

Evaluation Report Part A:

Urgent Stonework Repairs at Great Malvern Priory during 2019

1. Overview

The Stonework repairs attracted grants from the National lottery Heritage Fund (NLHF), the Garfield Weston Foundation, the Wolfson Foundation in association with Church Care, the Droitwich Preservation Trust and the Friends of Great Malvern Priory.

'Permission to Start' was received from NLHF on 21st January and permission to announce the grant was received on 29th January 2019. In February 2019 the Priory Surveyor (David Arnold of Arnold Bartosch Ltd.) advertised nationally on the Church Care website for expressions of interest from contractors for stonework repairs at the Priory. We received 8 expressions of interest; 5 companies were invited to tender against a specification [1] following an analysis of responses to a PQQ, and 4 tenders were received. We accepted the lowest tender from Sally Strachey Historic Conservation (SSHC) as advised in our surveyor's tender assessment report [2].

A pre-contract meeting with SSHC was held on 11th July when the contract was signed. Work started on 19th August and a practical completion was issued by Arnold Bartosch following a final inspection on 9th December.

2. The Repairs Required

The repairs comprised:

- Rebuilding a section of the West Wall behind the North Aisle and applying a render to an equivalent section of the West Wall behind the South Aisle.
- Pointing internal cracks in the stonework at the west end of the north and south clerestory walls, and pointing cracks in St Anne's Chapel (the south chancel aisle).
- Stabilising the pinnacles of the North Porch, repairing the carved detail and cleaning the stonework.

Peak Moor sandstone was used where replacement stone was required.

2.1 The West Wall

Figure 1 shows a plan of the Priory with the location of the section of west wall to be rebuilt marked in red. Note the very close proximity of the Abbey Hotel behind the Priory.

Figure 2 shows the wall before dismantling. Drill tests in 2013 [3] showed that the wall comprised an inner brick skin with an outer stone cladding, and that the stone cladding was not tied into the brick skin and was bowing with a gap of typically 10cms between the cladding and the brick skin. The coping stones required pointing and the stone at the apex was cracked. Furthermore, the brickwork above the aisle roof and visible from the east side were in a very poor state and also needed to be taken down and rebuilt.

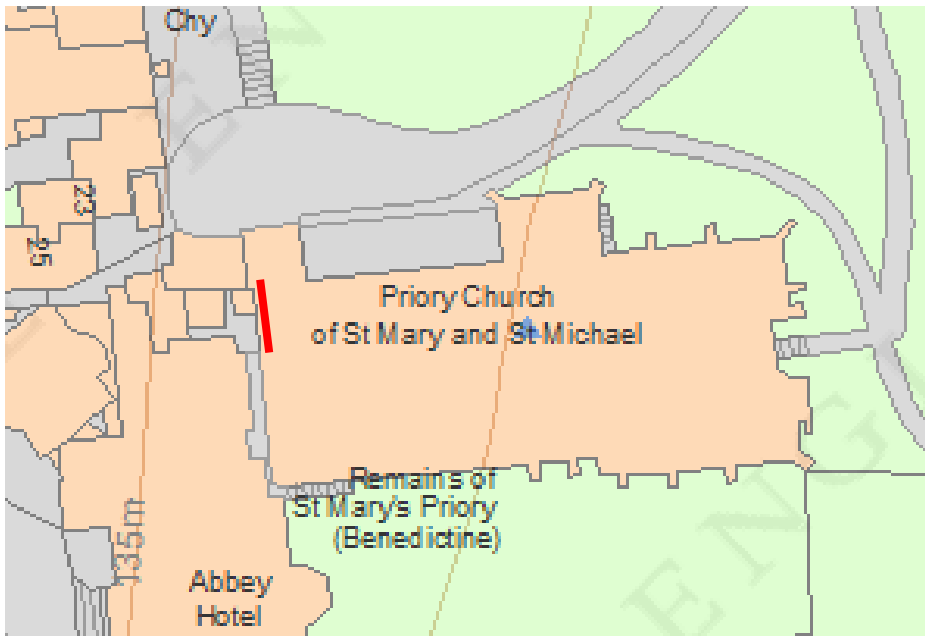


Figure 1: Plan of Priory showing in red the section of the West Wall to be rebuilt



Figure 2: Section of the West Wall to be rebuilt

Before the wall was dismantled, the masons prepared detailed drawings of the wall and each stone in it. As each stone was removed its dimensions were measured to prepare a cutting list of new stone.

As the old stone was removed it became apparent that the bricks of the inner skin had been cut back to a width of only around 5cms as shown in figure 3.



The wall was then inspected by the Priory's structural engineer (FW Haywood) who provided a report [5]. He, together with the Priory surveyor and the DAC, all agreed that since the inner brick skin had remained true for more than 100 years, it could remain in place provided the new outer stone wall was tied into it and that any space between was grouted. Alternate courses were either tied together with s/steel cramps or tied into the mortar of the brickwork.

*Figure 3: West Wall with stone cladding removed
(Note new stone courses in place at base)*



It was a requirement of the Faculty that the foundations of the wall be inspected. Old drawings and prints show a bank rising steeply from the foot of the West Wall. At some time later (possibly in the 1840s when the Abbey Hotel was built?), the ground was banked up to raise the level between the hotel and the Priory. To keep the earth away from the West Wall, a retaining wall was built approximately 70 – 100 cms away from the West Wall and arched over to the West Wall to form a tunnel that runs the whole width of the Priory. Figure 4 shows the entrance to the tunnel. In recent times two toilets have been formed in the space of this tunnel with an entrance through the west wall of the Porch.

Figure 4: Entrance to tunnel running behind the west wall of the Priory

The new stone needed to be built on top of the Priory wall that is the east wall of this tunnel. To judge its condition, the structural engineer and a stone mason climbed over the toilets and

found both the Priory and retaining walls to be in good condition [5]. Figure 5 shows the interior of the tunnel. Note the presence of cables and water pipes.

To judge the distance between the top of the tunnel and the level between the Priory and the hotel, a small pit was dug as shown in figure 6. This distance was only of order 25-30cms.



Figure 5: Interior of tunnel at north end (beyond the toilets)



Figure 6: Trial hole dug below the level of the West Wall visible from Abbey Hotel exposing brickwork in the roof of the tunnel below

The wall was then rebuilt with new stones, new brickwork on the east face of the gable and with new or cleaned copings as shown in figures 7 and 8.



Figure 7: Rebuilding the gable of the West Wall and its brick face (viewed from the aisle roof)



Figure 8: The completed gable of the wall viewed from the hotel side. Note the new flashing above the 'lean-to' shown in figure 2

To help preserve the delaminating stone forming the wall at the west end of the South Aisle, a render was applied with a horse-hair base coat. Figure 9 shows the render completed.



Figure 9: Completed lime roughcast render applied to S Aisle West Wall

2.2 Internal Cracks

Internal cracks in the north and south clerestory walls at the west end and at the east end of St Anne's Chapel (the chancel south aisle) were inspected by FW Haywood, the Priory's structural engineer, in 2018. His report [4] indicated that the cracks were not structurally significant but should be pointed with a flexible mortar to prevent small pieces of stone and grit getting inside that would prevent the cracks closing as the building moves.

The cracks in the clerestory were pointed with the aid of a cherry picker, shown elevated in figure 10.



Figure 10: 'Cherry Picker' used to repoint cracks in clerestory walls.

2.3 The North Porch

2.3.1 Condition before cleaning and repair work

Figure 11 shows the Porch before work started. It is the most decorative element of the Priory but its dirty condition set a 'down-at-heel' tone to the building. The pinnacles and carved detail around the parapet were heavily blackened with carbon deposits. A detailed survey in 2016 [6] stated that the pinnacles needed stabilising within 2 years. It explained also that the carved detail was losing form and legibility as shown in figure 12.



Figure 11. North Porch before work commenced.



Figure 12: Dirty and decaying stone in the parapet.

The stone was first steam-cleaned using a ThermoTech machine. Figure 13 shows the SW pinnacle being cleaned in this way.



Figure 13: Stone being steam-cleaned with a ThermoTech machine.

Some areas of carved detail were then cleaned further by applying an ammonium carbonate poultice, covering this with cling film for several hours as shown in figure 14, and then carefully washing the poultice off.



Figure 14: Ammonium carbonate poultice applied to clean carved detail.

The carbon deposits on parts of the stonework were too thick to be removed by poulticing and a VorTech machine was then used as shown in figure 15. This projects a swirling jet of water containing abrasive particles at the stone and was successful in removing the carbon or reducing it to a lighter grey colour.



Figure 15: The VorTech machine being used to clean the stone.

2.3.2 The Canopy

The masons were excited to discover the highly elaborate carving of the canopy above the statue of the Virgin and child. It is shown in figure 16. (It had been so covered in black deposits that it had been hard to discern.) Traces of historic red paint can be seen on the carving. A sample of this paint was sent for analysis together with other paint samples from the statue and elsewhere on the porch. The analysis report is included as Appendix 1.

The carbon deposits on the canopy had obscured the detail of its carving. To clean this, a trial with a laser was conducted. This proved effective, but it also removed the paint and was slow and relatively expensive. A ‘micro-air’ abrasive machine was then used. This is depicted in figure 17. It projects a fine jet of air with abrasive particles at the stone. This succeeded in either removing or thinning the carbon deposits so that they could be removed with a scalpel.

The cleaned canopy showing the red paint is depicted in figure 18. Because of the whiteness of its stone and the highly ornate carved detail, SSHC believe that the canopy is carved from high quality white Normandy limestone. From similar carvings they have seen elsewhere they believe it may date from the early 1500s. Due to the presence of the paint, and because the carved detail has remained so legible, there is speculation that it may have been taken at some point from an internal location in the Priory or from another building. However, records of a PCC meeting in August 1895 following the restoration of the Porch in that year show that the carved canopy stone was retained during the restoration. Further, a drawing of the N Porch by JM Turner (which probably dates from the early 1800s given that Turner died in 1851) shows the canopy in place.

In order to preserve the paint, it was stabilised and covered with a sacrificial layer of lime-based sheltercoat. The result is shown in figure 19.



Figure 16: The Canopy before and after steam cleaning.



Figure 17: Laser and micro-air abrasive cleaning jet.



Figure 18: The canopy after removal of carbon deposits showing red paint



Figure 19: The cleaned and restored canopy after application of sheltercoat.

2.3.3 Repairs to the Parapet

The original condition of the parapet is shown in figures 11, 12, and 20 below. In figure 20 note the black deposits on sky-facing surfaces, the eroded state of some of the mullions and the eroded cusps of the carved detail. Figure 21 shows the parapet being repaired: new stone mullions have been pieced in and lime mortar has been applied and is being pared back to the required forms. Figure 22 shows a lower section of the parapet. A lime-based sheltercoat has been applied (at this point still wet) to bind the stone.



Figure 20: Original Condition of the parapet



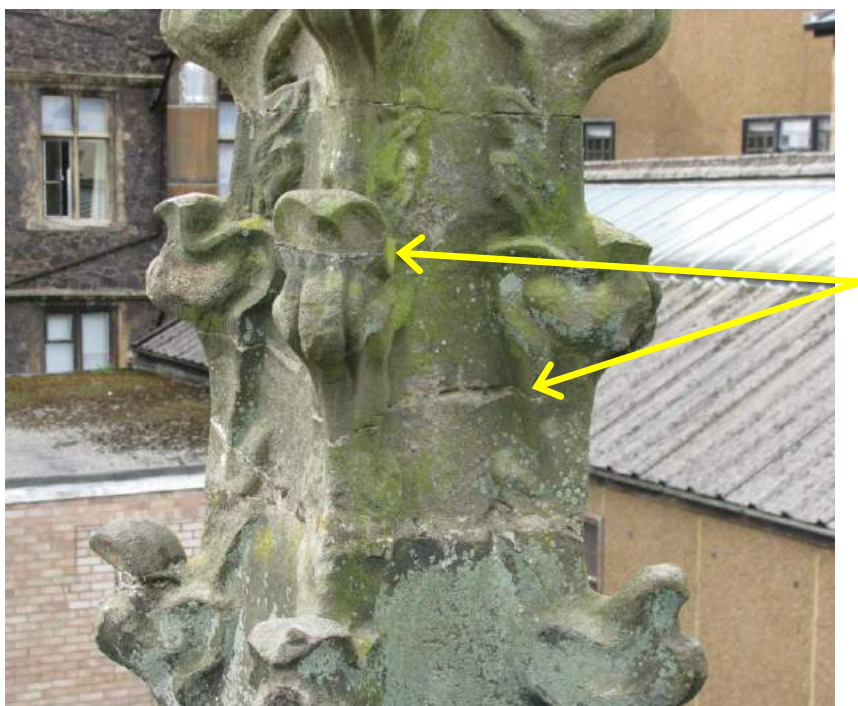
Figure 21: The section of the parapet shown in figure 20 undergoing repairs.



Figure 22: Sheltercoat (still wet) applied to a section of the parapet after cleaning and repair

2.3.4 The Pinnacles

The NW (front right) pinnacle bore cracks as shown in figure 23. The pinnacle was taken down and rebuilt as shown in figure 24 with a s/steel bar through its centre. (At this point the pinnacle had been cleaned with the ThermaTech but not with the VorTech machine.)



Cracks

Figure 23: the NW pinnacle before cleaning and repair.



*Figure 24: Left - The NW pinnacle being rebuilt (before VorTech cleaning).
Right – A pinnacle after VorTech cleaning.*

The SE (rear left) pinnacle also needed rebuilding because a stone at the base of the parapet bearing the pinnacle was severely eroded and much of it had fallen away. This stone can be seen by the top of the red and white pole in figure 25. Four new stones were carved to replace this and the three stones immediately above, as shown in figure 26.



Figure 25 (left): Eroded stone at the base of the parapet under the SE pinnacle.

Figure 26 (right): 3 of the 4 new stones in the parapet below the SE pinnacle (the 4th is below the scaffolding deck).

A third pinnacle (the SW (rear right) pinnacle) was leaning and could easily be rocked by hand. This was also rebuilt. Two decayed stones at its base were replaced.

2.3.5 Conclusion

The cleaned and repaired Porch is shown in figure 27. It now provides a bright and arresting entrance to the Priory. The highly ornate canopy has been revealed and can be enjoyed, and the carved detail of the parapet is again legible. The pinnacles are now safe and secure.

The failing section of the West Wall has been securely rebuilt.

The work is a tribute to the care and expertise of the contractor, Sally Strachey Historic Conservation. Competitive tendering showed that the company carried out the work at a competitive price.



Figure 27: The cleaned and restored Porch

2.3.6 Acknowledgement

The PCC of Great Malvern Priory is grateful to the following organisations that provided financial support to the work:

The National Lottery Heritage Fund through the National Lottery Players
The Garfield Weston Foundation
The Wolfson Foundation in association with Church Care
The Droitwich Preservation Trust
The Friends of Great Malvern Priory

Many of the photographs in this document are those of the contractor (SSHC) and used with permission.

*Howard Wells
Chair, Buildings and Grounds Committee
Great Malvern Priory PCC
December 2019*

References:

1. 'Specification and schedule of works for the repair and conservation of stonework at Great Malvern Priory, Great Malvern, Worcestershire', Arnold Bartosch Ltd., Bath Mews, Cheltenham, 1840/May/2019 Tender Issue (rev. A)
2. 'Tender Report for stonework repairs and conservation at Great Malvern Priory', Arnold Bartosch Ltd., Bath Mews Cheltenham, 26 June 2019
3. 'Findings of an investigation to the external West Wall, Malvern Priory', Sally Strachey Historic Conservation, 2013
4. 'Structural Report, Malvern Priory, Church Street Malvern', F.W. Haywood and Associates, 13 Allesly Old Road, Coventry, 11540, October 2017
5. 'Observations and recommendations following inspection of west wall', F.W. Haywood and Associates, 13 Allesly Old Road, Coventry, 13 December 2019, 11540/CH/SB, Inspection 27th September 2019
6. 'Condition and Recommendation Report, The External Stonework and External and Internal Window Stonework, Great Malvern Priory Church', Sally Strachey Historic Conservation, September 2016

Attachment:

Appendix 1: Paint Analysis Report, C Hassal, Report C418, October 2019

THE NORTH PORCH

Great Malvern Priory

Three paint samples were sent by Sally Strachey Conservation

- 1 Carved limestone canopy above the main door
- 2 Carved Victorian sandstone tracery
- 3 Main figure above main door [red sandstone]

Examination procedure

The samples were examined under low magnification and then the pieces were mounted in cold-setting polyester resin to be cut and polished as cross-sections.

Material from the different layers was dispersed on glass slides and the pigments identified using a polarising light microscope.

A chemical test for lead was carried out on each cross-section

RESULTS

The three samples all showed different layers

Sample 1 – Limestone canopy

More than one set of paint layers was present.

The remains of a very degraded limewash was the first coating. It is in very poor condition, but it does contain a few particles of ochre, and may have been a stone colour.

The limewash remains were followed by a coat of lead white, presumably applied as an oil paint.

The final layers are two coats of red, both based on iron oxides. These reds may in fact be two separate schemes.

Sample 2 – Carved tracery

The sample consists of a single layer of stone-coloured limewash containing particles of yellow and yellow/brown ochre.

The limewash now looks green because it has been affected by microbiological growth.

Sample 3 – Main figure

A thick layer of buff or stone-coloured oil paint, mixed from lead white, a combination of yellow and brown iron oxides and particles of charcoal black.

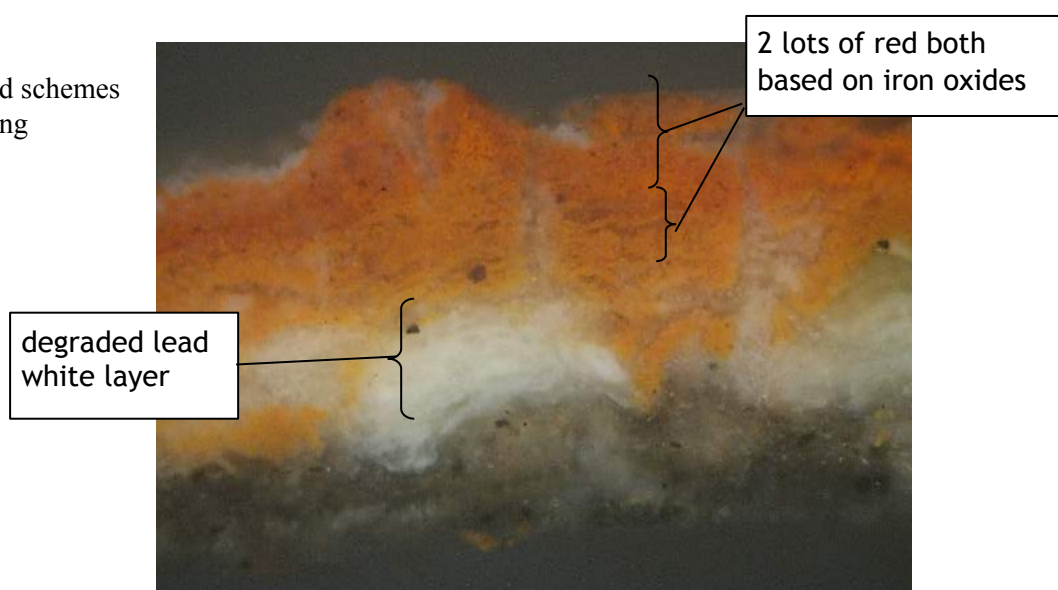
The pigments are not helpful for dating, but the fact that lead white is the bulk pigment means this coating was applied no later than the first half of the twentieth century.

SAMPLE 1

Limestone canopy

Fragment (i)

Showing how the later red schemes fill cracks in the underlying lead white paint layer



Fragment (ii)

Showing the early limewash more clearly



SAMPLE 2

Victorian tracery

Limewash layer containing ochre particles

**SAMPLE 3**

Main figure

The bulk pigment in this buff-coloured paint layer is lead white and so this must be an oil paint.