REPORT OF INSPECTION

OF

ROOF COVERING AND ROOF STRUCTURE

AT

THE SOUTH WALES CAVING CLUB HEADQUARTERS

1-10 POWELL STREET

PENWYLLT

PEN Y CAE

SWANSEA

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INSTRUCTIONS

I am instructed to carry out an inspection and prepare a report of the roof covering and roof structure at the South Wales Caving Club Headquarters at Powell Street, Penwyllt, Pen y Cae, near Abercraf, Swansea.

The inspection and report is concerned with the roof covering and main roof structure of the premises. It is not a full Building Survey of the property and should not be taken as such. None of the services within or provided to the premises have been tested and no comment can be made on the suitability, adequacy or condition of them.

None of the timbers, whether covered over, unexposed or built in have been inspected and no warranty can be given that they are free from rot or decay. The roof timbers have been inspected however and comment is made on their condition within the report.

GENERAL DESCRIPTION

The premises comprise a row of 10 two-storey former cottages, probably housing the workforce for the quarry situated very close to the premises. The properties are now in one ownership, and form the Headquarters of the South Wales Caving Club. The cottages are over 100 years old built of solid masonry beneath a traditionally pitched originally slate covered roof. It is clear that the roof has been re-covered in the past, from information provided, probably around the mid 1960's. The existing slate roof covering and under slate felt is therefore about 45 years old.

There are no front gardens or yards and from the evidence on site no rear gardens the rear boundary of the property appears to be close to the main rear wall of the properties.

There are entrance porches to some of the main front doors but these have not been inspected. They appear to be later additions to the properties.

The main walls are about 550 mm thick and semi-coursed and coursed to the front elevation built from locally quarried stone.

The roof is traditionally constructed comprising timber trusses purlins and rafters supporting a slate covering. Several chimney stacks remain but only one, at the right hand end is in use serving a wood burning stove at ground floor.

Internally significant alterations have been made to the layout at both ground and first floor to accommodate the club. This now provides overnight accommodation, administration facilities, kitchen, relaxation areas, workshop and stores, toilet and washroom accommodation. As would be expected the main sleeping accommodation is at first floor together with some toilet and washroom facilities while the ground floor is given over to the remaining facilities and accommodation.

Despite the alterations there remain distinctly 10 individual original dwellings with, in most cases, the original stairs to first floor.

CIRCUMSTANCES OF INSPECTION

The inspection was undertaken by N G Iveson MRICS on Saturday 13 January 2007. The weather conditions were overcast with continual rain.

All descriptions of the premises, that is, left and right, front and rear, are given as if facing the main front entrance to the property.

Access to all roof spaces was available.

The report is given on each individual former dwelling beginning with number 1 at the left.

GENERAL COMMENT

There is evidence of movement of the main walls although this is thought to be long-standing and evidently of some age. To the front there appears to be some general movement towards the head, top, of the wall inwards while correspondingly at the rear there is some minor lateral movement outwards, again towards the head of the wall. This does not affect all the main walls and parts are generally true and plumb. The movement outward to the rear wall is indicated by vertical cracking affecting former party walls, that is the original dividing walls between the original dwellings, at first floor.

This type of movement is considered common in properties of this form of construction and in this type of location where there has undoubtedly been some ground movement in the past. The cessation of extensive quarrying locally indicates that further movement of this type can be considered negligible. However, it is recommended that provision be made to provide lateral restraint to the rear walls to positively prevent any further movement. This can be achieved by the introduction of restraint straps fixed to the party walls and the main rear wall at suitable locations.

The right hand gable wall has been re-pointed in what appears to be a cement based mortar. This can affect the masonry blocks causing lamination of the stone and there is some evidence of this here. This type of erosion can lead to failure of the stone itself and consequent water and damp ingress and potentially failure of part of the wall. Also and possibly a more immediate problem the use of a cement based mortar creates a hard jointing compound that can lead to damp and water ingress. The original lime pointing allowed damp and moisture to evaporate through the outside surface. Using hard cementitious compounds prevents evaporation from readily occurring and thus the only natural method available to the moisture is to migrate to the inside face thus appearing as damp on internal surfaces.

INSPECTION

Number 1:

On the left gable wall there is a stone built chimney stack that remains open to the ground floor. There is evidence of quite severe sulphate attack affecting the mortar joints to the masonry and decay such that there are holes through to the flue. The flue should not be used although there is no evidence to suggest that this might be the case for the foreseeable future. Pots should be capped and ventilated to prevent excess moisture and water from entering the flue which will promote conversion of the sulphates to acid increasing decay of the pointing and jointing material.

There are metal tie bars at ceiling level between the feet of the rafters to the front and rear. There is noted to be very little tension in the ties that are fixed to the end of alternate rafters. As there is no tension the ties bars are considered redundant.

Timber purlins where bearing on to the gable wall suffer from severe dampness at and near the ends. This is indicative of damp and water penetration through the gable end wall at high level. External pointing should be checked, raked out and renewed as necessary. The comment above about pointing material should be noted. Dampness of the degree noted here could lead to wet rot. You should be aware however that if the amount of water ingress is only reduced certain levels of moisture content could promote dry rot fungal attack. It is essential that the timbers are allowed to thoroughly dry.

There is some visible sign of dampness towards the rear part of the roof the cause of which is probably rain entering below slates and passing through decayed brittle felting.

The feet of the rafters are correctly placed on the wall plates at front and, as far as could be seen, the rear. However, they are not spiked or apparently otherwise fixed to the wall plates, relying on the loads from the roof to maintain integrity and position. The ties would have provided some resistance to spread of the roof but as noted above these are now loose and therefore not functioning as probably intended.

The lack of mechanical fix of the rafters to the wall plates is common throughout the roof.

The party wall has been cut down and reduced at the centre to allow access and storage. This would have also provided some degree of lateral restraint provided that the roof structure was properly fixed to it and that there was some form of lateral restraint below this level. The remains of the party wall support the purlins.

The purlin to the rear pitch is not fixed square to the rafters. This is thus not providing proper support to the rafters as the bearing part is minimal and there are no fixings between the purlin and rafter. As the purlin is not fixed vertically, that is square to the rafter, there is a tendency for the timber to deflect, bend, under load and this is evident here.

General comment. The head or lintel to the first floor rear window is missing, probably taken out for renewal, but this allows the wall plate to span the opening which it is not designed for.

Number 2:

The chimney breast at the right hand side has been removed here and the remainder of the stack supported on a steel beam spanning between the front and middle spine wall and another from the rear to the middle spine wall. The load bearing capacity of the steel has not been checked however the size of the steel beam suggests that it is adequate for the purpose.

There is some dampness present in the masonry stack but this does not yet appear to affect further than the top parts of the masonry immediately below the roof line. Of course dampness cannot be detected inside any remaining flues or the inside of the masonry.

There is some decay affecting the feet of the rafter to the front pitch adjacent to the chimney breast. This appears to be localised and may be due to damp ingress from the front below the eaves. There was no evidence at inspection of water ingress from this part.

Number 3:

There are new rafters here although these may be of some age but certainly are not original. Similar comment applies about fixing to the wall plates.

The purlins to the front and rear pitches are laid and fixed almost flat, that is not vertical to the rafters, and as a consequence they have deflected under the normal loads applied from the roof covering and wind. It is suggested that these be replaced with adequately sized timbers, fully treated and fixed in accordance with good practice.

Of more importance however is the rear purlin. This appears to be made up from an original purlin and a newer section part of which is cut and does not extend the full width of the roof space. This should be renewed with an adequately sized treated timber in a full length properly supported and fixed to the party walls at each side.

The party wall has been cut down here and thus there is again a reduction in the lateral support afforded by this as noted in the roof space to number 1. There is also some dampness evident here to the party wall to the left probably from the stack above at that side and also to the remaining stack at the right. Damp ingress through stacks is usually through un-capped flues and open flues and this can be reduced to a minimum by providing ventilated caps to pots. In some cases there is some damp passing around flashings fixed to the stonework. Where these cannot be properly bedded to the masonry this is a problem.

There are cold water header tanks located here and positioned on the spine wall that runs along the centre of the building. There are angled struts as brackets to provide additional support to the tank bases and all are covered with timber panelling and insulation.

Number 4

There are new ceiling joists fixed here but again they are not fixed or spiked to the wall plates at front and rear nor are they fixed to the rafters. Fixing to the rafters, if the rafters themselves are

fixed to the wall plates, does provide some degree of lateral restraint to the outside walls provided of course the wall plates are themselves properly and adequately fixed to the walls. This is apparently not the case here and wall plates also need to be fixed.

The purlins to the front and rear are again laid almost, if not absolutely, flat and have thus seriously deflected under loading.

There are cold water storage tanks located in this roof space similarly supported off the spine wall with strutting and brackets. All are covered with panelling and insulation although as before some of the panelling is loose and insulation may not be as effective in some parts.

General comment. This is also applicable to the storage tanks noted in number 3. All overflow pipes should be properly and adequately lagged and protected against freezing since, if these freeze and there is a failure of the ball valve, overflow from the tanks would cause serious disruption to the accommodation beneath.

Number 5

There is insulation laid above the ceiling here. The roof space is not adequately, or possibly not at all, ventilated and therefore there is a real risk of condensation occurring and forming on the underside of the under slate felt. This can lead to decay of roof timbers and staining on ceilings below. Modern requirements suggest that ventilation is provided either by ventilating slates or at the eaves. For the size and type of roof space it is suggested that at least two ventilating slates are provided, one to each pitch, although it would be preferred to have two to each at about mid-height up the roof slope.

There is woodworm affecting the ceiling joists. Unfortunately it is not possible to confirm whether or not this is live since the flight holes are the only indication of woodworm infestation and these are formed in spring. It is suggested that the woodworm be treated with an appropriate spray treatment as if it were live. This would help prevent further infestation next year.

There is a rotted rafter adjacent to the stack at the left-hand side.

The purlins to the front and rear are again laid almost flat and they appear to be undersized for the span and loads to be supported. All are very badly deflected exhibiting severe sagging noted externally in the roof finish.

There are gaps at the party wall to the right and these are filled with compressed newspaper used as jointing compound for old bricks. While this may have been some idea of adequate support quite clearly it is totally unacceptable. It is suggested that the paper and bricks be removed and the gaps built up using proper materials. Of course the bricks could be re-used. There is a strut to the front purlin but this is fixed almost horizontal and therefore considered Inadequate. Strutting would not normally be required where the roof remains covered with slate as this would not be heavier than the original. It may have been provided to combat sagging of the purlin but is obviously woefully inadequate.

Number 6

In this roof space there is the spine wall across the centre. There are ties here formed from steel cables with tensioners fixed between the rafters to the front and separately to the rear. There is tension in the steel cables and thus must be working.

The purlins again are almost flat and sagged due to the weight of the roof. This is the same effect as noted previously to other roof spaces. However, in this instance several of the bearing points for the purlins are poor and some form of bracketing or additional support is required to properly support the ends of purlins. There is also some dampness affecting the purlin to the right hand side. This is due to damp and water penetration through and possibly around the stack. Apart from the steel cable ties this roof appears to be almost original certainly there is no evidence of any new timbers here.

Number 7

There is again deflection of the purlins in this roof space and severe deflection to the rear pitch. The purlin here is joined so is in two sections and the joint appears to be ineffective. It spans across the party wall to the number 6 but is not properly fixed. To the front the support afforded the purlin at the party wall to number 6 is inadequate.

There are timber ties at high level probably fixed when the rafters were noted to be parting from the ridge board. The gaps remain where the ends of the rafters have parted from the ridge board and it is evident that no additional fixing was or has been provided to prevent such movement.

At the party wall to number 8 there is again brick infill with paper joints. This is similar to that found in the roof space above number 5 probably carried out by the same individual. Similar comment applies.

It was noted above in roof space 6 that there was dampness affecting the purlin end. This is confirmed as being caused by water ingress through badly set slates close to and abutting the stack allowing penetration to seep through at the side and migrate to the purlin end on the opposite side of the stack. This is possibly due to large masonry blocks preventing water from exiting on this side of the stack.

Number 8

There is deflection of the purlins again here although they do not appear to be laid flat as others. The deflection is probably due to insufficient size of timber, several are quite small section, and any work carried out should take this into account i.e. the correct size should be used for any replacement.

This roof is again tied at or close to ceiling level with steel cable tries and again these were noted to be under tension so evidently working. The original spine wall remains across the centre of the roof

space and this does afford some degree of stability to the structure as a whole and also provides a secure fix for the cable cross ties.

The same person has dealt with bricking up gaps as noted above with the use of paper as a jointing material to the roof space at 7. Similar comments apply.

Number 9

There are water tanks on the spine wall here similar to those already detailed.

At the party wall to number 10 there is very poor make up and some attention is required to the masonry and brickwork especially around the support to the rear purlin.

Again deflection of the purlins is evident and as a result of inadequate sized timbers being used although they are possibly original. Square setting to the rafters is achieved but it is the depth of section of the timber that is suspect.

Number 10

There are holes through to the flue in the stack within the roof space. The fire below is in use and the holes should be filled to promote proper evacuation of the flue gases, smoke, and to prevent smoke and fumes from entering the roof space and very likely the rooms below. There is very poor gap filling evident to the party wall, the stack, and severe water penetration at the side of the stack probably due to failed lead flashing.
The purlin to the rear is badly deflected probably as a result of inadequately sized timber being used although some of these may be quite original.

There are some new rafter sections here although they are evidently not full length such that some parts have been renewed from the purlin to the eaves while others from the purlin to the ridge. This is likely to be as a result of renewal without removal of roof coverings. Many of the original rafters

remain alongside but are redundant. There is no real need to remove them but if the roof is to be overhauled this could be easily achieved.

The front part of the roof space is boarded over for storage but you should note that damp and water penetration occurring now may cause deterioration of items stored as well as long term deterioration of the structure.

As noted in the general comments section above there is, as would be expected, some damp penetration through the gable end wall within the roof space.

CONCLUSIONS AND RECOMMENDATIONS

There are evidently a number of defects with the roof structure although many of these are not seriously threatening the stability of the roof at present. That is, there does not appear to be a danger of imminent failure of the structure but nevertheless some urgent work is advised.

Much of the distortion of the roof covering visible from the outside is due to deflection of the purlins. As noted above under the individual roof spaces, the purlins, where they appear to have been replaced, are set, although possibly not fixed, almost horizontally, like a plank. The strength of the timbers is in the section and when used with the deepest section vertical or near vertical there is the maximum strength. Similarly when the purlin is not fixed at right angles to the rafters there is very little available strength.

There is some spread of the roof. This is a term used when the weight of the roof and roof covering bears down on the outside walls through the rafters and the bottom end of the rafter forces the wall plate outwards. This happens especially where the rafter is mechanically fixed to the wall plate but there is no corresponding tie at ceiling level i.e. the ceiling joists is not fixed to the wall plate or rafter. Here there are no indications of mechanical fixing. Some restraint is afforded by the cable ties. The rod ties are very loose in many cases and it is thought that these will be achieving very little in the way of restraint.

There is damp and water ingress through failed lead flashings. Whether this is due to lack of proper bedding in masonry joints or where they are not effectively bedded could not be determined. However, it is almost certain that, apart from the brick built stack serving the wood-burning stove located in number 9, there are no lead trays through the stacks to prevent migration of damp through the masonry. It may be worthwhile considering removal of all the disused stacks and continuing the roof covering over. This would effectively eliminate the problem.

It would be possible to undertake overhaul of the roof in parts or sections taking each "house" in turn. The purlins need to be renewed where they are noted as being undersized and seriously deflected or where they are laid flat or nearly so. This would, for ease of access, require that the roof covering be stripped and set aside for re-use. The rafters could be taken out and re-used where they are sufficiently robust but the cost of new rafters would not be considered prohibitive in any event.

The under slate felt is becoming brittle. Modern linings are available that allow some degree of vapour penetration thus relieving difficulties with condensation although positive ventilation is still required. Any stripping and recovering of the roof will require that Building Regulation Approval is obtained even where the same roof covering is to be re-used. This is to ensure that the rafters and purlins used are of adequate size and that the roof space is ventilated. Certainly, even in the short term, ventilation is required to the roof spaces above sleeping accommodation where insulation is laid. It is also recommended that ventilation is provided, again even in the short term, above washing facilities, especially as showers are fitted and these promote a considerable degree of moisture into the atmosphere. This is likely to form as condensation on the under side of felt in unventilated roof spaces.

Immediate repairs to loose or missing slipped or damaged slates is required to prevent water penetration into the roof and building generally.

Signed  Dated.. 14th March 2007

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