

Restoration of Bourn Mill

Situated in the Cambridgeshire countryside near to the village of Bourn, Bourn Mill sits majestically on an elevated piece of land perfectly positioned to harness the wind. The mill stands as one of England's most ancient surviving windmills built in the reign of King Henry VIII, its vast oak timbers and beams dating back to 1500.

Now under the care and ownership of the charity Cambridge Past, Present & Future, we look at the extensive restoration programme that brought the mill back to its former glory and the mill sails turning once again.

WHAT'S MAKES BOURN MILL SO SPECIAL?

Classified as an Ancient Monument and a Grade I listed building, Bourn Mill is an open trestle post mill, one of just 45 left in England. With a design that dates to medieval times, the mill operates via the body of the mill, known as the buck, which is able to rotate around a huge central oak post to allow the 4 sails to face the wind and turn to drive the machinery that grinds the wheat.



Figure 1 - Bourn Mill



Figure 2 - The buck supported by the vast wooden trestle

The buck is supported by a vast wooden trestle of 4 oak beams; the horizontal cross trees and angular quarter bars. These are suspended and supported on four brick piers. Following a routine inspection of the mill at the beginning of 2020, it was these beams where extensive decay was discovered, raising a real concern about the future of the mill.

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INVESTIGATION

Historic England were enlisted, and formal investigations began in 2020 to clearly understand the issues being faced. It was found that decay to the trestle beams had previously been addressed using a resin and sand-based filler forming blocks which were tied to the sound timber with stainless steel rods. What they found was surprising as Bill Griffiths, the Millwright describes:

“a sand and cement type material, which we had imagined had been used only in a limited way as a filler for small defects, was actually extensively distributed in the centre of all four cross tree arms. The wood surrounding this sand and cement material showed rot in several places and it appeared that rainwater was infiltrating the structure of the cross tree arms”.

The timber had in fact so significantly deteriorated that it became alarmingly apparent that these beams were providing little structural integrity to support the weight of the buck. The rotten timbers were also suffering from wet rot displaying cubing and a white bloom and although dry rot was not in evidence, the timbers were at the stage where this could occur; the resulting spores of which would be catastrophic to the timbers of the mill.

Found also was that the surface of the original timbers and main support column had undergone multiple applications of a black finish over the years. Identifying the specific coatings proved challenging but the presence of coal tar was suspected as a contributor to the deterioration of the timbers.



▲▲ Figure 3 - Extensive rot and decay to the oak beams

▼▼ Figure 4 - Scaffolding to support the mill from risk of collapse



SECURING THE MILL STRUCTURE AND THE WAY FORWARD

To alleviate stress on the supporting beams and reduce the impact of the wind, the mill sails were detached. A system of scaffolding and propping was then employed providing the essential support to stop the mill from collapsing. The mill was temporarily closed and Historic England placed the mill on the “Heritage at Risk Register”.

A team of specialists undertook an extensive investigation programme from which it was determined the existing supporting timbers were irreparable. A replacement programme with the primary goal of replicating and conserving as many of the original timbers as feasible was formulated. Preservation and repair was at the heart of the plan.

RESTORATION PROGRAMME BEGINS

In the spring of 2022, Bakers of Danbury Ltd the principal contractor, embarked on the restoration works. The initial phase centred on raising the main body of the mill to allow the detachment and removal of the rotten supporting timber beams. Determining the optimal lifting approach required thorough site surveys and close collaboration with the design team to define the most suitable lifting plan.

5-year air dried certified oak for the new oak beams was procured and delivered to the site in time to allow the new timbers to go through a process of acclimatisation, quality checks and approval before fitting.

RAISING THE MILL

The remarkable lifting process was key to the success of the project. Five hydraulic jacks were placed at specific points: four on the outer corners of the upper and lower cross tresses, and one under the central cross point main post, all supported by suitable base pads.



Figure 5 - Completed repair of the oak beams with rain covers fitted



▼▼ Figure 6 - Bourn Mill at the beginning of its restoration



▼▼ Figure 7 - Scaffolding down and hessian wrapped around rebuilt brick piers to protect from frost as the mill nears the end of its restoration



The existing side screw jacks supporting the structure were carefully loosened and a team of four operatives then lifted the entire trestle with the jacks under the buck being progressively tightened at 50mm intervals. Once the windmill was raised to the specified height of 150mm, the jacks under the buck and side supports were tensioned. The trestle was then lowered and detached from the buck and pivot plate. Internal timber supports were added. Throughout the process a spotter was present to monitor and ensure stability.

DISMANTLING AND REBUILD OF THE TRESTLE AND BRICK PIERS

The trestle was dismantled in sections. Extreme care was taken with lifting equipment used to reduce manual handling. All existing joints were

recorded wherever access allowed, and the old beams were removed and analysed for the patterns to be replicated in the new oak beams.

Each new oak beam of colossal weight was firstly dry fitted before the final fix. The beam ends were treated in a beeswax oil then held in position with stainless steel bolts & brackets and bolted to the brick piers. The existing wedges between the cross trees and the main post were retained and reused.

The brick piers providing the support for the beams were also reconstructed using lime mortar to match the original. There was a 30-day drying period to allow the lime to harden before the lowering process and the reconnection of the pivot plate and buck to the new trestle could take place.

THE MILL RESTORED TO ITS FORMER GLORY

The restoration project was completed in January 2023 with the newly installed oak beams seamlessly blending with the old to become part of the historical fabric of the mill. This fascinating project combined preservation with modern methods of repair to bring the historically significant Bourn Mill back to life for future generations to enjoy. 🌿

Bakers of Danbury Ltd
www.bakersofdanbury.co.uk
info@bakersofdanbury.co.uk
01245 225876