

THE HANGAR THREE PROJECT

APX B : TRUSS REPAIR METHOD

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Ref: Method of repairing a Belfast truss in position

Introduction

James Carroll Builders have gained extensive experience of repairing and renovating Grade 2 Star listed Aircraft Hangars. We have developed our own system for the repair of Belfast trusses in position and also constructing new trusses. An inspection was completed on 5th October 2016 at Old Sarum Airfield, Salisbury.

Please find a method for the repair of a Belfast Trusses in position. This document has been developed in accordance with the Site visit and report issued.

Please note due to the nature of this work this method may need to be adapted and changed due to the working environment or the condition of the trusses.

Stage 1

Install scaffold support tower to truss to be repaired. This encapsulates the truss to be repaired and provides safe access to the work area. The size of the scaffold is solely dependent on the area to be repaired. It is beneficial to always allow 4m additional scaffold to either side of the decayed areas. Best practice is to always scaffold the full length of the truss.

The transoms positioned under the bottom chord of the truss should be pushed up tight and check fittings installed to prevent slippage. The truss now becomes secure.

The scaffold standards should run up to the roof but also providing enough space for U Head jacks to be installed. These will be used later to lift the roof off the truss.

On the inside standards a tube should be fixed between the lattice works and locked to prevent the truss twisting.

Please note that if there is an area where more than one truss is to be repaired in the same location then the scaffold should be constructed to all the trusses. This will help when lifting the truss up into its original position.

Do not remove any decayed areas of the truss

Stage 2

An inspection of the truss should now be completed. We spray all areas that are decaying or that need to be removed in red. This will show how much bottom chord and top chord require replacing.

Note never patch piece the truss! Always go to existing joints! This is a repair using the same methods and same sizes of timbers and same nailing techniques. You may have to remove good timber to access poor timber behind.

Stage 3

Diagonal braces need to be removed as they will prevent the truss from lifting.

Using the U head jacks insert timber supports along the length and raise them up to beneath the existing purlins. Temporary nail the purlins to the timber supports.

Ensure jacks are directly beneath the skylight purlins. This will assist when lifting the skylight.

The existing purlins are nailed to the truss. Using a reciprocating saw cut the nails. Therefor the roof purlin is now supported by the U head Jacks.

Slowly raise the jacks to lift the roof off the truss.

Please note your roof covering construction is made up of timber boarding and the lifting of the roof is solely dependent on the pressure required. Hydraulic jacks may be required to assist lifting. I would consult your structural engineer for advice and guidance.

At this point in time the roof only needs to be lifted off the truss by 50mm. This then frees the truss, and therefore it is only sitting in the scaffold structure.

Stage 4

Ensure all the bottom chord scaffold transoms are fitted and even support the truss where it is not to be repaired. Two supports either side of the repair minimum, this prevents the truss from falling later.

Remove decayed timber now the truss is supported. Remember you may have to remove good timber to access decayed timber inside. This includes lattice woodwork (note it would be beneficial at this point to measure the setting out of the lattice work and create a setting out drawing). The lattice work is positioned at certain angles to create the trusses strength and if positioned incorrectly will result in the truss buckling under strain.

You may need to relocate certain braces that are preventing the truss from twisting.

Remove the decayed top chord back to the original joints.

At this point you should be left with solely the truss to be repaired.

Stage 5

The truss now has to be lifted into its original position. To determine how much it has to be raised we use a string line along the bottom chord.

Place one end of the string line on the top of the left pad stone, then run the string alongside the bottom chord and fix to the top of the right pad stone.

Once this is in position you must raise the centre by 50mm and this will create the deflection in the new bottom chord.

Move all the transoms that are now supporting nothing on the bottom chord, up to the string line.

Stage 6

Now we would lift the truss up to its original position. This is the most critical part of the repair. The truss will weigh approximately 1.8 tons without the roof attached.

Directly beneath the remaining bottom chord, fix a flat jack head to the scaffold vertical standards and transoms. This will be set out lifting points.

Using a flat head adjustable jacking head and a 10 ton hydraulic short body ram (you will also need steel plate shims 200mm x 100mm x 10mm put this under the bottom chord jacking point to prevent compression)

Starting from the outside and working to the middle slowly use these jacking points to lift the truss 10mm at a time. Does not lift in one go as this may snap the remainder of the truss. THIS IS A SLOW PROCESS FOR A REASON.

Once the existing truss is lifted up to the string line, lock out all transoms to secure the truss.

Stage 7

We pre drill all nails to prevent the wood splitting.

Using the correct size timber and same nailing methods replace the decayed lattice work (setting out drawing). We usually leave this slightly longer than the top and bottom chord and cut off later.

Once the lattice is installed you can commence with building up the bottom chord. NO JOINTS SHOULD BE IN LINE, ALL JOINTS MUST HAVE MINIMUM 1.5M OVERLAP. Use the same size nails (5" and 6" round head galv) we use sash clamps to keep the timbers tight together whilst nailing.

Fit the top chord timbers and bend into shape using sash clamps, nailing into position as you bend the timber. Start with the lowest top chord first. You may need to lift the roof again to enable access to nail the top chord.

Stage 8

During the lifting process the knee braces may end up shorter and may need replacing. They may have compressed over the years of the truss dropping.

Replace any bolts that are missing in the bottom chord.

Stage 9

Lowering the truss is very similar to lifting and must be done slowly. We strongly recommend the transoms are left in under the bottom chord for 24hrs after the truss is lowered.

Slowly starting from the middle out lower the transom braces by 10mm at a time until the pressure is taken off them. As suggested earlier leave them in for 24hrs but set another 10mm lower to allow for movement.

Lower the roof back onto the truss and re nail the purlins to the top chord.

Re fit the bottom chord base plate.

Re fit the diagonal wind bracing once the truss has settled.

Once all the repairs have been completed then the scaffold is safe to remove.