

**Report on Structural Survey of
Masonry Walls of Steading at
Balnagowan, Balnagowan Brae, Nethybridge**



Client :

Cairngorm National Park Authority
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1.00 Project Brief

- 1.01 Nortec Consulting Engineers Ltd were instructed by the Cairngorms National Park Authority to carry out a structural survey at The Steading, Balnagowan, Balnagowan Brae, Nethybridge.
- 1.02 The report was instructed after a Planning Application had been received for demolition of the premises and it was asked to consider the feasibility and practicalities of rehabilitation of the existing masonry structure for continued residential use.

2.00 Description

- 2.01 The report is based on a walkover survey carried out on 23rd March 2009. Only visible surfaces of the stonework could be inspected.

Most of the internal finishes had been previously removed and most of the internal face of stonework was exposed.

- 2.02 The building is of traditional construction with masonry walls and timber rafters and sarking with slate covering. It is rectangular in plan and orientated with the gables at north and south, the side walls east and west. The photograph on the front cover shows the north gable and east wall. There appears to be two distinct stages of construction. The northern section, approximately one third of its length, has been built with masonry to eaves level, and ties forming an attic floor at eaves level. The southern section is of one and three quarter storey construction and at a lower level, with first floor joists resting on slots in the masonry and a raised tie roof structure giving headroom to the first floor. There is a retaining wall approximately 1.8m high

across the building at the difference of levels. Ground level on the east wall, along the southern two thirds of the wall, is just below first floor level so that section of wall is also retaining. The four floors of the structure are all at different levels, but the roof is continuous, in one plane.

- 2.03 It is understood that works were carried out some 20 years ago to convert the steading to a habitable property. Some minor remedial work was carried out to foundations on the west wall, a door was converted to a window, a window to a door, both in the east wall, north end, and some ties were raised further at the roof junction to give access to the upper loft area. A dormer in this area, on the east side was also inserted at this time. A large area of the mid retaining wall was made good or faced with blockwork. A blockwork face was also constructed along the retaining section of the east wall, with a plastic sheeting separator, presumably in an effort to prevent dampness. The major alteration to the structure however was the demolition and rebuilding of the south gable. This has been carried out in blockwork with a roughcast finish, and incorporates a chimney breast finished in stone internally at first floor and a chimney head.
- 2.04 Some more recent work was carried out, the installation of a velux window, the stripping out of plasterboard and the replacement of timber lintels with prestressed concrete and concrete brick infill. At the east retaining wall area a section of blockwork had been removed to examine the make up of the wall in that area. Excavation of topsoil and some subsoil had also been undertaken around the outside of the building, revealing the foundations.

3.0 External Observations

- 3.01 North Gable. Masonry had been repointed, lines appeared true, no evidence of movement, leaning or settlement could be seen. The line of the east skew stones was true, the west showed a slight outward cant at the top. No cracking was noticeable. Old lime mortar in the exposed foundation area (Photograph 1) was slightly soft and could be raked out.
- 3.02 West Gable. Concrete underpinning had been undertaken some months previously, the formwork had not been removed. Masonry had been repointed and was generally in good condition (Photograph 2). A small area of blockwork underpinning was also noted. A fine crack in the wall running vertically could be seen at the line of change of construction (Photographs 3 and 4). No other evidence of movement or out of plumb walls was noted. The two storey section of the west wall is illustrated at Photograph 5.
- 3.03 South Gable. The south gable had been re-built in blockwork masonry, with stone quoins and had a dry dash roughcast finish. A chimney head had also been built. At the east end of the gable the reconstruction had been badly formed against the retained bank (Photograph 6). A thin crack was noted in the blockwork above and to the right of the upper east window and from the window vertically downwards (Photographs 7 and 8). The concrete foundation had been exposed in one area and was seen to be of poor quality of construction.
- 3.04 East Wall. The wall had been heavily repointed. No evidence of movement was noted, no leaning or cracking (Photographs 9 and 10). The foundation areas as in other areas were exposed and showed soft original mortar and, in places, some

topsoil in joints. It was noted that, at the north end, the door had been changed from a window and the window changed from a door.

- 3.05 Roof. The roof showed some signs of movement but generally was in reasonable condition. The ridge although not absolutely straight did not show any major sagging. A high point was noted at the change in construction and the slates appeared open in that area.
- 3.06 Ground Conditions. The ground conditions appeared to be of reasonably dense mixed sands gravel.

4.00 Internal Observations

- 4.01 North End Upper Floor. No stonework could be seen as the plasterboard had not been removed from the north gable. At the joint in the two types of roof construction it was noted that the sarking did not tie across the joint and the joint was tapered, being more open towards the top (Photograph 11).
- 4.02 North End Ground Floor. Masonry was generally good, mostly well pointed. The construction difference at the joint in the structure was noted on the east wall (Photograph 12). Poorer quality mortar, mixed with topsoil was noted at foundation level (Photograph 13).
- 4.03 South End Upper Floor. The east wall showed original stone masonry to the north of the door (Photograph 14) and blockwork to the south of the door (Photograph 15). Some masonry was loose at floor level of the north side of the door. The south gable had been reconstructed in blockwork with an exposed stone masonry chimney

breast (Photograph 16). A vertical crack was noted below the east window, mirroring that noted on the external face. The west wall showed original masonry construction, generally well pointed. Blockwork had been built into the wall at the return at the gable and a loose stone was noted in this area at high level. Pointing was more open along the floor line where the joists were seated in pockets in the wall. Timber windows and door lintels had been replaced with prestressed concrete and concrete brickwork. It was noted that the rafters all showed a lean of approximately 50mm towards the south, consistent with the widening gap noted in the sarking at the change of construction.

- 4.04 South End Lower Floor. The east wall had a blockwork skin. A section had been cut out to reveal 100mm thick blockwork, polythene sheet and original masonry (Photograph 17). The original masonry consisted of a stone inner leaf with a stone rubble infill. The inner face of the stone outer leaf could be seen. The rubble infill was not securely bonded, the mortar being little more than sand (Photograph 18). Temporary propping had been installed in this area. The south gable was constructed in blockwork, a crack being noted at the east side, mirroring that on the external face. Blockwork had been returned along the west face for a short distance, the remaining wall being original masonry. Pointing in the upper section was satisfactory but the lower area near the floor was more loose. Timber lintels had been removed and replaced with prestressed concrete and concrete brickwork (Photograph 19). The north wall, forming a retained section at the junction of the north and south parts of the building had been replaced and/or built with blockwork (Photograph 20).

5.00 Discussion

- 5.01 Much of the stonework of the structure is of good construction. The walls are all generally plumb with no leans. There does not appear to be any settlement of the building, the floors being level, the roof being reasonably straight.
- 5.02 Ground conditions appear satisfactory for the support of low rise traditional building of this nature.
- 5.03 The original building appears to have been in two phases. A difference in construction can be seen internally on the east wall. The portion to the south is at a lower level and the ground floor of the upper section is retained. The differing construction can also be seen where the roof structure changes, the sarking boards being discontinuous at that point and adjacent rafters having a different construction.
- 5.04 A fine vertical crack was noted in the external west wall at the point of the junction of the two constructions indicating that some movement has taken place since the repointing exercise (thought to be about 20 years previously). The cracking is of a minor nature and does not appear to be connected to any settlement. It may be due to some shrinkage in the cement mortar and indicating the previous change in construction.
- 5.05 The new south gable, although again plumb and true does have some defects, particularly the lack of construction into the bank at the east side and the poor quality foundation. A fine crack at the east side of the gable is seen on both internal and external faces. The crack is above and below a window where a 215mm thick section of gable wall abuts the much thicker masonry of the east wall. Once again, even with the poor quality of construction in this area, there is no evidence of settlement, the

window lintel being true and it is likely that the crack is due to shrinkage of the gable blockwork and being expressed at the weakest point of construction, above and below the window.

- 5.06 An unusual feature is the lean of some 50mm in the rafters of the south section of the building. The movement must have taken place either at, or before the time of reconstruction of the south gable as the lean has been corrected, the last rafter against the gable and the gable itself being plumb.
- 5.07 The reduced ground levels around the building has revealed that some topsoil is mixed with mortar and sand in the joints of the foundation stones. The topsoil can also be seen in the joints of the bottom stones in both the north and south areas of the building.
- 5.08 The construction of the main retaining section of the east wall could be seen at the lower level where a section had been cut open. The internal section of the wall was shown to be loose with rounded cobbles and no cohesion in the mortar.
- 5.09 Although there are some defects in the building the stonework has been in existence for many years, without showing serious evidence of failure. The founding stones in construction at this time were quite often padded with local material rather than using mortar and this aspect is not unusual in our experience. Some work has already been recently undertaken successfully, for example the renewing of lintels and underpinning to the north end of the west wall. The west wall, north gable and north section of the east wall could all, as far as masonry is concerned be retained, with the necessary remedial works of some underpinning and repointing. The remedial work in these areas could quite easily and safely be carried out in small sections. The southern section of the east wall, the retaining section, shows some poor quality

construction, the inner core being loose rubble and this section would not be so easily retained in use. A system of temporary works could be devised to support the upper section of wall while the lower section is rebuilt, but this will be costly. Alternatively the wall could possibly be stabilised by a system of pressure injection, although a scheme would require to be carefully worked out to ensure that no bursting of the wall would occur. The south gable, being of more recent blockwork presumably could be demolished but again a scheme for its replacement would require careful consideration to ensure stability of the leaning roof and the east wall where rebuilding at the south east corner would be required.

6.00 Conclusions

- 6.01 Much of the existing masonry of the west wall, the south gable and the north section of the east wall is in reasonable condition, being good in line and level and showing no evidence of settlement and could be retained, with remedial work, in a residential use.
- 6.02 The southern section of the east wall, the retaining wall, will require to be stabilised, either by rebuilding the lower section using a temporary shoring support system or alternatively by pressure grouting.
- 6.03 The south elevation is constructed of recent masonry block and could be retained, although temporary shoring would again be required in order to carry out construction of the wall at the southeast corner.

- 6.04 Whether or not the cost of carrying out any remedial works is viable compared with the demolition and new build cost envisaged can only be gauged if detailed schemes are drawn up and priced.

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