

The Cottage, 3 Low Green, Rafter Repair Schedule of Works.

Rafter replacement parts list and installation guidelines

Fire stop breathable membrane ('felt') to cover roof W3.4m x H4.33m (Bay 1) + W1.6m x H1.8m (Bay 2) = **total 17.5 m²** (17.5 linear meters including folded joint) **1.3m x 50m rolls** <http://thatchingadvisoryservices.co.uk/product/thatch-firewall-membrane/>

Fire stop breathable thatch batts 1200mm x 400mm x 50mm (12 slabs in a pack) to cover roof Bay 1 lower section, not loft space. 3.4m x 2.4m = 18 slabs **total 2 x pack**
<http://thatchingadvisoryservices.co.uk/product/thatchbatt/>

(Wired support system for holding thatch batts in place may be required)

Heavy duty Staples 10mm for felt **1 box**

Clay and straw 'daub' mixture

Waste material from the long-straw for the thatch coat can be used for reconstituting the clay and straw 'daub' mixture new straw cut into short lengths 50mm approx.

Treated softwood batten

50mm x 25mm treated softwood batten JB red. To cover roof on 300mm centres

Bay 1 = 14 x 3.4m

Bay 2 = 7 x 1.6m

Order 7 x 5m lengths, 7 x 3.5m lengths

Order total 59.5m

50mm x 12mm treated softwood batten JB red. (fitted vertically on top of the rafter, and under the battens)

Bay 1 = 7 x 4.3m

Bay 2 = 4 x 2m

Order 7 x 5m lengths, 2 x 4m

Order total 43m

Oak Plank

30mm x 150mm air-dried structural oak

To replace plank on top of rafter 1 at the gable end in Bay 1.

30mm x 150mm air-dried structural oak 4.3m

Order 1 x 5m length

Order total 5m

30mm x 100mm air-dried structural oak

As possible packing on top of rafter 7 adjoining Bay 2.

30mm x 100mm air-dried structural oak 4.3m

As possible packing on top of rafter 10 in Bay 2.

30mm x 100mm air-dried structural oak 2.5m

Order 1 x 5m length, 1 x 2.5m length,

Order total 7.5m

Rafter 100mm x 200mm

100mm x 200mm air-dried structural oak rafter

Parts list of replacement rafters referring to drawings Bay 2

8 4100 mm 100mm x 200mm **order 4.5m**

11 4080 mm 100mm x 200mm **order 4.5m**

Order total 9m

Rafter and others 100mm x 100mm

100mm x 100mm air-dried structural oak rafter

Parts list of replacement rafters referring to drawings

9 2210 mm 100mm x 100mm **order 2.5m**

Parts list of new rafters referring to drawings Bay 1

6x 4.2m L 100mm x 100mm rafters **order 4.5m (27m)**

Packing

Potential packing for rafter 7 and 10

7 2210 mm 100mm x 100mm **order 4.5m**

10 4150 mm 100mm x 100mm **order 2.5m**

Sprockets

2 x 650 mm 100mm x 100mm **order 1.5m**

Order total 38m

Purlin

100mm x 150mm air-dried structural oak

Bay 1

1 x 3.6m 100mm x 150mm order 4m

Bay 2

1 x 1.6m 100mm x 150mm order 2m

Order total 6m

Collar

50mm x 200mm air-dried structural oak

Bay 1

2 x 2.3m 50mm x 200mm order 5m

Order total 5m

Stainless Steel fixings

Attach New Rafter

M8 x L150mm stainless steel coach screws with washer, attach rafter to ridge board, ridge pole and purlin need 42 **order 50 total**

M8 x L170mm stainless steel coach screws with washer, attach rafter to ridge pole and purlin **order 20 for above if 150mm not long enough in some cases**

M12 x L150mm stainless steel coach screws with washer, attach rafter to wall plate need 10 **order 10**

Attach 17C Rafter to new Purlin

M8 x L200mm stainless steel coach screws with washer, attach 17C rafter to new purlin need 5 **order 0** as 23 in stock

Attach Collars

M8 x L100mm stainless steel coach screws with washer, attach sprocket to rafter need 4 **order 6**

Attach Sprocket

M8 x L150mm stainless steel coach screws with washer, attach sprocket to rafter need 2 **order 2**

M8 x L120mm stainless steel coach screws with washer, attach sprocket to rafter **need 2 order 2**

M8 x L100mm stainless steel coach screws with washer, attach sprocket to rafter **need 2 order 4**

Attach Softwood support section

6mm x L100mm stainless steel screws pozi-drive self-tapping, Attach Softwood support section to bottom of rafters **need 4 order 10**

Attach Soffit board to Sprockets

6mm x L 60mm stainless steel screws pozi-drive self-tapping, Attach Soffit board to bottom of sprockets **need 8 order 20**

Attach ceiling joists and dormer frame to Rafters

6mm x L 100mm stainless steel screws pozi-drive self-tapping, Attach Softwood
Attach ceiling joists to rafters **need 16 order 20**

Stainless Steel brackets

Stainless Steel brackets to attach new Purlin in Bay 1

2 x Stainless steel angle brackets 150mm x 90mm x 60mm (Tool station 37152)

Stainless Steel brackets to attach old Purlin to rafter 1 in Bay 1

2 x Stainless steel angle brackets 90mm x 90mm x 60mm (Tool station 44421)

Stainless Steel brackets to attach Ridge board to rafter 1 and rafter 7 in Bay 1

2 x Stainless steel angle brackets 60mm x 40mm x 60mm (Tool station 97230)

Screws for Brackets

M8 x L 50mm stainless steel coach screws with washer **order 10**

M8 x L 60mm stainless steel coach screws with washer **order 10**

M8 x L 80mm stainless steel coach screws with washer **order 10**

Coach Screws A2 Stainless Steel totals

M8 x L 50mm stainless steel coach screws **order 10**

M8 x L 60mm stainless steel coach screws **order 10**

M8 x L 80mm stainless steel coach screws **order 10**

M8 x L100mm stainless steel coach screws **order 10**

M8 x L120mm stainless steel coach screws **(3 in stock)**

M8 x L150mm stainless steel coach screws **order 60**

M8 x L170mm stainless steel coach screws **order 20**

M8 x L200mm stainless steel coach screws **(23 in stock)**

M8 x 25mm heavy-duty stainless steel washer, **order 100**

M12 x L150mm stainless steel coach screws with washer, **order 10**

Wood Screws A2 Stainless Steel totals

6mm x L 60mm stainless steel screws pozi-drive self-tapping, **order 50**

6mm x L 100mm stainless steel screws pozi-drive self-tapping, **order 50**

Nails

Nailing battens to rafters 3.35mm x 65mm Galvanised steel order 126 needed
Order 200

Parts list of existing components referring to drawings

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

1	4100 mm	150 x 90 mm	oak	damaged	replace*
2	2210 mm	110 x 90 mm	oak (total length given)	fragment remaining	replace
3	2170 mm	80 x 90 mm	UHW	intact	retain
4	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

General description of works

Thatcher will strip roof of straw coating in Bay 1. Fit new 100mm x 100mm air-dried oak rafters, 100mm x 150mm purlin and 50mm x 200mm collars over the top of the collapsed 17C rafters, attaching to the existing oak ridge board and 17C wall plate. Felt and batten the new rafters with fire-stop felt. Insert fireproof batts between the new rafters on the internal face of the first-floor roof.

Thatcher will strip the roof of straw coating in Bay 2 a short distance either side of the dormer window and the entire area above it. Prop the structure of the dormer window, and strip the roof of straw coating in Bay 2 a short distance either side of the dormer window and the entire area above it. Replace the damaged 17C rafters either side of the dormer windows with new 100mm x 200mm air-dried oak rafters, fitting new 100mm x 100mm air-dried oak sprockets to the ends. Replace the decayed 17C rafter above the dormer window with a new 100mm x 100mm air-dried oak rafter. Fit a 100mm x 150mm air-dried 'purlin section' to the new rafters. Felt and batten the new rafters with fire-stop felt in the small area above the dormer window.

All materials provided. All scrap and waste wood to be left on-site for disposal.

Background information

The building is a Suffolk 'long house' and was built in the late 17C using some component frame parts of at least one dismantled medieval hall houses with some additional new frame parts in green wood to make up a new building incorporating an additional bay. The building was split into two labourer's cottages in about 1810, as part of the superseding of many individual 'small holding' farms by larger farms incorporating surrounding land and buildings that occurred throughout the 18th and 19th Century,

At this stage the building was given a new façade in the early 19C Neo-Gothic style involving a rough-cast render coat, some structural and extensional changes, and various decorative exterior details such as barge boards with drop tracery to its gables, hoodmoulds over its windows and some larger replacement casement windows.

The roof of the NE front elevation is sheltered from the harmful effects of strong wind driving moisture through the thatch, and consequently the structural roof components are, in general, well preserved. Where components have failed, they have done so either due to inadequate strength, or poorly judged structural alterations. Although some 17C components do now need to be replaced due to insect attack and decay, these issues should not be regarded as ongoing.

This is because the complete overhaul of the SW rear elevation roof in application DC/16/0198/LB included a fireproof breathable membrane and new coat of long straw, which is successfully preventing the ingress of damp air into the roof space.

The surviving main structural components from the medieval hall house from which the building was mainly constructed appear to have come from a building of similar width but shorter length. The additional bay (Bay 1) included on the (SW) end of the

building during its construction in the mid 17C to make it longer is of inferior structural materials and workmanship compared to the reused substantial oak components, and this can be observed clearly when comparing the rafters, and other components such as wall plates.

The work is divided between the two bays. The work on Bay 1 is needed to overcome a design fault in the original building where rafters of an inadequate section were used. This led to deformation and partial collapse of the roof structure.

The work required on Bay 1 involves removing the loading of roofing material from the collapsed 17C structure, by copying the new oak structure on the SW rear elevation and replicating it on the NE front elevation, and also prevention of the spread of the two sides with two new collar ties. In an ideal world, both sides of the new structure should have been installed at the same time. But it is also possible to piece the structure together one side at a time, as is proposed in this application. This is because the load from the roof covering is shared by the 17C structure beneath it and the adjoining bay and gable end. The new oak structure on the SW side not only rests on the 17C roof structure via its new purlin, but is attached at the top via its ridge-board, which is secured to both the ridgepole of the adjoining bay, and the SE gable end. Because the new oak structure on the SW rear elevation is supported in this way, it should not need propping to carry out the new work.

The most challenging part of this job is to fit the new rafters to the extremely curved wall plate in such a way as to create a flat, straight plain in line with the gable end, causing minimal disturbance to the clay and straw 'wattle and daub' infill. Because the new rafters will be attached in different positions along the width of the wall plate due to its shape, it will not be possible to use the traditional 'birds' mouth' cut outs found on the 17C rafters. Once the new roof structure is complete, it will both stabilize the collapsed 17C roof structure below, and provide a strong, load bearing roof structure, which follows the correct line of the roof as can be seen on the gable end and adjoining bay.

The work on Bay 2 is also in part necessary to overcome a design flaw. And in part due rafters weakening through insect attack. In this instance, the design flaw has occurred due to an alteration compromising an otherwise fairly strong, stable roof structure on the NE elevation.

Not only were no strengthening measures taken when two rafters were cut to accommodate the dormer window, but the rafter to the right of the window structure has been cut down to fit the dormer frame structure to it. Due to the weakened condition and partial structural failure of the two rafters, there is a good opportunity to correct this design flaw with two appropriately stronger rafters to either side of the dormer structure to make up for the extra loading caused by the two rafters that were sawn off to accommodate the window. A new 'purlin section' above the existing purlin will complete the necessary strengthening measures to support the two sawn-off rafters above the dormer window. The two new rafters either side of the dormer window will also safely support the wooden framework of the dormer window and lessen the extra load placed on the 17C purlin and neighbouring rafters.

The specific positioning chosen for the dormer window within Bay 2 with a collar directly above it is particularly unfortunate, because cutting two rafters where a collar ties the two sides of the roof together puts an extra load on the purlin it is not

supposed to have. The proposed new oak structure will reduce this load on the historic purlin by transferring the load currently applied to it through to the two new stronger rafters either side of the window.

Because the softwood structure of the dormer window rests upon and is attached to the two 17C rafters either side of it, the window structure needs to be propped and supported, so that it doesn't move when the damaged 17C rafters are removed.

Seasoned structural timber needs to be used rather than green timber, because many of the components will not be held securely enough to stop them twisting if they start to warp, which would have disastrous results for the roof structure.

Detailed description of work

Scaffold to first floor level of front elevation with two lifts at each gable end to allow side access to ridge and eaves. Where possible, the scaffolding should be erected to the thatcher's specification: allowing 1' below the eaves for trimming, and 1' clearance all round at the gables. The scaffolding will also accommodate thatch recoating work. Scaffolding will be arranged separately from the thatching and building work contracts.

The work can be tackled a 'bay' (or section) at a time in terms of removing straw for access. This will limit the time spent with a tarpaulin in place awaiting rethatching. (all waste left on site)

Bay 1

Thatcher to strip front elevation of the roof of long straw thatch in Bay 1 to ridge board height, leaving as much of the long straw ridge intact as possible. Remove the straw over the rafter of the adjoining bay to allow the fireproof membrane and battens to be attached to it. Retain original deformed historic roof structure in its entirety, paying careful attention not to disturb the clay and straw 'wattle and daub' infill.

New Rafters

Examine rafter 19C softwood rafter 1 that makes up the gable end structure on the SE side elevation to check it is straight. Replace the partially decayed softwood plank attached to the 19C softwood rafter, with a 150mm x 30mm thick 3-4 year air-dried structural oak plank, including the section over the sprocket at the bottom. Attach it with stainless steel screws. Use the height of the uppermost surface of this plank to dictate the line and height for the surface of the new rafters. Examine 17C rafter 7 of the adjoining bay looking for any bowing.

If it appears to be at all bowed it will need to be built up to match the height and straightness of rafter 1 with its new 150mm x 30mm oak plank. Cut a 100mm wide oak section to fit the profile of the rafter to make up the height and attach it with stainless steel screws. This should now give a clear line at the top and bottom, and flat plane to lay the new rafters over the top of the 17C roof structure.

Insert the new 100mm x 100mm 3-4 year air-dried structural oak rafters, aligning them where possible so they mirror the new oak structure on the other side.

Cut the tops in-line with the ridge-board, and cut the bottom ends to fit the curved wall plate, to create a flat, straight plain. Coach-screw the new rafters into position. If the clay and straw 'wattle and daub' infill has been disturbed near the wall plate, secure any loose wattle woodwork with stainless steel screws and repair the clay and straw 'daub' mixture by reconstituting it with water and fresh straw soaked in water and cut into short sections. Waste material from the long-straw for the thatch coat can be tried for this purpose.

New Purlin

Cut the 100mm x 150mm 3-4 year air-dried structural oak purlin to length and fit it with 150mm side at right angles to rafter and at the matching height to the new oak purlin on the SW rear elevation. If it does not fit it in between the new oak rafter and the 17C rafters beneath it, remove material from face of the new oak purlin that butts up against the 17C rafters. Use stainless steel brackets to attach the new purlin at either end to both the adjoining bay and Coach-screw the new purlin into position onto the new rafters. Coach-screw the 17C rafters onto the new oak purlin, using new oak 'packing sections' to pack it out, as can be seen on the SW rear elevation opposite. (see drawing Cross Section AA Detail 01, 02)

New Collars

The two 50mm x 200mm 3-4 year air-dried structural oak collars can then be cut, fitted and coach screwed in place. They should be horizontal, given the new oak purlin just fitted on the NE front is level with the new oak purlin on the SW rear elevation. (see drawing Cross Section AA Collar Detail 01, 02)

Internal infill panels between rafters

'Thatchbatts' (high density rockwool slabs) should be cut and inserted in the gaps between the new oak rafters. This should not include the 'loft space', just the area below the first-floor ceiling.

Because Section 1 now has two sets of rafters with a gap in between, and the clay and straw 'wattle and daub' infill on the inside, the 'Thatchbatts' need to be attached before the felt goes on. The 'Thatchbatts' can be supported with battens to keep them in position against the Fire stop breathable felt. The void between the back of the 'Thatchbatts' and the 17C rafters can then be backfilled with low density rock wool.

Felt and batten

Bay 1 only will be felted and battened in its entirety. Carefully fit the felt under the riven battens resting on the 17C rafter of the adjoining bay. Several rolls can be used at once across the roof, unrolled stapled and battened into place. The bay slopes down about 125mm towards the gable end, due to historic sole plate decay, and the rolls can be laid inline with the roof structure. A satisfactory smoke-tight horizontal joint needs

to be made between the sheets of felt by folding over and stapling the horizontal overlap. (50mm from each horizontal side of the felt). Separate instructions will be provided for this. Batten on 300mm centre, with 65mm galvanised nails

The felt is showerproof only, so will also need a temporary polythene or tarpaulin cover until thatching can take place.

Bay 2

Securely prop the dormer window structure through to ground level, propping both its ridge, and the base of its rafters, taking care to securely prop the first-floor ceiling joists, below the dormer window structure.

The thatcher to strip front elevation of the roof of long straw thatch in two channels along the side of the dormer window, so that the two rafters either side of the window structure are exposed to ridgepole height. Strip the area in between the two rafters above the dormer window to ridge pole height, leaving as much of the long straw ridge intact as possible.

New Rafters

Remove the two rafters 8 and 11 either side of the dormer window structure, including the 19C sprockets, carefully cutting the 'wattle' sticks that hold the clay and straw 'daub' infill to release the rafters within the first-floor room space. Take care not to alter the position of the dormer window structure when removing the two rafters. In the area above the first-floor ceiling joist, between the two rafters either pull out (if loose) or cut the riven battens, so that the two new replacement rafters can ideally be slid underneath the riven battens to support the straw either side of the dormer in the loft space.

Replicate the historic birds-mouth cut-out on the two new 100mm x 200mm 3-4 year air-dried structural oak rafters to match the existing 17C rafters and fit or widen the notches in the 17C wall plate. (see drawing Cross Section BB Sprocket Detail 01, 02, 03).

Route or plane a 20mm 45-degree chamfer on the outer edge only (opposite side to dormer window structure), and just within the first-floor room space, (not the loft area). This is to replicate the chamfers on the 17C rafters within this bay. Re attach the dormer window structure to the two rafters using stainless steel screws. Carefully cut any further material from the 'wattle' sticks, needed to accommodate the new rafters before fitting them and coach-screwing them into position.

Support the wattle structure by attaching an oak batten along the side of the new rafter and securing the individual sticks with stainless steel screws. Repair the clay and straw 'daub' mixture by reconstituting it with water and fresh straw.

Cut two new 100mm x 100mm 3-4 year air-dried structural oak sprockets to support the 19C softwood Soffit board, attach the sprockets to the new rafters with stainless steel coach screw and attach to the soffit board with stainless steel screws. (see drawing Cross Section BB Sprocket Detail 01, 02, 03).

Remove the decayed remnant 9, and oak plank repair section 9a and insert a new 100mm x 100mm 3-4 year air-dried structural oak rafter, cutting its lower end to match the sawn-off 17C rafter 10 next to it before coach-screwing it into position.

The sawn-off 17C rafter 10 appears to be slightly bowed and is likely to need to be built up to match the height of the new oak rafters in order that this section can be re-battened effectively. Cut a 100mm wide oak section to fit the profile of the rafter to make up the height and attach it with stainless steel screws.

New Purlin Section

Cut a length of 100mm x 150mm 3-4 year air-dried structural oak purlin to fit across the width of the new oak new 100mm x 200mm rafters.

Fit the purlin section just above the 17C purlin, removing a section from it to accommodate the remaining 17C rafter if necessary, before coach-screwing it into place.

Felt and batten

Bay 2 has only the small area above the dormer window structure to be felted and battened with the Fire stop breathable felt. Carefully fit the felt under the riven battens resting on the two new 100mm x 200mm oak rafters. A satisfactory smoke-tight horizontal joint needs to be made between the sheets of felt by folding over and stapling the horizontal overlap. (50mm from each horizontal side of the felt). Separate instructions will be provided for this.

Batten on 300mm centre, with 65mm galvanised nails.

The felt is showerproof only, so will also need a temporary polythene or tarpaulin cover until thatching can take place.

All scrap and waste wood to be left on-site for disposal