ESKDALE CORN MILL
MACHINERY AND MILLWRIGHT PROGRESS

December 2018

OVERVIEW

1. Project Background and Description

The Eskdale Mill & Heritage Trust has raised almost £1 million to support the conservation project at Eskdale Mill. The work includes the renovation of the Mill building and associated cottage, internal corn milling machinery repairs and improved visitor access, facilities and interpretation. This is a summary, reporting on the progress made by the specialist millwrights tasked with the machinery repairs to the mill.

2. Project Scope

Janes Ltd, Traditional Millwrights, have been appointed to carry out the repair, restoration and conservation of the historic corn milling machinery at Eskdale Watermill. Work includes, but is not limited to:

- Restoring the upper waterwheel
- Millstone and millstone furniture renovation
- Sack hoist restoration and line shaft reinstatement
- Grain cleaning and lifting equipment
- Restore the lower waterwheel and axle after 80+ years of being dormant

The work will aim to showcase the unique elements of the historic machinery and bring them to fully working state so they can be safely demonstrated to the public and allow a new generation of operators to learn the skills in running and maintaining the large but intricate machinery.

3. Progress – work to December 13th 2018

1. The upper mill stone nut has been cleaned and the millwrights have sourced the hornbeam timber for the replacement cogs
2. The upper mill millstone shaft has been cleaned and the foot bearing inspected and found to be in good service
3. Upper waterwheel shaft was raised to inspect the bronze/brass bearing shells. They were found to be worn so the millwrights made new wooden casting patterns, then produced new brass cast bearing shells and bored them to fit the existing waterwheel shaft journal. The bearings are now fitted and awaiting the bearing caps to be fitted and lubricated.

4. The sack hoist has had the chain and Balata belt removed. The drum is straightened to its drive shaft and the new chain and belting is yet to be installed.
5. The stone nut release lever has been taken off for straightening and will be re-fitted once the stone nut cogs have been replaced.
6. Upper mill timber Hurst frame has been substantially cleaned and inspected. Some of the poorly fitted wedges have been removed if they are not to be used or require replacement with more suitable timber types.

   The timber holding the cast iron bearing block has been securely wedged in place.
7. The wire machine has been thoroughly opened, cleaned throughout and re-assembled securely. The brass bearing bushes have been serviced. It has been found that the drive shaft for the belt to the wire machine is not suitable to take the weight of the drive gear and new wooden pulley. Another shaft was found on site and was intended to be used. However, the millwrights stated that it would be more cost-effective and a better use of time to replace the shaft with a new unit as the used item would require quite a lot of machining and metalwork to fit the existing drive gears correctly.

7 Before and after the Millwright cleaning and inspection of the wire machine. S Hobbs / Maurice Steele

8. The right hand lay shaft has had new bearing shells cast by the millwrights and are custom made. This is done by making a bespoke wooden pattern to fit the bearing blocks and shaft exactly. These are slightly oversize and are used to produce a pattern in casting sand and when removed, leave a void where molten metal is poured. The will produce a metal cast bearing shell that will shrink when cooled. Final machining is done on a lathe and was due to be done the 3rd week of December.

8 An example of a new bronze/brass bearing shell in its block.

9. The wooden line shaft has been partially repaired in the millwright's workshop.

10. The upper millstone ‘shoe’ has been taken away for repair and timber selected for repairing the tun casing.

10 Upper mill stone and furniture - Maurice Steele

11. The metal hoops, hooks and straps for the jog-scry have been repaired and, as can be seen in the pictures, are repaired to a very high quality and look as good as new.

12. The upper waterwheel has had the most work undertaken on it so far. The timber has been stripped off the castings, enabling inspection of the cracks in the shroud castings. Originally the specification called for metal patches to be used to secure the cracks, as per historic repairs to the wheel. This was intended to preserve as much of the original wheel as possible. However, the millwrights found there was a substantial amount of work needed to repair the cracks and suggested having the worst of the cracked castings replaced with new cast iron shroud sections. The Trust has agreed that the repair would be longer lasting and more secure than using the original repair method without detracting from the history of the wheel. The old cracked castings will be retained on site. The millwrights have had new patterns made and provided picture evidence of this work that is often a specialist job. Having new cast sections has required the budget for repairs to be increased but has also saved labour time meaning the work is on schedule.

    The millwrights are also producing bespoke bolts, nuts and studs (fixings) that will fit the square holes of the waterwheel perfectly and replacing the old, incorrect hexagon fixings from the last restoration. The bespoke fixings replicate those that would have been blacksmith made when the mill was built.

12 Upper wheel showing a crack in the cast rim section. 12a The waterwheel with rotten paddles April 2016.

13. The stone nut has been taken off site for measuring as new cogs are required. The spare cogs that were in the mill in 2016 have not been found, so hornbeam timber has been sourced for their replacements. The millstone shaft that has been placed in the lower mill for decades has been found not to match the existing stone nut. Although this was a surprise, and requires extra un-budgeted work, the millwrights are confident this can be adapted to fit the existing stone nut and will work without further modifications to the millstone bearing housing. The adaptation work has been started.

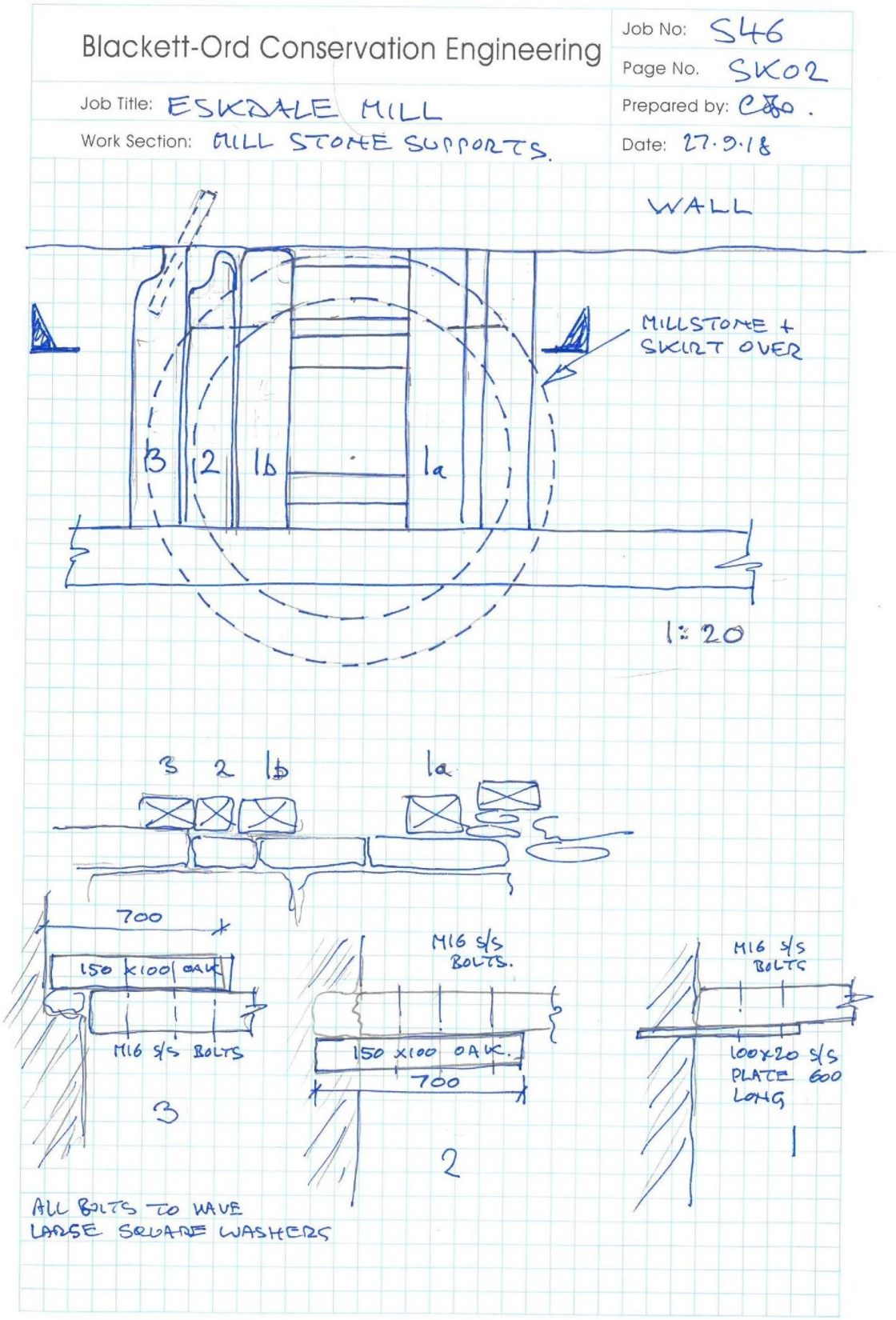
13 The lower millstone shaft and stone nut prior to alteration

14. Work to the lower waterwheel shaft has been completed to a high standard and is the first time the waterwheel has been secured to this timber shaft. The timber shaft was a replacement that made its way to the mill in 2004 and was never completed.

    Oak wedges were cut to fit between the wheel and hexagonal shaft and driven in from either side of the waterwheel hub castings. As well as holding the wheel to the shaft, they are also used to align the wheel so it does not run eccentric to the shaft.

15. Two new wooden caps have been produced as covers for the lower waterwheel bearings. The work has been completed to a high standard.

Some rotten timber has been found next to the outer wall where damp has set in. This was discovered after the removal of some debris and millstone furniture and a suitable repair method has been designed by the conservation structural engineer as shown below.



15a Structural Engineer's Repair Design

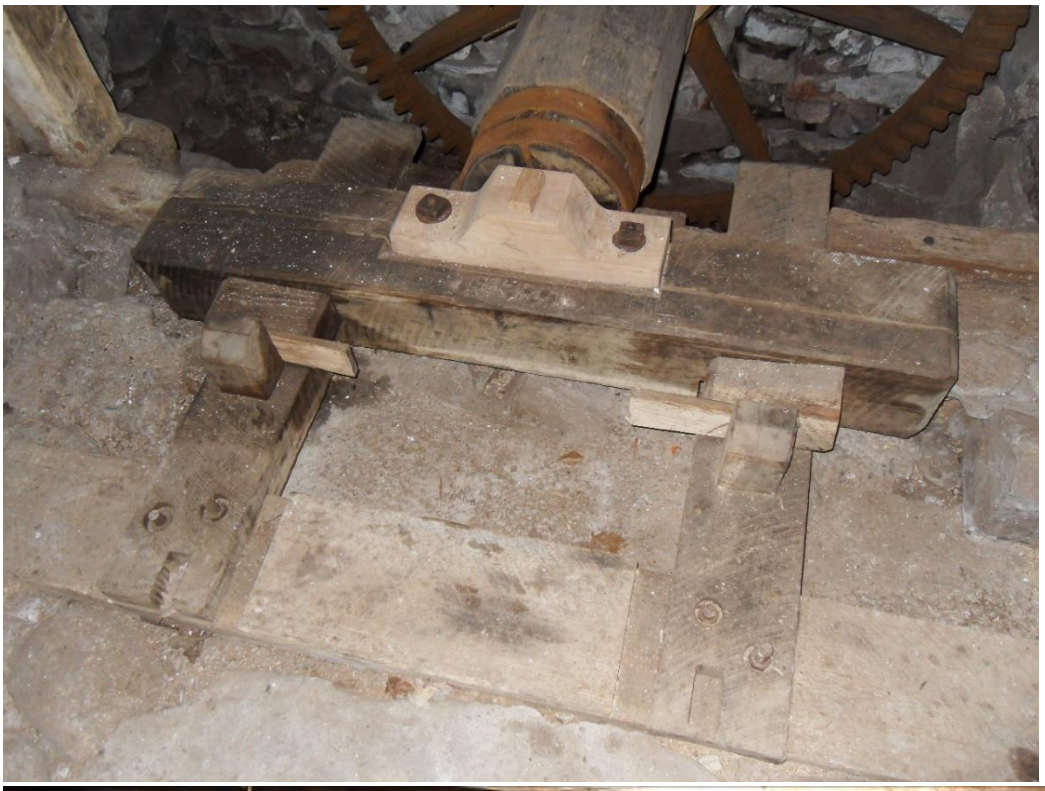
15b Inspection of the rotten timbers of the hurst frame by the outer wall.

16. The pit gear in the lower part of the mill has now been securely fitted to the waterwheel shaft. Like the waterwheel, oak wedges have been made to fit between the casting and the hexagonal shaft. New square-head fixings have been made especially to bolt the two halves of gear together. However, the metal repair section that was made to repair a broken section of the gear was found not to be strong enough for the job. The millwrights have carried out the extra work of re-inforcing the repair section with a fillet of metal welded to it.

16a and b A repair section after being strengthened by the millwrights.

17. The lower hurst frame has been thoroughly cleaned of years of dirt, grime, grain and rodent faeces. Unnecessary and incorrect wedges and pieces of timber have been removed. Suitable replacements have been found and fitted to secure the inner waterwheel bearing timbers. The rotten bridge tree has been removed for a new one to be made by the main site contractor.

    Some rotten timber has been found next to the outer wall where damp has set in. This was discovered after the removal of some debris and millstone furniture and a suitable repair method is being decided.



17a The cleaned bearing and new cover.

17b Before the restoration, the machinery was hardly visible.

18. The lower mill French burr stones have been cleaned and inspected ready for re-dressing of the furrows.
19. The lower waterwheel has been stripped of the rotten timber buckets and sole boards, cleaned and is waiting to be re-built with new larch timber when it has been supplied to site. The metal tie rods have had their protruding ends trimmed to a safe size, which is more aesthetic and is how they would have originally been made.

19 Lower waterwheel after rotten timber removal and metal work clean.

20. Work to the millstone furniture of the lower mill is nearly 50% complete. The majority of the work will be done in the millwright's workshop. New parts have to be made to replicate the remnants of the old furniture which cannot be repaired and the tun casing repaired and upgraded to meet local environmental health regulations for food produced by the millstones.

20 An example of the lower millstone furniture before millwright work

4. Summary of work to date

Having inspected the progress of work so far and looking at photographic evidence of work being done off site, I am more than happy with the quality of work. Although some unexpected issues arose, solutions agreed between the involved parties have been satisfactory and have not impacted on the expected finish date for the millwright repairs.

As of the 13th December 2018, the millwright's revised schedule is still on track for completion on time. The projected work for early 2019 seems feasible as long as materials arrive on time, weather allows the outside waterwheel repairs to go ahead and that any overlapping work around the waterwheel walls by the main site contractor are accommodating, I cannot see any reason why the remaining work cannot be achieved on time and to the high standards already shown by Janes Ltd Millwrights.

Stuart Hobbs
Advisor for Millwright repairs
20th December 2018