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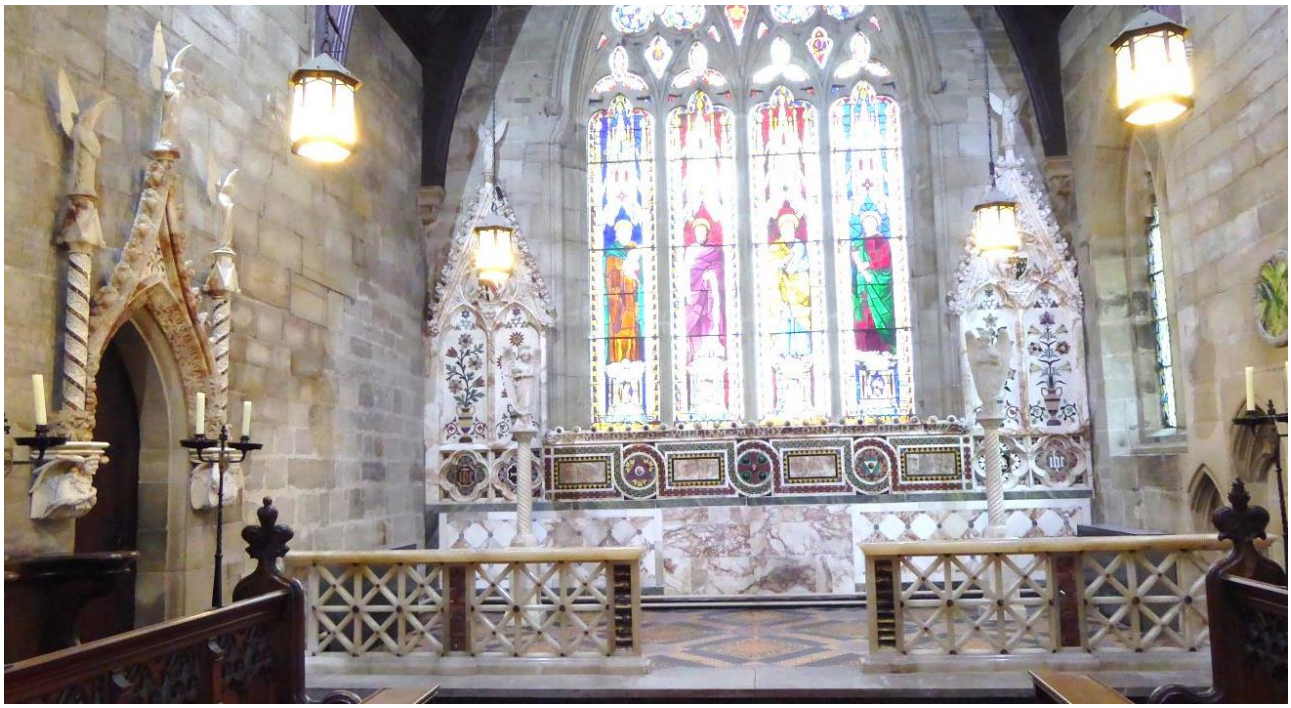
Conservation report for the reredos, communion rail, candlesticks, vestry door, exterior chancel east wall, pinnacles and coping stones

All Saints Church, Mackworth
Diocese of Derby



July 2017

MACKWORTH
DERBYSHIRE

Summary

Project	Conservation works to the reredos, communion rail, candlesticks and vestry door to the Chancel, and wall, pinnacles and coping stones to the Chancel exterior east wall.
Nature of project	To undertake the conservation works while assessing and recommend further works if found necessary.
Name and address of client	PCC All Saints Church Church Lane Mackworth Derby DE22 4NG
Name and address of Conservators who undertook the works	Tim Pretty, Sabina van de Bruck and Berta Mañas Alcaide Hirst Conservation Laughton, Sleaford Lincolnshire NG34 0HE
Address of works	All Saints Church Church Lane Mackworth Derby DE22 4NG
Date of works	15 May to 30 June 2017
Methods employed	Photographic and diagrammatic recording, mortar sampling, mortar removal, blocks removal and relocation, stone cleaning, mortar repairs, re-pointing, fixing loose elements, replica of missing elements, iron cramps treatment, and written documentation.

Contents

Contents 3
1. Introduction 5
2. Conservation works 6
2.1 Location and brief description of the conservation works 6
2.2 The reredos 7
2.2.1 Cleaning 8
2.2.2 Dismantling of stone blocks 10
2.2.3 Fixing loose sections 12
2.2.4 Replica of missing sections 13
2.2.5 Re-pointing 14
2.2.6 Colour retouching 15
2.3 The candlesticks 16
2.3.1 The plinths and bases 16
2.3.2 The angels 18
2.4 The communion rail 19
2.5 The vestry door 20
2.5.1 Re-fixing of angel wing 20
2.5.2 Cleaning 21
2.6 The Chancel east exterior wall 22
2.6.1 Mortar trials 22
2.6.2 Re-pointing 22
2.6.3 Mortar and capping repairs 25
2.6.4 Dismantled blocks 27
2.7 The pinnacles 27
2.8 The copping stones 28
3. Photographs of the conservation works 30
3.1 The reredos 30
3.2 The candlesticks 37
3.3 Communion rail 38
3.4 Vestry door 39
3.5 Chancel exterior east wall 41
3.6 Pinnacles 45
3.7 Copping stones 47
4 Table of figures 49

APPENDICES

Appendix A - Conservation works mappings to reredos

Appendix B – Mortar analysis results

Appendix C – Conservation works mappings to Chancel exterior east wall

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1. Introduction

Hirst Conservation undertook a condition survey of the reredos, candlesticks and communion rail in June 2016 and produced a condition report with treatment recommendations, dated July 2016. Some provisional works were undertaken during the survey to the communion rail, candlesticks and reredos.

The recommendations included conservation works to the reredos and the Chancel exterior east wall, works to the communion rail and dismantling, treatment and relocation of the candlesticks. An estimate for the recommended works was also provided and later approved.

Access to the higher areas of the Chancel exterior east wall allowed a closer inspection to this area, resulting in further recommendations for additional works to two pinnacles and coping stones. These additional works were approved.

In addition, the inspection of the rear of the reredos while removing some alabaster blocks to the central area, revealed some more blocks that needed dismantling and re-fixing. These additional works were also approved.

Once the reredos was cleaned, the PPC decided to commission the cleaning of the Vestry door.

All the works were undertaken at the same time and this report includes results of the mortar analysis as well as a description, photographic and diagrammatic recording of the conservation works.

2. Conservation works

2.1 Location and brief description of the conservation works

All the works are located to the Chancel at All Saints Church in Mackworth; some to the interior and others to the exterior.

The interior elements treated are the reredos, two candlesticks, a small section of the communion rail and the vestry door.

The works to the reredos comprised cleaning, block removal, iron cramp replacement, metal cramp treatment, pinning, fixing loose elements, replica of missing sections and re-pointing.

The works to the candlesticks included dismantling, pinning and relocation.

The works to the communion rail were dismantling of an alabaster block, removal and replacement of two iron cramps and relocation of the block.

The works to the vestry door were re-fixing of an angel wing and cleaning.

Figure 1 Location of treated reredos (1), candlesticks (2), communion rail (3) and vestry room (4)

The areas treated to the exterior east wall of the Chancel are the lower and central areas of the wall, two pinnacles and the coping stones.

The works to the wall comprised, raking out failed pointing and repair mortars, new mortar repairs, capping repairs and repointing.

The works to the pinnacles included lifting, pinning and repointing.

The works to the coping stones were raking out failed pointing mortar, fixing loose elements and repointing.

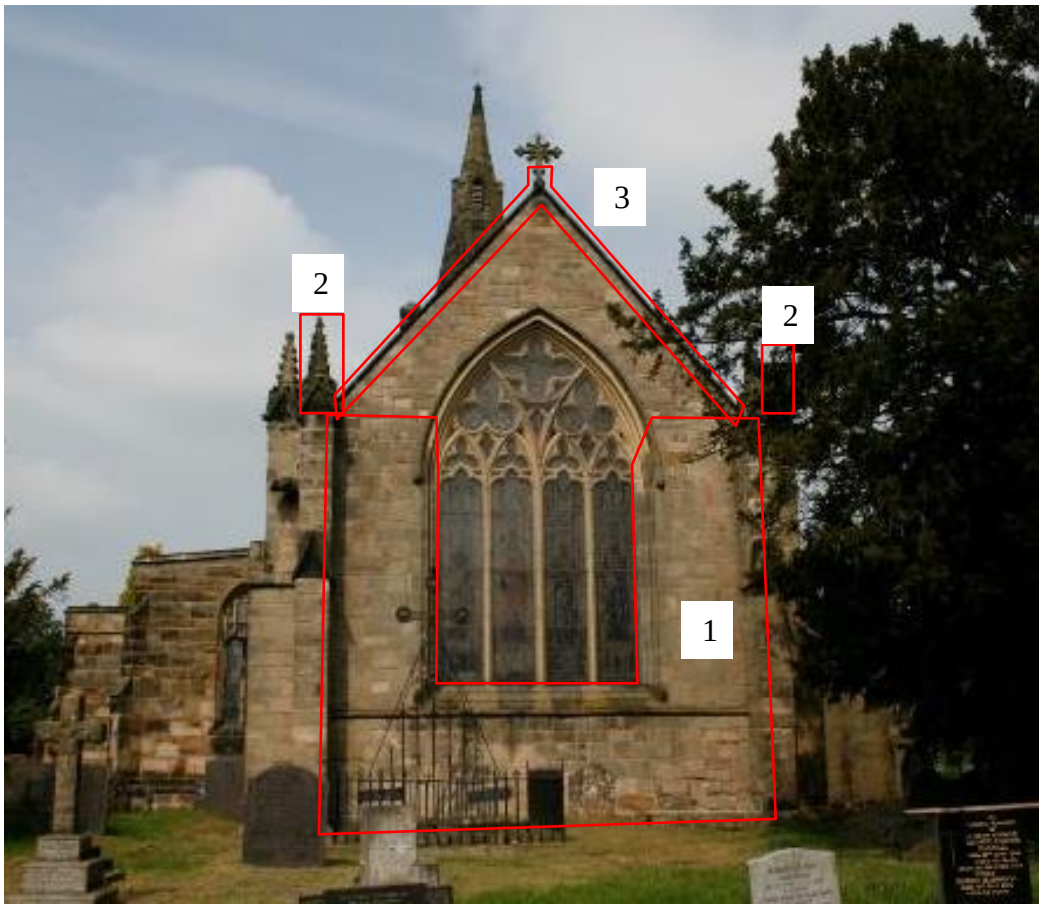

Figure 2 Location of the treated Chancel exterior east wall (1), pinnacles (2) and copping stones (3)

2.2 The reredos

As described in the condition report, the Chancel reredos is carved in red-brown veined alabaster, with many other types of stone inset to produce geometric and floral decorative motifs in flat and semi-sphered pieces.

The reredos is attached to the east wall by iron cramps and mortar. There is gap between the wall and the reredos that permits some air flow to the rear of the reredos, but also dust and debris accumulation.

For a full description of condition refer to the condition report. See Appendix A for mappings of the conservation works undertaken (left, central and right areas as viewed).

2.2.1 Cleaning

The reredos was firstly dry cleaned with brushes and vacuum cleaner. There were extensive amounts of cobwebs, dust and debris to the rear and sides of the upper sections.

Figure 3 Dust, cobwebs and debris before and after initial dry cleaning.

Once some of the blocks to the central area of the reredos were dismantled, the lower row of blocks were found to be filled with debris, which was manually removed and vacuumed.

Figure 4 Debris to rear of reredos before and after removal

The upper sections of the reredos were cleaned to match the rest of the reredos, which had already been cleaned during a previous intervention. A combination of chemical cleaning with ammonium hydroxide[1] diluted in water (1:25) and mechanical cleaning with melamine foam[2] was selected after several trials with different materials and methods.

[1] In water, ammonia is alkaline and becomes ammonium hydroxide, which can be used safely and effectively at 1-3% in de-ionised water to remove surface dirt, and is very effective in the removal of dirt and grease. Ammonia solution is able to wet surfaces more easily than water and acts as a detergent. It has the advantage that the ammonia gas itself will be lost to the atmosphere from the cleaning solution, negating the need for clearing with water.

[2] Foam-like material consisting of a formaldehyde-melamine-sodium bisulfite copolymer.

Figure 5 Location of cleaned areas to reredos

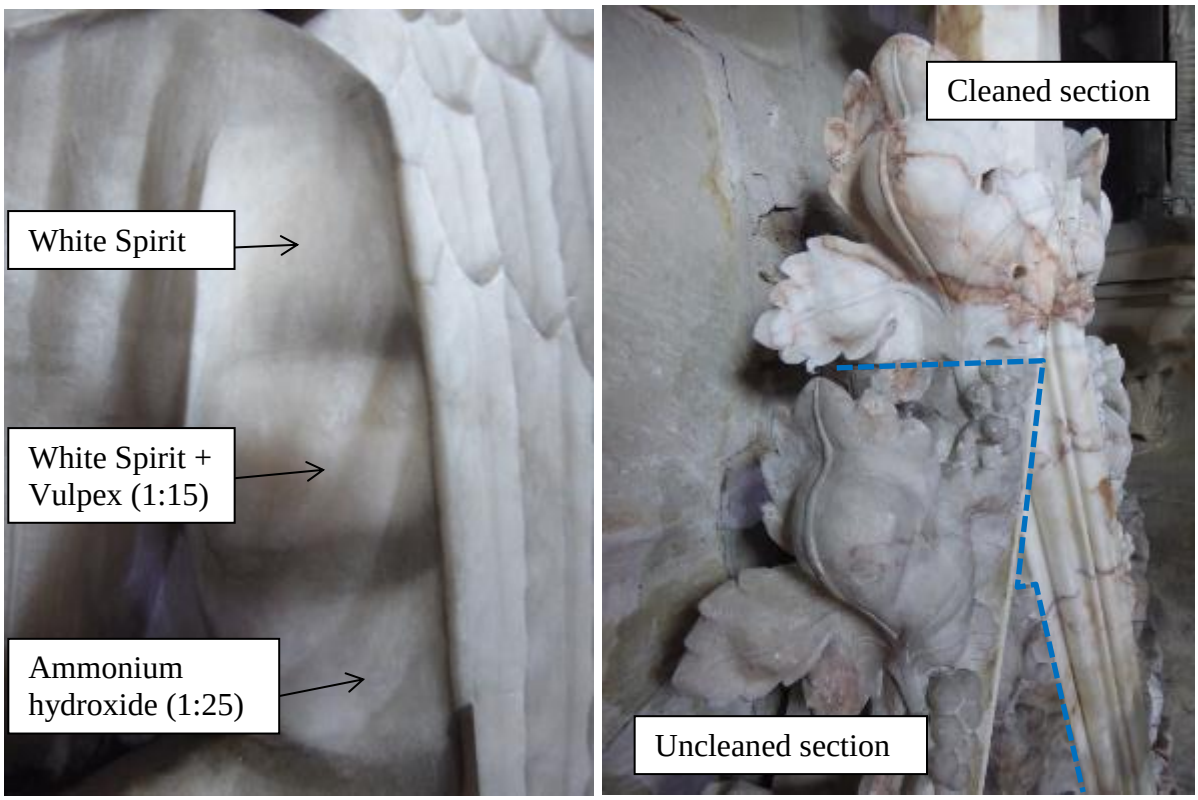

Figure 6 Cleaning trials and detail of cleaned and uncleaned section

The two polychromed shields to the upper sections were cleaned in the same way as the rest of the alabaster.

Figure 7 Detail of the polychromed shield before and after cleaning

2.2.2 Dismantling of stone blocks

Some of the stone blocks of the reredos had moved forward due to the corrosion and expansion of the ferrous cramps used during its construction. See condition report for a more detailed description and location of the displaced blocks and metal cramps (page 9, 16 and Appendix C in the condition report).

There were three areas where blocks were dismantled: upper and lower sections to the central area and lower section to the right side, as viewed.

Figure 8 Location of dismantled blocks to reredos

Three large blocks of alabaster were removed from the upper section of the central area. They were loose and no metal cramps or rods were found in two of the three blocks. The two blocks located to the sides were pinned to the adjacent lateral blocks and all three blocks were also pinned to the lower row of blocks with stainless steel rods and polyester resin[3]. The alabaster blocks were relocated, bedded in gypsum with no aggregates.

Additionally, the metal rods joining the lower row of alabaster blocks and the east wall were cleaned of rust, treated with a rust convertor[4] and painted with black metal paint[5] to prevent further corrosion and expansion.

Figure 9 Pinning dismantled block and treated metal rods behind the reredos

Two green marble blocks and twelve alabaster blocks were dismantled to the lower central section of the reredos. The rusted iron cramps and most of the cement based mortar used for their fixing to the wall were removed. See Appendix B for mortar analysis results. The blocks were fixed to the wall with stainless steel rods and polyester resin. The stone blocks were relocated, bedded in gypsum with no aggregates.

Figure 10 Condition of the ferrous cramps and cement based mortar. Replacement for stainless steel cramps

[3] Jolly and R-KF2. General purpose polyester resin is a quick curing unsaturated polyester resin based on Orthophthalic raw material. The quantity of catalyst and accelerator can be adjusted to get a shorter or longer gel time. The accelerator must be completely mixed before catalyst is added in order to avoid a direct blending which may cause an explosion.
[4] Kurust by Hammerite
[5] Satin black metal paint by Hammerite

A large green marble block and two alabaster blocks to the right lower section of the reredos, as viewed, were carefully dismantled. The rusted iron cramps were removed and replaced for stainless steel rods fixed to the wall and stone with polyester resin. The stone blocks were relocated, bedded in gypsum with no aggregates.

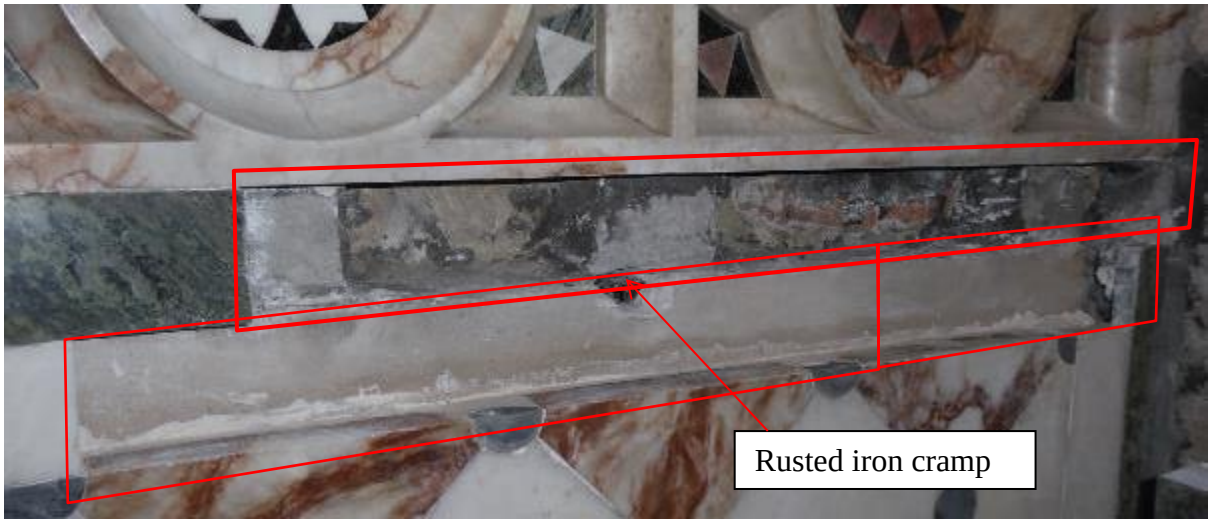

Figure 11 Dismantled blocks to right lower section

Figure 12 Location of pinning between stone blocks (orange) and pinning to wall (green)

2.2.3 Fixing loose sections

During the condition survey, the left wing to the upper right angel, as viewed, was dismantled as it was loose and was at risk of falling. The wing was cleaned of gypsum and the two rods replaced for stainless steel rods. The position was corrected and relocated bedded in gypsum.

Figure 13 Angel wing before replacement of rods and after relocation

There were many stone geometric pieces to the lower section of the reredos that were loose. They were cleaned of gypsum and resin and re-fixed with a polyester resin (Jolly Vertical Straw).

Figure 14 Location of the loose sections (blue)

2.2.4 Replica of missing sections

There were four geometric stone pieces missing to the lower section of the reredos. They were replicated in polyester resin with pigments and fixed with polyester resin to the reredos.

Figure 15 Location of the missing sections (red)

Figure 16 Replica of the missing sections

2.2.5 Re-pointing

Much of the pointing mortar had failed due to the movement of the stone blocks, and some was totally missing. The failed pointing mortar was carefully raked out with very small chisels and scalpels. They were repointed with gypsum without any aggregate. For a larger image see Appendix A.

Figure 17 Location of the re-pointed joints

Figure 18 Joint before raking out and after repointing

2.2.6 Colour retouching

The new repointing stood out too much in some areas so it was decided to tone it down to match the previous pointing using water colours.

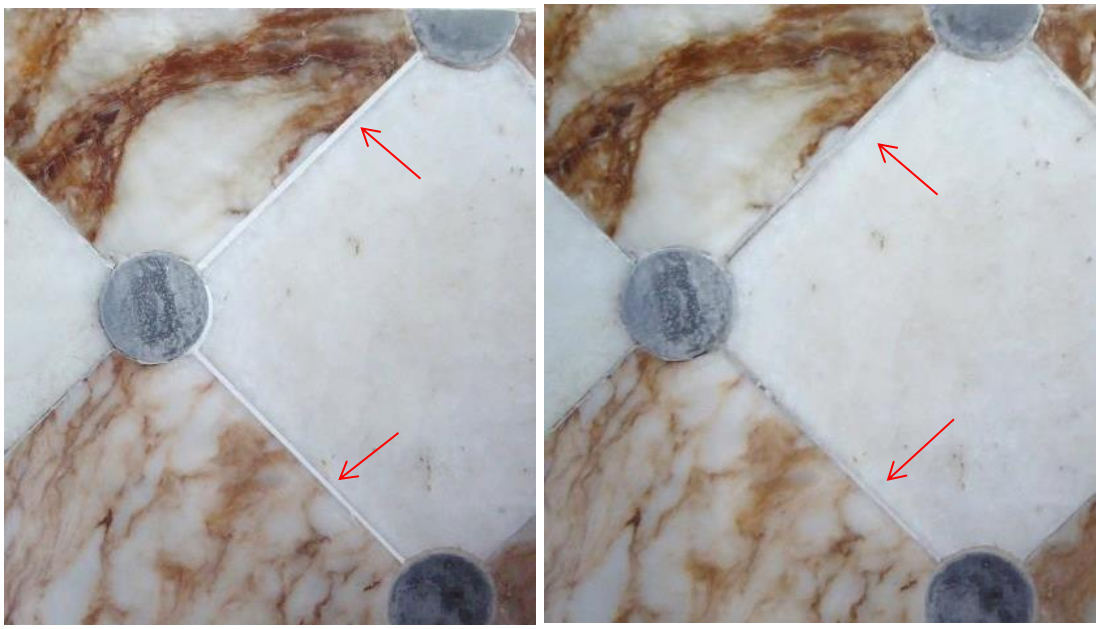

Figure 19 New pointing before and after the colour retouching

2.3 The candlesticks

The two candlesticks were partially dismantled during the survey visit in June 2016. The angels had been kept locked in a wardrobe in the nave. See condition report pages 27 and 28.

2.3.1 The plinths and bases

The plinth bases were both cracked as a result of the corrosion and expansion of the internal metal rod. These metal rods were in direct contact with the ground, absorbing moisture from the chapel floor and getting rusted. The plinths were slightly opened to candlestick A and widely opened to candlestick B.

The shafts and plinths were carefully lifted from the ground and the bases were dismantled. All the metal corrosion was mechanically removed from the alabaster and metal rods. Approximately two centimetres of both rods were cut out to prevent further direct contact between the metal and the ground.

Figure 20 Metal corrosion before and after removal from the bases

Apart from the cracks, there were also thin but large fissures to the bases. Pinning and cramps with stainless steel rods and polyester resin wereused for fixing the bases together.

Figure 21 Drilling for pinning and view of base with stainless steel cramps ready to be fixed with resin

The plinths to both candlesticks were also pinned together with stainless steel rods and polyester resin to close the openings and prevent further movement.

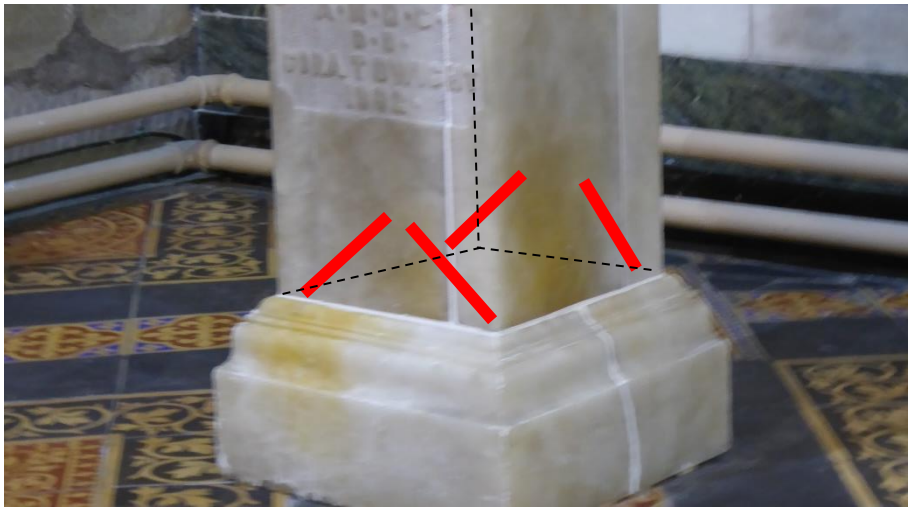

Figure 22 Location of the pinning works to plinths.

Once the bases and plinths were fixed together, the internal metal rods were covered with resin to prevent corrosion and fixed to the bases with resin. The plinths and bases were bedded in gypsum with no aggregates.

The joints to the plinths were raked out to remove previous pointing repairs. The joints and cracks were filled with gypsum with no aggregates.

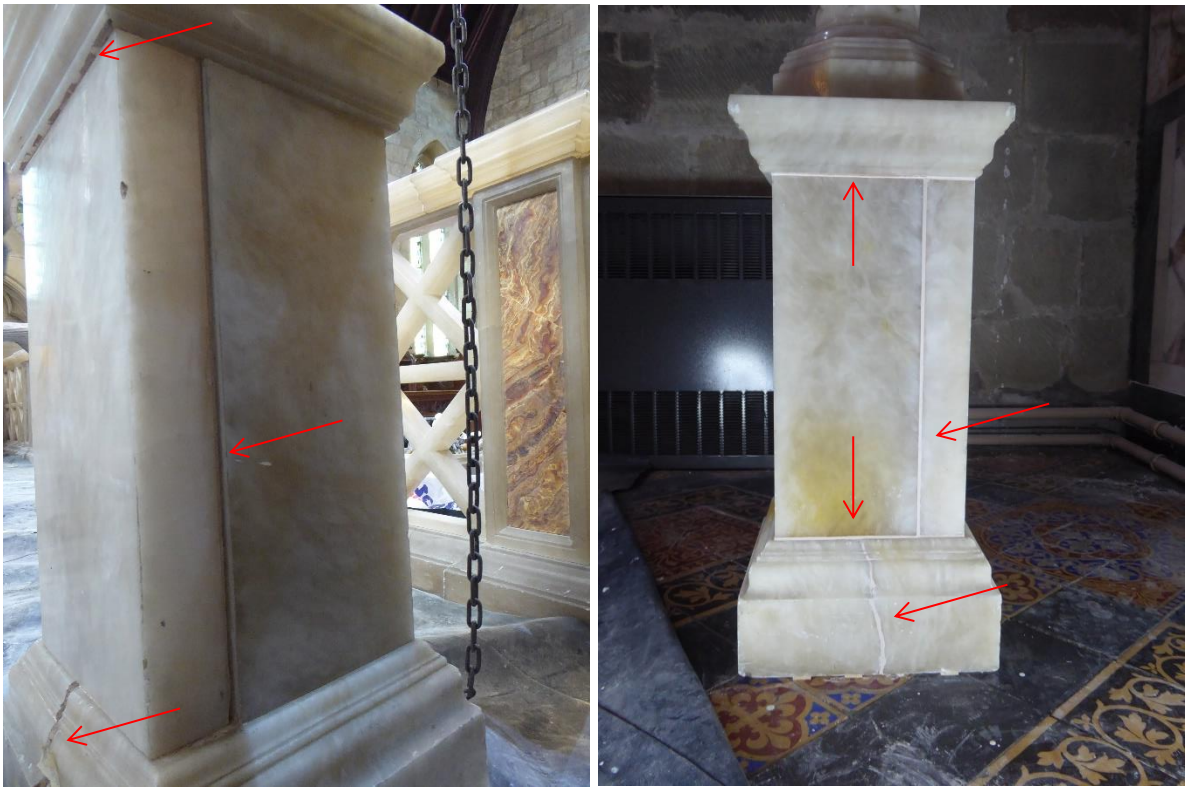

Figure 23 Plinth joints and cracks before raking out and after filling

Some trials were performed to reduce the ferrous stain to the surface of the alabaster. Poultices of EDTA, ammonium carbonate, tri-ammonium citrate, hydrogen peroxide and sodium hydrosulphite were tried but staining was not reduced.

Figure 24 Trials to reduce the ferrous stains to the alabaster surface

The new pointing was also toned down as in the reredos with water colours.

Figure 25 New pointing before and after the colour retouching

2.3.2 The angels

Before the relocation of the angels back on to the candlesticks, the columns were relocated to their original locations. They needed some timber wedges to level from the irregular tile floor. No other material was placed as an interlayer between the alabaster and the tiles.

The angels were carefully lifted and relocated without adding any resin or gypsum. The large metal rods that run through the columns serve as supports to the angels, not requiring any further fixing. They were not fixed before dismantling and this allows changing the position of the angels without difficulty. The chalices and auras were re-fixed using the same screws as before their dismantling.

The candlesticks were not cleaned as part of this phase of conservation works.

Figure 26 Location of the metal rod inside the angel and the column

2.4 The communion rail

An alabaster block to the north end of the communion rail in contact with the north chancel wall was moving. The reason was the oxidation and expansion of the ferrous cramps, producing movement and detaching from adjacent alabaster blocks.

The treatment consisted of the removal and replacement of these iron cramps with stainless steel cramps, fixed with polyester resin. The alabaster block was relocated, bedded in gypsum without aggregates. The same material was used for pointing, toned down with water colours.

The communion rail was not cleaned as part of this conservation works.

Figure 27 Replacement of ferrous cramps for stainless steel cramps and polyester resin

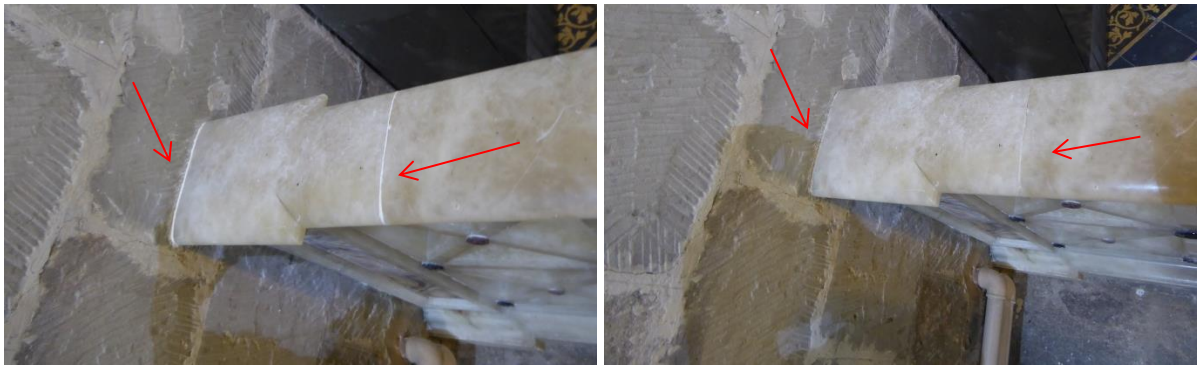

Figure 28 Pointing before and after toning down with water colours

2.5 The vestry door

The vestry door is a memorial monument (Harriot Mundy 1886) carved in alabaster and other stones by R.C Lomas from Derby and fixed to the Chancel north wall. Works to this monument were limited to re-fixing of an angel wing and cleaning of the monument.

Figure 29 General initial view of the vestry door and sculptor's signature

2.5.1 Re-fixing of angel wing

The left wing of central angel had been previously fixed with wire, gypsum and resin. The wire surrounded the wing at the break point, and had been fixed with gypsum, which completely covered the reverse of the wing.

All the gypsum, resin and wire were removed and the wing was found to be in three separate pieces.

The pieces were cleaned and pinned together. The wing was double pinned and fixed with polyester resin to the angel. The crack and a small missing section were filled with gypsum. Finally the gypsum was toned down with water colours.

Figure 30 Dismantling of angel wing in three pieces

Figure 31 Pinning and re-fixing angel wing

2.5.2 Cleaning

The monument was dusted and vacuumed to remove dust, cobwebs and debris using a soft brush. The same materials used for the reredos cleaning were tested and used for the cleaning of this monument; a combination of chemical cleaning with ammonium hydroxide diluted in water (1:25) and mechanical cleaning with melamine foam was used.

Figure 32 Examples of cleaned and uncleaned sections

2.6 The Chancel east exterior wall

See detailed condition description (page 16) and treatment recommendations (page 21-22) on the condition report dated June 2016. See Appendix C of this report mappings of the conservation works.

2.6.1 Mortar trials

Mortar trials with different aggregates and lime-aggregate ratios were performed to match the colour and texture of one of the existing pointing mortars and the stone for the mortar repairs. The selected mortars were intended to be lighter in colour as they will eventually get darker/greener from weathering.

Figure 33 Mortar trials for repointing and mortar repairs

2.6.2 Re-pointing

The exterior wall needed some re-pointing to areas where the previous pointing was missing or had already failed, allowing water ingress inside the wall.

Figure 34 Examples of failed pointing mortar to the exterior wall

The pointing mortar in bad condition was carefully raked out using hand chisels. The joints were very deep in many sections and needed filling with slate fragments and the bigger holes were filled with brick fragments.

Figure 35 Failed pointing mortar raked out and filling of joints with slate fragments

Since many joints were very deep, a base coat mortar was applied while filling with slate and bricks: natural hydraulic lime 3.5 and sharp sand (1:3).

Figure 36 Wall section after the application of the base coat mortar to most of the joints

The selected top coat composition is natural hydraulic lime 3.5, sieved sharp sand (reddish) and coarse sharp sand (yellowish) with a 1:2:1 ratio.

Figure 37 Re-pointing top coat mortar while still wet (left) and dry (right)

All the re-pointing works to the Chancel exterior east wall are located in the conservation works mapping (Appendix C).

Figure 38 Location of the re-pointing works to the Chancel exterior east wall

2.6.3 Mortar and capping repairs

Some previous mortar repairs had also failed, and stone degradation to some ashlar blocks required capping repairs[6] to prevent further degradation.

The failed mortar repairs were carefully cut out using hand chisels. The depth of some of the missing stone sections was over 10 cm in some areas.

Figure 39 Removal and depth of failed previous mortar repairs

Due to the depth of the mortar repairs, stainless steels cramps were used to form an armature. A base coat mortar was applied; using the same composition as the pointing base coat mortar. Natural hydraulic lime 3.5, kiln dried sand and sieved sharp sand (yellowish) with a ratio of 1:2:1 were used for the top coat mortar. The top coat mortar was cut still wet to form the pointing lines which were filled with the same top coat pointing mortar used to the rest of the wall.

Figure 40 Preparatory armature and application of base coat

[6] Capping repairs/ending repairs. Mortar additions undertaken to protect exposed plaster and stone eges against loss, water and dirt infiltration.

Figure 41 Application of top coat and final mortar repair with pointing lines

The same mortar composition as for the top coat of the mortar repairs was used to undertake the capping repairs to the stone.

Figure 42 Before and after the capping repairs to stone

All the mortar and capping repairs to the Chancel exterior east wall are located in the conservation mappings (Appendix C).

Figure 43 Location of the mortar (blue) and capping (green) repairs to the Chancel exterior east wall

2.6.4 Dismantled blocks

One block needed dismantling and relocation after the failed pointing mortar was removed. It was cleaned of previous mortars and placed back bedded in mortar. See location in Appendix C.

Figure 44 Dismantled block before, during and after relocation

2.7 The pinnacles

Two of the pinnacles to the east elevation needed stabilization works. See Appendix C for their location.

The pinnacle to the south was carefully lifted and a stainless steel rod was inserted through the centre, fixed with polyester resin. Two smaller pieces needed pinning. They were all relocated bedded in lime mortar and joints and cracks were filled with lime mortar: natural hydraulic lime 3.5 and aggregates (ratio 1:3).

The pinnacle to the north only needed pinning works to secure its position. Two stainless steel rods were pinned and injected with polyester resin. The holes and joint were filled with the same lime mortar used for the other pinnacle.

Figure 45 Relocation of the south pinnacle upper section and pinning to the north pinnacle

2.8 The coping stones

The pointing mortar to the coping stones on the east elevation had failed and there was a danger of possible water ingress coming into the roof and/or wall. All the pointing mortar was carefully raked out with small hand-held chisels.

Figure 46 Removal of failed pointing mortar to coping stones

Some of the previous mortar repairs and cracked stone sections became loose during the pointing removal. These pieces were fixed with polyester resin and some were pinned with stainless steel rods. See Appendix C for location.

Figure 47 Pinning of failed previous mortar repair

The joints gaps were filled where possible with pieces of slate. A base coat of lime mortar [NHL 3.5 and sharp sand (1:3)], was applied, followed by a top coat of lime mortar, [NHL 3.5, sieved sharp sand and sharp sand (1:2:1)]. They were all protected with hessian to prevent cracks and quick drying.

Figure 48 Base mortar coat for pointing works to the coping stones

Figure 49 Top mortar coat for pointing works to the copping stones

The cross to the east elevation exhibited slight movement although it appeared sound and was thought to pose no danger of falling. However, some polyester resin was injected to give it some further stabilization and prevent water ingress into the bedding mortar.

Figure 50 Injection of polyester resin to joint of the cross

3. Photographs of the conservation works

3.1 The reredos

Figure 51 Initial condition of alabaster blocks to the central section

Figure 52 Dismantling of alabaster and marble blocks process

Figure 53 Fixing the alabaster blocks to the wall

Figure 54 Final condition of central section

Figure 55 Initial condition of alabaster and marble blocks to right area of reredos

Figure 56 Dismantling alabaster and marble blocks to right area of reredos

Figure 57 Cleaning of upper section to reredos

Figure 58 Cleaning of upper section to reredos

Figure 59 Replica of missing pieces to reredos

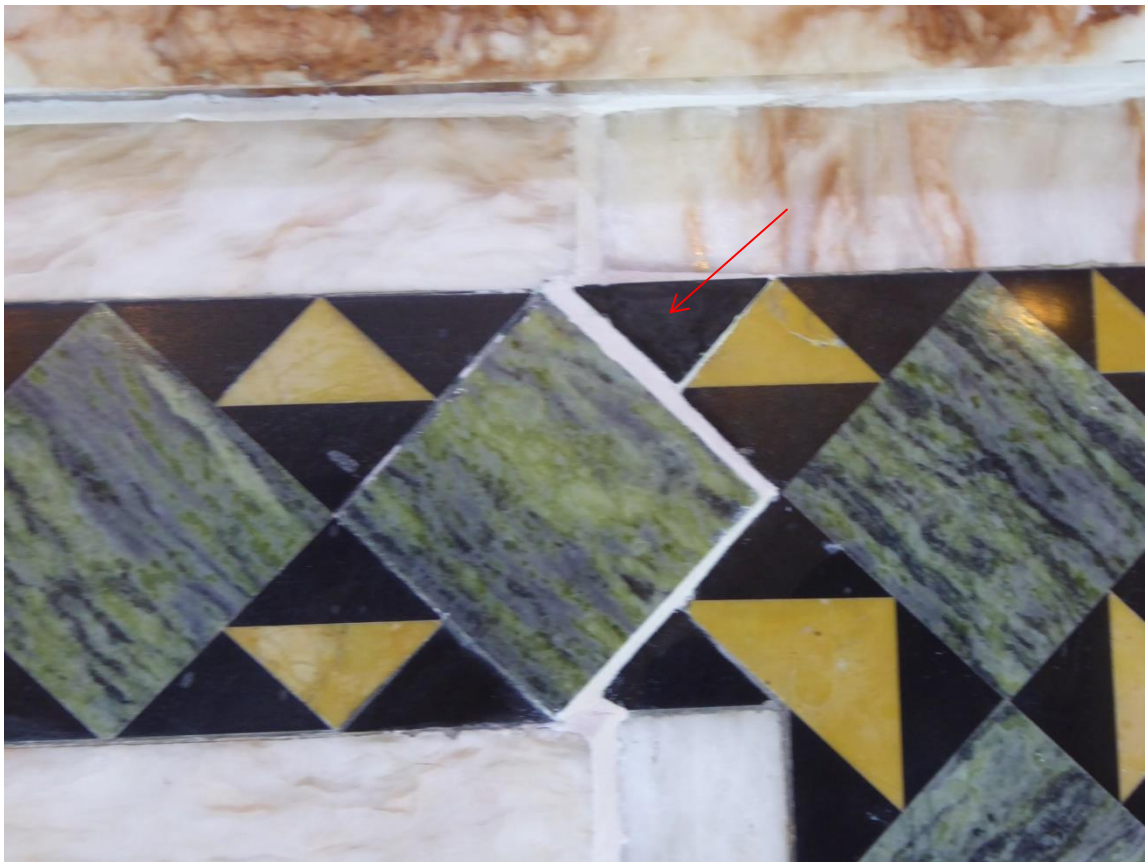

Figure 60 Fixing replica piece to reredos

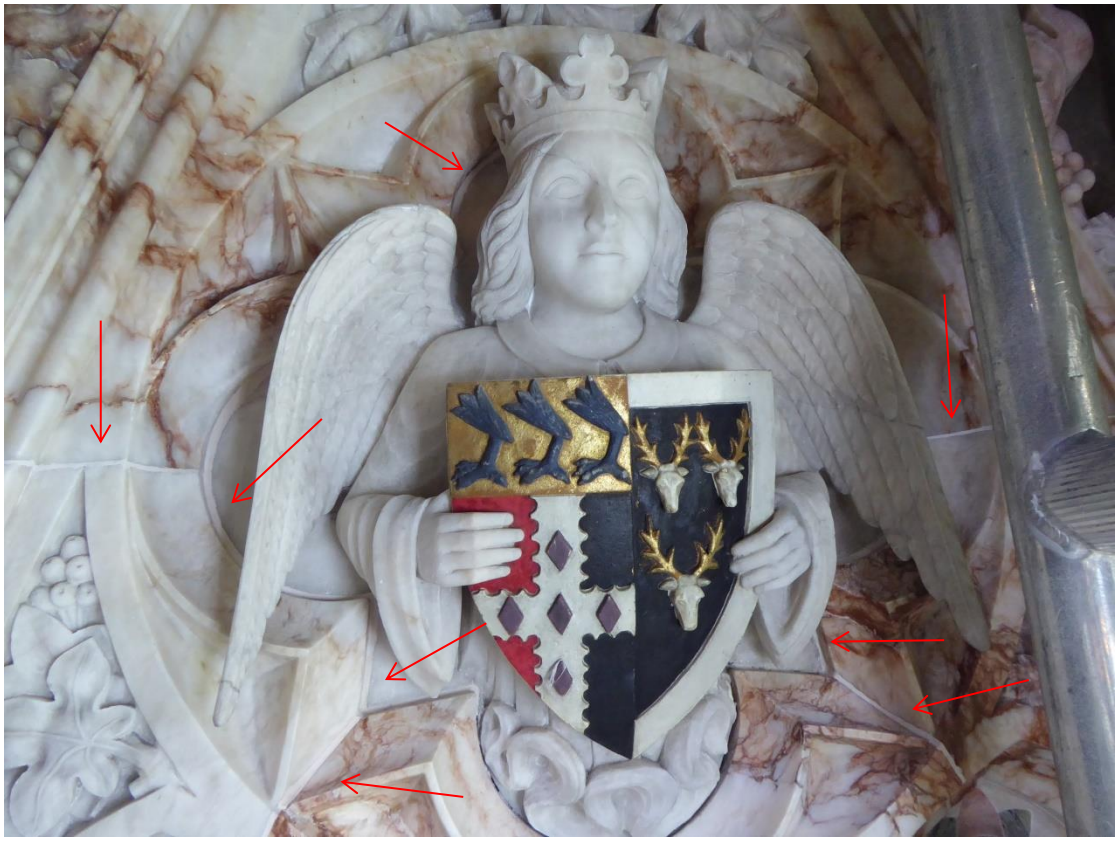

Figure 61 New pointing to reredos

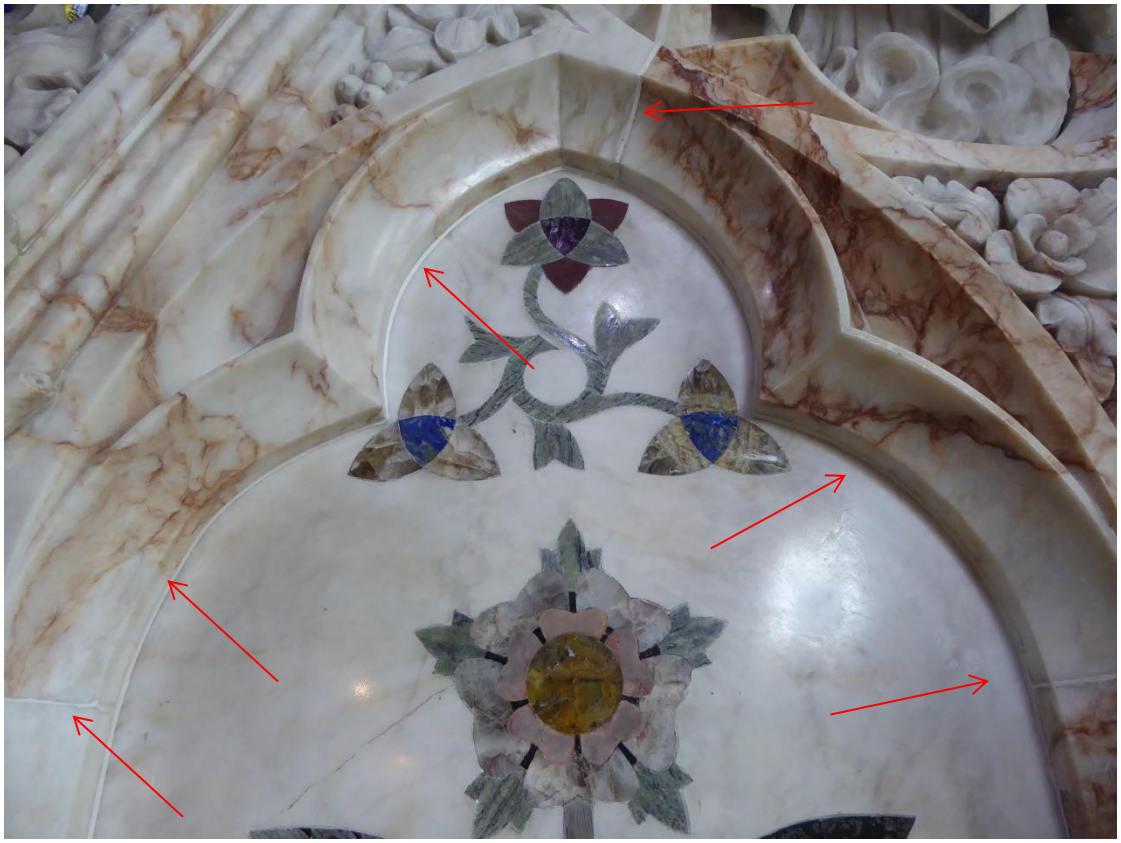

Figure 62 New pointing to reredos

Figure 63 Pointing mortar before toning down

Figure 64 Pointing mortar after toning down

3.2 The candlesticks

Figure 65 Initial condition of crack to the base of candlestick

Figure 66 Crack condition after fixing and filling

3.3 Communion rail

Figure 67 Replacement of two metal cramps and fixing with resin

Figure 68 Relocation of block and new pointing

3.4 Vestry door

Figure 69 Initial and final condition of the vestry door

Figure 70 Initial, during process and final condition of the angel wing to the vestry door

3.5 Chancel exterior east wall

Figure 71 Initial condition of previous mortar repairs to exterior wall

Figure 72 Condition of new mortar repairs to exterior wall

Figure 73 Initial condition of pointing mortars to exterior wall

Figure 74 New pointing works to exterior wall

Figure 75 Initial condition of pointing mortars to exterior wall

Figure 76 Raking out of failed pointing mortar

Figure 77 Application of first coat of pointing mortar to exterior wall

Figure 78 Application of pointing top coat to exterior wall

3.6 Pinnacles

Figure 79 Dismantling top section of pinnacle

Figure 80 Fragmented pieces to south pinnacle

Figure 81 Cleaning of joint from previous mortars and resins

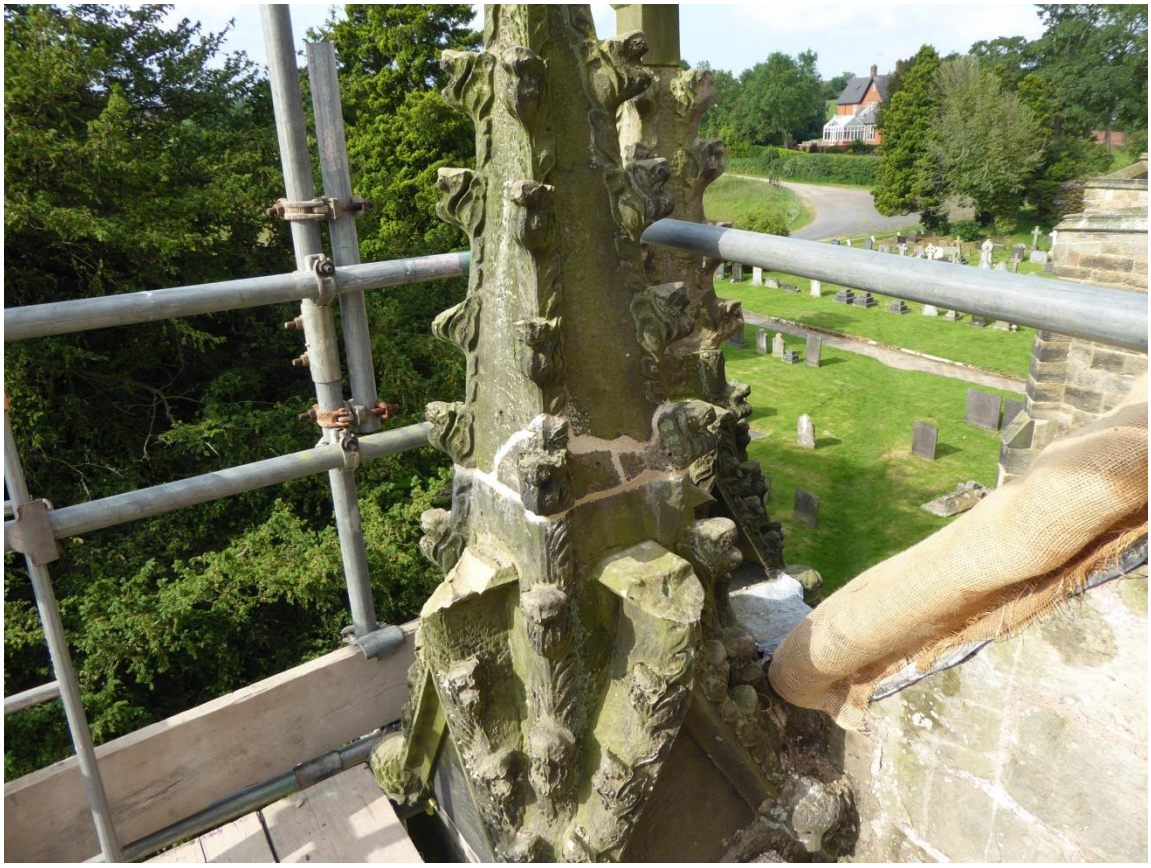

Figure 82 Final condition of pinnacle with pointing works

3.7 Copping stones

Figure 83 Initial condition of pointing to coping stones

Figure 84 Pointing base coat to coping stones

Figure 85 Wetting and protection with hessian of new pointing mortar

Figure 86 Pointing top coat to coping stones

4 Table of figures

Figure 1 Location of treated reredos (1), candlesticks (2), communion rail (3) and vestry room (4) 6
Figure 2 Location of the treated Chancel exterior east wall (1), pinnacles (2) and coping stones (3) 7
Figure 3 Dust, web cobs and debris before and after initial dry cleaning. 8
Figure 4 Debris to rear of reredos before and after removal 8
Figure 5 Location of cleaned areas to reredos 9
Figure 6 Cleaning trials and detail of cleaned and uncleaned section 9
Figure 7 Detail of the polychromed shield before and after cleaning 10
Figure 8 Location of dismantled blocks to reredos 10
Figure 9 Pinning dismantled block and treated metal rods behind the reredos 11
Figure 10 Condition of the ferrous cramps and cement based mortar. Replacement for stainless steel cramps 11
Figure 11 Dismantled blocks to right lower section 12
Figure 12 Location of pinning between stone blocks (orange) and pinning to wall (green) 12
Figure 13 Angel wing before replacement of rods and after relocation 13
Figure 14 Location of the loose sections (blue) 13
Figure 15 Location of the missing sections (red) 13
Figure 16 Replica of the missing sections 14
Figure 17 Location of the re-pointed joints 14
Figure 18 Joint before raking out and after repointing 15
Figure 19 New pointing before and after the colour retouching 15
Figure 20 Metal corrosion before and after removal to the bases 16
Figure 21 Drilling for pinning and view of base with stainless steel cramps ready to be fixed with resin 16
Figure 22 Location of the pinning works to plinths. 17
Figure 23 Plinth joints and cracks before raking out and after filling 17
Figure 24 Trials to reduce the ferrous stains to the alabaster surface 18
Figure 25 New pointing before and after the colour retouching 18
Figure 26 Location of the metal rod inside the angel and the column 19
Figure 27 Replacement of ferrous cramps for stainless steel cramps and polyester resin 19
Figure 28 Pointing before and after toning down with water colours 20
Figure 29 General initial view of the vestry door and sculptor signature 20
Figure 30 Dismantling of angel wing in three pieces 21
Figure 31Pinning and re-fixing angel wing 21
Figure 32 Examples of cleaned and uncleaned sections 21
Figure 33 Mortar trials for repointing and mortar repairs 22
Figure 34 Examples of failed pointing mortar to the exterior wall 22
Figure 35 Failed pointing mortar raked out and filling of joints with slate fragments 23
Figure 36 Wall section after the application of the base coat mortar to most of the joints 23
Figure 37Re-pointing top coat mortar while still wet and dry 24
Figure 38 Location of the re-pointing works to the Chancel exterior east wall 24
Figure 39 Removal and depth of failed previous mortar repairs 25
Figure 40 Preparatory armature and application of base coat 25
Figure 41 Application of top coat and final mortar repair with pointing lines 26
Figure 42 Before and after the capping repairs to stone 26

Figure 43 Location of the mortar (blue) and capping (green) repairs to the Chancel exterior east wall 26
Figure 44 Dismantled block before, during and after relocation 27
Figure 45 Relocation of the south pinnacle upper section and pinning to the north pinnacle 27
Figure 46 Removal of failed pointing mortar to coping stones 28
Figure 47 Pinning of failed previous mortar repair 28
Figure 48 Base mortar coat for pointing works to the coping stones 29
Figure 49 Top mortar coat for pointing works to the coping stones 29
Figure 50 Injection of polyester resin to a cross joint 29
Figure 51 Initial condition of alabaster blocks to the central section 30
Figure 52 Dismantling of alabaster and marble blocks process 30
Figure 53 Fixing to wall the alabaster blocks 31
Figure 54 Final condition of central section 31
Figure 55 Initial condition of alabaster and marble blocks to right area of reredos 32
Figure 56 Dismantling alabaster and marble blocks to right area of reredos 32
Figure 57 Cleaning of upper section to reredos 33
Figure 58 Cleaning of upper section to reredos 33
Figure 59 Replica of missing pieces to reredos 34
Figure 60 Fixing replica piece to reredos 34
Figure 61 New pointing to reredos 35
Figure 62 New pointing to reredos 35
Figure 63 Pointing mortar before toning down 36
Figure 64 Pointing mortar after toning down 36
Figure 65 Initial condition of crack to the base of candlestick 37
Figure 66 Crack condition after fixing and filling 37
Figure 67 Replacement of two metal cramps and fixing with resin 38
Figure 68 Relocation of block and new pointing 38
Figure 69 Initial and final condition of the vestry door 39
Figure 70 Initial, during process and final condition of the angel wing to the vestry door 40
Figure 71 Initial condition of previous mortar repairs to exterior wall 41
Figure 72 Condition of new mortar repairs to exterior wall 41
Figure 73 Initial condition of pointing mortars to exterior wall 42
Figure 74 New pointing works to exterior wall 42
Figure 75 Initial condition of pointing mortars to exterior wall 43
Figure 76 Raking out of failed pointing mortar 43
Figure 77 Application of first coat of pointing mortar to exterior wall 44
Figure 78 Application of pointing top coat to exterior wall 44
Figure 79 Dismantling top section of pinnacle 45
Figure 80 Fragmented pieces to south pinnacle 45
Figure 81 Cleaning of joint from previous mortars and resins 46
Figure 82 Final condition of pinnacle with pointing works 46
Figure 83 Initial condition of pointing to coping stones 47
Figure 84 Pointing base coat to coping stones 47
Figure 85 Wetting and protection with hessian of new pointing mortar 48
Figure 86 Pointing top coat to coping stones 48