

CONSERVATION GUIDELINES
TECHNICAL SUPPLEMENT



UNDERSTANDING
THE ORNAMENTAL
PLASTERWORKS

December 1997

SINGAPORE

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TOWARDS A TROPICAL CITY OF EXCELLENCE

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INTRODUCTION

Ornamental plasterworks, characteristic of the different architectural styles and periods, contribute to the original character of conservation buildings. They give the facades a sense of scale and architectural expression. Examples of common decorative ornamental plasterworks include the round-arched openings supported by decorative columns, painted murals of birds, flowers or figures either flat or in relief, geometrical designs of arches, pediments, keystones, cornices, stringed courses, dentils, pedants and plaques. Each particular shophouse style has its own characteristic ornamental plasterwork, depicting the period in which the shophouse was built. (See Fig 1 - 7)

Fig 1: Intricate ornamental plasterworks, reflecting the craftsmanship of the past.



Fig 2:
The Early Shophouse Style (1840 - 1900) has minimal ornamentation. Cornices and horizontal mouldings along the beams and columns of the Tuscan and Doric Orders are the types of ornamentation adopted for these shophouses.



Fig 3:
The First Transitional Shophouse Style (Early 1900s) usually has a lighter expression due to the greater height of each storey. Transoms are flat-arched or semi-circular and infilled with carved timber panels. The use of cornices, dentils and upturned string courses give an overall expression of elegant simplicity.



Fig 4:
The Late Shophouse Style (1900 - 1940) is the most spectacular, especially in the use of ornamentation. Brightly-coloured ceramic tiles and plaster bouquets, festoons, plaques and other elaborate ornamentation are evidence of the builder's artistry.



Fig 6:
The Art Deco Style (1930-1960) is typified by the streamlining of classical motifs such as capitals, arches and keystones. The use of simple-designed corbels and fair-faced bricks are common features.



Fig 5:
The Second Transitional Style (Late 1930s) has simpler ornamentation. The shophouses combine Late Style motifs such as ornately carved transoms and colourful ceramic tiles with Art Deco elements such as simple geometric designs.



Fig 7:
The Modern Style (1960s) is characterised by a geometric, free-form approach. Overhanging concrete sunshading fins, use of rustication and rectangular-shaped concrete transoms, are common features of this style.

Over the years, many of the ornaments and mouldings on the pilasters, capitals and bases of columns, flutings as well as decorative panels have been painted over many times. Some of the features have broken off and are not properly repaired before repainting. This often results in the loss of clarity and sharpness of the intricate details of these ornaments, causing them to lose their original character. (See Fig 8 - 9) In order to recover the clarity and sharpness of these details, it is important that care and sensitivity be exercised in their restoration.

Fig 8: The loss in clarity and sharpness of the relief mouldings on the columns as a result of several layers of paint applied over time.

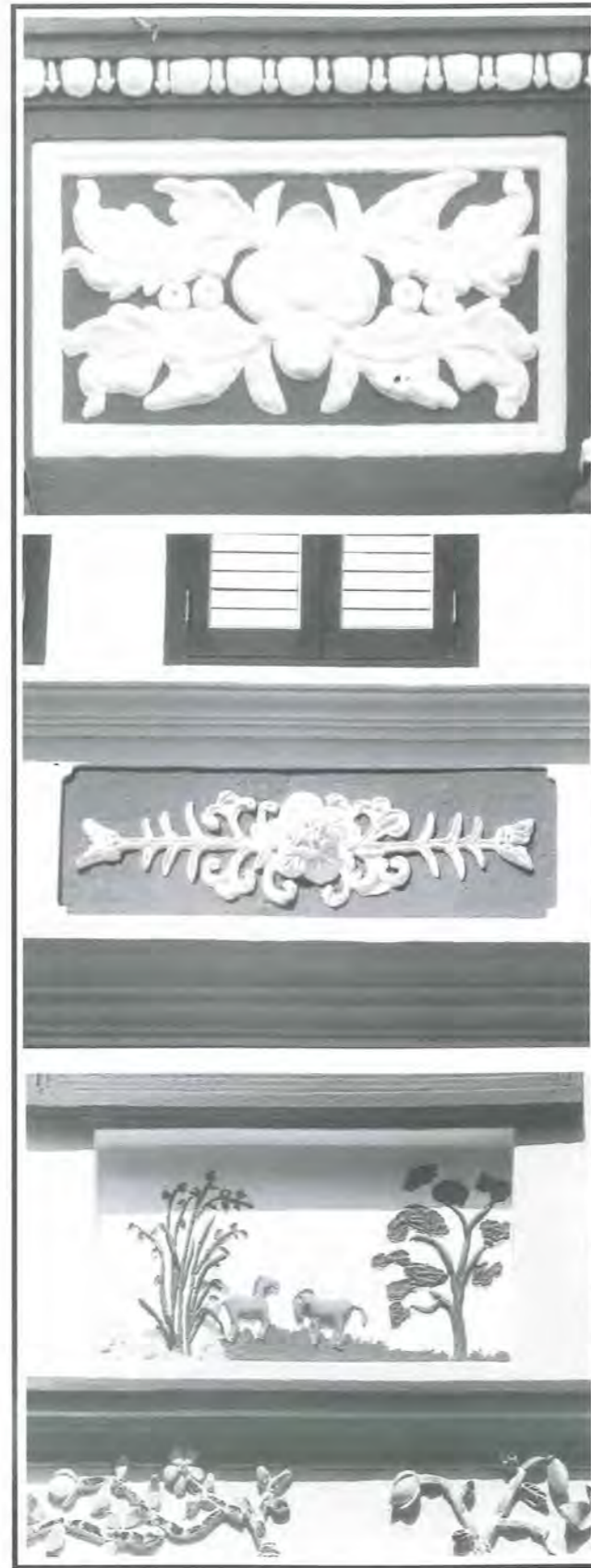


Fig 9: The loss in clarity and sharpness of the painted murals of flowers, figures, and plants, on the relief panels as a result of improper repair and cleaning methods, and the application of too many layers of paint over time.

Assessment

Before restoration works can begin on site, a close examination of the existing physical condition of the plasterworks should be carried out to determine the general nature and source of dirt, and the extent of deterioration of the plasterworks so that appropriate restoration methods can be proposed.

During site inspections, checks should be made for crazing on the surfaces, as this indicates that there might be shrinkage due to dirty aggregate, excessive early strength or dense impervious mix. If there is blistering or separation from backing or between coats, this indicates the loss of adhesion due to water penetration, lack of adequate key, or excessive thickness of coats. Crumbling and powdering on the surface, with or without efflorescence provide evidence of salt contamination from backing, aggregate or rising damp. All these symptoms indicate the probable causes of failure and should be remedied immediately to prevent further deterioration. (See Fig 10 - 13)

Fig 10: Crumbling of the plasterworks, giving evidence of salt contamination from backing, aggregate or rising damp. This indicates the need for patching repair.




Fig 11: Cracked architrave, indicating the need for in-situ repair works.

Fig 12: Damaged capital of column indicates the need for strengthening and repair.



Fig 13: Deteriorated column capital due to improper detailing, water penetration and accumulation of environmental grime. This indicates the need for cleaning and repair works.





TEMPORARY
PROTECTION
AND
STABILISATION

The restoration of the ornamental plasterworks is carried out after the main structural elements of the conservation building have been restored and repaired. In the course of the restoration process, the plasterworks have to be properly protected to prevent further deterioration or damage that might be caused by the construction works.

Collapse of the front facade walls during restoration have occurred from time to time. This is due to the lack of lateral restraint or inadequate shoring of the walls. It is thus important that adequate protection is carried out before commencement of restoration works on site. Temporary shoring or propping of the front facade walls, with the use of a protective cover to prevent further deterioration of the plasterworks and other elements of the front facade, is necessary. This would help prevent the collapse and deterioration of the front facade walls where most ornamental plasterworks are found. (See Fig 14 - 17)

Fig 14: Temporary hoarding set up for restoration works to be carried out.




Fig 16: Temporary scaffolding and protective covering to be put up to protect the facade elements during restoration.

Fig 15: Temporary hoarding is required during the restoration works. This not only protects the elements from further deterioration and collapse, but also acts as a safety measure to prevent accidents.



Fig 17: Temporary propping of facade walls to prevent collapse during restoration.





RETENTION
AND
RESTORATION

During restoration, the extent of cleaning and repair required is determined by the extent of deterioration of the ornamental plasterworks. Deterioration can be assessed through visual inspection and by knocking to check for hollowness.

In some instances, moulds and mosses attach themselves to the exposed parts of the buildings, making them look dirty and beyond repair. Generally, proper cleaning of these surfaces, which includes careful stripping of the paints, would reveal the sound physical condition of the plasterworks under the unsightly exterior.

Removal of Paints

Stripping the paintwork off the surface is necessary when there are cracked or peeling layers or when there are excessive layers which obscure the architectural details. (See Fig 18)

There are several safe and effective techniques for removing paint from the plasterworks, depending on the amount of paint to be removed:

1 Steam Stripping

Steam at low pressure is applied to the paint film via a hose capped with a perforated metal concentrator. Water thinned paints, including emulsion paints, are softened by the combination of heat and moisture, and are then removed with a sponge and water. Steam used in conjunction with methylated spirits can be effective in removing applications of old emulsion paint.

2 Chemical Paint Removers

Softening of paint layers with chemical strippers (solvent and alkaline), followed by scarring, peeling or brushing and washing with water. This is often used for total paint removal and is best used for stripping off paintwork from plaster mouldings.

3 Abrasive Methods

Abrasive methods include mechanical or manual means such as hand scraping and sanding or the use of water-entrained grit or air abrasive pencil. The latter is normally used for special details or features. These methods are generally used for surface preparation and limited paint removal.

Fig 18: The peeling of paintwork due to excessive layers of paint.





Fig 19: Cleaned plasterworks revealing the intricate details, otherwise covered by excessive paintworks.

The biocide is diluted with water and applied by hand sprays or by brush-flooding. It is also possible to remove some lichens and mosses before treatment by gentle scraping with a spatula and brushing with small bristle or nylon brushes.

Removal of growth after treatment can be rather time consuming largely because of the small scale tools that are used. It is absolutely essential to work "with the detail" and not to use any system which scrapes or brushes across modelled areas.

Fig 20: Dampened areas of plasterworks with mosses, lichens and algae growth, requiring the need for biocide treatment.



2 Removal of Environmental Grime

Environmental grime is often caused by environmental pollution such as fumes from industrial buildings or exhaust fumes from motor vehicles. (See Fig 21) Some of the staining may be light, in which case cleaning with mild abrasive system like hand brushing or water-jetting and the use of detergents coupled with hot water can achieve good results. Heavy staining, due to the penetration of the grime into the substrate, requires the use of alkaline reagent, water-entrained grit methods under the appropriate conditions or steam cleaning.

Fig 21: The stained plasterworks due to environmental grime, requiring the need for cleaning with mild abrasive systems like hand brushing and the use of detergents coupled with hot water.



Fig 22: Weathered plasterworks in need of cleaning and repair.

Cleaning

Proper cleaning of the surfaces of the plasterworks is required to expose the intricate details of the ornaments. (See Fig 19) For such intricate plasterworks, the use of specific tools, like bearing scrapers, to clean the features requires skilled craftsmen.

1 Removal of Organic Growth

Organic growth such as mosses, lichens, algae and moulds are often found on the dampened areas of the plasterworks. (See Fig 20) The use of a chemical biocide would eliminate the growths by stopping them and the residue would then be left to weather away over a period of time.

3 Removal of Efflorescence and Weathered Plasterworks

Efflorescence is often caused by the slow build-up of water-soluble salts at sheltered sections of building exteriors. Flaking or fretting often results. The external plasterworks, due to constant exposure to the elements of the weather, would deteriorate after some time. The weathered plasterworks would flake and crumble upon contact. The salts should be removed with a dry bristle brush before general cleaning begins, since salts can soak back into masonry and cause deterioration. (See Fig 22)



STRENGTHENING AND REPAIR

Failures of plasterworks are mostly localised ones, requiring the use of patching techniques. It is important that the patching materials are compatible in terms of colour and texture to the original material. Repair works should also have proper adhesion so that the traditional character of the buildings can be restored. It is also important to note the proportion of the cement and sand in the plaster mix as this would determine the strength of the plasterworks.

Strengthening of the facade wall would be required if the wall is found to be structurally unsound or unstable. Repair of the facade beams should be carried out before the plasterworks are repaired to prevent the collapse of the front facade wall. (See Fig 23 - 27)

Fig 23: Cracks in the facade beams requiring the need for careful repair before repair of ornamental plasterworks can be carried out.

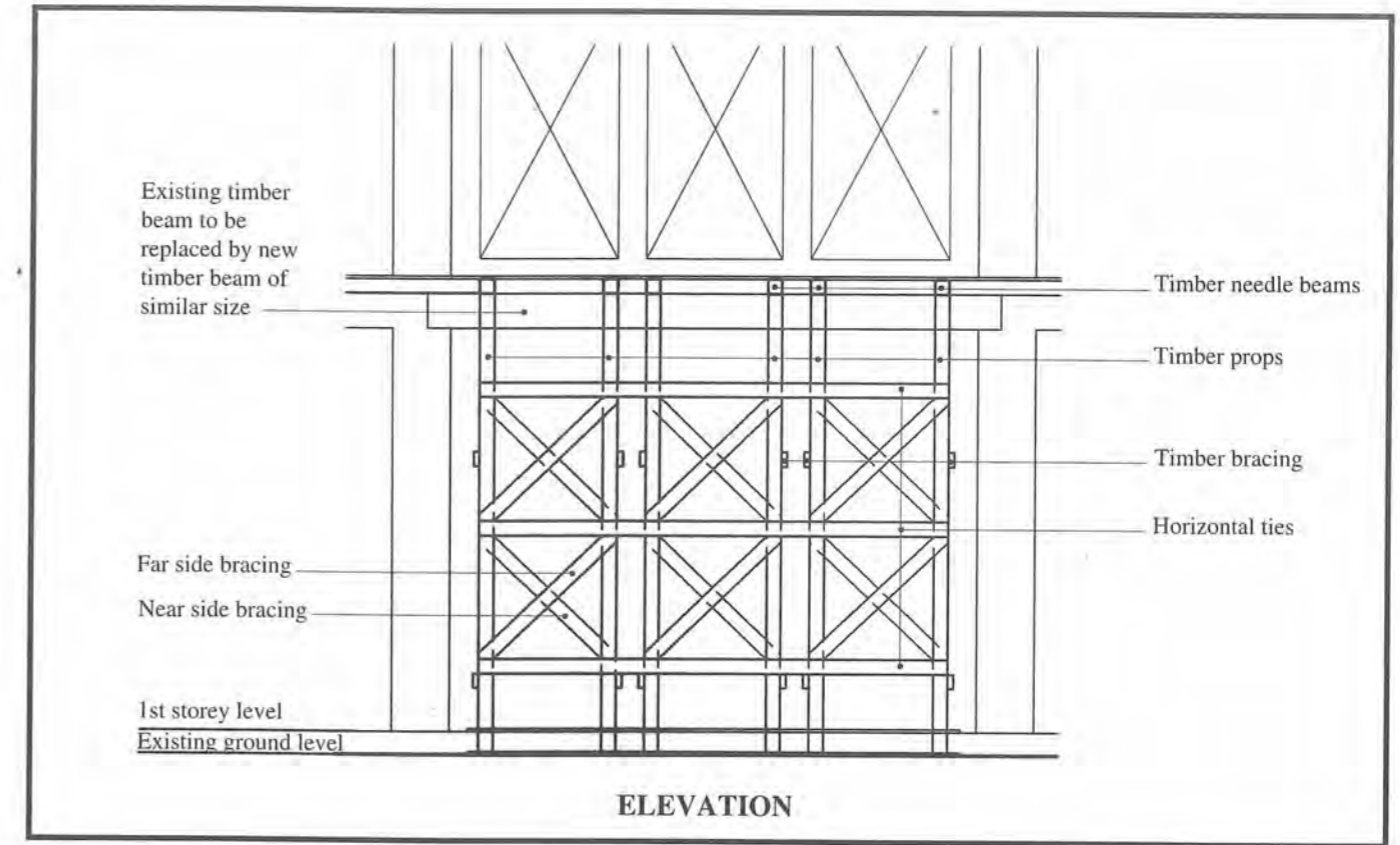


Fig 24: A diagrammatic representation showing the strengthening of the facade beam with adequate propping and shoring so as to prevent the collapse of the front facade wall.

Fig 25: The use of timber bracing and ties to provide adequate propping during the strengthening and repair of the facade beams.

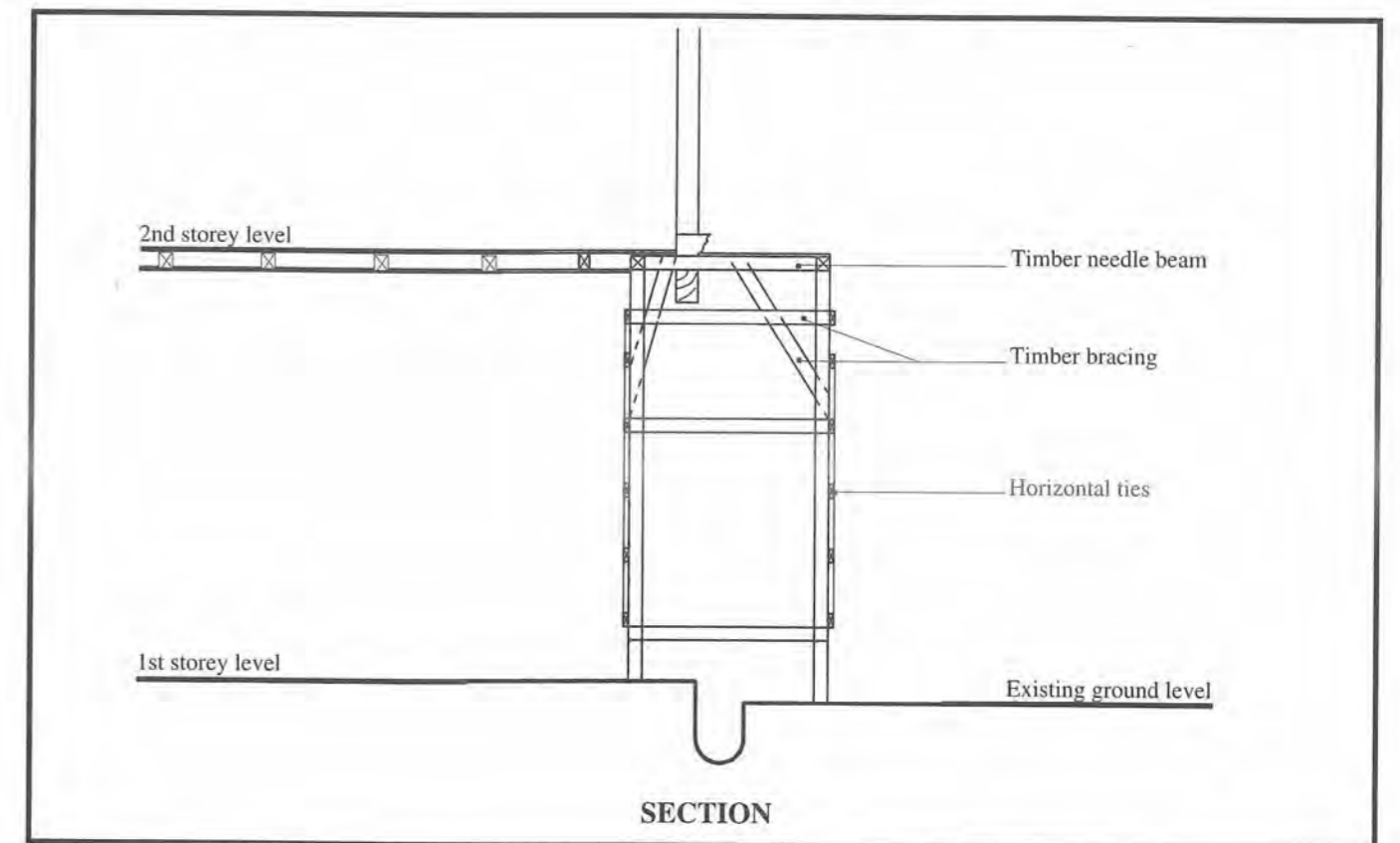




Fig 26: Damaged facade beams in the process of being repaired.

Fig 27: Facade beams strengthened and repaired, at times even changed, due to extreme structural damage and decay.

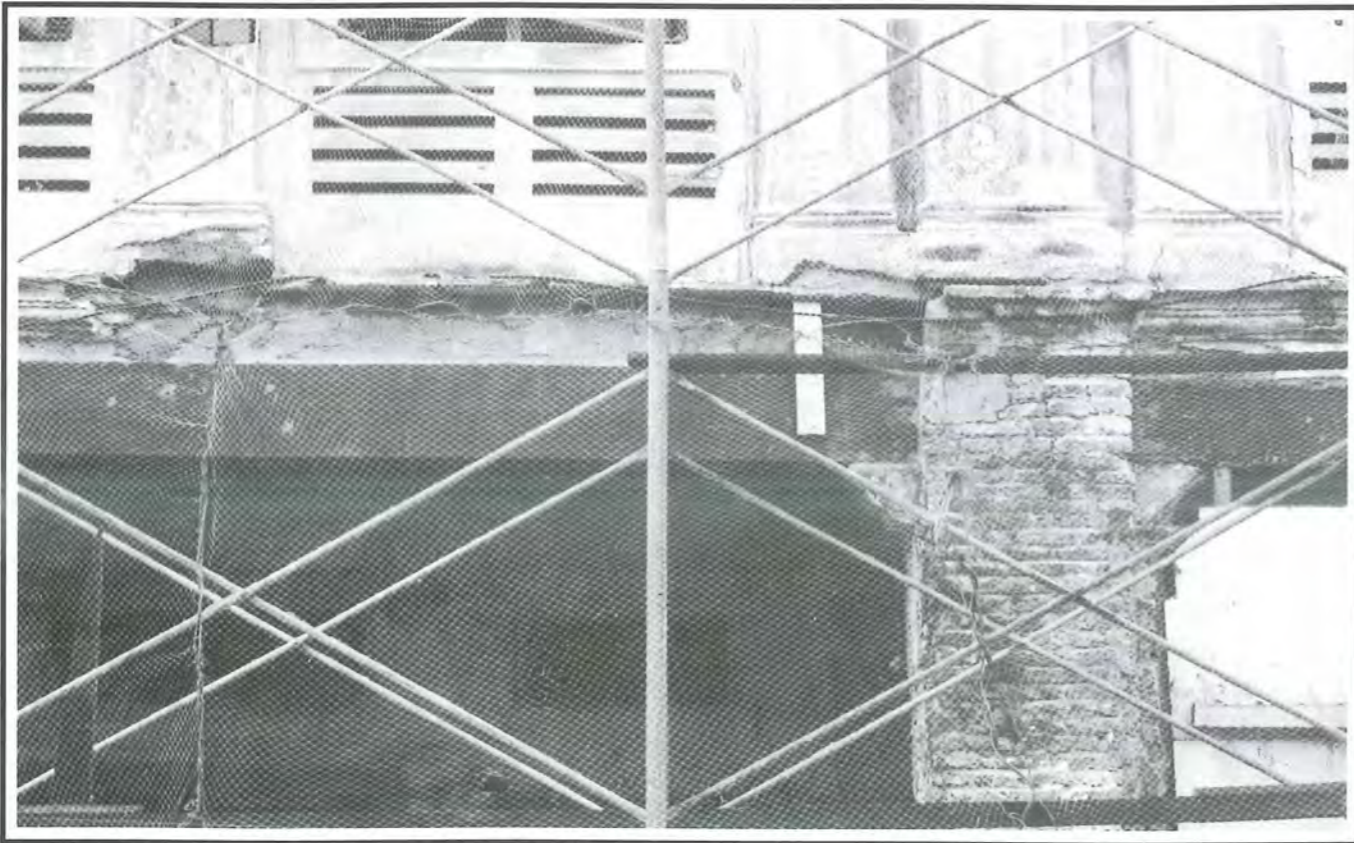


Fig 28: Damaged or decayed plaster in the process of being removed.

Fig 29: Reconstruction and patching-up of damaged plasterworks on site in the process of restoration.



Fig 30: Repaired capital of column on the front facade.

Part of the ornamental plasterworks which have deteriorated beyond repair can be reinstated through reconstruction by:

- 1 proper and precise measurements to be taken in order to replicate the original details;
- 2 proper documentation of the ornamental features through the study of archival records;
- 3 the use of photographic records to register the existing features/ornaments; and
- 4 a precise template will then be hand-made on site by skilled craftsmen for use in the reconstruction process.

In the case of restoration of existing plasterworks; this intricate process involves (See Fig 28 - 30):

- a consolidating the existing plasterworks;
- b use of mortar fillets around the edges of the exposed plaster to prevent the penetration of water into the plaster;

- c using free flow grouting to those detached interfaces between plaster and wall to achieve the adherence of the old plaster to the existing wall; and
- d provision of mechanical supports of non-ferrous gauze and screws where needed.

In some cases, repair of the existing moulding features are carried out with the use of porcelain pieces. This process is used when the form, colours and texture of the existing ornamental mouldings are unique and hence requires the use of porcelain pieces in the reconstruction process. This is another intricate process which involves 2 major parts:

A Ornamental Moulding Preparation

The steps are as follows:

- 1 obtaining the suitable matching porcelain pieces in terms of colour and texture;
- 2 tracing the required shape of the moulding onto tracing paper and it will subsequently be transferred onto the porcelain; and
- 3 cutting these porcelain pieces to the required shape and size for the next process.

B Surface Preparation & Restoration of Mouldings

The following steps are included:

- 1 removing the existing mouldings and damaged plaster from the wall surfaces;
- 2 cleaning surfaces of dust and loose particles and treating existing backing with hardener;
- 3 replastering the surfaces as per photographic records/pre-documentation records;
- 4 tracing out the moulding position and shape as per records;

- 5 installing pieces of trimmed porcelain by using a mixture of semi-wet clay and lime plaster in order to achieve better adhesion and workability; and
- 6 installing galvanised nails for increased holding strength of backing aggregate, where necessary.

Upon the completion of the patching and repair works, mortar filling of the remaining edges, weather coat application to the undercoat plaster and re-treatment of plaster and adjacent masonry with biocide should be carried out. (See Fig 31 - 33)

Fig 31: Types of ornamental mouldings which are unique in form, colour and texture, requiring the use of porcelain pieces in the reconstruction process. This brings to life the relief features, examples of which include birds, flowers and figures.

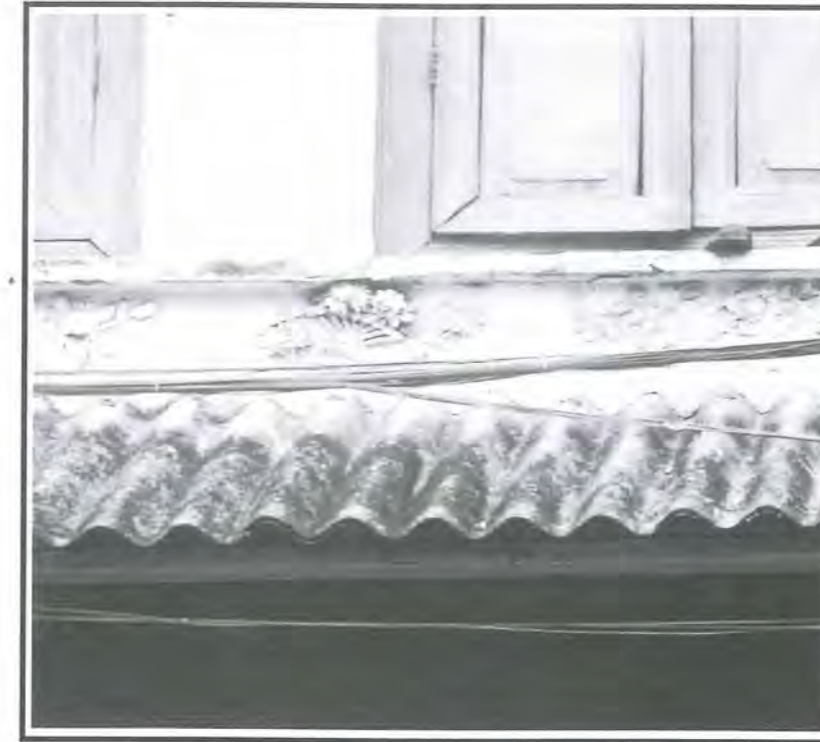
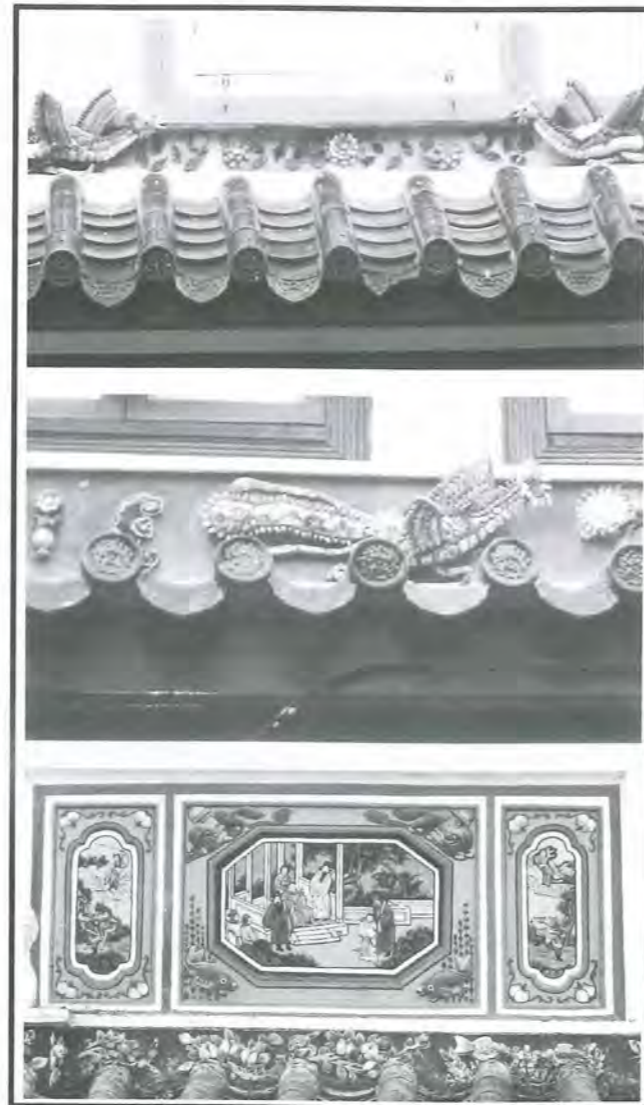


Fig 32: Deteriorated ornamental mouldings which require proper repair and reconstruction through proper documentation and archival records.

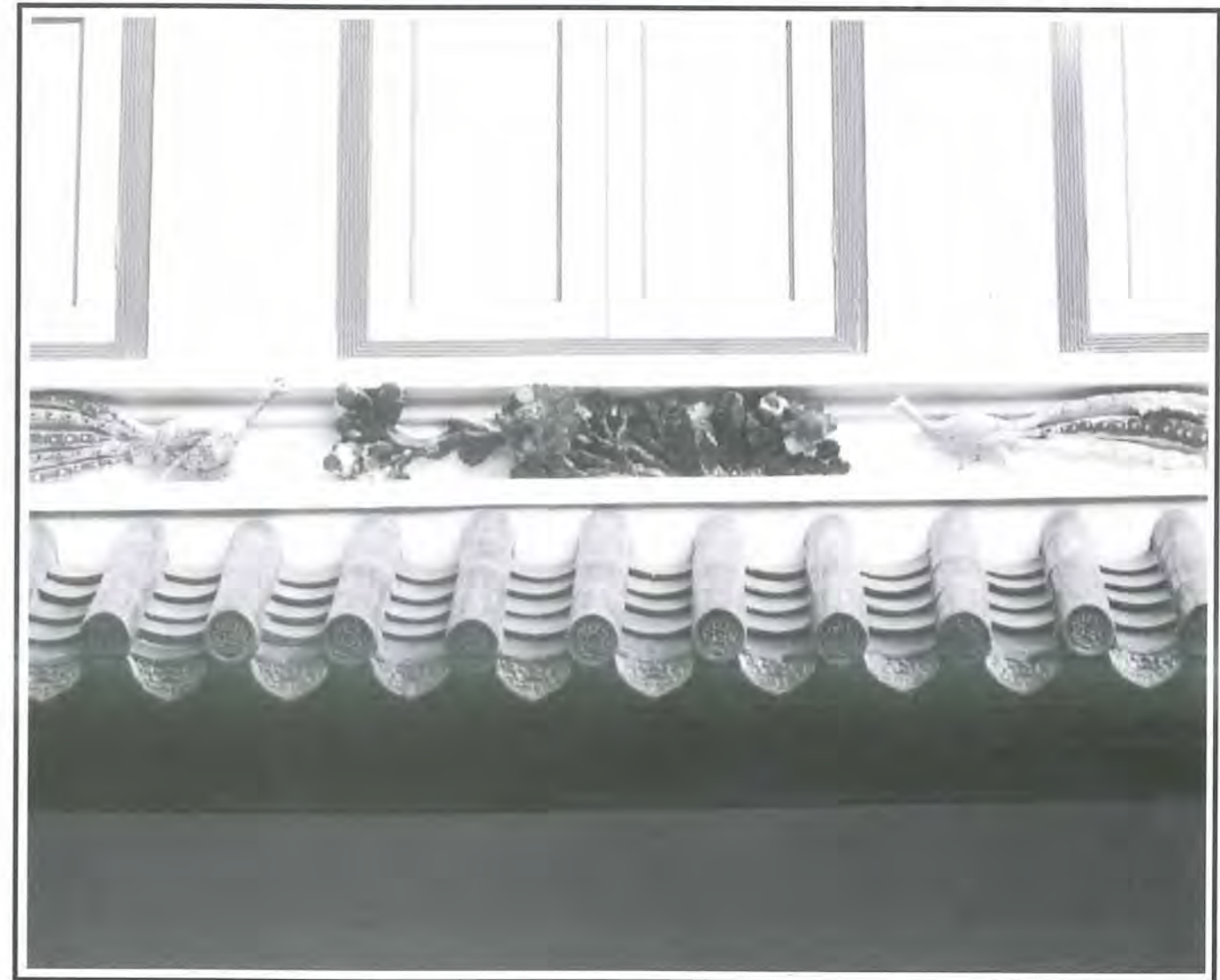


Fig 33: Restored ornamental relief mouldings through the use of porcelain pieces to retain the form, colour and texture of the original through reconstruction.



REPAINTING

It is important to correctly evaluate the situation before repainting the plasterworks. If existing paint conditions show no signs of deterioration or failure, then there is no clear reason to remove the paint or to repaint.

Colour fading of the paint is not a reason for repainting as this is due to the paint reacting to the weather elements, in particular to ultraviolet rays. Additional coatings of paint may cause peeling or cracking of the surface due to weak adhesion of the oldest layers of paint. Excessively thick paint is less tolerable to shrinkage or pull of layers when drying, and to thermal stress.

Generally, upon proper preparation of the surface, with cleaning, light scraping, sanding if necessary and repair works, adhesion of the new coats of paint to the surface would be enhanced. The plasterworks must be adequately cured before the application of the base coat and two layers of finishing coats should only be applied upon the drying of the base coat. This would give the paintwork a longer life. (See Fig 34 - 37)

Fig 34: Intricate details properly reinstated and repainted upon restoration.



Fig 35: The process of cleaning with light scraping to prepare the surface for repainting.



Fig 36: Surface properly cleaned and prepared for repainting.



Fig 37: Repainted ornamental plasterworks.

Regular maintenance is the best means of ensuring the continued preservation of the ornamental plasterworks of historic buildings.

General maintenance includes:

- a regular cleaning with the gentlest possible method so as to prevent surface build-ups;
- b proper repainting procedures like cleaning, light scraping and sanding to enhance the adhesion of new coats of paints;
- c regular checks to ensure that there is no decay of the plasterworks due to moisture penetration, organic growth of mosses, lichens and algae, and staining due to rusting of downpipes and gutters.

The use of proper detailing at the connections of fixtures (like rainwater downpipes or signages) to the buildings, and adequate overhangs and use of copings, would prevent the deterioration of the plasterworks due to elements of the weather.

(See Fig 38 - 40)

Fig 38: Plastered ornaments should be restored and properly reinstated. This is one of the features found in conservation buildings with forecourts and gates.



MAINTENANCE



Fig 39: Well-restored column of the Late Shophouse Style. Tile ornamentation and plasterworks reinstated.

Fig 40: A well-restored corbel, painted.



The ornamental plasterworks of conservation buildings give them their distinct character and also reflect the fine craftsmanship of the past. Restoration techniques should take into consideration the compatibility of patching materials to that of the original materials in terms of composition, texture and colour. The quality of craftsmanship is also critical. The use of appropriate techniques would serve to preserve the historic integrity and appearance of the conservation building. (See Fig 41 - 44)



CONCLUSION



Fig 41: Restoration of the elaborate ornamentation on pediments, arches and columns, bring back to life the craftsmanship of the past.

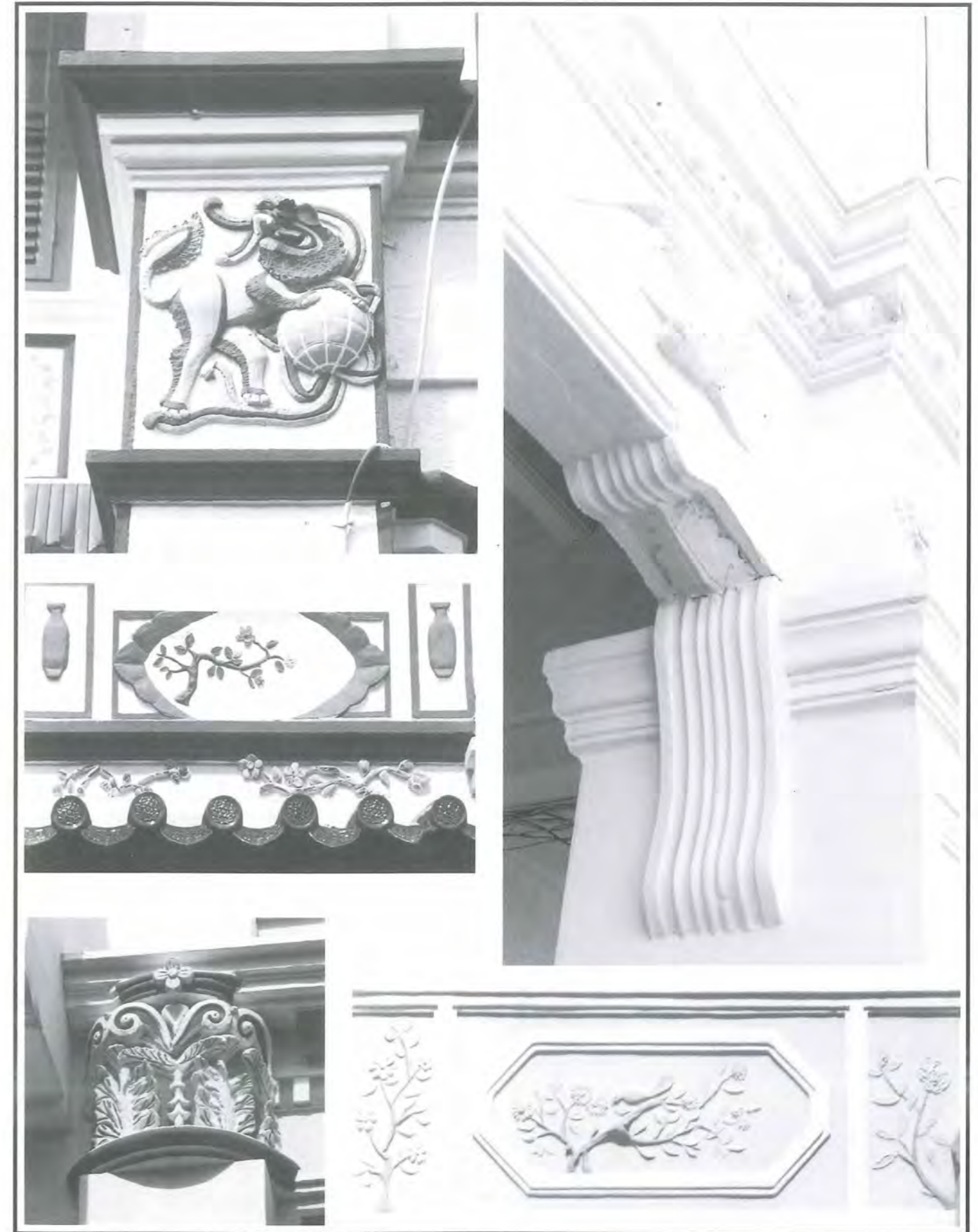


Fig 42: Well-restored ornamental plasterworks which retain the original character of these buildings.

Fig 43: Restored facades where the original ornamental mouldings and features are retained. They enhance the historical significance of the conservation buildings.



Fig 44: The historic integrity and significance of the conservation building is retained and enhanced by the well-restored plasterworks, which are characteristic of the period in which the building was built.

