



Downie's Cottage, Braemar

Repairs and upgrades to a Highland cottage



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Contents

1. Introduction	4
2. Location and history of the building.....	5
3. The cottage	7
4. Adjacent buildings.....	9
5. The inside of the cottage.....	10
6. External condition.....	16
7. Repair and conversion works.....	16
8. Restoration of the adjacent steading building.....	19
9. External masonry work to the croft.....	21
10. Internal masonry work.....	23
11. Joinery work.....	27
12. Rebuilding of the porch	29
13. Services and heating	30
14. Electrical works.....	33
15. Energy efficiency improvements and environmental monitoring	33
16. Finishing works.....	34
17. Conclusions	34
Annex A. Additional archive images.....	36

1. Introduction

This Refurbishment Case Study describes works to a small vernacular building in a rural location close to the town of Braemar. The building had been unoccupied since the 1930s, and due to a modern plantation of Douglas fir and Spruce, had been largely hidden. A change of ownership in recent years resulted in a plan to refurbish the cottage for holiday accommodation. During this process the almost unique nature of its survival and the importance of the building was recognised by the client and Historic Scotland¹ was informed. The building was investigated in detail by Historic Scotland and quickly designated as a Category A Listed building in 2011, denoting a building of national importance, as an exceptionally rare survival of the open hearth tradition of vernacular building in the north east of Scotland. This designation was supported by the owner and, as such, financial assistance was given in progressing designs for upgrade for the building. The objective was set for the building to retain its special character and traditional build as part of a pilot project to demonstrate repair and thermal upgrades. The refurbishment works were extensive, and there was subtle but significant alteration to much of the ground floor. However, as this work was designed, planned and delivered ‘in the spirit of the building’, and working with the existing fabric (not against it), there was not a conflict with the objectives of building conservation and achieving Listed Building Consent was not difficult. The Listed Building Consent process (often misunderstood) is to seek to manage change appropriately, not prevent it.

The survival of almost the entire interior, together with some valuable documentary evidence by what was then the Royal Commission on the Ancient and Historical Monuments of Scotland¹, give a particular human dimension to this project. Therefore the history and development of the building will be discussed below as part of the refurbishment. While this building is special, and now rare, it was once a very common building type in many parts of Scotland, especially the Central Highlands. Improvements in housing in the 19th century, and changing rural populations, mean that there are few examples of this once common vernacular house type. Generally, a vernacular building is one built largely with local materials, and constructed in a traditional way with a high degree of skill and understanding of the material properties of what was used in its construction. While vernacular buildings are typically found in rural areas, they were not exclusively so. Most materials such as stone and timber would have been obtained and largely finished by hand, giving a softness of edge and profile that is very distinctive.

This Refurbishment Case Study describes the upgrade measures, what made them suitable, how the work was done, and captures key learning points in the process. Wider considerations of bringing in new services, and the challenges that this can bring when doing construction work in a rural location are also considered as an important part of this study.

¹ Historic Scotland merged with the Royal Commission on the Ancient and Historical Monuments of Scotland in October 2015 to form Historic Environment Scotland

2. Location and history of the building

The cottage house is located on high sloping ground to the south of Braemar, with a north westerly aspect, on the lower slopes of a hill known as Morrone, and formed part of a community of small dwellings referred to as Tomintoul. The building was part of a small agricultural holding reputed in the 19th century to be the highest cultivated land in Scotland. The land was part of the Duke of Fife's Estate, later to be known as Mar Lodge. It is shown on the First Ordinance Survey map of 1867, with the croft house and adjacent byre largely in its present form.

The building is hard to date accurately, but it is likely to have been in its present form by the mid-19th century, with the final feature being the later addition of a small lean-to porch, all of which is shown clearly in a late 19th century image (Figure 1).



Figure 1. The cottage in the late-19th century, viewed from the north west.

The cottage was generally referred to as “Downie’s Cottage” after the family who lived there. At some stage the porch door was changed from the west side to the east, possibly to give better shelter from the prevailing south westerly weather. The cottage was painted by the well-known Scottish painter Myles Birket-Foster in the late-19th century, in a pastoral style popular at the time (Figure 2).



Figure 2. A late-19th century watercolour showing the porch of Downies Cottage painted by Miles Birket-Foster.

The small farm on which the cottage stood was farmed by the Downie family, well established in Braemar, from around 1850. The house was inhabited by the family until the late 1930's with James Downie (1880 – 1933) being the last resident; the property remained empty following his death. Agricultural activity was continued by James Downie's nephew, James McGregor, who until his death in 1960 lived at Braeview, a new house he built himself a hundred metres or so down the hill from the cottage. This resourceful and capable man was well known in the area, and his resilient way of life, knowledge and love of the land was recorded by the well-known Scottish writer and poet Nan Shepherd in an article in the *Deeside Field Magazine* in 1962. Following James' death the croft house and ground was largely unused, although Braeview remained occupied by his descendants. References to the condition of the croft house vary – in 1961 Nan Shepherd refers to the building (sometimes mentioned as 'the bothy') as 'now a ruin'. This was fortunately not quite true; due to its remote location, the croft house was largely undisturbed, although the byre building was burnt down in the 1970's.

By pleasing happenstance, information about the croft was published on-line by the new owners, and a daughter of James McGregor who had emigrated to the United States after WWII made contact. The family were able to supply copies of the archive photographs used in this paper. These images showed many stages of the croft's development over time, and occasionally members of the Downie family.

In one image they are clearly dressed for an event, posing in front of the cottage (Figure 3).



Figure 3. The Downie family by the porch door c.1900. The man in the centre is probably James Downie, the last resident of the croft house who died in 1933.

As well as the personal history they convey, the images also give a good indication of the construction and finish of the croft house when it was lived-in and used; especially details of the roof. The absence of rhones is noteworthy, as well as the window fully open with a raised sash; suggesting a high importance was attached to ventilation. Also of note are the flowers and shrubs, not entirely expected in this exposed highland location. Other images showing the cottage at various stages are at Annex A.

3. The cottage

The croft house is rectangular in plan, constructed of a single storey in mortared rubble stone. Both gables are masonry, one with an internal flue. The accommodation consists of two principal rooms on the ground floor, separated by a stair and smaller bedroom in the middle. The narrow stair leads to two upstairs attic sleeping areas. Ceilings on the ground floor are low, and the footprint of the building is by any standard, very small. Heating would have been provided by the two hearths, one on each gable. The roof was originally a heather thatch, presently covered in corrugated iron, seen here in Figure 4 before works started, which has ensured its survival. A thatch roof in Scotland, regardless of material, has an effective lifespan of about 40 years; less in wetter areas.



Figure 4. The Croft house in 2011 prior to the refurbishment. The corrugated iron roof covering is of relatively recent date but has largely ensured the survival of the building and the heather thatch beneath.

The corrugated iron would appear to be of a relatively recent date but this additional protection for the thatch was preceded by another protective layer - horizontally laid timber planks, shown clearly in an early image (Figure 5). Interestingly, these planks seem to have also been covered with a form of material, possibly a tar or bitumen painted canvas.



Figure 5. The croft house viewed from the north in the late 19th century, showing the timber plank roof covering protecting the thatch. Note the steading to the left roofed with vertically laid sawn planks.

4. Adjacent buildings

With older structures it is important to note that in many cases it is not just the building itself that is of importance, but the ancillary features and structures that give the building its context and contribute to the wider story. In the case of the croft house, there are several associated structures that, whilst not of any antiquity, are of note. Built against the west gable is a low shed (known as the store room) with a pitched corrugated iron roof, informally constructed for agricultural use (Figure 6). From the timber pieces used it probably dates from around 1930.



Figure 6. The store room on the west side of the croft house.

Inside the shed featured a lined pit, approximately a metre deep with a slatted timber cover; this was probably used to store potatoes, protected from frost over the winter. It appears that this building replaced an earlier structure made with larger masonry walls and a steeper pitched roof; this range of masonry structures can be seen to the right of the croft house in Figure 1.

Close to the shed, the remains of a horse drawn sledge were found; a common implement in rural Scotland when winters were colder and snow lay for much of the winter. A small greenhouse, made up from salvaged materials had also survived. To the east of the house was a low single height byre, rubble built, and open to the south. The photographs show an early thatched structure on the site with the roof replaced with a roof covering of vertical cut timber; the building then having been replaced by the newer masonry structure shown un-finished circa 1900 (Figure 7).



Figure 7. Downie's Cottage circa 1900. The later byre is under construction, here viewed middle foreground. Note the adjacent structures to the right which no longer survive.

This byre was probably used for cattle, as evidenced by a part cobbled floor, with hay probably stored in the roof space. Today only the masonry on three sides survives, as well as the concrete footings for some form of fixed machinery, possibly an oil engine for threshing. There were several other structures close by that can be seen in the early photographs, which no longer survive. What is of note with these smaller buildings is their roof coverings. Thatch and corrugated iron are well known in the highlands and elsewhere, but the images show what seems to be timber planks, laid vertically on the roof pitch (Figures 5 and 7).

5. The inside of the cottage

Internally, many early fittings were still present, although damaged. They collectively constitute a unique survival of mid-19th century rural habitation. These items ranged from furniture, domestic cooking implements and clothes. Some items of clothing and other domestic items found during the clear up were undoubtedly 19th century. In addition, a number of greeting and Christmas cards survived, all providing an insight into the lives of the former inhabitants (Figure 8).



Figure 8. Victorian greeting cards and other items found in the upper floor during the tidy up.

Entrance porch

The timber addition to the main structure, while probably not original, is nevertheless present in the late 19th century images featuring the Downie family. It is a simple timber framed lean-to structure with a window in the north side. Furnishings found suggest it was used as a scullery area, with easy access to the outside water supply and the garden.

Kitchen

Lit by a single sash window to the north, with a stone flagged floor and a box bed, this is a virtually complete original room, including the dominant feature, a chimney flue made up of timber (known as a 'hanging lum'). By the nature of its timber construction such features rarely survive; there are few remaining in Scotland today. In addition this was complete with hearth, grate and even some fire irons (Figure 9). The cast iron fireback appears to have been cut down from a larger one, and is likely to have been taken from elsewhere.



Figure 9. The hanging lum in the kitchen prior to works; a very rare survivor of a once common feature in rural homes.

A family source was able to forward a sketch of the interior of the kitchen, done in approximately 1920, shortly before the cottage fell vacant. It shows many of the surviving features and some interesting domestic details of how the hearth was used (Figure 10).

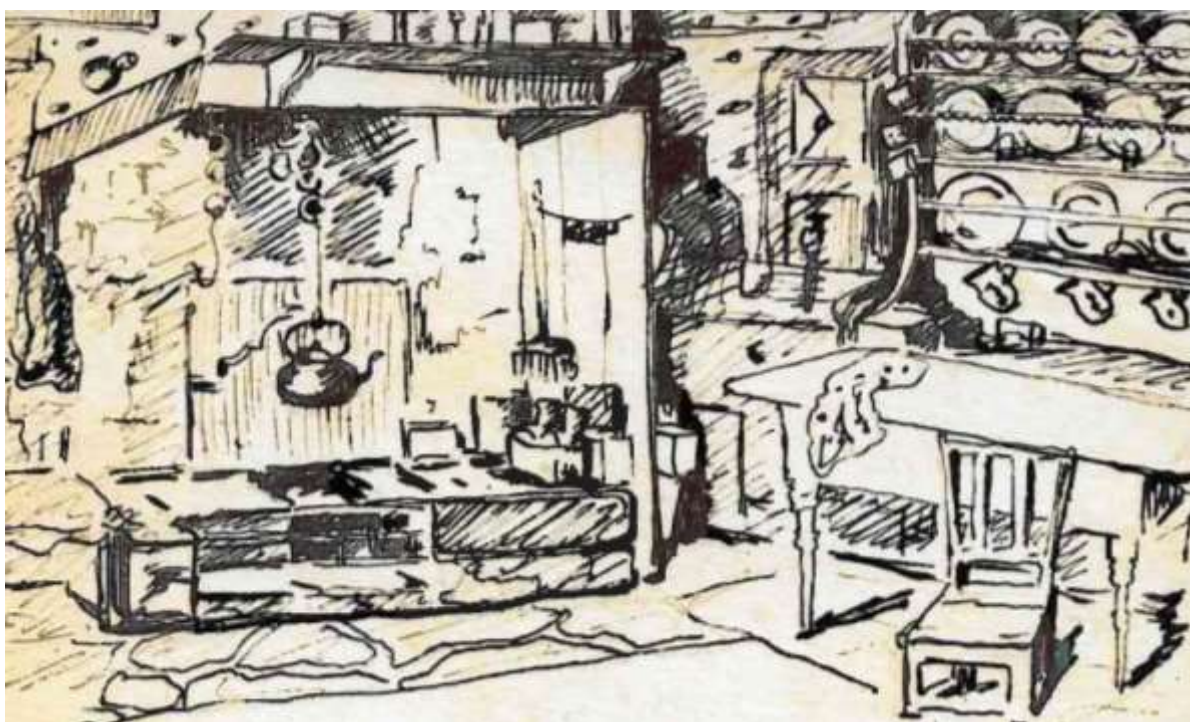


Figure 10. A sketch of the kitchen circa 1920, showing the main features still surviving today.

Against the west partition in the kitchen there is a timber framed area with a box bed and a fitted cupboard. The box bed appears to have been formed from panelled window shutters and timber mouldings of an early 19th century pattern, although could be earlier. These are of interest, not just because of the type of bed they were used to make, but for the painting details on the shutters, which may reflect part of the decorative scheme of the property from where they came. It is thought locally that the shutters might have been salvaged from the original Mar Lodge Mansion House, burnt down in the mid-19th century (replaced with the current building that stands in a different location).

Box beds were common in rural and urban dwellings, including tenements, until the early 20th century. They provided a compact and neat sleeping space and, in this case, the closing leaves allowed a degree of privacy. The straw filled mattress was still in place, though not usable (Figure 11).



Figure 11. The box bed in the kitchen. Note the straw filled mattress just visible through the open shutter leaf.

The walls of the kitchen were plastered directly onto the masonry (termed 'on the hard'), and limewashed a white or off-white colour. The ceiling joists and floorboards were covered in a sequence of wall papers, in some places seven layers thick. The window was a glazed sash. The joinery is characteristic of Victorian work.

While the remaining interior details were impressive, conditions in the room varied. Against the south wall, water ingress from the hill behind had caused damage and

decay of timber and masonry. Roots from trees had grown in seeking water. The flagstones had broken up and in many places were extensively delaminated. The plaster had also broken down and was largely beyond repair. By contrast on the north, drier side, the plaster was in better condition, and the window was sound.

In Nan Shepherd's article, she records memories of the croft house while it was still occupied by the Downie family in the 1920's when she stayed at Braeview with the McGregors. She describes "we stopped to look at its ancient knobble of glass in one of the windows... and see the deas, the box bed, the plate rack reaching to the roof...". The windows seem to have been re-glazed, as no 'bulls eye' glass survives, nor does the plate rack; but the box bed described is present.

A 'deas' (or deece) is a piece of traditional Scottish furniture resembling a bench with a folding table attached. This item remained in the house but was known to have been relocated and used locally after James MacGregor's death, but was returned to the bothy when repair works started (Figure 12). The Tomintoul example is well made with moulded panels and tenon joints of a high standard; the folding table, while clearly old, does not appear to be original. The cut-away corner on the left hand side was made to allow it to fit against the kitchen window.



Figure 12. The 'deas' referred to by Nan Shepherd, returned to the bothy after some time away.

Parlour

The other end of the building was in a less sound condition. The rear wall had largely collapsed; the gable masonry was very fragile, with settlement in the northwest corner. The suspended timber floor was entirely decayed, but the box bed, made up of salvaged window shutters, was in good condition. A small open hearth and traditional mantel indicated that this might have been termed the parlour, or the better room. The cast iron inset or grate was missing, but it was subsequently returned to the house once repair work got underway.

This room, while plastered on the hard, had at a later date been re-lined with vertical timber boards. This was common practice in Scotland in the 19th century, sometimes termed 'V grooved lining'. The window was similar to the kitchen one – a single opening sash. Still in place was a small roller blind with fragments of material attached. Also surviving was the tensioning device for the blind cord.

Second bedroom

A small room adjacent and below the staircase to the south side was fitted with a third smaller box bed and fitted drawers. This room was later converted to be the bathroom.

Upstairs/roof space

The stairwell and the two sleeping areas under the roof, while modest in scale, were interesting due to their unusual decoration. The inside was lined with rough sawn planks fastened horizontally to the roof structure; this in turn was covered almost entirely with illustrations, coloured and monochrome, from picture magazines dating from the 1890's to the early-20th century. While of modest fiscal value, their excellent condition in-situ gives them a significant cultural worth. Despite the house being unoccupied for nearly 80 years, unheated, with areas of damp downstairs, the paper illustrations appeared as fresh and bright as when they were pasted on (Figure 13). It is likely that the stable conditions provided by the insulation and thermal buffering of a thick layer of thatch prevented any fast changes of temperature, preventing condensation and subsequent damage. The absence of any significant light apart from that provided by a small peep window meant that there was no fading of the inks from light damage.



Figure 13. The wall coverings on the stairwell partition; their survival is unusual.

6. External condition

The solid masonry walls varied between 700-800mm thick, built of large glacial boulders, some split to give a flat face, and quarried granite rubble. While apparently lime bonded there were many voids in the core. The external elevations were flush pointed in lime, and traces of limewash survived in many places. The northwest corner masonry had suffered settlement, and the southwest end wall had partially collapsed. The conditions of both gables had been helped by a covering of corrugated iron; this had, to a degree, prevented loss of mortar from wind driven rain in these exposed areas.

7. Repair and conversion works

Design, planning and consents

The building is a Category A Listed building, located in a National Park, and adjacent to a National Nature Reserve and Site of Special Scientific Interest. It had no services and very limited vehicular access. All these factors added to the challenge

of the refurbishment project. However, this was achieved, and some relevant points are covered here:

Building Warrant

The work required a Building Warrant, and thus compliance with The Building Standards was necessary. However, as the property had been vacant for many years, the work was deemed to be a conversion; and conversion work in Listed Buildings, and those of traditional construction, are only required to satisfy the functional standards of the Building Regulations 'where reasonably practicable'. Performance against the standards should be no worse than before. This is an important point in planning any alterations in traditional buildings where a building warrant is required. Specific areas of discussion regarding the building warrant were energy efficiency, evacuation in the event of fire, structural stability, protection against damp and wind driven rain.

Listed Building Consent

Listed Building Consent was required for the restoration of the croft cottage and its adjacent remnant steading/byre. The application for Listed Building Consent was dealt with by Cairngorms National Park Authority, in consultation with Aberdeenshire Council and Historic Scotland. It was established that while thermal upgrade and modernisation of the cottage was entirely possible, the nature of its modest but significant vernacular construction and surviving internal fittings obliged sensitive upgrade, to safeguard the building's special architectural and historic interest. Consent was granted in 2012, with conditions addressing the detailed conservation treatment for special features, including the stone hearth, hinging lum, box beds, and attic timber plank and newspaper wall covering'

Light and power

There was no power to the building, although mains electricity was present only 100 metres away. Dialogue with the utility company established that a new connection could be made, and this required a new pole mounted transformer to be installed several hundred metres away. In order to improve visual aspect it was decided to bury the new cabling from the transformer rather than use wooden poles. The connection fee for the new transformer and cabling (excluding groundworks) was £7,500.

Access road

The existing estate track behind the house, while adequate for occasional sporting use and recreational foot traffic, was not considered suitable for construction access. Additionally the track crossed a National Nature Reserve and a Site of Special Scientific Interest. Accordingly, upgrading this track to a width and standard that would permit the transport of building materials was not feasible and therefore consideration was given to upgrading and extending another existing track to the north of the property.

Water

There was no mains water at the croft. It is presumed that originally water would have been sourced from a small burn behind the house and in the past this had been diverted to a small covered cistern to provide a supply to Braeview. The available options were to install a pumped system to deliver mains water or to utilise a private water supply with appropriate filtration and treatment. The latter option was selected.

Programming the works

Due to the location of the croft house, and its exposed nature, the works were planned to avoid extremes of weather. Low winter temperatures meant that construction work between October and April, while possible, could be problematic, and it was decided to focus on works between spring and autumn. While there was an aspiration that work could be done in one season, this proved over optimistic. As it happened, work took place over the summer and autumn of 2014, 2015, and the early part of 2016.

Tree clearing

The stand of Douglas Fir and Spruce that had enclosed the site for 60 years had become unstable and subject to windblow, and was felled. The timber was of good quality, and converted to planks and other dimensions with a portable 'Miser Saw' giving some useable timber (Figure 14). There was an aspiration by the client to utilise this material in the repairs to the byre and the construction of a new property close by; unfortunately for reasons relating to building warrant compliance requiring the certification of timber used in construction this proved unfeasible. However, this timber was used for non-structural repairs to the property. The use of local timber in construction is a current issue, and with appropriate grading and certification it is possible, although in this case time and resources did not allow it.



Figure 14. Sawn baulks of timber from the cleared trees.

Drainage and landscape work

Considerable internal damage was caused by water run-off from the hill behind. This resulted in a clogged and half-filled ditch behind the house and water then seeped through the rear wall, affecting furniture, plaster and timber linings on the ground floor. Tree roots and suckers from adjacent Aspen trees, seeking moisture, had made their way through the wall and into the kitchen. In any refurbishment dry and stable ground conditions adjacent to a property are important; and every effort should be made to ensure sites are well drained. Such action will address the source of the problem and reduce the need to attend to damp masonry in the building itself.

A mechanical excavator was used to clear the ditch behind the house and a drain was installed, diverting water to a newly formed pond (a further requirement of building control; ensuring there was adequate water supply in case of fire). In addition, runoff from the roof of the croft and steading was channelled to this pond.

Sewage arrangements required a septic tank. This was located to the north of the plot, with a glass-fibre 'onion' unit placed in a newly dug pit. Porosity tests provided information to allow an adequate soakaway for treated run-off to be designed/installed, again to comply with building control requirements.

8. Restoration of the adjacent steading building

Masonry repairs

The byre, shown in various stages of construction in the early photographs, was entirely ruined, although the masonry walls were standing to the eaves height and the stone appeared sound. The repair of this building was important as the croft house was so small, much of the services, plant and equipment, as well as storage had to be located outside the house, the byre being of a good size and suitable location. Furthermore, the retention of this structure provided historical context for the croft house. Accordingly, it was decided to re-roof the building and use it to house the heating plant, water storage/treatment and provide utility space for the croft and for other storage. Despite having been open to the weather for some time, the masonry was in good condition, and only minor works were required.

New roof

A design for the roof and the open side to the south was straightforward and the re-construction of this building was begun first to give a storage facility for the construction work on the croft house (Figure 15). The roof timbers were grade C16 softwood, with trusses of standard dimension made up on site. This allowed the slight changes in level of the existing masonry to be easily accommodated. Roof construction on traditional buildings is structurally simple and proven; pre-manufactured trusses are not necessary, even on much larger buildings. The chosen roof covering was corrugated iron, of traditional profile (sinusoidal). The roof was painted with a 2 part epoxy based system, of traditional colour to match the croft house roof.



Figure 15. The new roof structure on the byre.

South wall

The byre had always been open to the south for the storage of agricultural equipment, but as an enclosed space was required a new timber front was designed, with large opening doors. The design and construction was simple and easily assembled, using standard timber lengths and fastenings. This gave a useful enclosed space that was entirely consistent in spirit to the croft house, and to other buildings in the vicinity (Figure 16).



Figure 16. The restored byre with new doors and roof, blending in well with adjacent structures.

9. External masonry work to the croft

Foundations

Vernacular buildings of this type do not have foundations as they are understood today; the thickness of the walls increases the footprint and mean that the pressure on the ground is modest. Typically, to provide support to the fabric a base course of large stones is usually set into the ground, to a depth of a 300 mm (Figure 17), often a few inches wider than the above ground wall. However, at Downie's it was in places less. While this can be alarming to those from a modern construction background, it is generally sufficient. At the cottage, this base course occasionally touched bedrock and the walls were stable and in most areas the foundations required only simple re-pointing. However, the northwest corner was on a glacial gravel and there had been some settlement (the wall collapse at the southwest end was largely due to issues with the ditch and tree roots).



Figure 17. The foundation stones at the base of the wall.

Rebuilding walls

While the roof was in good condition, external ground conditions had led in some areas to settlement of masonry and collapse. This settlement appeared to be from 3 causes: poor drainage behind the house and a build-up of soil and organic material against this elevation causing leaching and decay of the lime mortar; fallen limbs

from the trees; and on the southwest gable and corner where the bedrock changed to glacial gravel resulting in a poor foundation. Half of the rear wall was rebuilt with salvaged stones and a lime mortar. While at first sight in satisfactory condition, the west gable was not stable, and previous buttressing indicated that there had been problems here for some time. The gable end was dismantled and rebuilt (Figure 18), including the existing flue. Other areas of the masonry walls were repointed with a hot lime mix, and finished with limewash.



Figure 18. Rebuilding work on the west gable wall in 2013.

Repointing work

The walls of the croft were thick, varying between 700-800mm. generally. The wall core appeared to be dry masonry, with mortar work being restricted to pointing only. This construction may have contributed to a degree of structural instability where the pointing mortar had degraded through damp and water action. The masonry was repointed on all sides, and finished with a flush point traditional in this area.

Limewashing

The repointed walls were protected with three coats of traditional lime wash, made up on site from quicklime and water (Figure 19). A small amount of tallow was added during the slaking to impart a degree of water resistance to the limewash.



Figure 19. Completed limewash on the partly re-built south wall.

Roof work

The galvanised corrugated iron was in satisfactory condition considering its age. The thatch underneath, which is an important part of the history and significance of the building, was left in-situ. Occasional fastenings were replaced, and the wires that held the roof to the walls were refastened and replaced as necessary with a heavy 12 gauge fencing wire. The existing corrugated iron was retained, with localised repairs. It was then cleaned with a wire brush, treated with a rust stabiliser and painted with a 2 part epoxy paint in a traditional 'red oxide' colour.

10. Internal masonry work

Repairs

Internally, with the exception of the west bedroom, most walls were satisfactory, but in several places substantial re-pointing was needed due to leaching of lime mortar and settlement and displacement of individual stones. This was done first in order to consolidate the masonry prior to excavations into the floor for the under floor heating (Figure 20).



Figure 20. Completed re-pointing work in the parlour.

Excavation of the floor

An underfloor heating system supplied from a ground source heat pump was specified. This required the removal of the existing flagstones and the excavation of the floor, down to a depth of 400mm below the floor level. Part of this depth was required by the client to increase the room height. This was done by hand, and material was transported out in wheelbarrows. The depth of the excavation caused some apprehension for the contractor, fearing masonry movement due to removal of material at the base of the wall. In practice, for short periods (hours) exposing short lengths of wall in good condition on one side did not lead to issues. It was decided to excavate the floor in short sections (Figure 21), and additional masonry was built into the exposed footings of the wall.



Figure 21. New masonry consolidation on the wall footings following the excavation of the floor.

Laying of the insulated lime concrete floor

An insulated lime concrete floor plate, designed for a heating loop, was laid in two layers to just below the final floor level (Figure 22). Level of the floor excavation was tapered up towards the walls to minimise excavation close to the wall foot. The floor consisted of an insulation layer of aggregate (expanded glass cobbles) overlayed with a geotextile membrane to provide a clean working surface, and enclosed with a 100mm lime concrete layer.



Figure 22. Laying the first lime concrete layer in the parlour. The final floor level was as the original at the height of the hearthstone.

Internal plastering

The building had originally been plastered on the hard; this plaster was in generally in poor condition, and on the rear wall it was entirely gone. The walls were re-plastered with an insulated lime plaster, applied in two coats to a thickness of around 60mm (Figure 23). This was intended to re-instate the original finish and provide improved insulation. Given the original thickness of about 35mm, an increase to a thickness of 60mm gave a very small reduction of internal volume. The vapour-open nature of the new plaster maintained the breathable construction of the traditional build.



Figure 23. The first coat of insulated lime plaster being applied in the kitchen.

The original flagstones had all been removed and numbered to allow their replacement in identical order and these were then relayed over the lime concrete slab, giving a floor finish much like the original (Figure 24)



Figure 24. Re-laying the flagstones in the kitchen onto the insulated lime concrete.

11. Joinery work

Stairs and internal partitions

There was little damage to the stairs, but some local areas of vandalism required making good. Some lower sections of framing and panelling needed to be repaired. The fitted dresser/drawers in the box bedroom behind the stairs were removed to allow the formation of a new bathroom in the original space.

The hanging lum

Whilst one of the most interesting and significant features of the building, it only required modest repair, mostly associated with the fitting of an insulated flue liner. A double-skinned sectioned flue liner was used, following the line of the existing timber lined flue. The void between the liner and the flue interior was left clear; some modern practice requires this to be filled with a granular filler, but this is not appropriate in traditional flues of timber or masonry.

Timber floors

The original flagstone floor was only present in the kitchen and hallway, whilst the remainder of the ground floor had a timber floor, although as previously noted this had largely rotted away. In order to replicate the original floor finishes, the area of the previously timbered floors was made up with timber battens set into a lime concrete screed to allow fixing of replacement timber flooring. In order to ensure that the new timber flooring is unaffected by the underfloor heating, an engineered board was specified which comprised a softwood wearing-course bonded to a plywood tongue-and-grooved base which was fixed to the timber battens (Figure 25).



Figure 25. The new timber floor and the repaired box bed panelling in the west bedroom.

Repairs to the box beds

Where the lower sections of the box beds were in contact with the ground there were areas of timber decay. The damaged timbers were cut back, and new pieces were spliced on as seen in Figure 25. The splices used a diagonal joint that gives the best balance of strength and aesthetics. The new wood was a redwood of standard C17 grade, but care had been taken to allow it to settle in dry conditions before use. The bed frame on the kitchen box bed was retained and the area was re-upholstered as a form of sofa.

The timbers of the box beds, possibly made from salvaged shutters and other run timber, from another property were generally in good condition and there was only modest decay on some lower sections. The framing for the box beds was left in situ during the floor insulation works.

Works to the upper floor

This area of the building was largely left as it was to be used for storage. A layer of wood fibre insulation was laid on top of the existing floor (Figure 26) to give a thermal break between the inhabited floors below and the cooler space above. The existing lapped boards, with their covering of paper illustrations, were left in situ. The door giving access to the stair was repaired and used to close off the attic.



Figure 26. Wood fibre insulation laid on top of the floor in the attic rooms.

Repair to windows

There were two principal windows on the front elevation serving each of the core rooms with a further very small window in the rear elevation serving the small bedroom area behind the stair.

The two sash style windows appeared to be original and matched those pictured in the 19th century photographs. The upper sections were sound, but new cills and styles were required (Figure 27). Due to their small size, and their history, they were repaired like-for-like with no thermal improvement required by Building Control. There were no early glass panes remaining, nor the 'ancient knobble of glass' described by Nan Shepherd. Older glass, especially that from pre-1880 can be thin (down to 3mm), and it is likely to have been damaged at some point. Modern float glass, 6mm thick was used in repairing both sash windows.

In order to comply with Building Control requirements to ensure that the building could be evacuated via the windows in case of fire in the porch, the upper sashes had to be adapted to form casements; this require Listed Building Consent.



Figure 27. The repaired parlour window, following adjustment for use as a fire escape.

12. Rebuilding of the porch

This additional feature, probably from the late-19th century, appeared sound but was found to have rotted considerably at ground level. While it was to be retained as part of the Listed Building Consent, it required additional work in order to be re-configured as a kitchen; it was therefore entirely rebuilt on a new foundation (Figure 28).

Wood fibre-board was fitted between the new framing to provide insulation, and new larch boarding was fastened to the exterior in the same manner as the original.



Figure 28. The rebuilt porch, on the original footings and to the same profile, which became the kitchen.

13. Services and heating

Heating

The client wished to heat the building with renewable technology. A ground source heat pump was deemed to be suitable, and the heat was delivered by a wet system through an under floor coil bedded in the insulated lime concrete floor. This type of system, where low level heat is delivered into the building fabric for extended periods, is considered suitable for older buildings with a high thermal mass, and the construction of the croft suited this.

Due to the size of the croft being too small to fit the plant, the heat pump unit and associated tanks and vessels were located in the restored byre building close by, with insulated pipework linking the buildings (Figure 29). The system works by extracting thermal energy stored in the earth and this is collected by fluid circulating through underground pipework. The system specified required 400 metres of collector loop to be buried approximately 1.2 metres below the surface. This is now a standard specification, although involves large plant and equipment. The trenches

were dug in the field to the north east of the croft house (Figure 30). In some circumstances there will be considerations regarding buried archaeological remains; an assessment of the site indicated that this was most unlikely. In this instance, nothing was encountered.



Figure 29. The heat exchanger and other equipment in the restored byre.



Figure 30. The junction or collector for the ground source heat pump coils laid in the field to the north east of the croft house.

The underfloor heating matrix for the ground source heat pump was fixed to steel reinforcing mesh as the proprietary fixings supplied would not sit accurately on the lime concrete insulation layer (Figure 31). A smooth lime concrete floor slab was then laid encapsulating the heating coils.



Figure 31. The heating coil fixed in place prior to the final lime concrete layer.

The client also wanted to augment the under floor heating with a wood burning stove that could raise the temperature quickly in the kitchen if required. This was located in the kitchen, on the footprint of the hearth below the hanging lum (Figure 32). A modern double skinned flue was fitted within the existing timber of the hanging lum. This allowed the safe use of a fire in the building.



Figure 32. The new wood burning stove in the hearth below the hanging lum

14. Electrical works

Following dialogue with the utility company, it was determined that the existing power supply to Braeview was insufficient for the needs of the croft house and potential new demands on the site, and therefore the new supply described earlier was installed.

The electrical works for the croft house were for domestic purposes, and modest in scale. The new mains supply was terminated in the restored byre with all cabling to the croft house ducted and a consumer unit fitted within the croft to facilitate the lighting and mains circuits. Considerable efforts were made to ensure that the electrical fittings were discrete with all cabling incorporated within the new insulated plaster layers. LED and energy saving lightbulbs were fitted throughout the building.

15. Energy efficiency improvements and environmental monitoring

Part of the Historic Scotland support to the project was to pilot measures to improve energy efficiency. Key areas for upgrade were the insulated lime concrete floor, the insulated lime plaster, and the improvements to the ceiling. The ground source heat pump was an additional low carbon feature, although this case study will not address technical matters relating to this.

To demonstrate that the measures were effective, and that real improvements to traditional building fabric were achievable, in situ monitoring was commissioned. This has been carried out in most Historic Scotland Case Studies, and has been an important part of most projects. The pre and post intervention U-values of the walls, floor and ceiling are currently being measured using heat flux plates and standard procedures. The results of this monitoring will be available in Spring 2017.

Wall insulation

In refurbishment attention must be paid to assessing the risk of interstitial condensation. Recent work has shown that the methodologies for assessing condensation in some wall types are not suitable for mass masonry walls, as found in most traditional Scottish buildings. Therefore a robust attitude was taken in this case, and an assumption was made that in the event of a condensation event, the vapour open nature of the fabric would disperse any vapour or liquid water that might have formed (much as it had done when the building was first constructed with wet mortar). In addition, the occupancy of the building was going to be light, consisting of holiday lets, with room for only 2 people. In much retrofit of existing buildings, the provision of a vapour barrier is considered essential. This is not an appropriate approach for traditionally built structures, and in many places leads to trapped moisture, condensation, and progressive wetting of the masonry. Building regulations do not mandate a barrier, although many details do specify such. In the case of Tomintoul, Building Control were happy to accept the recommendations in Historic Scotland's '*Guide for Practitioners 6, Application of the Scottish Building Standards*'. In this document the principle that traditionally constructed buildings are

technically different from modern ones, and that they require a different approach in refurbishment, is accepted.

Lime concrete floors

In much refurbishment work suspended timber floors are replaced with mass concrete over a damp proof membrane. In traditional buildings this may cause dampness in the walls. This is due to moisture building up in the ground under the floor, where it could formerly escape. This moisture then rises up the walls. A lime concrete floor was specified for this project to allow a degree of vapour movement and dispersal from under the floor. It was also suitable for a heating loop for the underfloor heating system. Curing times for such floors are longer, and they need to dry out, as does a conventional concrete floor.

16. Finishing works

The built environment, while composed of structures and buildings of all sizes, is often assessed at two levels; the overall aesthetic and the 'feel' or impression given by the details of a building. In traditional structures, especially one where there is a high 'vernacular component', such details matter. In a small building like Tomintoul, especially inside, the details are particularly important. As such, much emphasis was placed on the correct repair and re-fastening of fittings and finishes. This included how plaster arrisses or edges were finished – not with a modern corner bead, but with a rounded, hand formed edge. The nature of the plaster, which while being smooth, was not entirely flat, giving a softness of line and plane. Existing joinery features, such as fire surrounds and shelving were retained. Re-painting of such work was kept to a minimum. It is the combination of these details that gives such buildings their special feel, and it is considered that this was achieved in this refurbishment.

Paint

The insulated lime plaster was painted with a clay paint. This modern material is vapour open and will assist the wall fabric in buffering and dispersing moisture. This is required, not just because of benefits to the traditional fabric, but also that the small internal volumes of the croft house will not be able to absorb the water vapour from habitation and cooking alone; therefore the internal surfaces will absorb some of this moisture. Limewash would have been equally suitable, with similar properties, but the client wanted to have a material that was easy to maintain and repair.

17. Conclusions

The building has been successfully upgraded and brought back into use. Damaged and defective items have been repaired and improved using traditional materials and techniques. Historic finishes have been retained while modern services have been

installed. The unique set of circumstances that made planning and design potentially problematic have been worked through and a most satisfactory result achieved, where the built and natural environments can co-exist. The accommodation, while small, has been maximised for use as a most attractive holiday let (Figure 33). The use of renewable energy and the energy efficiency upgrades have ensured that this small building, of proven durability and reliance, has a strong and sustainable future. Woven into this refurbishment has been an appreciation of the people who lived there and how such links connect us with a way of life that lies at some distance from our own.



Figure 33. The croft house viewed from the southeast in September 2016 following completion of works in July of that year.

Annex A. Additional archive images.



Catherine Downie at the cottage porch, early-20th century.



Janet Downie at the back of the cottage, circa 1890.



Tea party at the cottage, late-19th century.



The farm viewed from the hill behind the house, looking towards Braemar below, circa 1910.



The cottage in the 1990's.

Cuttings and images from the 'Illustrated London News' used as internal wall coverings at stairwell partition





Refurbishment Case Studies

This series details practical applications concerning the conservation, repair and upgrade of traditional structures. The Refurbishment Case Studies seek to show good practice in building conservation; some describe projects supported by Historic Environment Scotland, and some are entirely privately resourced projects. The results of some of this work are part of the evidence base that informs our technical guidance. At the time of publication there are 22 case studies covering measures such as repairs to masonry, upgrades to windows, walls and roof spaces in a range of traditional building types such as tenements, cottages and public buildings.

All the Refurbishment Case Studies are free to download and available from the HES website <https://www.historicenvironment.scot/refurbishment-case-studies/>

Technical Papers

Our Technical Papers series disseminates the results of research carried out or commissioned by Historic Environment Scotland, mostly related to improving energy efficiency in traditional buildings. At the time of publication the series has 23 titles covering topics such as thermal performance of traditional windows, U-values and traditional buildings, keeping warm in a cool house, and slim-profile double-glazing.

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Our INFORM Guides series provides an overview of a range of topics relating to traditional skills and materials, building defects and the conservation and repair of traditional buildings. At the time of publication the series has over 50 titles covering topics such as: ventilation in traditional houses, maintaining sash and case windows, domestic chimneys and flues, damp causes and solutions, improving energy efficiency in traditional buildings, and biological growth on masonry.

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