Design and Access Statement

The building has been neglected in the past, but as a result of 'Works to Roof to include the replacement of decayed wall plate, rafters and modern softwood purlin' DC/16/0198/LB and 'Works to Walls and Sole Plate' DC/16/1532/LB, the building is now in good order structurally with a few exceptions. This application aims to address the remaining structural issues regarding the roof.

Application DC/16/0198/LB dealt with the SW elevation rear only. This new application addresses issues with the opposite (NE) side of the roof.

The NE front elevation roof structure has some structural issues that need to be resolved to ensure the long-term survival of the building. The North Easterly facing elevation, is exposed to less sun and wind than its South Westerly counterpart, and therefore the straw does not deteriorate as quickly, and critically, wind does not drive moisture through the straw onto the roof components. Because of this, the NE elevation roof components are, in general, remarkably well preserved. The age of the long straw base coat on the NE elevation is unknown. It is apparent from inspecting the loft space that it does not date back to the original construction of the house, although there are a few rope ties remaining from earlier coats attached to the clay wattle and daub infill between the rafters.

Turning now to the survey drawing and accompanying photos, we can see that the 17C rafters 2, 3, 4, 5, and 6 in Rafter Section Bay 1 are severely deformed. **Photo 1** The bark still attached to the rafters in this bay indicates these hardwood components were installed 'green'. The rafter cross-sections, particularly toward the top end of the roof, are of a small size, - (rafter 3, 50mm diameter at ridgepole union) in comparison with the rafters in the other bays in the building. The rafters have deflected approximately 300mm at the most extreme, compared to the relatively straight rafters in the adjoining bay. The entire 17C structure seems to have dropped down about 200mm from the ridgepole height of the adjoining bay, **Photo 2** and also move at least 200mm away from the adjoining bay. As part of this collapse of the structure, the end of the purlin is no longer attached to the purlin in the adjoining bay, **Photo 3.** It has been made good with a new oak repair section attached to the 17C rafter of the adjoining bay. The single collar in Rafter Section Bay 1 appears to be sound with some minor insect attack.

It is difficult to establish how much of the deflection of the rafters has occurred over an extended period of time, and how much was the result of the rafters bowing due to the weight of the initial thatch coating when the building was first constructed. Due to the small cross section of the upper end of the rafters, it is likely that some deformation occurred when the first roof covering was applied. It is also likely that the deflection was then compounded due to the addition of thicker layers of straw during re-coating work and the backfilling of straw into the cavity created by the deformed rafters, to form a straight roof surface. At some point the ridgepole and purlins in this section became completely detached from the adjoining bay. It is unlikely this happened before the major work was carried out in 1810, which included making up the new gable end on the SE elevation. This is because no measures dating from that period can be found to counteract this extremely serious structural problem.

Other than this deformation, the rafters are in good condition with no significant insect attack, as are the purlin and ridgepole. All 17C components mentioned here are made from unidentified hardwoods, the rafters are believed to be elm.

The 17C rafters have 19C softwood sprockets attached to their lower ends, supporting a 19C softwood soffit board. The sprockets could not be inspected, the soffit board appears to be in reasonable condition. The rafters are attached to a curved wall-plate, made from an unidentified hardwood. This is in good condition.
The 17C clay and straw 'wattle and daub' infill between the rafters on the inside of the first-floor room is largely intact. **Photo 4.**

The 17C rafters on the opposite side of Rafter Bay 1 (the SW rear elevation) are similarly deformed, and a new oak rafter, purlin and ridge board structure has been built over the top of them to remove the load from the 17C structure on this side of the roof, **Photo 5.** This structure replaces an earlier softwood structure, believed to have been installed in the 1980's when the 17C structure had partially collapsed on this side. This structure is currently attached to both the SE gable end via the new ridge board and the ridge pole of the adjoining bay on the other side. It is also attached to the deformed 17C structure, via its new purlin, which lies over the top of the 17C structure. This new oak work was carried out as part of application DC/16/0198/LB (2016). Whilst this new oak work alleviated issues effecting the SW elevation, it does not provide a wholistic fix for the roof structure in this bay, neither does it address issues of deformation of the opposite NE roof components.

Moving on now to Rafter Section Bay 2 we can see that a dormer window has been inserted into the17C roof structure on the NE front elevation. Evidence in construction and plaster-work would suggest this feature was part of the work done in the early 19C to convert the house into two cottages. Two 17C rafters have been sawn off to facilitate this. One of these rafters, (9), is missing apart from a short section, very severely damaged by insect attack and decay, next to and below the purlin **Photo 6**. A new oak 'plank' temporary repair section, (9a) has been inserted internally here to prevent the long-straw roof collapsing inwards. The second, sawn-off rafter (10) is intact, **Photo 7** and forms a sound union with the adjoining collar and purlin.
To either side of the dormer window, the two 17C rafters are no longer viable as load-bearing components. Looking now at oak rafter 8 to the left of the window, we can see severe insect attack and some decay, certainly historic, and possibly on-going. **Photo 8.** The sap-wood is either missing altogether or eaten away to the extent it has no structural value, and the insect attack also appears to have compromised the structural integrity of the heartwood in places, **Photo 9.** The softwood frame of the dormer window in parallel with this rafter and the softwood ceiling joists, are sharing the load of this component.
The rafter to the right of the window made from an unidentified hardwood (11) also has some insect attack, but it is the section cut out of it to accommodate the window, and the part of its face that is cut off which is the main cause of failure, **Photo 10.** The rafter is deformed, having bowed inwards, and has a large fracture in it about one meter down from the purlin, **Photo 11.** The frame of the dormer window in parallel with this rafter, and the softwood ceiling joists, are sharing the load of this component.

The supporting 17C purlin is in good condition, as is the adjoining collar, **Photo 7.** The load from the straw roofing material on the main roof above the dormer window now appears to be shared by the purlin, the first-floor ceiling joists, and the structure of the dormer window insert itself. No successful attempt has been made during the installation of the dormer window to account for the extra load applied to the two rafters either side of it, or the supporting purlin. The other 17C oak rafters in this bay appear to be sound, despite some historic insect attack to the sap wood, and many are of substantial section. Soot blackening and cut-outs from an earlier structure indicates some of these rafters have been used in an earlier building, such as a medieval hall house.
The 17C rafters have 19C softwood sprockets attached to their lower ends, supporting a 19C softwood soffit board. The sprockets could not be inspected at this time. The soffit board appears to be in good order.
The softwood structure of the 19C dormer window is in good order.
The 17C clay and straw 'wattle and daub' infill between the rafters on the inside of the first-floor room is largely intact.

The proposed work is the outcome of some years of research and consultation with some of Suffolk's most knowledgeable and well-established historic buildings Contractors. The work is a repair only, with no alteration to the appearance of the exterior, and little if any alteration to the appearance of the interior. The work also coincides with essential long straw stripping and re-coating work that now needs to be done.

It is proposed the roof on the NE rear elevation be repaired, with maximum retention of historic components where viable, and with a strong bias towards compatible component materials and specification where replacement components are needed. Where Historic components cannot be repaired, similar components should be created as a substitute. Care should be taken to retain and repair 17C clay and straw 'wattle and daub' infill where it is necessary to disturb it.

Structural symmetry will be restored between the front and rear roof elevations, and the design flaws in both Rafter Section Bay1 and Rafter Section Bay2 will be addressed.

Turning now to Rafter Section Bay1, a structure of new oak rafters, purlin and collars will be fitted over the top of the 17C roof structure mirroring that already built on the opposite side (the rear SW elevation). This will remove the load of the straw roofing material from the deformed and partially collapsed 17C structure of the front NE elevation roof. It will also 'prop up' the SW elevation's existing new oak structure by attaching the new oak to the new oak ridge board already in place. This will carry the load down to the wall plate below on the NE elevation, creating a strong, balanced, roof structure in this bay. Two collars will also tie the SW and NE new oak structures together. This will leave the 17C rafters to carry the load of the first-floor ceiling only, whilst they are also attached to the new structure via the new purlin. The new oak rafters will be placed beside the existing 17C rafters, although they will only be next to each other at the lower (wall plate) end, due to the deformity of the 17C structure. This should limit any interference to the clay and straw 'wattle and daub' infill to the very bottom of the rafters near the wall plate. A breathable, fireproof

membrane, with treated softwood battens will be fixed to the proposed new oak structure. This will match the work previously carried out on the SW elevation and complete the fire-retarding measures in this section of the house, safeguard the historic fabric of the building against the effects of the long-straw thatch catching fire. The 17C structure should remain intact, with its clay and straw 'wattle and daub' infill, and the 19C sprockets and Soffit board should remain intact also.

Turning now to Rafter Section Bay 2, there are two issues to address: the extra load created on the remaining 17C components caused by the cutting of two rafters to accommodate the dormer window, and the deterioration of the 17C components.

Two oak rafters will be installed either side of the dormer window, replacing the decayed and broken rafters. Where new oak rafters were installed on the opposite (SW) elevation, 100mm x 100mm oak was used. The other rafters in this bay on the NW elevation typically measure about 150mm at the lower end. 100mm x 200mm will be used either side of the dormer window to account for the extra load carried due to the two 17C rafters sawn off to accommodate the window. These rafters will be chamfered on the corner of the inner face to match the existing 17C rafters in appearance. The clay and straw 'wattle and daub' infill, either side of the replacement oak rafters will be carefully repaired. New oak sprockets will be fitted to support the soffit board and battens. The remnant of decayed sawn-off rafter, (9) and temporary repair section (9a) will be replaced with a new 100mm x 100mm oak rafter. A 100mm x 150mm oak 'purlin section' will be used to support both the new 100mm x 100mm oak rafter, and the surviving 17C sawn off rafter, spreading the load to the two stronger rafters either side of the window. This will also reduce the extra load currently placed on the existing 17C purlin.
A breathable, fireproof membrane, with treated softwood battens will be fixed to the area of the main roof above the dormer window. This will encompass the small area in the loft above the ceiling joist, spanning the width of the dormer window between the two new oak rafters. This will match the work previously carried out on the SW elevation. There is also an opportunity to insert two strips of fireproof membrane over the lower section of the two new rafters, either side of the dormer window, if it is practical to staple it in place over the wattle rafters.

Please see 'Schedule of works' doc for complete materials and repairs breakdown with a detailed description of works, and 'Description of works' in the application form for a brief summary description of works.

Parts list of existing components referring to drawings (The Cottage 3 Low Green Survey and The Cottage 3 Low Green General Arrangement 01)

Rafters

No. length cross-section material condition status

Rafter Section Bay 1

Ridge pole and Oak 40 x 125 ridge board

1	3790 mm	100 x 100 mm	Softwood	intact	retain
2	4000 mm	110 x 60 mm	UHW	intact	retain
3	4100 mm	80 x 70 mm	UHW	intact	retain
4	4050 mm	80 x 70 mm	UHW	intact	retain
5	3960 mm	150 x 100 mm	UHW	intact	retain
6	4050 mm	100 x 80 mm	UHW	intact	retain
7	4150 mm	150 x 90 mm	UHW	intact	retain

Rafter Section Bay 2

Ridge pole

8	4100 mm	150 x 90 mm	oak	damaged	replace*
9	2210 mm	110 x 90 mm	oak (total length given)	fragment remaining	replace
10	2170 mm	80 x 90 mm	UHW	intact	retain
11	4080 mm	120 x 80 mm	UHW	damaged	replace*

replace = 100 x 100mm 3-4 year air dried structural oak rafter
replace* = 100 x 200mm 3-4 year air dried structural oak rafter
UHW (Unknown hardwood) believed to be Elm.