

# THE STORY BEHIND THE CATHEDRAL'S WALLS

by June Gwee

In 2022, the Cathedral begins the new year with new hope and joy... and a face-lift. The Nave will be closed for a year for repair and restoration, which is much needed. The last time major repairs were done was in the 1990s, and its walls were last painted in 2009.

The latest round of restoration will be a key milestone in the history of the Cathedral. Extensive works will be carried out to repair the walls, timber carpentry and joinery, stonework and metalwork, electrical works and plumbing, roof and floor. These works were originally slated to start in 2020, but could not be done because of COVID-19.

And while the pandemic situation remains uncertain, it is with much faith and prayer that restoration works have finally started.

## RESTORING THE FACADE

Some of the most extensive work that will be done in 2022 is the restoration of plaster and painting works. An obvious priority is the external walls, which are the most visible facade of the Cathedral.

Like with many pre-war buildings in Singapore, lime-based plaster was used for the plastering in the Cathedral. The formula was simple — seashells or limestones were burnt to obtain quicklime (calcium oxide), to which water was added (slaked) and mixed well to form a paste. This paste was left to mature (cure) before being used for plastering.



Lime-based plaster was preferred because it was “breathable” – that is, it was porous and allowed moisture to escape from the brick walls so that the building could stay dry.

Lime-based plaster was also widely used in early colonial structures, as the raw materials, local production and skilled artisans were available and relatively affordable then. It also had anti-fungal and anti-bacterial properties suitable for buildings in warm, humid and disease-prone areas.

As with most historic buildings of that period, the Cathedral building was not constructed with a damp-proof course, in which an impervious material, typically tar or bitumen, was laid onto the wall to prevent moisture from rising through the ground.

Thus, the porosity of lime-based plasters was needed to ensure that any moisture trapped in the Cathedral's walls could dissipate and evaporate. This unique characteristic of lime-based plaster would become an important consideration in restoration, to ensure that the walls were properly restored and preserved.





## TRIED AND TESTED

Since 2012, the Cathedral has been studying and testing various methods and plaster compositions to find the most effective way to carry out the conservation.



## WHY RESTORE THE PLASTER?

As with most buildings, the Cathedral's walls have fallen victim to the weather in humid Singapore. Some common problems include cracks, rust stains, debonding, erosion, and biological growth. Between 1990 and 1992, repair works were carried out to address rising damp in the internal and external ground walls. The Cathedral's walls were replastered with three layers of Portland cement screed after provision for damp proofing and staining were made, a common method employed for historic buildings around Singapore during the 1980s and 1990s. In 1999, the same method was used to repair failing wall plaster.

Later, however, plaster and paint failures were discovered between the heights of 1.2m and 2m on the walls and columns. These were seen in the form of cracks and blistering on the walls.

Experts have since realised that applying Portland cement-based plaster/screed over historic lime plasters can cause the lime layer to crack and debond. This is because Portland cement and the underlying historic lime plaster expands and contracts at a different rate, making it susceptible to crack over time. Portland cement is also difficult to be removed without damaging the masonry substrate during repair and restoration works.

In this latest round of restoration, lime-based plaster will be used for restoration – similar to the original material used to plaster the Cathedral. The church's Restoration Works Committee believes that this material will not only be compatible with the Cathedral's historic lime plaster, but also fulfil conservation principles, hence meeting longer-term considerations regarding preservation of the Cathedral walls.

Several trial repairs with lime plasters have been carried out in selected areas. The damaged surfaces were first removed, exposing the bricks, which were found to be in relatively good condition. The bricks were then saturated with lime water before lime plaster was applied and allowed to dry. A final skim coat was applied before painting with mineral paint.

As it was found to be effective, this procedure will be applied on all the damaged walls around the Cathedral, including the top of its spire.

## THE RESTORATION PROCESS

While it is straightforward, conserving the plaster in this way is labour-intensive and time-consuming. This is because different layers have to be applied and time given for each layer to dry before the next layer is applied. This is why plastering and painting is the costliest component of restoration works, and have to be executed over a prolonged period of time.

The plaster and painting works will be carried out in sections and will involve five stages.

First, research and planning is needed. Past documentation on the site materials will be reviewed to assess how cleaning and maintenance works were carried out in the past. The condition of the existing plaster also needs

to be assessed. This will help answer the key question of how the existing material should be restored, as there are clear guidelines on how conservation should be done if there is any damage to the existing material.

Second, old layers of paint need to be removed before fresh coats are applied. The 2009 renovation showed that when silicate paint was applied onto the walls without first removing the old layers, delamination occurred.

This happens because unlike with emulsion paint, which forms a separate layer of film, the silicate in silicate paint acts as a binding agent to the substrate of the walls to form the paint.

Old paint layers will thus need to be removed either mechanically or chemically. There could be some four or five layers of paint currently on the walls that would have to be removed until the substrate of the wall is exposed.

Fourth, lime plaster is then applied layer by layer (normally three coats) until it evens out with the rest of the surface. Each layer needs to be allowed to dry and harden before the next layer is applied.

This process of “curing” takes time and skill, to ensure the quality of the cure. It cannot be hurried, because drying the plaster too rapidly will cause it to fail. This can happen if the surface of the lime plaster dries faster than the rest of the plaster, which remains damp within.

To ensure that the plaster dries evenly, plaster sheets may be mounted to cover the plaster so that the surface does not dry out too quickly. Each layer of lime-based plaster may take two to four weeks to dry out.

## Stages of Restoring the Cathedral's Facade

**Research on the walls and past repairs**

**Removal of all paintworks**

**Waterproofing, where necessary**

**Apply lime plaster, in different stages**

**Apply silicate paint**

Following this, checks will then be carried out to identify areas where the plasters may have failed. This is done by tapping on the walls: a hollow sound suggests that the plaster has debonded. In such areas, the section of the wall will have to be hacked to remove the old plaster and expose the bricks.

At the same time, checks on the bricks will be carried out to find out that they are still solid. If the bricks show signs of being friable, a chemical compound called consolidant will be applied to strengthen the bricks. Areas that were previously plastered with Portland cement-based plaster will also be removed and replaced with lime-based plaster.

Third, waterproofing compound will be applied to the walls wherever necessary. The use of such compounds or any other form of chemical, however, will be kept to a minimum and done only on a need-to basis, so that the walls' historic material and form are retained as much as possible.

Fifth, once all the layers are dry, the Cathedral's wall will be painted with silicate paint, which allows the lime-plastered walls to “breathe”. Silicate paint is preferred because it penetrates and bonds with the plaster to achieve a breathable, matt finish.

As these restoration works begin, scaffoldings will be erected around the Cathedral over the next 12 months, sending a strong visual signal on the importance of preserving St Andrew's Cathedral as a national monument.

Undoubtedly, the restoration will alter visitors' experience of the Cathedral grounds during this time. However, we also need to remember that the experience of a place is but partly defined by its architecture; it is also created by the people who work and serve in that space.

One thing that will always remain unchanged is the cultural and historical significance, urban character and spiritual purpose of the Cathedral – to restore lives.

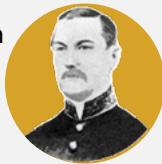


# An Overview of Key Restoration Works at St Andrew's Cathedral



**1856**

The foundation stone of the present Cathedral building is laid by the **Right Reverend Daniel Wilson**, Lord Bishop of Calcutta. The building is designed by **Lieutenant-Colonel Ronald MacPherson** of the Madras Artillery, and its construction supervised by John Frederik Adolphus McNair of the Madras Artillery.



**1973**

St Andrew's Cathedral is gazetted as a **national monument** on 28 June.



**1998**

The **external walls** of the Cathedral are repainted for the commencement of the Diocesan's 90th anniversary celebrations in 1999.

**2000**

The **interior walls** of the Cathedral are repainted.



**1990 - 1993**

Structural cracks found in the main building's arches, floors and walls are fixed, the **roof is repaired and re-slated**, ceiling plasterboard is replaced, and staining and rising damp on walls addressed.



**2009**

The main building is repainted. External walls are repainted with silicate paint while the internal walls are painted with a mixture of silicate and emulsion paints.



**2016**

Investigations of the building's lime-rich plaster reveal that areas of the wall that were previously repaired using Portland cement have crumbled.

New trials using **slaked-lime plaster** show minimal shrinkage cracks, forming a key turning point for subsequent restoration of the walls.



**2018**

The **Restoration Works Committee** is formed to steer and direct restoration of the Cathedral's main building, including the two transepts. The committee is headed by Cathedral member Lee Chi Kuan, and Dr Yeo Kang Shua is appointed conservation consultant.



**2019**

The **Cathedral Heritage Fund** is set up to raise funds for the restoration, which is estimated to cost \$6 million. The Preservation of Sites and Monuments Board provides a grant of \$977,000; remaining funds are to be raised by the congregations.

**2022**

The **Nave** is closed from 1 Jan for restoration. Services held in the Nave are moved to other venues on Cathedral grounds.

## Glossary of Technical Terms Related to Facades

**Curing:** process in which a chemical reaction or physical action takes place to form a stronger linkage – such as between two layers – or tougher substance.

**Debonding:** condition in which two materials stop adhering to each other, such as when plaster no longer sticks to the substrate.

**Delamination:** when a material, normally a coating or layer, separates from the material it is adhered to.

**Emulsion paint:** water-based paint containing tiny polymer particles. When dry, these particles fuse together to form a film on the wall and cannot be washed off.

**Friable:** easily crumbled and broken into smaller pieces. Painting on friable surfaces is challenging because most film-forming paints will flake and peel off over time.

**Silicate:** a compound that contains silicon and oxygen. It is widely used as a binding agent and is found in paints. It enables the paint to form a strong, long-lasting bond with the substrate of the wall instead of a separate film. Silicate paints are also environmentally friendly, durable and breathable – that is, it allows water vapour to pass through.

**Substrate:** refers to the layer of substance on which plasters and paints are applied. In the case of the Cathedral, the wall substrate refers to the bricks.