

Our ref: HMS ID 2221

Ms Annika Hather
Planner
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By email: Annika.Hather@planning.nsw.gov.au

Dear Ms Hather

Sandstone Precinct Mod 18 - Lands Building Ceilings (SSD-7484-Mod-18) – Lands Building Ceilings

Thank you for your referral dated 12 January 2023 inviting comments from the Heritage Council of NSW on the above State Significant Development modification.

The proposed modification involves demolition and replacement of ceilings and cornices on the lower ground, ground and level one of the Lands Department Building and the removal of the Lyon and Cottier Coat of Arms.

The applicant engaged with Heritage NSW and presented the proposal to remove the ceilings to the Heritage Council's Technical Advisory Panel (TAP) on two occasions. The comments made by the TAP can be found in Attachment 1.

The application states that the ceilings cannot be conserved because:

- the preferred conservation methodology uses Westox RAP adhesive that cannot be warranted and may impact the building's insurability; and
- the proposed performance-based solution (ie performance of materials) for the building will not meet the agreed Fire Resistant Levels (FRLs).

Heritage significance of the Lands Department Building - State Heritage Register item (SHR no. 00744)

The Lands Department Building is one of the most outstanding surviving Victorian era buildings in Sydney. The building is significant for its long-term use as the administrative head office of Department of Lands, the purpose for which it was designed by prominent architect James Barnet. The building forms a visually satisfying enclosure to the southern side of Macquarie Place and relates in scale and materials to the other Government buildings at the eastern end of Bridge Street. A vital landmark in the history of surveying, land titles and public works in New South Wales.

Our analysis of Modification 18 including the supporting drawings and documents is in Attachment 2. A summary of the analysis and recommendations are outlined below.

Summary

The ceilings proposed for removal in Modification 18 are of high and exceptional significance. The policies in the Conservation Management Plan state that the lath and plaster and decorative plasterwork throughout the Lands Building are of exceptional and high significance and should be retained *in situ*, repaired, and conserved.

It is noted that the condition of the ceilings in the Lands Building has deteriorated considerably from generally good and fair in 2015 to poor and very poor in 2022. It is not clear from the documentation the exact cause of the ceiling deterioration. It is likely that the deterioration is related to localised water ingress, a lack of regular maintenance and possibly the vibrations from the current construction activities. Furthermore, it is understood that ~34% of the ceilings were not given a condition rating because ceiling protection is installed and there are floorboards above the ceiling.

The implementation of the methodology for conservation of the ceilings and cornices as outlined in the Northrop report, *Preliminary Report on Permanent Stabilisation Detail of Timber and Metal Lath Ceilings* (16 August 2022), is supported. According to Northrop's assessment, the proposed method of conservation will have a low risk of major ceiling failure/collapse.

Westox has been used in other buildings for conservation of ceilings in NSW. These public and privately owned buildings remain open to the public and for commercial use including the Australian Museum and the GPO Building.

The fire safety strategy proposed by Warringtonfire is reliant on material performance to ensure life safety and property protection. Meeting the agreed FRLs is not the only way to achieve the performance requirements of the National Construction Code for fire safety and fire resistance. We support a first principles fire engineering analysis using computer modelling be undertaken and peer reviewed to determine the actual fire resistance levels needed for the ceilings.

The Department of Planning Environment should give consideration to the cumulative impact of incremental loss of original fabric over time that is having a direct, permanent and adverse impact on the intactness and authenticity of the interior of the Lands Building.

Comments

Ceilings, cornices and decorative plasterwork

Given that the proposed demolition and replacement of ceilings and cornices on the lower ground, ground and level one of the Lands Department Building will have a direct, permanent and adverse impact on the heritage values, the Department of Planning and Environment (DPE) should give consideration to:

- engaging independent reviewers to peer review the proposed fire strategy and structural engineering approach as part of the assessment of Modification 18
- whether DPE is satisfied those alternatives to the use of Westox and a performance-based fire safety strategy have been considered and assessed, as the removal of significant heritage fabric should be a last resort.

The *Preliminary Report on Permanent Stabilisation Detail of Timber and Metal Lath Ceilings* (16 August 2022) details the conservation methodology options for the stabilisation of the lath and plaster ceilings. Timber block attachment and adhesive (Option B) is the option preferred by the consultants (Northrop). This conservation methodology conserves the lath and plaster ceilings and the concrete arch ceilings by allowing those original ceilings that can be retained and treated to meet fire safety requirements are retained *in situ*.

This methodology also allows the removal of those ceiling components where they are beyond structural recovery or they do not meet the agreed fire requirements. Northrop believe that if Option B is applied, the risk of major failure/collapse is low. This would be an acceptable approach after consideration is given to a peer review of the proposed fire strategy and structural engineering approach and alternatives to the use of Westox and a performance-based fire safety strategy.

Northrop have also recommended that where lath and plaster ceilings have collapsed this portion of the ceiling should be removed and the lath and plaster ceiling reconstructed. This is an acceptable approach and consideration should be given to:

- The condition of all ceilings must be assessed in order to determine the appropriate stabilisation approach. It is noted that ~34% have not been allocated a condition rating.
- Where original ceilings and cornices are designated for total or part replacement, the replication of those elements must meet exactly the scale, form and detail of the original ceilings and ornamental cornices.
- Any removed fabric must be archivally recorded prior to removal to the requirements of Heritage Council guidance. Elements of removed detail should be considered for public display in the building as a record of the technology used in the building's craftsmanship.

Lyon and Cottier Coat of Arms

The proposal to temporarily remove the Lyon and Cottier Coat of Arms is appropriate. However, it is recommended that the Coat of Arms be carefully removed and stored in its entirety including the more recent restoration works that reinstated lost tiles.

If you have any questions regarding the above advice, please contact Andreana Kennedy, Senior Assessments Officer at Heritage NSW on 02 8289 6692 or andreana.kennedy@environment.nsw.gov.au.

Yours sincerely



Sam Kidman
Executive Director
Heritage NSW
Department of Planning & Environment
As Delegate of the Heritage Council of NSW

7 February, 2023

Attachment 1 - Technical Advisory Panel advice

Technical Advisory Panel advice – meeting 31 August 2022

Stabilisation methodology options and issues

The panel noted the amount of intervention indicated by structural drawings and provided some feedback on the proposed options and approach to the lath and plaster ceiling conservation including:

- The option for internal battens fixed to the sides of the joists from above and inside the ceiling void would still rely on an adhesive between the battens and may pose some risks
- Option for glue mesh to be applied to lath and plaster after being stabilised with mesh tied to the floor joists on the sides and lined onto the ceiling itself with a filler material used to stop fire
- TAP noted the heritage publication (*Maintenance series 7.1 plaster finishes*) includes information on the composite system which involves mesh and thermatex and guidance on stabilising a ceiling with re-adhesion from above with glues and metal lath
- Improve the connection of the ceiling to the joists to address concerns of large areas of solid ceiling making them less likely to become detachable as a single panel

Use of intumescent paint and other adhesives

- The proposed use of intumescent paint was discussed, and the panel noted that if it has a waxy finish it may potentially change the appearance of the ceiling and be irreversible.
- The panel discussed whether transparent intumescent may be acceptable as it could potentially produce a finish that would not significantly change the appearance of the original ceilings/cornices.
- Mechanical fixing with the plaster washers in conjunction with the Westox system was discussed and the Panel questioned whether the Westox adhesive product would prevent the ability for future repairs to timberwork. The Panel discussed various adhesive options including use of acrylic glues or a lime solution.
- The use of intumescent paint would need to be assessed and tested, particularly in conjunction with the use of Westox adhesive.

Fire systems, ratings and compliance with NCC fire requirements

- Given its future use as a hotel, it was assumed that the building will be fully sprinklered
- The current proposal suggests the fire rating is dealt with underneath the ceiling level
- Whether any additional fire rating can be generated in the void between the joists should be assessed by the fire engineers
- The panel discussed ways to increase fire protection and fire rating, including a method for mesh installation between the two joists with fire retardant material on top of mesh which would only leave the floor joists exposed underneath. Such a system is outlined in a Heritage Council technical guideline publication.
- Annual inspection and ongoing maintenance would form part of insurance requirements.

Examples of other ceiling repairs

- The Australian Museum which has been stabilised throughout using the Westox system
- GPO Building which has a three layered system: (i) *Floor on separate structure* (ii) *series of coke breeze arches which act as the fire rating system*; (iii) *the lath and plaster at the bottom as a separate structure*

General comments / initial feedback

- The TAP questioned whether regular maintenance and ceiling repair had been undertaken to date and suggested that efforts should be made to conserve the existing material and only seek to repair/replace those areas which are unstable
- Furthermore, TAP noted the importance of retaining the existing ceilings and cornices in situ as the first option, and only as a last resort should these be replaced, and if necessary only in those specific areas
- The TAP noted that the future use of the building will drive the fire requirements and more information is required regarding the uses and the active systems proposed throughout the building in order to form a view
- The owners should look towards a fire-engineered solution in order to develop a way of achieving adequate fire protection

Additional information requested

In order to provide more definitive advice, the panel asked for further information to be sought, including:

- A copy of the Condition Report: *with details of the ceiling condition in each room. More detailed analysis of the different parts of the structure: in order to determine what the issues are within each ceiling condition in each room/space*
- More info on the current and proposed fire safety systems: *to better understand whether it is to be fully sprinklered, proposals for early smoke detection etc.*
- More technical information about the intumescent coatings proposed: *appearance and impact - and if possible details of thickness and appearance, to determine for example if a thirty minute rating may be adequate as part of a fire engineered solution and what would be the visual character of the finished ceiling underneath*

Technical Resources & Publications

The panel recommended the following Heritage NSW publications be forwarded to the applicant:

Maintenance series 7.1 plaster finishes:

<https://www.heritage.nsw.gov.au/assets/Maintenance-Series-7.1-Plaster-Finishes-1998-rev-2004-hard-copy-scan>

Publication includes references to the upgrading of lath-and-plaster ceilings:

<https://www.heritage.nsw.gov.au/assets/The-fire-resistance-of-ceiling-floor-systems-in-heritage-buildings-2021>

Publication includes advice on intumescent paints/coating:

<https://www.heritage.nsw.gov.au/assets/Intumescent-paint-systems-and-heritage-buildings-2021>

Next Steps

The Panel thanked Heritage NSW for their presentation and the opportunity to provide some initial comments on the proposal.

The Panel asked Heritage NSW to request further information and seek an out of session meeting with Northrop together with the Lands Building structural engineer, heritage consultant, fire engineer and fire safety consultant.

Technical Advisory Panel advice - out of session meeting 20 October 2022

- The Panel remains firmly of the opinion that the existing original lath-and-plaster ceilings are significant elements within the building and should wherever possible be repaired and conserved. The Panel does not support the encapsulation of the lath-and-plaster ceilings with new fire-rated ceilings at a lower level.
- The Panel noted the large number of public and private buildings both in Australia and overseas that have retained their lath-and-plaster ceilings and are evidently able to satisfy insurers that the public is reasonably safe and that any risks remain insurable.
- The Panel notes that the Westox RAP ceiling repair system has been successfully used in Australia since the 1970s. Subsequent investigation by Panel members indicates that Westox can provide 15-year guarantees for the material, and contractors currently accredited by the manufacturer can provide 15-year guarantees for the installation, which would include mechanical fixing of laths to ceiling joists where necessary.
- The Panel also noted that other forms of mechanical repair, such as installation of a grid of wires beneath the plaster surface, screw fixed to joists, have been successfully used overseas.
- Before any decision is taken to remove lath-and-plaster ceilings, a first principles fire engineering analysis using computer modelling should be undertaken and peer reviewed to determine the actual fire resistance levels needed for the ceilings, to enable the building to satisfy the performance requirements of the BCA when equipped with a fully functioning sprinkler system, smoke detection and alarm system, and other active measures. This analysis should also explore enhancements to conventional sprinkler systems, such as local fire suppression in higher-risk areas such as kitchens.
- Should this analysis determine that the existing lath-and-plaster ceilings can achieve the required fire resistance level, if necessary with the assistance of the tested intumescent paint, they should be retained, stabilised and repaired. Where such ceilings have failed completely they should be reconstructed in accordance with the original construction methods and similarly treated.
- The proposed acoustic treatment of rooms with lath-and-plaster ceilings should be reconsidered to avoid placing additional load on these ceilings or preventing regular inspection of them.
- Should the fire engineering analysis determine that there is no possibility that the existing ceilings can meet the required fire resistance levels for the proposed uses, consideration should be given to limiting the use of and access to selected significant spaces to allow their original ceilings to be conserved.

Attachment 2 – Analysis of SSD 7484 Modification 18

Significance of the ceilings

The *Lands Building Conservation Management Plan* (2015) prepared by the Government Architect found the significance of the ceilings to be:

- exceptional – for those lath and plaster ceilings with ornate molded decorative cornices
- high - for those lath and plaster ceilings with simple cornices.
- high – for the concrete vault ceilings of the main corridors.

The floorplans with the relative significance levels in the endorsed 2016 Conservation Management Plan (CMP) prepared by GBA Heritage includes grading diagrams copied from the endorsed 2015 CMP. The table below lists the rooms proposed for ceiling demolition in Mod 18 whose spaces are graded as having exceptional and high significance.

Table 1: Relative gradings of significance for room spaces whose ceilings are proposed to be demolished.

Grading of significance	Room number.
Exceptional	Timber lath and plaster LG.40 and LG.41 G.01, G.02 G.06 and G.07 1.01, 1.02, 1.06 and 1.07 Metal lath and plaster LG.42, LG.42a G36 and G37 Concrete arch (corridor) LG.46, LG.48a and LG.49
High	Timber lath and plaster LG.01 and LG.04 G.03, G.04, G.05, G.08, G.09, G21, G.22 and G.24 1.03, 1.04, 1.05, 1.09, 1.10, 1.20, 1.21 Metal lath and plaster LG.10 and LG.11 G.10, G.11, G.13, G.15, G.17, G.18, G.19 and G.20 1.11, 1.12, 1.15, 1.17, 1.18 and 1.19,

In the statement of significance in 2016 CMP it is noted the building is associated with the work of the builder and notable citizen John Young, who was instrumental in forming the Master Builders Association of NSW. Young is accredited as one of the earliest users of concrete in construction in Sydney in the 1870s including for the Lands Building.

The 2016 CMP also states that the building was noteworthy for its innovative use of materials, particularly iron girders, reinforced concrete and iron framed roofing. Criterion c) of the SHR assessment states that the Lands Building was one of the first purpose-designed government administration buildings and is notable for its innovative use of fire-resistant materials. This includes one of the first reinforced concrete slab floors and coke concrete vaults (corridors) for fire rating.

Therefore, the ceilings and the cornices proposed for demolition are both high and exceptionally significant fabric.

CMP policies for ceilings

The following policies in the 2016 CMP relate directly to the lath and plaster ceilings:

Policy 6.14.15 - Ceiling plasterwork

The elaborate lath and plaster decorative plasterwork throughout the Lands Building contributes to the significance of the place and should generally be retained in-situ, repaired and conserved.

Any division of a large space should minimise damaging the plaster ceiling detailing.

Policy 6.14.16 - Ceiling protection

Lath and plaster ceilings should be protected during construction - particularly when construction vibration occurs. Strategies, such as temporary battening, should be investigated in order to ensure that failing plaster keys do not lead to ceiling failure.

Assessment of lath and plaster ceiling condition

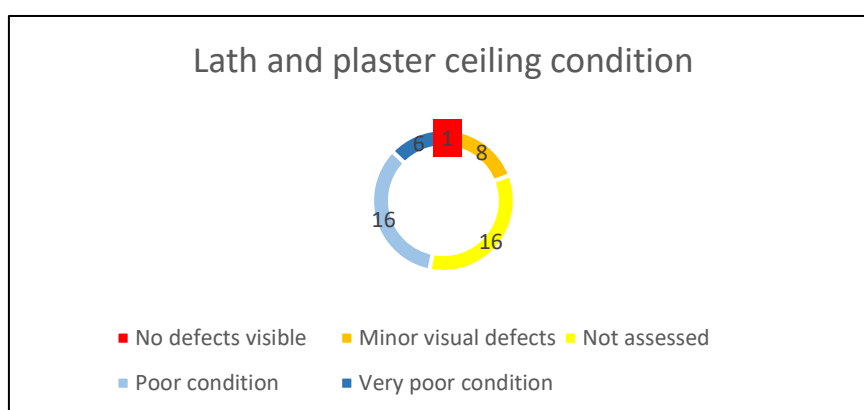
From the documentation provided, the condition of the lath and plaster ceilings has deteriorated from generally good and fair in 2015 to poor and very poor in 2022.

Table 2: Summary of the condition assessment of the lath and plaster ceilings

Year	Assessment
2015 Lands Building CMP (2015) prepared by the Government Architect's Office	Generally good for those ceilings with ornate molded decorative cornices and fair for those with simple cornices. Some lath and plaster ceilings in the building had failed in the past. Generally, these ceilings are vulnerable to damage from vibration due to works within the building. The past insertion of fire service sprinklers and services are thought to have caused some of these ceilings to dislodge, crack and fail.
2016 Lands Building CMP (2016) prepared by GBA Heritage	Ceilings were in fair condition and some ceilings were cracking.

2022 Condition assessment (2022) prepared by Northrop for Mod 18	Found considerable deterioration in ceiling condition with 47% now being of poor or very poor condition. Approximately 34% were not given a condition rating as ceiling protection is installed and there are floorboards above the ceiling.
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Table 3: Condition of Lath &Plaster ceilings proposed for demolition by Mod 18.



Previous works to ceilings and heritage approvals

It is our understanding that some works had previously been undertaken to the lath and plaster ceilings that is inconsistent with current heritage requirements i.e. spot replacement of lath and plaster ceilings with fibre cement sheeting. According to Heritage NSW records, there is no approval under the *Heritage Act 1977* for these works. This work may have occurred before a Permanent Conservation Order was placed on the building in March 1991 and/or its inclusion on the SHR in April 1999.

However, Heritage NSW records do indicate that there was an endorsement issued on 28 August 2018 to undertake works consistent with the standard exemptions of the *Heritage Act 1977*. The endorsed works included the repair and stabilisation of lath and plaster ceilings, cornices and beams using Westox RAP system to reinstate plaster keys to original timber laths and roof maintenance and repair works to ensure building was watertight and to prevent further ceiling deterioration and water damage. It is unconfirmed to what extent these works were completed or even if they commenced.

The decline in the ceilings over this short period of time is likely to be reflective of the lack of ongoing maintenance and the continued ingress of water before the roof was made watertight. It is also possible that vibrations from the construction may have contributed to the deterioration of their condition.

Ceiling stabilisation

Applicant's approach

The *Preliminary Report on Permanent Stabilisation Detail of Timber and Metal Lath Ceilings* (16 August 2022) details the conservation methodology options for the

stabilisation of the lath and plaster ceilings. Timber block attachment and adhesive (Option B) is the option preferred by the consultants (Northrop) and involves:

- initial repair and ongoing maintenance of the plaster
- treating the topside of the ceiling with Westox primer and adhesive (or approved alternative)
- using new timbered battens to fix the top of the existing lath and plaster ceiling to the existing joists. The battens are secure through chemical adhesion (Westox RAP thickened adhesive) and mechanical fixing (skew screws).

For the beam and wall cornices, Northrop recommend that the treatment is very similar using a primer and adhesive. A seasoned timber batten shaped to fit the cornice geometry is imbedded in the thickened adhesive and mechanically fastened to the existing cornice brackets with screw fixings.

The Northrop report recommended that any collapsed ceilings should be demolished and new lath and plaster reinstated.

Northrop noted that the ceilings would require yearly inspections to monitor the condition of the ceilings. Table 4 below outlines the design life and the service life for the ceilings forecasted by Northrop.

Table 4: Forecasted ceiling life

Ceiling type	Forecast design life	Forecast service life (to first major maintenance)
L & P ceilings	25+ years	10+ years
Concrete arch ceilings	25+ years	15+ years

Comments

A conservation methodology that conserves the lath and plaster ceilings and the concrete arch ceilings is supported.

Northrop in their report noted that if their preferred method of conservation were to be applied the risk of major failure/collapse is low.

Ceiling failure has been observed in the past however maintenance is overdue. Approval was given for maintenance works in 2018 that included the repair and stabilisation of lath and plaster ceilings, cornices and beams using Westox RAP system to reinstate plaster keys to original timber laths.

Northrop have also recommended that where lath and plaster ceilings have collapsed this portion of the ceiling should be removed and the lath and plaster ceiling reconstructed. This is also supported.

One of the key reasons identified by the engineers for the loss of lath and plaster ceiling stability is the ingress of water. This is attributed to poor roof and rainwater goods maintenance and a single event of substantial water dousing to extinguish a significant fire. The making good of the roof/rainwater goods and ongoing maintenance will reduce if not eliminate future water ingress.

Concern was expressed by the applicant that delamination and imminent failure could not be predicted or observed without invasive monitoring. Remote survey methods, such as point cloud laser scanning and high-resolution photogrammetry, allow production of reflected ceiling plan spot level or distortion maps. These ceiling maps have up to a $\pm 3\text{mm}$ accuracy and when compared to baseline data can detect even minor movement. Where movement is observed this can be followed up with a physical examination of the ceiling but only as necessary. Remote testing will also reduce the level of disruption to hotel operations.

More detailed investigation is required and where void access above a ceiling isn't possible coring small boreholes allows a steerable borescope with integrated torch to reach into voids. The lifting of floorboards above, or the creation of new permanent access hatches are other options. Such hatches are destructive but can prove warranted for the long-term conservation of the ceiling asset. The use of remote survey methods and selective access hatch/boreholes would substantially reduce the invasiveness of more detailed checks should they be required.

Regardless of the suitability of the conservation methodologies recommended by Northrop, the application states that the ceilings cannot be conserved because the preferred conservation methodology uses Westox RAP that cannot be warranted and will not meet the required fire resistance levels. Several buildings throughout NSW and wider Australia have used Westox RAP to stabilise lath and plaster ceilings. These public and privately owned buildings remain open to the public and for commercial use including the Australian Museum and the GPO Building.

Fire compliance requirements

Applicant's approach

The application notes that even if stabilisation could be achieved, the ceilings will not achieve compliance with National Construction Code requirements based on the proposed fire engineered solution. Fire and Rescue NSW have agreed to a 50% decrease of the deemed-to-satisfy FRLs:

- FRLs serving Class 6 areas from 180/180/180 to 90/90/90 minutes,
- FRLs serving Class 9b areas from 120/120/120 to 60/60/60 minutes.

It is noted that Warringtonfire tested the application of intumescent paint to the significant ceiling surfaces in an attempt to achieve the agreed FRL. The fire tests of the lath and plaster ceilings and concrete arched ceilings coated with intumescent paint failed to achieve the required FRLs.

Based on these results, the proposal seeks to replace all lath and plaster ceilings and associated cornices and the nominated coke breeze and concrete arched ceiling with new fire rated ceilings that will achieve the required FRL.

Comments

The most appropriate fire protection strategy for heritage buildings is finding the right balance between the requirements of achieving a sufficient level of life safety and property protection and an acceptable level of impact on historic character and significant fabric.

The loss of all exceptionally and highly significant lath and plaster ceilings and the loss of some highly significant concrete arch ceilings is an unacceptable loss of significant fabric at the Lands Building.

The National Construction Code requirements can be complied with by achieving a deemed to satisfy provision, satisfying a performance requirement with a performance-based solution or a combination of both. The proposal outlines a fire strategy that is heavily reliant on material performance. No documentation has been provided that assessed alternative options including performance based solutions to reduce the impact and the severity of any future fires. These measures could include a functioning sprinkler system, smoke detection and alarm system and local fire suppression in higher-risk areas such as kitchens.

A first principles fire engineering analysis using computer modelling derived from the real-world measurements and variables of the Lands Building was not undertaken. The use of FRLs that have not been derived from this type of computer model limits the opportunities for a more nuanced fire safety solution for the Lands Building and the potential retention of exceptional and highly significant heritage fabric.

It is recommended a first principles fire engineering analysis using computer modelling be undertaken and peer reviewed to determine the actual fire resistance levels needed for the ceilings.

It should be noted that the company that produces CAP508 have tested this product in the CSIRO testing lab with a lath and plaster ceiling and a CAP508 coating of 700microns. This treatment achieved FRLs of 90/90/90 and 60 min RISF. There are many variables that may explain the difference in testing results. One variation is the age of the plaster being tested. It is important that lime plasters used in testing facilities are fully carbonated and have achieved their full strength and fire potential before being tested. This can take several months.

Lyon and Cottier Coat of Arms

Mod 18 proposes to temporarily remove the Lyon and Cottier Coat of Arms. It is recommended the Coat of Arms be carefully removed and stored in its entirety; including the more recent restoration works that were undertaken to reinstate lost tiles.