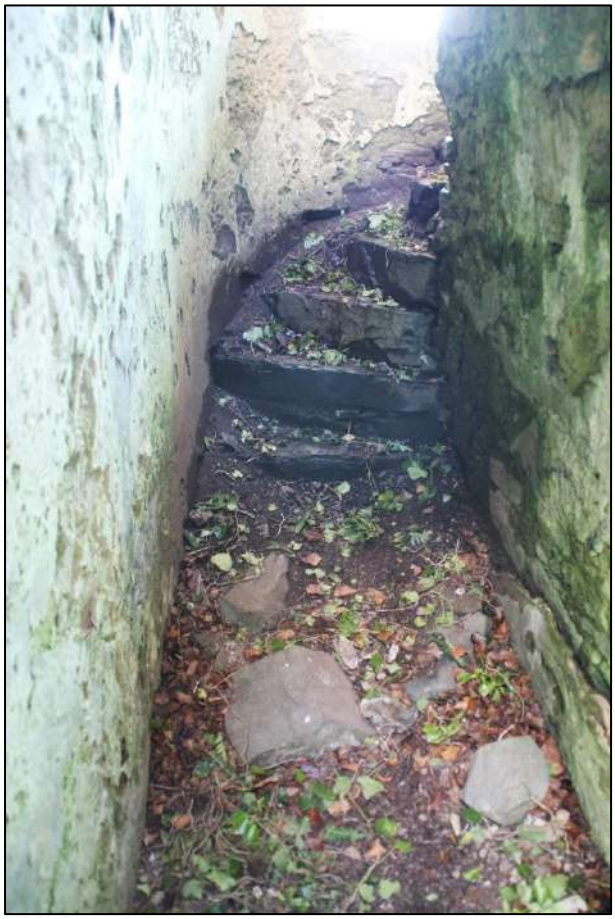
The garderobe chamber or passageway is accessed off the western side of the stairs where it begins to turn into the first floor landing.

There is a single window lighting the stairs on its southern side, this is situated to allow light into the lower part of the stairs and the entrance lobby as well as the upper part of the stairs and the entrance to the garderobe. The window opening is widely splayed, with an arched head on the interior and a flat head on the exterior. It is 0.90m wide and 1.55m high. The stairwell is plastered throughout with numerous examples of graffiti on its lowest level.

There is no evidence to indicate that the spiral stairs continued upwards to allow access to the second floor. This area is covered with a uniform thick coat of plaster which prevents examination of the masonry. There are no indentations or protruding elements which might suggest the continuation of the stairs.

At the junction of the first and second floors the plaster surface terminates at a ceiling level. This is marked by a series of five joist holes around the circumference of the stairwell with the plaster ending immediately below these holes. Above this level the stairwell continues but without a plaster coating. Immediately above this ceiling level is another opening on the southern wall of the tower house. This is rectangular in shape and appears roughly finished. It has a single stone forming a flat head on the top. This opening is 0.27m wide by 0.43m high. The exterior face of this is much smaller with only the lower part open, the exterior wall face covering the upper part of the opening.

Above this opening the masonry indicates that a cap was present. Only limited traces of this survive but it appears to have sloped from the two side walls of the tower towards the interior, being roughly triangular in shape. This unusual arrangement is not original to the construction of the tower house and has all the appearance of being a makeshift arrangement put in place when the tower house was refurbished in the late eighteenth century.



Pl. 59 The lower part of the stairs by the entrance lobby

Pl. 60 This window lights the stairs and the entrance lobby

Pl. 61 View of the stairs, the splayed window opening, the garderobe passageway (on centre right) and the entrance to the main room of the first floor (on lower right).

Pl. 62 The spiral stairs. It enters the first floor lobby on the far left.

Pl. 63 Looking upwards at the stairwell from the highest remaining steps. It is likely that more were originally present, either in stone or wood. Note the good condition of the plaster finish.

Pl. 64 The clear division between the plastered stairwell and the first floor lobby on the left. The lobby may have had some form of panelling as a wall covering.

Pl. 65 The stairwell looking south. The rectangular opening visible near the top of the photograph was above the plaster ceiling level, marked by the small joist holes below the opening.

Pl. 66 Detail of the opening and the ceiling supports. This window is much smaller on the outer face of the wall.

10. THE GARDEROBE

Contained within the southern wall of the tower house is an intramural passageway with a garderobe at its western end at first floor level. It is accessed off the stairwell. The long, narrow passageway is 4.50m long and 2.18m high. It varies in width from 0.55cm at its base to 0.36m at ceiling level. It has a single window opening midway along the southern wall. The walls are plastered while the ceiling of flat stone lintels is unplastered. The floor surface appears to have consisted of small stone slabs most of which have been removed leaving a rough stone and earthen floor. There is a hole in the floor below the window opening. This was caused by the collapse of part of the window head of the large window on the ground floor.

The only evidence for any sort of doorway is a narrow vertical scar on the plaster of the southern wall at the start of passageway. This scar is quite shallow with a single projecting lump of plaster. Given that the passageway is quite narrow, any door that was present would have made access to the garderobe even narrower, particularly so if some sort of door frame existed. It could also be the case that this scar was from some form of decorative timber that marked the entrance to the garderobe.

The window opening on the southern wall is splayed being 0.66m wide on its inner side and 0.29m wide on its outer side. It is flat-headed with three lintels, the outer two projecting to leave a small rectangular opening on the exterior wall face 0.20m by 0.16m. The sill of the opening slopes towards the exterior.

The latrine itself consists of a rectangular opening the same width as the passageway itself with a large slab forming the front of the seat. Slots on either side show that a timber seat was present. The shaft is at least 1.80m deep with the base blocked with loose stone. The

northern side of the shaft is angled towards the outer (southern) side. There is no evidence of an exit for the garderobe chute on either the southern wall or western walls.

There is a considerable amount of graffiti on the southern wall of the passageway.

Pl. 67 The intramural garderobe passageway looking westwards. A small ope is on the left, marked by the brighter area.

Pl. 68 The latrine.

Pl. 69 Detail of the garderobe. Note that impressions of a timber seat or lid are on the left and right.

Pl. 70 View down the garderobe shaft. There is no evidence of an exit chute.

Pl. 71 This is the only means of allowing light and ventilation into the latrine area. The splayed ope allows in the maximum amount of light while still sheltering those using the garderobe.

Pl. 72 The narrowness of the garderobe corridor would have made the provision of a door very difficult. There is a vertical scar in the plasterwork which suggests that some form of screen or partition may have been present at some point.

11. THE FIRST FLOOR LOBBY

The exact layout of the tower house between the top of the stairs and the main chamber at first floor level is unclear. This is due to the presence of a thick layer of soil on top of the floor here that sits on top of the western wall of the entrance lobby. The threshold of the doorway in the northern wall which led to the first floor of the industrial building is lower than the estimated floor level here. There is no evidence to support or discount the presence of wooden steps here to give access from this doorway to the first floor lobby of the tower house.

The greater part of the north-east corner of the tower house has been altered significantly. It has been rebuilt with the walls in this corner now being thinner than in the unbuilt sections. The division between the two sections is marked by the window in the eastern wall. The wall on the southern side of this is thicker, 0.85m than the wall on the northern side, 0.60m. This window is unusual in itself as originally the opening was larger, extending a further 0.52m lower. This lower part has been infilled with masonry but only at the front (exterior) part of the opening. When this is added to the existing height of the opening it now measures 2.38m in height with a width of 0.70m. This would have meant that window ran almost the full height between the floors. There is nothing to suggest on the exterior that the longer opening ever formed a doorway. The opening is splayed. It had a timber lintel overhead.

While the stairwell has a thick coat of plaster present, this finishes where the stairs meets the lobby at this level. On the edge of this plaster is the vertical impression of a timber baton. Another is present on the plaster of the southern side of the window opening where the plaster extends beyond the wall face. The wall surface here has the remains of a thin render coating. The presence of the timber baton impressions could indicate that some form of wall covering, such as panelling was present here at one stage.

The eastern wall above this window also is of two different heights, apart from having wider and narrower sections. The wall immediately south of the window is thicker and higher while it is thinner and lower north of the window. The northern wall of this lobby has been further reduced in height. The top of this wall is now lower than the head of the window on the east wall. The exact reason for carrying out these modifications is unknown but it has been surmised that it was done to create a viewing platform. Given the amount of work involved it may be that there were serious structural issues with this corner of the tower house which resulted in it being substantially rebuilt. This was certainly in place by 1839 when a sketch of the site show it as it presently stands.

There is no evidence of a doorway leading from this lobby into the main chamber of the first floor. The corner of the partition wall between the garderobe and main chamber is angled where the stairs reaches the lobby level.

Pl. 73 The location of the first floor lobby. It is presumed that there was some form of partition separating this from the main room at this level.

Pl. 74 View looking towards the lobby from the main room at this level. Floor level would have been where the vegetation begins.

Pl. 75 This division between the plaster surface and the unplastered area to the left is at the top of the steps and marks where the lobby proper began.

Pl. 76 The eastern window in the first floor lobby. The wall on the left of the window is the result of later rebuilding.

Pl. 77 Note the difference in thickness between the later wall on the left and the medieval fabric on the right.

Pl. 78 The wall forming the north-east corner, a later construction now in poor repair

12. THE MAIN CHAMBER OF THE FIRST FLOOR

This is rectangular in shape measuring 5.50m east-west by 3.55m north-south. The principal features are a small chamber in the north-west corner known as the 'oriel', a large fireplace centrally placed in the southern wall and a large window embrasure in the western wall.

The fireplace is defined by a projecting hood which had two corbels supporting a timber lintel. Over the lintel was a segmental arch of rough voussoirs. The hearth measures 1.90m wide and is 2m high at present but would have been *c.* 1.50m high originally. It is 0.38m deep. The side are angled towards the rear.

At a later date the width of the fireplace was reduced by 0.50m when rubble masonry was placed against its western side. This was done quite roughly and the masonry projects 0.05m outside the face of the wall. This resulted in a fireplace 1.40m wide. The chimney hood rests on two stone corbels. The inner hearth narrows further where two large stones project from the sides making the lowest part of the hearth 0.50m wide. The hearth is built on two layers of material. On top is a mixed layer of mortar stone and small bricks with a course of larger bricks below. All of the bricks are handmade.

The hood of the fireplace is roughly built in that the eastern side is straight-sided whereas the western side is irregular and narrows in width a short distance above the fireplace. The eastern side of the hood has been extended by adding a narrow vertical band of small stones to it, the hood merging with the wall face over this feature.

The masonry infill in the western side of the fireplace mostly contains medium and large stones at the base with smaller stones and a small amount of red brick at the top. Much of the stone used in the construction of the hood and the fireplace is smaller in size.

The window embrasure on the western wall is similar to those found on the ground floor. It has a camber-headed segmental arch overhead with rebates on either side of the opening. The embrasure is 1.80m wide and 2.10m high. The window opening measures 1.30m wide and 1.93m high. The head of the window opening has a slightly more pronounced camber-headed arch than the embrasure. Plaster scars on the edges of the inner rebates show that timber edge beading was present.

A wall cupboard is present on the southern side of the embrasure. This measures 0.60m wide by 0.50m high and is 0.58m deep.

As was found on the western embrasure on the ground floor chamber, traces of wickerwork centring are also present in this embrasure, on the southern side of the soffit. This measured 0.27m by 0.17m. The plaster coat on this part of the embrasure was in relatively good condition. Only a small section of the plaster on the sides of the embrasure survives on the northern side.

On the first floor there is no plaster visible except for a thin coating in isolated areas. This has the appearance of being a dash coat. While this could be due to weathering of a more regular plaster coat over time, the fact that it is intermittent indicates that the room was

never plastered in the manner of the ground floor chamber. There is some evidence from the edges of the plaster coating by the stairs and at the edge of the oriel window that some form of wood panelling may have been present on this level. An impression of a vertical timber is present at the limit of the plastered surfaces of these two areas. This may have been simply two timbers delimiting the stairs and entrance to the oriel window.

It should be noted that in one area the masonry on the inner face of the wall is irregular; where a long, clear vertical break is evident on the inner face of the northern wall which would have been an obvious feature if not covered by either a plaster coat or panelling. This feature is in the centre of the wall and does not extend to either floor or ceiling level.

A narrow rebate 0.15-0.20m wide below the floor level on the north, west and south sides gave support to the eight wooden joists. These were orientated north-south.

Pl. 79 The first floor chamber looking west. Note the 'oriel' chamber on right.

Pl. 80 The southern wall of the first floor.

Pl. 81 The upper part of the fireplace. The corbels on either side would have supported a timber lintel. The masonry to the right of centre was inserted to reduce the width of the feature at a later date.

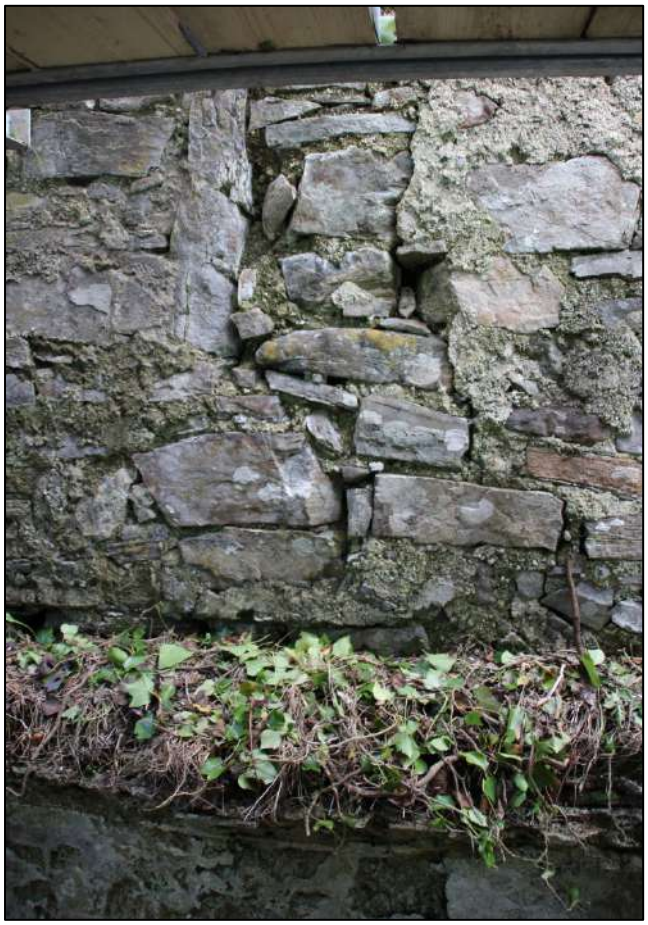
Pl. 82 Base of fireplace. Note the bricks in the base of the hearth.

Pl. 83 Wall cupboard in the southern side of the western embrasure, first floor.

Pl. 84 The northern side of the western window embrasure, first floor. There is a small section of plaster remaining on the upper part of the feature near its top.

Pl. 85 View of the plastered soffit of the western window embrasure. Traces of the impression of wickerwork centring are present on the extreme left.

Pl. 86 Impression of wickerwork centring, southern side of the western window embrasure, first floor.



Pl. 87 Vertical break in masonry in the northern wall of the first floor of the tower house. Note that it does not extend as far as floor level.

12.1 THE 'ORIEL' CHAMBER

This feature has been described in some descriptions of the site as being an oriel window. An oriel is an upper-storey projecting or overhanging window supported by brackets or corbels (Dictionary of Architecture and Landscape Architecture, London, 1999). In this instance the windows and the small chamber they form part of are contained within the walls of the tower house. The only reason it has been (incorrectly) called an oriel is due to the presence of a single corbel below the window on the western exterior wall. A semi-circular masonry hood is present over the two windows of the chamber which extends down the sides of windows. Two corbels are present on the northern wall, both supporting a brick, chimney–like feature. Another possible corbel exists below the window on the eastern wall. This is a square stone that projects from the wall surface. No other corbels, stones or slots are present that would support any external structure. There is also no means of accessing any such feature as the windows are too high off the floor to permit this.

The chamber is entered directly from the north-west corner of the main chamber on the first floor. It is clear from the scars of the floor levels that the floor of this area would have been *c*. 0.40-0.50m higher than that of the main room. This would have necessitated some form of step(s) which were presumably of wood. The floor of this area was also wooden. Evidence for this is the slots for five timbers that were present in the mortared surface beneath. These are all orientated southwest-northeast.

The entrance was through an arched opening. This has collapsed with only a small part of it surviving on the northern side. Two rectangular windows were present on the northern and western walls. These would have held wooden frames with scars in the plaster marking their location on the outer part of the reveal. The windows were 0.70m wide and 1.30m high. These are not splayed. The wall face between these is curved.

The ceiling was of two parts, a lower flat plaster one with a corbelled stone ceiling above. Two joist holes show that the plaster ceiling was supported by a centrally placed timber beam.

Where a section of plaster has collapsed from the southern door edge, the stone behind was revealed to have two chamfered sides and is likely to be from the edge of a window frame. It could also be a mullion but it is quite wide to be one of these.

Pl. 88 The 'oriel' chamber.

Pl. 89 The difference in levels between the floor of the main chamber, represented by the linear scar in the masonry and the higher level of the 'oriel' chamber floor.

Pl. 90 There was an arched entry to the 'oriel' chamber originally

Pl. 91 The western window in the chamber.

Pl. 92 The corbelled roof of the 'oriel' chamber.

Pl. 93 The floor of the chamber. Note the linear slots which originally held timber boards. There are five in total. A timber floor would have been laid over these.

Pl. 94 Medieval dressed stone, possibly a mullion or window moulding, reused on the southern side of the 'oriel' chamber entrance.

13. THE SECOND FLOOR

This is the uppermost floor of the tower house at present. While it is possible that another floor could have been present there is no evidence to indicate that this was the case. The western wall appears to have the remains of a gable but the eastern wall has been substantially altered by the removal of the north-east corner of the tower. Some of the features noted here are challenging to interpret due to the alterations made to the structure in the past.

This floor measures 6.40m east-west by 3.60m north-south. Its principal features are a window embrasure on the western wall; a possible window or opening on the southern side; two chimney breasts, on the northern and southern walls respectively and three recessed areas, two on the southern side and one on the north. The northern one of these has a narrow drain slot present. There is a weatherslated panel on the north-west side of the northern wall.

Exactly how this floor was accessed from below is unknown. Although the stairwell is present, there is no evidence of stone steps present albeit a thick plaster coat could hide any traces of these. A timber spiral stairs is also possible. A much easier and historically documented solution from other sites would have been ladder access.

The window embrasure is 1.88m wide by 1.75m high. The head of it was formed by a timber lintel with a camber-headed rough stone arch overhead. The embrasure is quite shallow being 0.40m deep. Centrally located in this is a flat-headed splayed ope, the four sides of which are made of dressed stone. This is now blocked with thin horizontal stones. It is 0.17m wide and 0.60m high. The bottom of the embrasure is covered with soil. A small rectangular hole is present a short distance above the window ope. This may have been for a timber support for the lintel or could be associated with a later roof.

There is another possible ope on the southern wall, near its south eastern corner. This is over the stairwell and is located directly above the plaster ceiling. It is rectangular in shape on the interior with rough sides. A stone projecting from the top of the opening on its exterior face gives it a much smaller external appearance. This feature looks quite rough in construction. It has the appearance of being a window opening that could have lit the stairs but there is no evidence for the stairs continuing to this floor. Given that there is only a single window at this level it may have been used to provide more light to the area.

The chimney breast on the southern side served the fireplace on the first floor. It is a square in shape with the western side splayed. The flue appears to be square in shape.

The chimney on the northern side serviced the fireplace on the ground floor of the tower house and probably also the one on the ground floor of the industrial building. This latter fireplace and flue was excavated out of the northern wall of the tower house. It too is square, slightly smaller in size than the southern one. Both of these stand to the height of the wall and do not extend above that level.

The recessed areas on the southern side of this level are on either side of the chimney breast. The south-western one is set back 0.90m from the interior face of the wall and is 1.60m wide. The sides are splayed. In the eastern side of this feature is a square opening which runs through the thickness of the wall ((0.60m here, the full thickness is 1.95m on this side). This has rough sides with some of the surrounding stones being displaced. The function of this is unknown. Its low position on the wall, almost at floor level suggests that it was not for light. It possibly could have served as a slop hole or may have been a later creation associated with drainage off of whatever roof was present.

The second recessed area on this side is in the south-eastern corner. It was where the roof of the stairwell was located. This appears to have been a stone cap, built against the corner of the eastern and southern walls. There are several vertical stones present near the mid-point of this recess. They appear to be associated with the roof over the stairs.

The recessed area on the northern side is located midway along that side of the tower house and has the southern chimney breast on its eastern side and a sloping weatherslated area on its western side. In the north-eastern side of this area is a vertical opening, the base of which slopes towards the outside. This is 1.14m high by 0.34m wide. The sloping base indicates a drainage function.

An unusual feature is a weatherslated panel that runs from the western wall eastwards. This is 2.90m long and *c*. 1.15m wide. It slopes inwards. It is made of slates set in a mortar bed.

This has been penetrated by vegetation especially the roots of two small bushes that were growing here and is now in a poor condition with many of the slates loose and several fallen. In the extreme north-western corner is the outer surface of the corbelled roof of the 'oriel' chamber on the floor below. Most of this has collapsed. None of the slates have nail holes present. They average in size at 0.15m wide by 0.30m long and 0.08cm thick (approximately 8 inches by 12 inches by ¾ inch). They have a dark blue colour. Their size and appearance suggest a Welsh origin, possibly from the Cilgwyn quarry in the Nantlle valley in North Wales.

A narrow rebate is present on the northern and southern walls. This varies from 0.20m on the northern side to 0. 14m on the southern side.

Pl. 95 The second floor of the tower house looking west.

Pl. 96 The upper part of the western gable showing the flat-headed arch over the window embrasure. A timber lintel supported the arch.

Pl. 97 The window embrasure on the western wall of the second floor. The window ope is blocked. There is a slot for a timber just above the window. Slight traces of a plaster scar are present on the northern (right hand) side of the embrasure. This extends from the slot downwards towards the inside of the northern and southern walls. It is very intermittent.

Pl. 98 The chimney breast on the southern wall of the second floor. Visible is a line of slates bonded to the chimney with mortar. These are laid sloping towards the interior. Note the different weathering above and below the slates.

Pl. 99 The chimney breast on the northern side of the second floor. This too has a line of slates (on centre right of photograph) laid in the same manner as those on the southern chimney breast. Visible in the left foreground is part of the large weatherslated panel on the north-western corner of this level.

Pl. 100 The weatherslated panel in the north-western corner of the second floor. This is laid sloping towards the interior of the building. The opening in the masonry on the left exposes the 'oriel' chamber.

Pl. 101 The recessed area on the southern wall of the second floor. Note the opening in the wall and plaster scar on left on chimney.

Pl. 102 View of the second floor looking east. The irregular masonry on the centre right of the photograph marks the location of the roof cap of the stairwell.

Pl. 103 The northern side of the stairwell roof cap. The sloping line of stones marks the break between the stairwell with the smooth faced masonry and the window opening forming the uppermost part of the stairwell.

14. THE ROOF

The only evidence for a roof is the gabled appearance of the top of the western wall. This is much less evident on the eastern wall where approximately the northern half of this wall was removed to create a viewing platform in the late eighteenth or early nineteenth century. An examination of the interior of the upper wall faces did not reveal any slots, corbels, rebates or any evidence for a roof structure. This suggests a simple gabled roof for the tower house.

On the eastern and southern walls are the scars of a roof that covered the stairwell. These take the form of areas of rough masonry that have stones pitched at various angles. On the eastern wall the scar runs at a 45° angle towards the corner of the eastern and southern walls. There is a similar scar on the southern wall. These would suggest that a semi-circular stone cap formed the roof over the stairwell when the tower house was last in use in the late eighteenth or early nineteenth century. How something like this could be supported is unclear. When this cap-style roof was present it would have required support on its northern and western sides especially.

There are traces of plaster scars around the walls of this level indicative of roof lines. The only area of wall plaster that was noted occurred on the northern side of the window embrasure. Some of the scars such as that on the southern chimney breast have slates adhering to the plaster. Intriguingly all of the plaster scars noted bar two were angled inwards, towards the interior of the tower house. All were low, meaning that none appeared to be high enough to belong to a roof that could cover the entire tower house. Their layout suggests a series of low, angled roof surfaces draining inwards. This appears to have been 'W-shaped' in section, in that the slating on the northern side of the tower drains inwards, that on the southern side drains inwards and there is tentative evidence for a higher pitched roof in between. The only evidence for water removal is the opening on the northern wall and perhaps the small opening towards the western end of the southern wall.

There is a tentative plaster scar within the window embrasure. This has its apex over the blocked opening, where there is a small slot for a timber present. It extends outside the northern side of the embrasure.

The evidence suggested by these mortar scars and weatherslating is that the roof covering the structure when it was last in use was irregular in appearance and layout. It appears to have been set below the level of the walls of the tower house, possibly to preserve the external appearance of the structure as a ruin. It could also be the case that replacing the original style of roof would have been too difficult from an engineering viewpoint or have been too expensive for the intended use of the tower house.

15. THE INDUSTRIAL BUILDING

Past descriptions of the site have described this building as a 'fishing lodge'. It should be noted that this appellation may have come about due to lack of information as to the industrial nature of the building but also as a convenient name for the building. As the lake and the surrounding area have a long association with fishing such a description would have seemed appropriate.

Whether this was as a summer house or as a site of some industrial use, by the late eighteenth and early nineteenth century activity was happening on the island. The industrial use of the site marks the end of the tower house as the dominant structure on the site.

15.1 GROUND PLAN

The present structure consists of a large rectangular room aligned north-south on the eastern side of the site. Attached to the western side of this is another smaller rectangular area containing two other rooms both containing kilns. The southernmost kiln is hereafter described as kiln 1 with the other northerly one being kiln 2.

There are two doorways leading to the outside; one in the eastern section of the building and the other giving access to kiln 2.

15.2 EASTERN ELEVATION

This face of the industrial building is all associated with a single phase of construction. It has however undergone some modification during its working lifetime. This structure consists of a three bay over three bay two-storey building. The window arrangement varies between the floors and within each floor the type of these also differs. Narrow slit opes are situated at the southern and northern ends of the ground floor. That at the southern end is a later change to the original scheme as this ope has been constructed in the infill of a doorway that was originally here. This can be clearly traced by the smaller masonry used in the infill and the frequent use of handmade red brick. This is one of the relatively few instances where this material is used in general construction on the island. The doorway had a flat-headed arch overhead. Only the sandstone voussoirs of the northern half remain, the remainder being replaced with smaller stones bedded at various angles. The slit ope has been created by building up the northern part of the doorway and leaving a small section as the slit.

The other slit ope, at the opposite end of the building is set much lower down in the face of the wall but is similar size albeit a little shorter. In between these is a larger square window. This also has a flat-headed arch forming a head, also with roughly shaped voussoirs. It can be seen that the area immediately north of this opening has been altered. A vertical break in the masonry is present with a long, narrow stone above this. It looks as if another slit ope

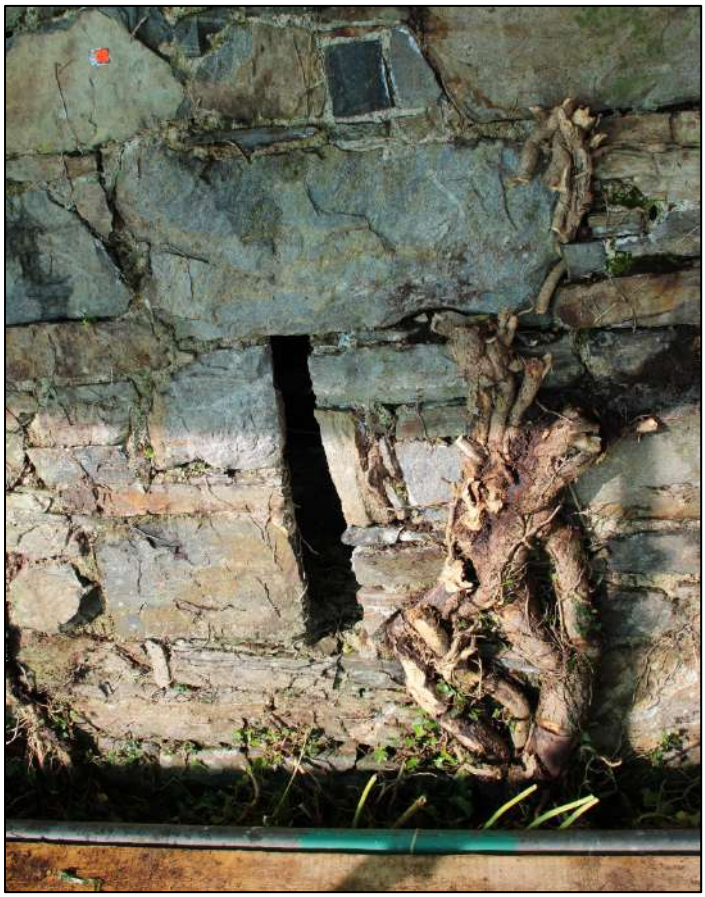
was planned for this area with the narrow stone being the lintel. As the rest of the masonry around the window opening is similar to that in the remainder of the wall face, it could be that this change in design happened during construction rather than being carried out at a later date.

While the types and numbers of windows and opes at first floor level is identical to that on the ground floor, their layout is very different. Here they are grouped together at the northern end of the building with the window being the most northerly feature. This is a large that originally would have been almost at floor level. The head of this has collapsed and there is a pile of loose stone in the interior of the building under this area. The two slit opes are regularly spaced in relation to the other window. It is clear that some thought went into the positioning of these windows and opes as those on the upper floor would allow plenty of light and fresh air into the roof space. Those on the ground floor would work the same function in the central part of that floor. The presence of the doorway at the northern end of the building meant that a large window was not required at the position.

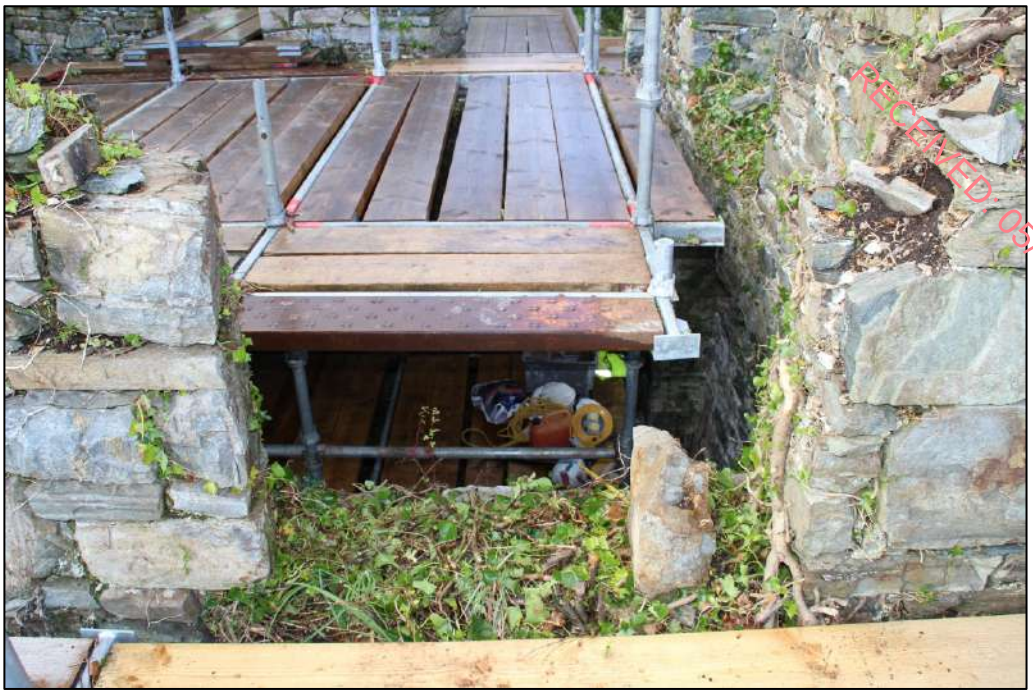
The top of the wall at eaves level from the rear wall of the tower house almost to the position of the first floor window is marked by a stone cornice. This consists of medium sized flat stones projecting out beyond the wall face. Towards the southern half of the elevation the stone cornice has been replaced with one made of two roofing slates with a layer of mortar in between them.

Pl. 104 Blocked doorway converted into a slit opening on the eastern side of the ground floor of the industrial building. Note the use of brick in the infill.

Pl. 105 Window on the ground floor of the eastern side of the industrial building. The vertical break in the masonry on the right of the window, indicates that a slit opening was going to be placed here with the linear pale stone forming its lintel.



Pl. 106 Slit opening at the northern end of the eastern elevation of the industrial building. This is set quite low on the wall.



Pl. 107 The larger window at the northern end of the first floor of the building, eastern elevation.

Pl. 108 Slit openings in the central part of the first floor of the industrial building. Note the two cornice stones.

15.3 NORTHERN ELEVATIONS

This is comprised of two sections, the eastern one which presents itself as the gable end of the larger earlier structure and the slightly smaller western side where kiln 2 was later constructed. In the eastern elevation there is of a single bay on each storey with a doorway 1.40m wide just off centre on the ground floor. At the base of the doorway are two projecting jamb stones which act as jostle stones and door stops. These indicate that there were double doors present which open inwards. The flat-headed arch over this doorway is well built with roughly dressed sandstone voussoirs. Overhead is a centrally located window opening 1.25m wide. The upper part of this gable has fallen removing the window head. In the north-west corner of this elevation is a rectangular opening at first floor level, right at the floor level. This is too small to be a window and given the fact that there are two much larger windows immediately adjacent it must have another function.

The western element of the northern face is of two storeys with a doorway 1.40m wide just off centre. This has a well-constructed flat headed arch overhead with sandstone voussoirs. The inner part of this was supported by two timber lintels no longer present but which the slots for on either side of the top of the doorway survive. A noticeable feature of this part of the northern elevation is the use of large quoin stones on the western corner. A distinctive brown sandy mortar is present in the gaps between the stone in places here.

Pl. 109 Northern doorway of the industrial building.

Pl. 110 Moulded door stop at base of large doorway on the northern wall.

Pl. 111 View of doorway leading to kiln 2, the later kiln built in the north-western side of the industrial building. It can be seen inside the doorway.

Pl. 112 Northern end of the eastern side of the industrial building. This had a gabled end with a large central window.

15.4 WESTERN ELEVATIONS

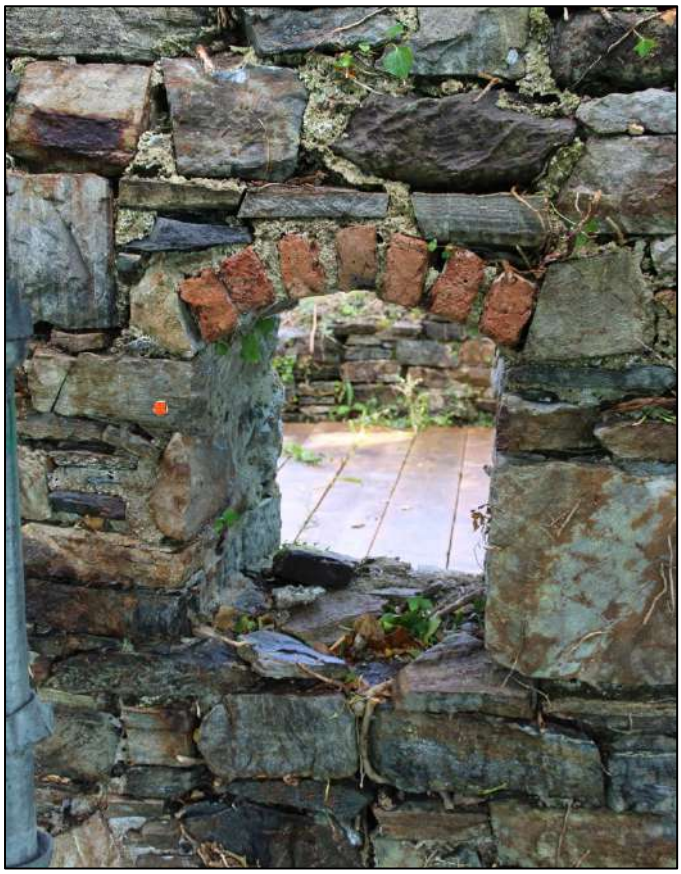
Three different parts of the structure are represented on the western elevation of the industrial building. At the southern side is the single bay, two-storey kiln 1 element. This has a single pitch gabled roof which is attached to the northern wall of the tower house. The central portion consists of the single bay, two-storey, gable-ended structure that is kiln 2. The third section is the northernmost part of the long eastern room. This is two-storeys in height with a single bay on each storey. The first and third sections are part of the original industrial building erected on the island.

There is a clear division between the masonry of the tower house and that of kiln 1. This is emphasised by the base batter of the tower house projecting beyond the lower part of the foundation of the kiln. Generally the masonry of the kiln comprises of smaller and more regular squared stones. These are set in mortar which for the most part lies flush with the wall face. No attempt has been made to tie both structures together on the exterior face. A small vertically aligned rectangular slot is present close in this wall close to the tower house, south of the window opening. There is a possible counterpart in the valley of the roofs between the two kilns but this is in a poor condition. These may have been putlog holes for timber scaffolding put in place when the single pitched gabled roof was being built.

The differences between the masonry of kiln 1 and kiln 2 are more subtle but in the latter the mortar is recessed more between the stones and there is a higher proportion of medium sized squared sandstone blocks present. The coursing of the masonry is also more conspicuous by its presence whereas in kiln 1 is not as clear due to the mortar lying flush with the joints.

The northernmost part of the eastern room in this elevation has a narrow slit ope in the centre of the ground floor with a large window opening above. The head of the window has fallen. Only the southern side of this window is splayed. The uppermost courses of the wall have fallen over the years. This has likely removed the stone cornice that is present at eaves level on the eastern side of this structure.

Pl. 113 The slit window on the western side of the large room of the industrial building.



Pl. 114 The window of the first floor room over kiln 2 in the north-western part of the island.

Pl. 115 Masonry of the first floor of kiln 2. This is a later addition to the industrial structures on the island.

Pl. 116 The window of the first floor room over kiln 1, the first kiln on the site. The wall on the far right of the photograph is that of the tower house. The rectangular slot may be a putlog hole with another possibly present on the left hand side of the window, out of picture.

15.5 SOUTHERN ELEVATION

The northern wall of the tower house forms the southern end wall of both the eastern room and kiln 1.

16. GROUND FLOOR

This and its first floor counterpart were the largest rooms or working areas on Castle Island. The ground floor measures 8.75m long by 3.70m wide with its longer axis orientated north-south.

Access to the building was originally via four doors. Of these three entered the large eastern room and the other only gave access to kiln 2 in the north-west corner of the complex. One of the three other doors, that at the south-eastern corner, gave access to the tower house while the other two led outside the building. There was a wide splayed doorway present near the south-eastern corner of the ground floor. This was later blocked to make a slit ope with the blocking material only filling the outer half of the doorway. The only surviving internal plaster finish is located around this blocked doorway and the adjacent doorway to the tower house.

There is a large doorway at the northern end of the eastern section. This has a flat-headed segmental arch overhead with two cut stone jostle stones which also functioned to stop the double doors that were here from opening outwards. No other stones of this type or function are present in the building.

The window opes are all splayed, particularly the slit opes which are almost akin to medieval style examples in their style. There are no windows on the western wall however there is an area that clearly has been infilled midway along this wall which may have been a window as it is of the right size being 1.10m wide. Kiln 2 is on the other side of the wall.

The interior (and exterior) wall face immediately north of the large window opening midway along the eastern wall shows that some alteration has occurred to this area. There is a vertical break in the masonry on the northern side of the window. The stone work between this break and the opening is all of the one building phase. Together with the evidence from the other side of the wall it appears that another slit opening was planned for here but during construction a larger window was built to the south.

Two fireplaces are present, a larger one that has been mined out of the north wall of the tower house which is just off-centre of the room and a second close to the midpoint of the western wall. Both of these have a rough appearance.

The northern example is 1.15m wide with a depth varying from 0.40m to 0.62m, being shallower on its western side. It is splayed on both sides. Single stones survive on the eastern and western sides which show that a segmental arch was present over the fireplace. Just west of the fireplace is the entrance to kiln 1.

The western fireplace is of similar width but is shallower with a depth of 0.25m. The sides of this curve towards the back with no distinct splay present. Much of the upper part of the wall face over the hearth is no longer present but on the northern side the slot for a timber lintel can be seen. Next to the southern side is the small window or viewing ope that looks into kiln 1 and would have enabled a person to see the drawing hole of the kiln clearly. Directly over this is a small rectangular opening which appears likely to be a vent leading to the area over kiln 1 which would have been just at floor level of the attic room over the kiln.

There is a rebate on the eastern and western walls to carry the floor joists. None are present on the northern or southern walls. The rebates on the eastern and western walls are present as areas of damaged masonry with no joist slots being visible. There is a rebate on the northern exterior wall of the tower house which varies between 0.04m-0.13m wide. This is at the top of the wall level. It blends into the eastern wall face where that wall abuts the tower house.

Pl. 117 View looking north of the large (eastern) room of the industrial building. This is From the doorway connecting to the entrance lobby of the tower house.

Pl. 118 View of the southern end of the large (eastern) room of the industrial building. The doorway on the left leads into the tower house lobby, that on the right leads to kiln 1. The fireplace just right of centre appears to be inserted. The doorway in the top of the photograph is part of the later rebuilding of the north-eastern corner of the tower house.

Pl. 119 General view looking south. The line of the floor is marked by the rough masonry on the left and right.

Pl. 120 The interior of the blocked doorway on the eastern wall of the southern end of the large room of the industrial building. This was adapted as a slit window.

Pl. 122 Scar of the floor/ceiling line of the large room of the industrial building.

Pl. 123 Interior of the northernmost slit window of the eastern elevation, ground floor of the industrial building. Note the wide splay to allow the maximum amount of light.

Pl. 124 Inner side of the eastern elevation of the industrial building, ground floor. The infilled masonry area on the left is where a slit window was constructed but changed in favour of the larger window opening.

Pl. 125 The fireplace on the exterior of the northern wall of the tower house. This is in the large room of the industrial building. A single rough stone voussoir can be seen on either side of the top of the feature. Note how the right hand side of the fireplace is shallower in depth than the other side, giving an uneven appearance.

Pl. 126 The south-western side of the large room of the industrial building. The doorway leads to kiln 1. Immediately right of the ope at the centre of the photograph is a shallow fireplace.

Pl. 127 The large opening on the upper right is the doorway leading to the room over kiln 2. On the upper left is a small opening (vent?) into the same area. The fireplace can be seen in the lower left. The vertical break in the masonry in the bottom centre of the photograph may be the remains of a (slit?) window that was blocked when kiln 2 was constructed.

17. FIRST FLOOR

A full floor exists over the eastern room of the industrial building and the room over kiln 1 and 2. The method of access to this floor from the rest of this building is unknown. It could have been by ladder or possible via the tower house where a doorway was constructed in the rebuilt north-eastern corner. This was just under the apex of the roof of this part of the industrial building. No evidence for a stairs was found.

On the eastern side at this level are a single large window opening and two slit opes. The former has splayed sides with a greater splay visible on the southern side. In comparison to the widely splayed slit openings found on the ground floor those on the first floor are not as pronounced.

The wall separating the large room from the two kilns has two doorways present. That at the southern end utilised the north wall of the tower house as one side. It gave access to the small room over kiln 1. The flat-headed doorway has stone lintels but these have broken and the area over the doorway is in danger of collapse. This section of wall is not bonded to the tower house which further weakens it structurally.

The second doorway is on the northern side of the first floor above kiln 2. No head survives but it is likely to have had a timber lintel originally.

A large window is present in the north-western corner of the main large room. This is splayed on its southern side only, identical to its counterpart directly opposite on the eastern wall. The head of this is also missing.

Another window of comparable size is at the northern end of the large room on the eastern side of the industrial building, at its gable end. The head of this has also has collapsed. Both sides of the opening are splayed.

Pl. 128 The view of the first floor of the industrial building looking north. Note the collapsed top of the gable.

Pl. 129 The southern end of the first floor. The doorway leads to the first floor lobby of the tower house. All of the north-eastern (left hand side of the doorway) corner has been rebuilt. Note the mortar scar running from the tops of the walls of left and right to just over the doorway.

18. KILN 1

This is a rectangular room divided into two parts by the presence of a kiln in the centre. The southern side of this is formed by the northern wall of the tower house. It is accessed by a doorway in its south-eastern corner which leads to the large eastern room. This is flat-headed and made of small stone bonded with mortar.

There is a half-vaulted ceiling over the area in front of the kiln which is orientated east-west. This area measures 2.45m north-south by 1.08m east-west. The lower part of the kiln face is built of well-dressed ashlar limestone three courses high. The arch over the drawing eye is made from three pieces of limestone that have the shape of a cambered arch. The sides are splayed inwards towards the draw hole. There are two iron hinges on the northern side of this which held an iron door that is no longer present. The poking hole here has loose stone and soil filling it and obscuring its shape.

At the northern end of the kiln chamber is a small access hole set into the wall. This is 0.48m wide by 0.70m long. It allows access to the area behind and above the poking hole. This is obscured by soil, vegetation and scaffolding at present and will require further examination and recording. The poking hole measures 0.48m wide.

Opposite the kiln face the eastern wall of the kiln chamber has a small window or viewing ope present, measuring 0.40m wide and 0.65m high. The wall face between this opening and the edge of the doorway shows that it was constructed in two parts, with a clear division between the masonry on either side. It appears that the doorway was made smaller at some stage with an infilling strip 0.37m wide being added.

The northern wall of this area also shows signs of alteration. High on the northern wall is a void where some stones have come loose. The upper part of this contains the remains of a timber lintel and further down the wall traces of a window opening can be seen. This would have been present when there was only a single kiln, this one. The construction of kiln 2 on the other side of this wall meant that the window was filled with stone. This opening would have been 0.66m wide by *c.* 0. 70m high. The lower part of this has been obscured by dirt.

The area over this kiln was clearly designed to be utilised. It is plastered down to the timber floor level. Some of the joist holes for this can be seen orientated north-south. The area beneath the floor is unplastered. This upper area was entered by a low doorway adjacent to the northern wall of the tower house. This has a stone lintel which has broken and partially collapsed. The wall above this is not bonded into the tower house and is also in danger of falling. On the western wall is a splayed window opening. This had a flat timber lintel overhead.

Pl. 130 Kiln 1 looking at the drawing hole. Two iron hinges are present on the right hand side of the inner doorway. The poking hole in inner part of the kiln is full of debris. The quality of the masonry here is excellent. At the top right can be seen the access opening to the back of the kiln.

Pl. 131 The front of kiln 1 showing the access opening to the rear of the kiln. This appears to have been the only means of getting into this space.

Pl. 132 possible blocked window opening on the northern wall of kiln 1. This has the remains of a timber lintel overhead with the vertical break in the masonry on the right hand side marking one side of the feature. This was sealed by the construction of kiln 2 directly behind the wall.

Pl. 133 The inner side of the wall separating kiln 1 from the large room to the east. Note the vertical break in the masonry on right of photograph.

Pl. 134 Small window or opening looking out into the large room of the industrial building from kiln 1.

Pl. 135 The space at the rear of kiln 1. The lower part of this has not been plastered while the floor above has been plastered. The floor line is evident.

Pl. 136 The doorway at first floor level leading into the room over kiln 1. Note how poorly it is bonded to the north wall of the tower house and the poor condition of the wall and window head.

19. KILN 2

Kiln 2 is constructed perpendicular to kiln 1 in a separate though adjoining structure. This is in the north-western corner of the site. The kiln itself occupies the south-eastern corner of the area where it is built. Access to the front of the kiln where the drawing eye is located is through a doorway 1.40m wide. The ceiling inside this wall is a brick built half-vault orientated east-west. The western portion of this has collapsed but there is no trace of this being bonded into the western wall of the structure. In front of the drawing eye there is a short section of groin vaulting where the arch over the drawing eye meets the half-vault. All of this is built of brick. The east-west vaulted section measures 2.80m long and the north–south section measures 1.30m long. This latter section forms a funnel shape where it reduces in diameter as it enters the draw-hole. The sides of the drawing eye are made of ashlar limestone which is well finished. The poking hole measures 0.60m deep by 0.58m wide.

The space on the western side of the kiln is angled towards the south-east. A low curved piece of limestone is attached to the outer side of the kiln here. The area here is filled with soil and loose stone and brick.

As was the case in kiln 1, the space above kiln 2 was used. Here also in this kiln, the lower floor is not plastered while the upper one is fully plastered. Access to this was via a low doorway leading to the first floor of the larger eastern section. There is no evidence of a door being present but much of this doorway is filled with soil and scaffolding making this unclear but this is plastered on both sides. Just on the southern side of this doorway was a small rectangular opening that faced into the first floor of the eastern building. The purpose of this is unclear. While it would allow some light in to larger space this was well served by windows at this end of the building. A possible function may be associated with its proximity to the chimney breast from the kiln in the room below.

This chimney breast is clearly a later feature. It is constructed against the corner of two walls in the south-east corner of the rooms. It is built of low quality handmade red and yellow bricks. The flue may be connected to that of the fireplace in the western wall of the large eastern area as this is the only chimney located. This connects to the charging area below. This is obscured by soil and some vegetation but appears to be made of brick.

There is a small segmental-arched window in the western wall. The head of this is formed with handmade bricks.

Pl. 137 View of kiln 2.

Pl. 138 The interior of kiln 2 looking east. The drawing hole of the kiln is on the right. This structure is a later addition to the industrial complex on the island.

Pl. 139 The brick groin vaulting in kiln 2.

Pl. 140 The upper part of the drawing hole arch has collapsed. This was built of brick with ashlar masonry used for the lower part.

Pl. 141 The lower part of the drawing hole of kiln 2.

Pl. 142 The first floor room over kiln 2. The doorway is on the right. Like in the first floor room of kiln 1, this is also plastered internally.

Pl. 143 The chimney in the south-eastern corner of kiln 2. This is built of handmade brick.

Pl. 144 Aerial view of kiln 2. The kiln itself occupies the lower right-hand part of the building.

20. ROOFS

Fortunately an illustration of the castle and adjoining structure was drawn in 1839 as part of the compilation of information for the Ordnance Survey. This was drawn looking towards the northwest and shows that the eastern part of the industrial structure had a gabled roof aligned north-south.

Nothing can be seen of the roofs on the western side of the building but their form can be identified from the standing remains. Over kiln 1 was a gabled single pitch roof. This can be seen by the shape of the two gables and the plaster scar on the northern wall of the tower house. This roof cut across the lower part of one of the 'oriel' chamber windows. This section has no evidence for any blocking material but it is possible that this was made of timber and no longer survives. As this kiln is believed to be an original part of the industrial structure this type of roof makes sense given the adjoining higher building.

The roof over kiln 2 was a gabled roof which joined the larger roof over the eastern section in a cross-gabled fashion. A plaster scar for this is evident on the northern wall of the tower house. The top of the roof here would have been very close to the top of the rebuilt section of the north-east corner of the tower house.

Pl. 145 The gabled single pitch form of the roof over kiln 1 can be seen here. The manner in which the roof crosses the lower part of the northern 'oriel' window on upper right is unusual as no trace of any blocking material is present.

Pl. 146 The gabled form of the roof over kiln 2 can be seen here.

Pl. 146 Mortar scar evident running from the top of the wall on the left towards the top set of scaffolding planks. This marks the position of the roof over the large room of the industrial building.

21. DISCUSSION

21.1 THE TOWER HOUSE

One of the striking features about Ballynahinch Castle is that given its historical associations with the leadership of the O' Flaherty family and its connection to Grace O' Malley, how such a small building could be the residence of such powerful and influential people. There is no evidence that the tower house was substantially higher, indeed it may well have been the same height originally as it is now. It is also possible that one or more other buildings were present on the site of the later industrial building to the north. Even so, the physical space on the island is very limited and it seems more probable that the castle functioned as a refuge in time of strife, where people and their portable valuables would be safe as the surrounding countryside was under threat or actual attack. Domestic dwellings may have been located in the vicinity where space would have been plentiful and ease of access would have been greater.

The need to retreat to an island refuge would have dissipated greatly by the time the Martin family, particularly Richard Martin were in ownership of this part of Connemara. It was under his direction that the estate was developed from 1782 onwards. Such a setting as the castle on the island however could still be of some value.

At some point in the past substantial work was done on the north-eastern corner of the structure which resulted in much rebuilding of this area. This corner of the tower house was rebuilt with thinner walls, new door and window openings and was reduced in height. This works appears to have been carried out above ground floor level on the eastern side and almost from ground level on the northern side. Part of the eastern face adjacent to the main door also appears to have been refaced. This area has several large voids now which is affecting the wall plaster on the inner side of the wall.

Why such extensive work was done is unknown. It is likely that the new openings made could have been created by mining through the existing walls, a common enough undertaking in the medieval and post-medieval periods. The openings are not so particularly tall or wide as to result in serious structural issues arising if this had occurred. The differing wall thickness on either side of the large window at first floor level on the eastern elevation possibly indicates that there was an earlier window in this location.

One possible explanation is that the owners of the tower house, the Martin family wanted to create a viewing platform on this side of the tower. This could have been as part of using the tower as a summer house-style retreat or folly. This could be easily achieved by simply lowering the existing walls in this corner and excavating through a new door or window. So much additional work seems to have been done if a viewing platform was all that was required.

Another possibility is that there was some form of serious structural issue with this corner that necessitated its dismantling and rebuilding to something resembling its original condition. If there was a problem here rebuilding could have dealt with this and allowed the insertion of the window and door openings. Of interest here is the treatment of the

stairwell, in particular the roof over this which appears to have been a simple stone cap. If a structurally sound building was merely being adapted

The decorative coving found at Ballynahinch Castle owes more to the later tradition of plasterwork where simple bands of different moulding are combined to give a pleasing result. It would have been a relatively simple, quick and cost effective method of elevating the appearance of the interior of the tower house. It could also have been combined with painted surfaces to further enhance the appearance of the interior. It would have linked with similar decorative elements in the larger house nearby and created a unity of design between the two.

Other aspects of the modification of the tower house would have reinforced this design similarity. The window openings received new timber framed windows. The design of the original medieval elements is unknown but the large embrasures and the relative security offered by the island site could have meant that large mullioned window surrounds could have been present and the possible mullion built into the western wall by the entry to the 'oriel' could be from one of these. The main doorway was given an arched head, perhaps with a plain fanlight or else a simple wooden panel over the door. This arched head was repeated inside the entrance lobby on the approach to the stairs and over the entrance to the 'oriel' chamber.

This tiny chamber is very unusual. Its size clearly indicates that it could only be used as a viewing area, looking westwards and northwards. It would not be possible to furnish the chamber with any items which could be used to admire the surrounding countryside as it would be physically impossible for an adult and an item such as a chair to both fit in the space. The manner of accessing the chamber is also strange, requiring some form of step, presumably of wood, to enable a person to enter the chamber from the lower floor level of the first floor.

The two window openings here are more akin to what would be found in a nineteenth century domestic dwelling rather than any sort of fortified structure.

The elaborate stone hoods over the windows of this 'oriel' are yet another unusual feature. Their shape is distinct yet seems to be designed to emphasise both windows. This is enhanced by the manner in which the tapering side sections mirror each other. These hoods are unique features with no counterpart know to this writer. Features that share some broad similarities with these hoods are known. Rounded corner bartizans are found in Strongfort (Caheradangan) tower house near Athenry in Co. Galway. There the bartizans are supported by single corbels on each side of the building. Small rounded turrets are a distinctive feature of Scottish castles, often found in Plantation or post-Plantation buildings in the northern part of Ireland.

The single corbel below the western 'oriel' window serves no known purpose while the chimney-like brick feature supported on two corbels on the northern wall similarly lacks explanation. The corbelled roof of the chamber does seem to be unnecessary when a simpler roof type could suffice.

Could it be that this corner of the tower house is a later creation? Perhaps the 'oriel' was mined out of the thickness of the wall to create an interesting feature, drawing from several architectural influences. It would have been a prominent feature of the site as seen from the modern N59 road skirting the northern side of the lake. This was not completed until the 1820s however.

A closer and more detailed examination of this chamber may give further information as to its origins.

21.2 THE INDUSTRIAL BUILDING

The detailed examination of the site has shown that there was originally a single kiln present (kiln 1, abutting the northern wall of the tower house), attached to a two-storey structure. This larger building is most likely to have been used for manufacture or processing on the ground floor with storage, whether for raw materials used in whatever process was being undertaken there or for storing the finished product on the first floor. The small room over the kiln could have served as accommodation, possibly along with the tower house. It could also have served as a storage area for smaller items

Subsequently another kiln was added. This does not appear to be the case of the later one replacing the older kiln. It may be that a different process or function was undertaken by the new kiln. As with the earlier kiln, the room over the new one may have been used for accommodation or storage. It should be noted that neither of these rooms has a fireplace, although if the kilns were operational or had just ceased being used the rooms would have been heated from below.

Clearly the construction of the two kilns and the industrial building is evidence of a significant financial outlay into the venture. The fact that another kiln was built indicates that the site was functioning for some length of time. It is likely that the advantages of security on the island and an existing structure outweighed the disadvantages of bring raw materials or fuel to the island.

FLORENCE. M. HURLEY

October 2015

MORTAR ANALYSIS

Ballynahinch Castle, Recess, Connemara, Co. Galway

Recorded Monument GA GA036-00101

Mortar analysis was carried out of 9 samples of bedding mortar and renders (interior and exterior) during October 2015. This is to comply with best practice standards in the recording of the structure prior to consolidation works being carried out. Mortar analysis was necessary to ascertain the type of mortars and renders originally used and to identify aggregate types and ratio which will inform repair mortar specifications. The analysis was carried out by Kevin Holbrook of Living with the Past, Hollybrook Cottage, Enniskeane, Co Cork.

Reference- Ballynahinch Castle, Mortar Analysis.

Samples 1-9

Scope of analysis- Binder/ aggregate ratio

- Binder type
- Aggregate geology
- Condition
- Historical interpretation.

Sample locations and sample type- as given by Southgate Associates

Sample 1- Tower house, south elevation, interior render to 19th century window.

Sample 2 - Tower house, south elevation, R/H of window, surface pointing/render.

Sample 3- Tower house, south elevation, 19th century mortar, window ope.

Sample 4-Tower house, east elevation, masonry core fill.

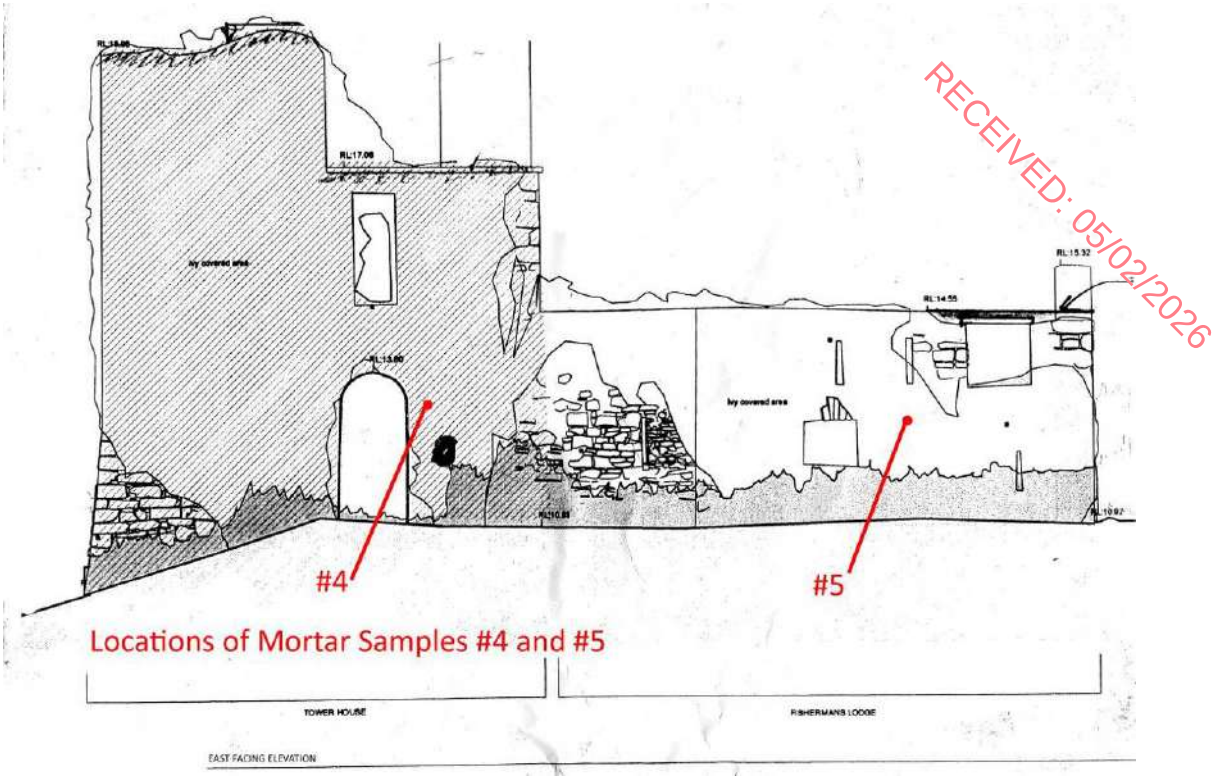
Sample 5-Industrial building, east elevation, (window) surface pointing/render.

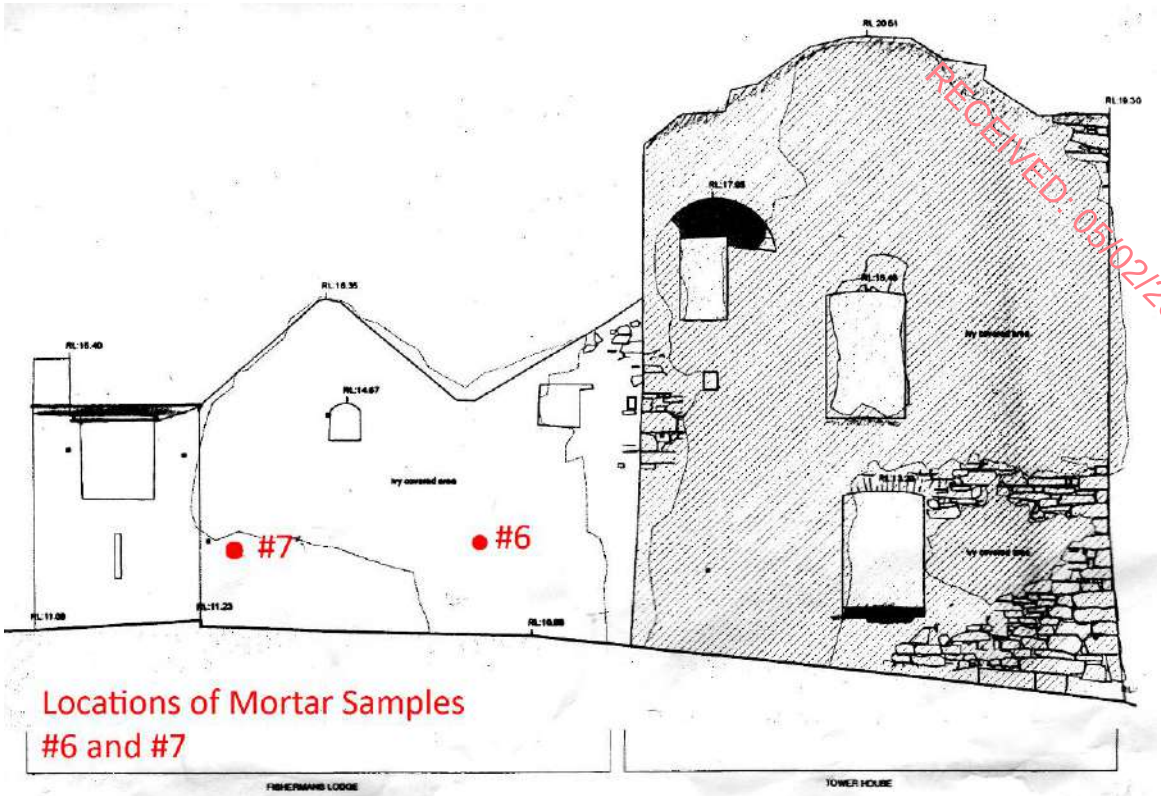
Sample 6-Industrial building, west elevation, surface pointing.

Sample 7- Industrial building, west elevation,19th century (earlier part), pointing.

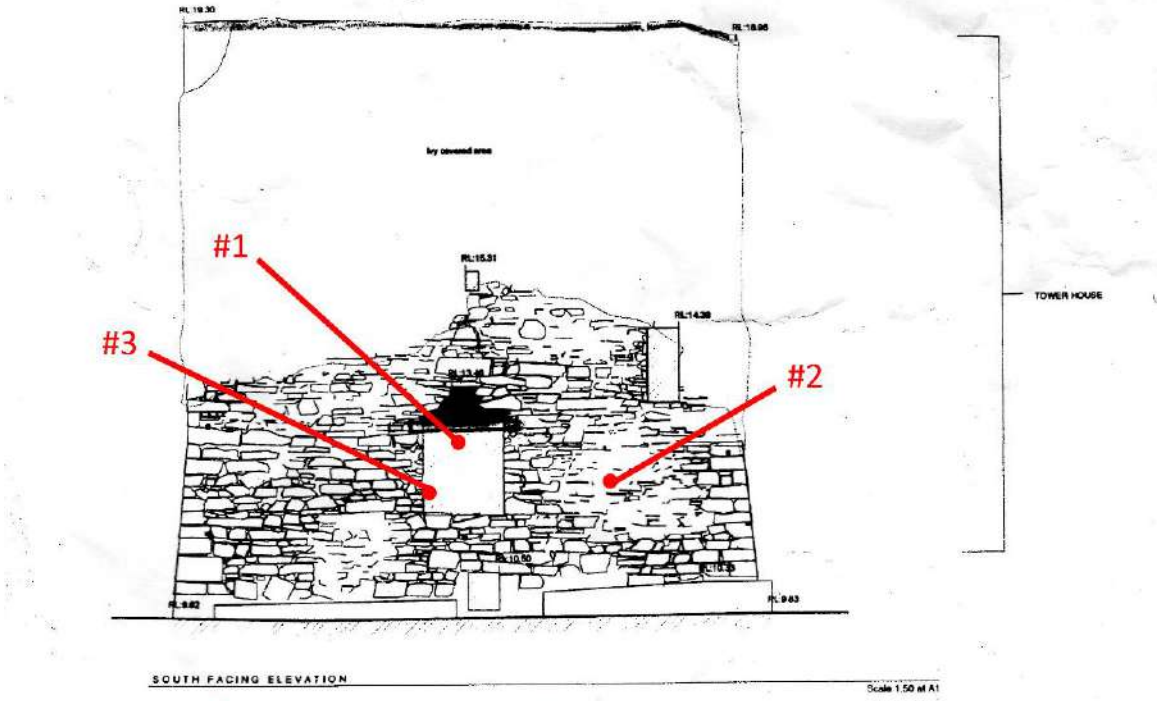
Sample 8- Industrial building, 19th century, internal long room, east facing west elevation, above window, mortar.

Sample 9 – Industrial building, 19th century, north elevation, earth mortar.

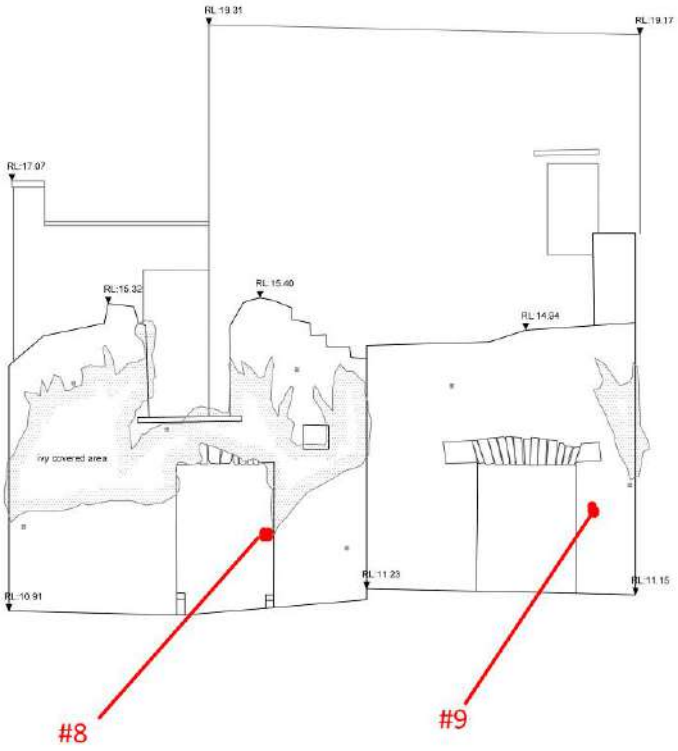




Locations of Mortar Samples #6 and #7



Locations of Mortar Samples #1, #2, #3



Location of Mortar Samples #8 and #9

DATUM 5.00m (O.D. MALIN HEAD)

BALLYNAHINCH TOWER HOUSE - EXTERNAL ELEVATION 1 (NORTH FACING) - 1:50

Sample 1

Sample taken by- Southgate Associates

Visual analysis in situ- n/a

Visual analysis in laboratory- The sample in its largest section indicated that the application was made up of a minimum of 2 coats, applied wet on wet (while backing coat is still soft). The outer surface shows signs of compression, indicating work from a float or brushed surface. The sample is beige / off white in colour, the second coat contains animal hair (cattle hair), the sample is compact indicating a thrown application as opposed to a trowel applied render.

Microscopic examination- Under magnification the sample showed fine traces of clinker from the binder calcination process. The aggregate blend is of a consistent size, and finely graded. Binder is well distributed throughout the mortar sample, with the size of lime inclusions at approximately 0.500mm and lower, the indications are that the mix process is typical dry slaking common mortar, this process involves the blending of calcium oxide and aggregates in set proportions and only adding enough water to convert the calcium oxide to calcium hydrate in powder form before being allowed to cool and then being further mixed with more water to the required consistency. Fine traces of salt crystals are present at the outer face.

Aggregates- Angular- sub rounded shape, the aggregates are a blend of silica based material (dense quartzite, milky quartz and fine sand), and fine limestone traces, possible unconverted binder material.

Moisture content- wet weight 20g
dry weight 19g- moisture content 5%

Carbonation test (phenolphthalein test)- sample fully carbonated.

Disaggregation- Strong resistance to crushing, complete separation achieved.

Wet chemical analysis- acid dissolution
Pre dissolution weight- 30g
Post dissolution weight- 11g

Binder and carbonate content - 63.55

Aggregate content-36.5 %

Sieve test- % retained on sieves
5.00mm-n/a
2.26mm- 12%
1.18mm- 17%
0.600mm-23%
0.300mm-19%

0.150mm-18%
0.075mm- 11%

Conclusion- The sample sent for analysis is a lime mortar, produced by a method of mixing known as dry slaking, a common method used extensively from the 19th century up to the mid-20th century, this method was much favoured by plasterers as it allowed mortar to be prepared well in advance of the work being carried out and allowed any unslaked material to air slake before being used. The lime used would have varying characteristics depending on the calcination process that was employed, i.e., running kilns of flair kilns. The historical context and the mortar condition would put the lime in the non-hydraulic region, with possible weakly hydraulic elements.

Approx. mix ratios at time of mortar production.
1 Part calcium oxide
2.5 Parts quartz aggregate

Sample 2

Sample taken by- Southgate Associates

Visual analysis in situ- n/a

Visual analysis in laboratory- The sample sent for analysis is in a series of well weathered individual pieces. The colour is light brown - beige and contains varying traces of organic growth in the form of lichens. The samples have an open appearance with large pores evident, due to binder dissolution. The samples show no evidence of multi-applications or interfaces. The samples do not exhibit an evidence of compression on the surface face, indicating the material is a thrown application, which is well weathered.

Microscopic examination- Under magnification the sample showed considerable binder loss, from the weathering process. The sample showed a distinctive intersection between layers on one of the pieces, while this is not evident on the other traces, it should be noted that the sample may be a combination of two different phases of work. The sample contains fine salt crystals, which line the larger areas of pore structure. Traces of lime wash are evident on the outer face. Lime inclusions are larger than sample 1, and are distributed unevenly throughout the mortar , which would suggest a mortar produced by "hot lime method", also known as common mortar, but in this method the lime content is slaked into a workable consistency in one process.

Aggregates- The aggregates are primarily quartz based, angular- sub rounded. The sample also contains unconverted binder material.

Moisture content- wet weight 20g
dry weight 19g moisture content 5%

Carbonation test (phenolphthalein test)- sample fully carbonated.

Disaggregation-Strong resistance to crushing, full separation achieved.

Wet chemical analysis- acid dissolution
Pre dissolution weight- 42g
Post dissolution weight- 26g

Binder and carbonate content- 38%

Aggregate content- 62%

Sieve test- % retained on sieves
5.00m- 17%
2.26mm-14%
1.18mm- 9%
0.600mm- 21%
0.30mm- 18%
0.150mm-12%

0.075mm-9%

Conclusion- The sample was a traditionally produced mortar made by using a mix process known a hot lime mixing, which involves blending calcium oxide and aggregates together, and slaking and mixing in one process. This method dates back to the earliest times of construction, while generally considered a building mortar as opposed to a plaster; it was used by masons as well as plasterers. Lime type see sample 1),

Approx. mix ratios at time of mixing.
1part calcium oxide
3 parts quartz aggregate.

Sample 3

Sample taken by- Southgate Associates

Visual analysis in situ- n/a

Visual analysis in laboratory- The sample sent for analysis is a combination of large individual pieces (approx. 40-60mm dia.), and disaggregated elements. The sample is light brown/ beige in colour, the colour is consistent throughout the sample, and while some of the pieces are large, the uniformity of colour and element blend suggests a single mix procedure. There is evidence of a compacted outer face, indicative of a floated or brushed finish.

Microscopic examination- Under microscopic examination the sample exhibits a fine binder distribution, 0.500mm and smaller, this being typical of a mortar produced by dry slaking (see sample 1). The sample contains a varied pore structure, with a compact nature on the external face, indicative of the mortar being further worked after application (scouring) The sample contains traces of salt crystals within the pores. Kiln slag is evident in the form of charcoal traces from the binder calcination, but in a low percentage with unlikely pozzolanic characteristics.

Aggregates- Quartz aggregates, angular- sub rounded. Fine limestone material evident.

Moisture content- wet weight 20g
dry weight 19.5g moisture content 2.5g

Carbonation test (phenolphthalein test)- sample fully carbonated.

Disaggregation- Weak bonded mortar, separation with ease.

Wet chemical analysis- acid dissolution

Pre dissolution weight- 35g
Post dissolution weight- 19%

Binder and carbonate content-46%

Aggregate content- 54%

Sieve test- % retained on sieves
5.00mm-16%
2.36mm- 10%
1.18mm- 7%
0.600mm- 19%
0.300mm- 22%
0.150mm-18%
0.075mm-7%

Conclusion- The sample is a similar type of mortar as sample 1, made by dry slaking in the typical 19th century method, the evidence of later compaction indicates that the plaster/render was later work after application , by a method known as scouring, this involves using a timber float in a circular fashion to compress the material to reduce shrinkage. Lime type (see sample 1).

Approx. mortar ratio at time of mixing

1Part calcium oxide

3 parts quartz aggregate

Sample 4

Sample taken by- Southgate Associates

Visual analysis in situ- n/a

Visual analysis in laboratory- The sample sent for analysis to a blend of large solid lumps of mortar, separated material and large unconverted binder material. The sample is typical of common mortar,(traditionally made mortar, made by blending calcium oxide and aggregates together and mixing and slaking in the one process). The colour of the sample varies from white to light brown indicating that the sample is made up of material from separate batches or may be affected from lime leaching of variable background suction. The sample has an open texture which would suggest that the mortar was placed in the wall core with no further compaction.

Microscopic examination- Under microscopic examination the sample shows clear separation between mortar batches and placement within the wall core, the sample has a varied pore structure, partly due to later lime leaching, and partly from the method of use (i.e. no further compaction) . Lime inclusions vary in size from approx. 0.150mm- 30mm lumps of partly converted material. The high content of unconverted and partly converted material binder within the sample would directly affect the binding ability of the mortar mass. Kiln slag is evident in the form of charcoal.

Aggregates- Aggregates are primarily quartz based, angular- sub rounded. It should be noted the unconverted binder material (limestone) , is also acting as part of the filler blend.

Moisture content- wet weight 20g
dry weight 18.5g moisture content 7.5%

Carbonation test (phenolphthalein test) - sample fully carbonated.

Disaggregation- Strong resistance to crushing, well bonded

Wet chemical analysis- acid dissolution
Pre dissolution weight- 50g
Post dissolution weight- 23.5g

Binder and carbonate content-53%

Aggregate content- 47%

Sieve test- % retained on sieves

5.00mm- 19%
2.36mm- 9%
1.18mm- 13%
0.600mm-9%
0.300mm-18%

0.150mm-21%
0.075mm-11%

Conclusion.-The sample is traditionally made lime mortar, mixed in a process known as hot lime (see sample 2) , the core fill uses a combination of aggregates from fine sands up to waste from the masonry processing . The lime type is very pure, and would be classified as non-hydraulic, as the mortar would be contained within the wall interior there would be limited exposure to carbon dioxide and further moisture, this effecting the final strength of the mortar.

Approx. mortar ratio at time of mixing.
1 part calcium oxide
2.5-3 parts aggregate.

Sample 5

Sample taken by- Southgate Associates

Visual analysis in-situ- n/a

Visual analysis in laboratory- The sample sent for analysis was a collection of varying sized lumps of mortar, from approx. 30mm diameter-80mm diameter. The samples appear to have no visible laying of interfaces between coats. The samples are well compact, indicating a thrown applied and further compacted application. The surface contains light covering of lichens, which due to their acidic secretion has left the finish pitted. The colour of the samples is a uniformed beige colour, indicating a single mix process.

Microscopic examination- Under microscopic examination the sample showed a fine pore structure which is typical of mortar which has been further worked after application. The lime inclusions range from 0.150mm- 0.500mm, which strongly points to mortar which has been produced from the dry slaking process (see sample 1), the method was commonly used from the 19th century onwards. The outer surface of the sample contains higher binder content, which may be due to the movement of fluid binder during the scouring process.

Aggregates- The aggregates are primarily quartz based. Angular- sub rounded. The sample also contained masonry processing waste.

Moisture content- wet weight 20g
dry weight 18.5g moisture content 7.5 %

Carbonation test (phenolphthalein test) - sample fully carbonated

Disaggregation- Medium strength, separation achieved.

Wet chemical analysis- acid dissolution
Pre dissolution weight- 43g
Post dissolution weight- 24g

Binder and carbonate content-45%

Aggregate content- 55%

Sieve test-% retained on sieves

5.00mm- 17%
2.36mm- 14%
1.18mm- 5%
0.600mm-16%
0.300mm- 21%
0.150mm-18%
0.075mm-9%

Conclusion- The sample is a lime mortar, produced by the dry slaking method (see sample 1), The lime should be classified as a non-hydraulic- feebly hydraulic lime, it should be noted that this classification , feebly hydraulic would be considerably weaker than the EN495-1:2010, NHL 2, and would be closer to a non-hydraulic with a pozzolanic additive.

Approx. mortar ratio at time of mixing
1 part calcium oxide
3 parts aggregates.

Sample 6

Sample taken by- Southgate Associates

Visual analysis in-situ- n/a

Visual analysis in laboratory- The sample sent for analysis was a blend of individual mortar pieces and separates aggregates, the samples indicates no evidence of layering or after application compacting. The surface of the larger sample pieces are covered with lichen growth and exhibits an open texture which may be due to binder loss of from thrown application. The sample contains no organic matter in the form of animal hair or kiln slag. The rear of the sample (face adjacent to the masonry substrate), exhibits a large amount of voids and general disintegration, again indicative of secondary binder dissolution.

Microscopic examination- Under microscopic examination the sample showed a varied pore structure, indication considerable secondary binder dissolution taking place during the weathering. The binder inclusions are very fine (0.150mm- 0.300mm) , indicating a dry slake or separate off site hydration of the binder. The sample contains salt crystals within the outer pore walls. No kiln slag was evident within the sample given.

Aggregates- Quartz, angular-sub rounded.

Moisture content- wet weight 20g
dry weight 19g moisture content 5%

Carbonation test (phenolphthalein test) - sample fully carbonated

Disaggregation- Medium strength, separation achieved

Wet chemical analysis- acid dissolution
Pre dissolution weight- 53g
Post dissolution weight-29.5g

Binder and carbonate content-45%

Aggregate content-55%

Sieve test- % retained on sieves
5.00mm- 5%
2.36mm-11%
1.18mm-9%
0.600mm-18%
0.300mm- 22%
0.150mm28%
0.075mm-17%

Conclusion.- The sample is a mortar produced by the dry slaking method commonly used through the 19th century (see sample 1), the very fine binder aggregate size may indicate

that the lime had been allowed to air slake before being blended with the aggregates, this method helps to ensure the complete conversion of oxide to hydrate. The medium strength of the sample may indicate the presence of a hydraulic element to the lime component.

Approx. mortar ratio at time of mixing
1 part calcium oxide
2.75-3 parts aggregate.

Sample 7.

Sample taken by- Southgate Associates

Visual analysis in-situ- n/a

Visual analysis in laboratory- The sample sent for analysis is a blend of individual mortared pieces and separate aggregates. The larger pieces range in size from 30mm diameter, up to 75mm diameter. The samples appear to contain no evidence of layering, and appear to be the result of a single application. While the sample has be described as surface pointing, the large aggregates present in the sample (25mm diameter), would indicate that the mortar was produced as a construction mortar, rather than a separate pointing procedure. The sample is covered with lichen growth and has a weathered open surface, indicating considerable binder loss.

Microscopic examination-Under microscopic examination the sample exhibits a varied pore structure and areas which have weathered out completely, indicating that the mortar contained poorly bonded material. The sample contains fine traces of organic material in the form of fine roots which have partly rotted away, leaving behind voids and disaggregated material. The sample contains considerable salt contamination within the sample (earth mineral salts). The lime inclusions are fine in nature indicating a typical 19th century dry slake (see sample 1). Small amounts of kiln slag is evident.

Aggregates- Quartz based, with small amounts of unconverted binder material. Angular- sub rounded.

Moisture content- wet weight 20g
dry weight 18.5g moisture content

Carbonation test (phenolphthalein test)- sample fully carbonated.

Disaggregation- Medium strength, localised strength.

Wet chemical analysis- acid dissolution
Pre dissolution weight-38g
Post dissolution weight-17g

Binder and carbonate content-56%

Aggregate content-44%

Sieve test- % retained on sieves
5.00mm- 15%
2.36mm-6%
1.18mm- 16%
0.600mm- 13%
0.300mm- 26%
0.150mm-15%

0.075-9%

Conclusion- The sample is a dry slaked lime mortar (see sample 1) , with an aggregate size which would indicate that this was a construction mortar as opposed to a plastering mix. The lime classification for the binder would indicate it as a non-hydraulic lime/feebly hydraulic lime (see sample 5)

Approx. mortar ratio at time of mixing
1 part calcium oxide
2.5-3 parts quartz aggregate.

Sample 8

Sample taken by- Southgate Associates

Visual analysis in-situ- n/a

Visual analysis in laboratory- The sample sent for analysis is a collection of mortared pieces, ranging in size from 125mm diameter, down to 30mm diameter. The samples are heavily covered with lichen growth indicting high moisture levels within the mortar. The samples exhibits no indication of layering and the consistent colour and aggregate blend present would suggest a single application and mix process. While the sample exhibits an open texture on the external face, (secondary binder loss) the mortar sample generally has a solid composition in its mass.

Microscopic examination- Under microscopic examination the sample shows evidence of a finer aggregate being used in the mortar, possibly to improve the workability of the material. The sample has a large pore structure, which may be due to high water content at the time of mixing the mortar or later moisture percolating through the material. The sample contains considerable salt contamination, consistent with high moisture levels. The lime inclusions are fine in nature, indicating dry slaking (see sample 1).

Aggregates- Quartz, angular- sub rounded,

Moisture content- wet weight- 30g
dry weight 15g moisture content 50%

Carbonation test (phenolphthalein test)- sample fully carbonated

Disaggregation- Medium strength mortar

Wet chemical analysis-acid dissolution
Pre dissolution weight- 47g
Post dissolution weight- 26.5g

Binder and aggregate content-44%

Aggregate content- 56%

Sieve test-% retained on sieves
5.00mm- 11%
2.36mm- 16%
1.18mm- 11%
0.600mm-18%
0.300mm- 23%
0.150mm-9%
0.075-4%

Conclusion- The sample sent for analysis was a 19th century lime mortar, produced in the

dry slake manor, (see sample 1), the sample ad a high level, and if consistent this may account for the high void characteristics of the sample. The majority of the aggregate range (0.600-0.075), indicate a mortar produced for good workability, i.e. plastering. The lime type used in the mortar should be considered a non-hydraulic lime, within the general lime spectrum.

Approx. mortar ratio at time of mixing
1 Part calcium Oxide
2.5-3 parts aggregate

Sample 9

Sample taken by- Southgate Associates

Visual analysis in situ- n/a

Visual analysis in laboratory- The sample sent for analysis is a loose blend earth and fine aggregates. The sample is a consistent colour, we would suggest a single source. As the sample is completely disintegrated, there is non-evidence of mix method or application sequence. The sample contains organic growth in the form of fine roots.

Microscopic examination- Under microscopic examination the sample

Aggregates

Moisture content- wet weight 20g
dry weight 15g moisture content 25%

Carbonation test (phenolphthalein test)- The sample contained very small traces of lime binder, but traces indicated that carbonation had taken place.

Disaggregation- Strong resistance to crushing.

Wet chemical analysis- acid dissolution
Pre dissolution weight- 58g
Post dissolution weight- 49g

Binder and carbonate content-16%

Aggregate content-84%

Sieve test-% retained on sieves

5.00mm- 4%
2.36mm- 9%
1.18mm- 7%
0.600mm-16%
0.300mm- 17%
0.150mm-26%
0.075mm- 27%

Conclusion- The sample sent for analysis was a earth/clay mortar, while the is evidence that these mortars were used for plastering, they are more commonly used as building mortars or core fill for mass masonry. The lime content is very low by traditional mortar standards, and it is generally considered that the lime played a stabilising role in the mix blend, to counter the shrinkage due to clay content, but to the general condition of the sample it is impossible to determine the limes nature, but the likely hood, is that it was non-hydraulic.

Approx. mix blend
90-95% earth/aggregate blend
5% active lime binder
5% limestone filler.

General note- The above analysis indicates that all the samples used calcium oxide,(quick lime) in the mixing process, as opposed to a pre-hydrated lime. The calcium oxide upon slaking would expand on volume up to twice and three times its bulk, which explains while mix ratios of 1-3 , calcium oxide, produce a mortar with a binder to aggregate ratio nearer 1-1.
Calcium oxide- quick lime, lump lime
Calcium hyroxide - lime, lime putty, hydrated lime