

RESEARCH ARTICLE

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Colourful treasure on Shanghai's Bund: uncovering original paint finishes in the Chinese Banking Hall of the former HSBC Building

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Abstract

The former HSBC Building, today occupied by Shanghai Pudong Development Bank, is one of the largest iconic buildings on the Bund in Shanghai. Designed by Palmer & Turner in the neoclassic style, the building was completed in 1923. Restoration of the interior of the Chinese Banking Hall, located within the southwestern corner of the building, is now underway. This rectangular room features four columns in the centre and stucco decoration on parts of the walls; the ceiling originally had a distinctive, vibrantly colourful design in a bold mix of Western and Chinese styles. The only extant documentation of the banking hall's original decoration includes black-and-white photographs and a short, written description. Today, all the plaster surfaces are covered over with several layers of white and cream-coloured paint finishes. A preliminary analysis of the hall's decorative finishes was conducted to determine the colours, paint materials, and condition of the original paint layers. The investigation revealed that in some sections, the original paint was very brittle. Restoration by exposing the finishes in the entire room (removing the modern layers covering the original one) did not appear feasible. This article investigates the results of the following: assessing the condition of the paint materials; identifying the significance of the decorations; the challenges facing the room's conservation; and potential conservation options for the room's decoration.

Keywords: Shanghai Bund, paint finishes analysis, historical decoration, paint materials, historical interior design, conservation approaches

1 Introduction

Every decision regarding conservation interventions on a building or site should be based on a sound understanding of the impact the decisions could have on the significance of the existing fabric and other heritage values. Therefore, the first steps in any building conservation project involve understanding the significance and historical context, the integrity and authenticity of the existing fabric, and the current condition. Investigating architectural finishes (and their scientific analysis accompanied by studying historical documents on the building's history and paint materials) can help in comprehending

the following: original historical materials and later additions; existing colours and painting techniques; original outlook of a building; and decorative history over time. This approach can serve to document and preserve such information even if conditions do not permit preservation of the evidence on-site, assist in selecting appropriate materials for cleaning, consolidation, or repair, and much more.

The detailed investigation of paint finishes by means of instrumental analysis and microscopic investigation of cross-sections has been practised in the field of conservation in the West for about a century; in around the 1960s, it developed as an important tool for investigating architectural finishes (Plesters 1956; Krotzer 2008). Investigating paint finishes is regarded as an essential part of the

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Fig. 1 Examples of typical *caihua* decoration on ceiling panels, wooden beams, and eaves, here apparently recently renovated. Left: Fahai Temple, Shijingshan District, Beijing. Right: Baiyunshan Temple complex, Jiaxian County, Yulin, Shaanxi Province (Source: the author)

early steps of conservation (after and parallel to desktop studies of a building's history) and as part of detailed documentation and assessment of the building's fabric (Jablonski and Matsen 2009; Nilsen and Degerblad 2015). With architectural conservation, unlike museum conservation, the scientific investigation of materials is far less common in China and other Asian countries than in the West. In China, mural conservation is considered closer to museum conservation; in the West, it is thought more akin to architectural conservation. With built heritage conservation projects in China, scientific investigation of materials is still not commonly applied in the conservation process; there is a lack of understanding of historical materials for built heritage assessment and repair work (Dai and Schwantes 2016; Shua, Chin, and Lim 2014).

For the conservation of architectural finishes, in contrast to murals or decorations, restoration through repainting building parts is common practice. The building finish can be considered from an aesthetic viewpoint as a decoration in addition to the protective finish for the architectural elements. Restoring a facade finish can be a step toward restoring a building to its original condition; at the same time, the new finish protects the underlying building fabric. However, using compatible repair materials is highly important. A matte latex paint finish applied to a porous building surface in the original colour tone may, to some laypeople, appear satisfactory. In terms of colour, texture, and aesthetics, it could under certain circumstances temporarily appear authentic. However, the incompatibility of non-breathable paint finishes can result in serious follow-up damage: the new finish soon cracks, bulks, or blisters; furthermore, the humidity trapped behind such finishes can weaken the original

building fabric, thereby accelerating decay instead of contributing to the structure's conservation. Studying the original building materials and finishes as well as understanding the paint's physical and chemical properties can improve the compatibility and authenticity of the intervention; it can also aid in identifying appropriate materials for restoration and avoid damage through applying inappropriate cleaning methods.

Regarding conservation of the Chinese Banking Hall in the former HSBC Building on the Bund, Shanghai, the finishes are neither simple architectural finishes nor polychrome murals: they are both protective finishes of architectural elements and colourful decoration. These architectural decorations may be considered close to *caihua*, the traditional Chinese polychrome decorative painting used for architecture—especially wooden constructions (Fig. 1). Here, similar to decorative architecture painting in Western architecture (such as imitation masonry, marbling and stenciling), properly deciding on the appropriate approach for conservation can be a complicated matter. Restoration may be appropriate to preserve building elements: severely deteriorated finishes on wooden elements cannot conserve the wood from external influences, which an intact paint finish is able to do. However, depending on the artistic execution or scientific value¹ of certain original decorations, restoration by repainting may diminish the value of the architectural decoration. That is especially true if repairs

¹ Scientific value refers to the capacity of a historic place to provide evidence that can advance our understanding of a culture. 'The scientific or research value of a place will depend on the importance of the data involved, on its rarity, quality or representativeness, and on the degree to which the place may contribute further substantial information.' (Australia ICOMOS 1999)



Fig. 2 The former HSBC Building shortly after opening in 1923. (Source: reproduced with the permission of HSBC Holdings plc)

are not conducted using proper materials or by a skilled craftsperson. As with any conservation project, decisions related to identifying the appropriate approach require a detailed case study of the cultural significance, materials and techniques, feasibility, and building function.

In 2019, Shanghai Pudong Development Bank commissioned the Tongji University Architectural Conservation Laboratory to conduct an analysis of the architectural finish of the Chinese Banking Hall interior; the aim was to determine possible future conservation and restoration alternatives for that interior. This article introduces this important site and describes the process of investigating the finishes on site and in the laboratory. The findings are a combination of scientific analysis results and on-site observations of material properties; they are interpreted in light of published details about the painting materials at the time of creation. Information about the condition of the finishes (such as scaling paint and strong adhesion of later finishes above the original coloured decoration) has a direct impact on challenges faced during conservation interventions. The discussion about possible alternative future conservation approaches demonstrates the importance of conducting a finish analysis for decision making in conservation.

2 Former HSBC Building and Chinese Banking Hall

The former HSBC Building (currently occupied by Shanghai Pudong Development Bank), located on the Bund (or Zhongshan East First Road), No. 12 at the

intersection with Fuzhou Road (Fig. 2), has served as the headquarters of the Shanghai branch of The Hongkong and Shanghai Banking Corporation from 1923 to 1955. It is one of the largest structures among the many iconic buildings on Shanghai's Bund. Completed in 1923, the building was designed in the neoclassic style by Palmer & Turner, an architectural design company with headquarters in Hong Kong since the 1890s.

The former HSBC Building is especially known for the rich interior decoration of its entrance hall and central main banking hall, which includes mosaics and massive Sienna marble columns. The domed ceiling of the octagonal centre of the entrance hall is decorated with a mosaic depicting the Greek deities Demeter and Helios in the central dome; the eight principal panels below represent the banking centers of the east and west (clockwise as appearing in the dome starting in the West opposite the main entrance: London, Paris, Calcutta, Bangkok, Hong Kong, Shanghai, Tokyo, and New York). The banking hall and other public spaces within the building are richly decorated with differently coloured marble. The offices and smaller banking halls are lesser known; however, as this article will demonstrate, their decoration is no less.

The Chinese Banking Hall is a rectangular room situated in the southwest of the ground floor. The hall's ceiling is divided into nine large coffer panels with four central columns and corresponding pilasters separating the sidewalls of the hall. Today, the columns and ceiling are present as white stucco decorations (Fig. 3);



Fig. 3 Today, the ceiling of the banking hall is covered in several layers of paint, and the currently visible finish features a matte-white acrylic dispersion paint. (Source: the author)

however, historical images and written documents record a unique, brightly coloured decoration. In the original brochure of the opening ceremony on June 23, 1923, the Chinese Banking Hall is described as follows, giving an impressive description of the original decoration:

One is arrested on the threshold by the totally unexpected sight of a blaze of Chinese decoration. This is the Chinese Bank. The Architect has attempted here the boldest scheme of decoration ever tried in a modern building, and he has been utterly success-

ful. While the design, both in the mass and in its details, is entirely new, one feels the influence of the best traditions of fourteenth century Chinese art in this gorgeous Oriental decoration of a Hall of twentieth century Western construction. These fortunate who have seen the palaces of Peking are immediately reminded of the dazzling colourings of those wonder-halls ("The Hong Kong and Shanghai Banking Corporation" 1923).

Despite being black-and-white images, the photographs in the brochure further document the colour accentuation of the former interior decoration (Fig. 4). The original room design is considered to be of high aesthetic value in terms of its vibrant, bold colour use and combination of Chinese and Western design and decoration. Today, the vibrant colours of the walls and ceiling are covered in several layers of white and cream finishes, but the original paint remains beneath the modern finishes—as confirmed by the following investigation.

3 Investigation of the room decoration: materials and condition

This architectural finish investigation combines scientific results with an interpretation of the findings with respect to sample locations and building context. The research team carefully selected relevant sample locations, minimum number of samples, and required analysis techniques.



Fig. 4 The Chinese Banking Hall from the original pamphlet of the opening ceremony of the HSBC Bank in 1923. (Source: "The Hong Kong and Shanghai Banking Corporation", 1923. Reproduced with the permission of HSBC Holdings plc)

3.1 Objective and sampling at the Chinese Banking Hall

Investigation of the finishes in the Chinese Banking Hall had several objectives. First, it aimed to determine how much of the room decoration remained and clarify the condition of the original finishes. Second, it sought to gain a better understanding of the chemical makeup of the materials used in 1923 to decorate the room (i.e., identify the original materials) as well as the properties of the materials used to cover the decoration and their bond to the original finish and to each other. As is common for this type of room decoration and visible from historical photographs, there is repetition and symmetry in the pattern of the room's architectural decoration. It could therefore be expected that investigating one element (e.g., column, ceiling section) would be representative for the entire room. To investigate the colour scheme, the original finishes were exposed in small squares for identification of the colours present; a representative sample was removed. Other sample materials were collected for reference in areas where paint scales had already separated. Additional smaller openings were made during the on-site assessment until a clear picture of the repeated decoration was achieved.

Analysis of historical paint finishes delivers different kinds of information about the materials depending on the analytic methods employed. The results have to be studied and evaluated in comparison with studies of historical materials. The room decoration in the Chinese Banking Hall was created in the 1920s: a wide range of natural and synthetic paint materials was available and could have been used at that time. The manufacture of paint materials, including a growing number of synthetic pigments and dyestuffs, began in the early 19th century (Baty 2017; Zuk Pen 1984). This makes interpreting the preliminary analysis rather complex.

3.2 On-site and laboratory investigation

The interior decoration of representative sections of the walls and ceiling was investigated in situ using a lift crane (Fig. 5); covering layers of paint were removed by scalpel after softening the area with a biodegradable water-based paint remover (BioLine Eastrip produced by Shanghai DS Building Materials Co., Ltd., China). Openings of approximately 1–5 cm² were prepared and standard colour tones were defined by comparison with an Natural Color System (NCS) color chart (see Sect. 3.4).

Representative samples of areas with different colours were removed for further analysis in the laboratory. The unprepared samples and polished cross sections were initially investigated with simple magnification (up to 40 times) under an Olympus SZX10



Fig. 5 On-site investigation of finishes and sampling conducted using a lift crane. (Source: the author)

stereo microscope. Subsequently, they were examined under a scanning electron microscope (SEM) with energy dispersive spectroscopy (SEM–EDS): that provides information about the elemental composition of samples by detecting backscattered energy signals from X-ray beams striking the sample surface. A FEI Quanta 650 SEM was used combined with an Oxford INCA X-Max 250 energy spectrometer. The samples were analysed under high vacuum with an acceleration voltage of 20 kV and working distance of 10 mm. The samples were embedded in epoxy resin and coated with carbon.

Cross sections were also examined using Fourier transform infrared spectroscopy (FTIR): that is an infrared analysis technique providing information about characteristic molecular structures, which are then compared with reference databases to identify sample materials or components. A Bruker Lumos FTIR microscope was used in attenuated total reflection mode. Only initial FTIR analysis was conducted: owing to peak overlap, the results were not always conclusive; interpretation involving several outcomes had to be considered, and the results were combined with those of other analyses.

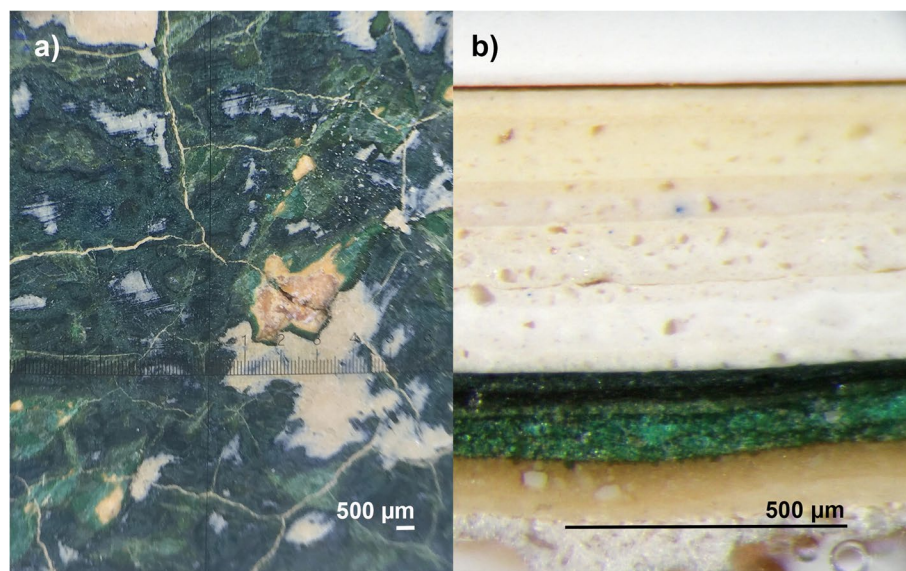


Fig. 6 **a** Detail seen through a magnifying glass, showing the original green paint layer exposed at the site. Where the upper darker finish was scratched off during exposure, the brighter, intense-green lower layer became visible. **b** Photomicrograph of a polished cross section of the same green colour layers. (Source: the author)

3.3 Results of exposure combined with visual observation on cross sections

The currently visible finish of the room ceiling and walls is a matte-white synthetic dispersion paint. Investigation showed that the original decorative finishes were largely still in place despite being partially in poor condition. The original multicoloured decoration of the room is hidden beneath a variously thick covering of several layers of previous renovation efforts. The subsequent finishes above the original painted colour vary from an approximately 2-mm-thick layer of beige and off-white paint to an up to 8-mm-thick layer of filler material applied between the earliest and later finishes. The initial aim was to expose an opening (approximately 10 × 10 cm) of selected decorated areas to gain information about the application and texture of the original paint surface. However, removing the covering finishes proved extremely difficult. Notably, the layer directly above the original colour decoration had an extremely durable bond to the paint surface. The strong bond between the original layer and subsequent layers resulted in both sets of layers separating from the ground when pressure was exerted during mechanical removal. Removal tests using solvent paste and standard solvents (acetone, paint thinner) resulted in softening both sets of layers. That made it very difficult to excavate clear, closed areas of the original painted surface. As a result, the size of the excavated areas was reduced to allow a full investigation of the decoration within the framework of the scheduled on-site investigation.

The results indicated five base colours: bright red, dark warm yellow, emerald green, cobalt blue, and black (emerald green and cobalt blue are used here to describe commonly associated colour tones and have no relation to paint composition). In the excavated areas, it was visually evident that the decorative finish comprised two to three coats; that was later confirmed in the microscopic cross sections. The first coat appeared slightly lighter and more strongly coloured; the subsequent layers were semi-translucent and darker (Fig. 6). That technique gave more depth to the red, blue, and green finishes.

Gold was also found on some relief stucco elements applied above the coloured paint layer. The gold was used for highlighting and applied only at the height of the stucco reliefs.

Visual observation of the cross sections under the stereo microscope showed a primer layer upon the smoothed plaster finish. The decorative paint layer was applied onto the plaster by first applying that primer, then a cream-beige base coat, followed by two to three colourful painted layers, as noted above. The colour finishes have very fine texture. They are followed by several layers of white, beige, and cream finishes (Figs. 6b, 7).

3.4 Results for colour design of the room

The five main base colours mentioned above were further identified with respect to hue, saturation, and blackness by visual comparison and recorded by matching them with the closest NCS colour (Fig. 8). Together with the

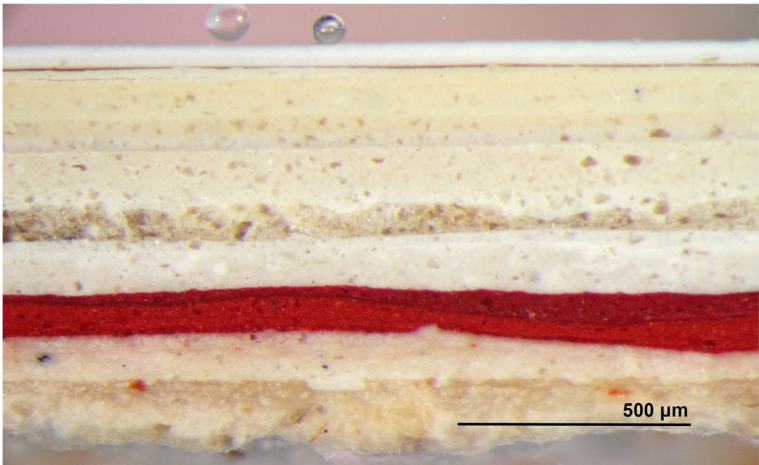


Fig. 7 Polished cross section of the paint stratigraphy: the top white finish is the currently visible paint finish; the red layer with ground and primer is the original paint layer, which was covered by several cream and white finishes at later stages. (Source: the author)



Fig. 8 Magnified detail of the yellow paint layer (opening approximately 30 mm wide). The darker tone in the lower part of the opening is the original finish. (Source: photograph reproduced with the permission of Zhong Tang)

Table 1 Colours used in the room design

	Colour	NCS Code
Main Colours	Red	S 5040-R
	Black	-
	Yellow	S 3560 Y
	Green	S 7020/6030-B90G
	Blue	S 7020- R80B
Main gilded areas	Gold on black	
	Gold on yellow	
Gilding on some flowers and small decorative elements	Gold on blue	
	Golf on green	

gold highlighting, the room decoration showed five different colours and four combinations of colour and gold (Table 1). In larger areas, red, black, and yellow were dominant; some smaller areas were accentuated in green

and blue. Green and blue, with small accents in red and gilded highlights, were used for decorations that resembled Greek meanders and flowers (Fig. 9). Figure 10 shows a detail of the ceiling montaged with watercolours and presents a schematic representation for the colour distribution; it is simplified to five tones, which roughly match the original colours.

3.5 Results of paint material identification

Within the frame of the preliminary investigation, initial SEM–EDS analysis was conducted on selected samples of paint finish around the coloured layers. Analysis was undertaken on single measurement points or small areas of approximately 0.05 mm². The gold observed on-site and in the sections was identified as real gold (Au) (Fig. 11a). In several of the white and cream layers lead (Pb) was detected. In the white layer immediately below the colour finish had the highest intensity of lead. All the layers, including the coloured ones, also showed the presence of zinc (Zn), barium (Ba), calcium (Ca), and sulfur (S) (Fig. 11b). FTIR analysis identified barium sulfate (Fig. 12). Titanium (Ti) was confirmed by EDS in one of the more recent finishes.

In synthetic form, white barium sulfate has been available since the early 19th century; it is chemically inert and used as an extender for lead white and as a base for the preparation of lake pigments. A mixture of barium sulfate and zinc sulfide, the compound lithopone is a common component in paints and colourants (Feller 1986). Most of the detected elements listed above appear to be related to filler materials in paint, such as lithopone and calcium carbonate. The results of the initial SEM and FTIR analysis indicated the use



Fig. 9 Detail of ceiling decoration (flower in the meander band around the main ceiling panels), indicating the colour scheme on-site and illustrated digitally. (Source: the author)



Fig. 10 The Chinese Banking Hall with a montage of the coloured decoration to visualise the colour scheme found for the room decoration through on-site investigation and stratigraphy. (Source: the author)

of synthetic organic pigments (dyes fixed onto mineral substrates) rather than mineral pigments (those commonly used in traditional Chinese *caihua* decoration, e.g., cinnabar, ultramarine, malachite, and azurite (Yang, Liu, and Lei 2015; Liu et al. 2018)). The FTIR analysis also suggested the presence of an alkyd resin rather than oil as a binder in the coloured finishes. Both sets of results pointed to the use of synthetic organic pigments in a synthetic resin rather than a classic oil

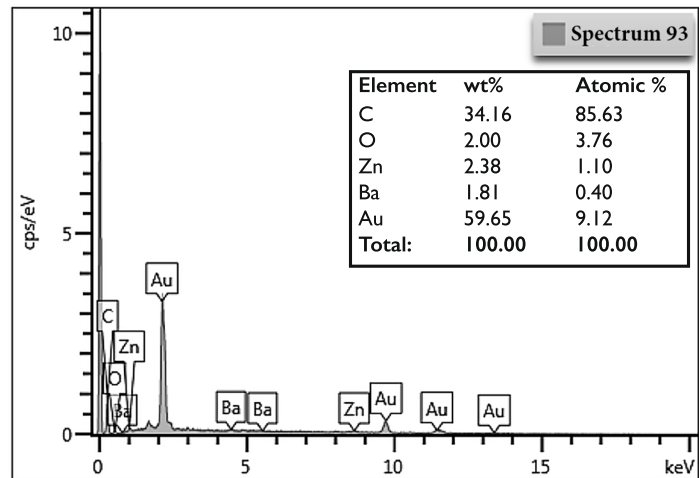
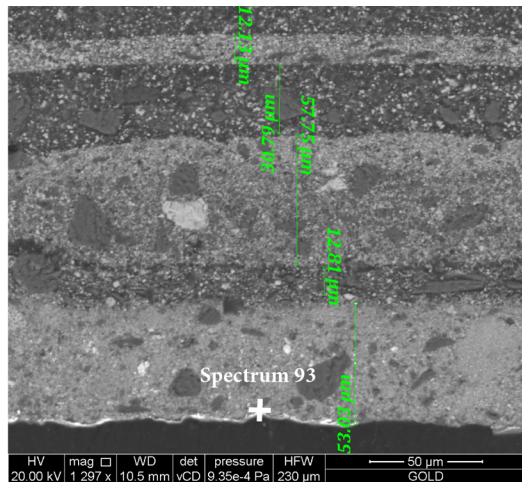
paint with mineral pigments. Identification of the synthetic pigment or dyes would require further analysis.

3.6 Condition of paint finishes

There were several clear signs of deterioration of the paint finishes within the entire room. Several areas show cracking; in some spots, the whole set of finishes (from the first primer on the stucco plaster to the final white covering) was detached from the wall in areas up to 3–4 cm long. This most likely resulted from humidity and condensation, causing tension between the dense packages of multiple paint finishes and the porous substrate. Consequently, the adhesion between the paint layer package (original paint with primer and covering layers) and the stucco plaster ground was likely poor in some areas. Particularly in such areas, it was impossible to remove the modern white and cream covering layers from the original colour finishes without first consolidating them. As noted above, any slight pressure from a tool on the surface would cause the entire package to become detached.

In other areas, the finishes were well bonded to the ground; however, beneath the covering finishes, craquelure and fissures were evident in the original paint finish. As explained above, the finish immediately covering the coloured finishes adhered extremely well to the surface of the paint. It is possible that the paint surface had been cleaned or that the surface had been lightly ground before applying covering layers, which is common practice to create better adhesion of a new paint finish.

a)



b)

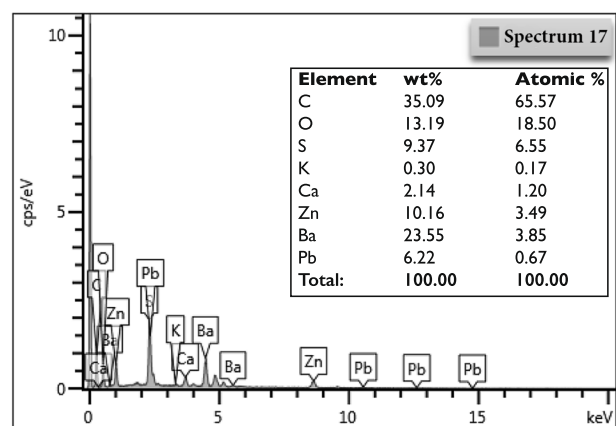
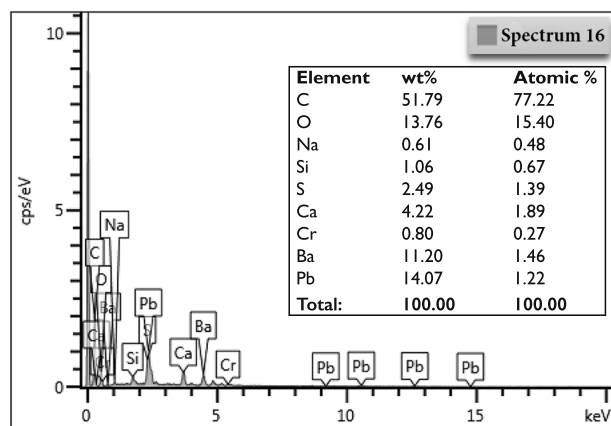
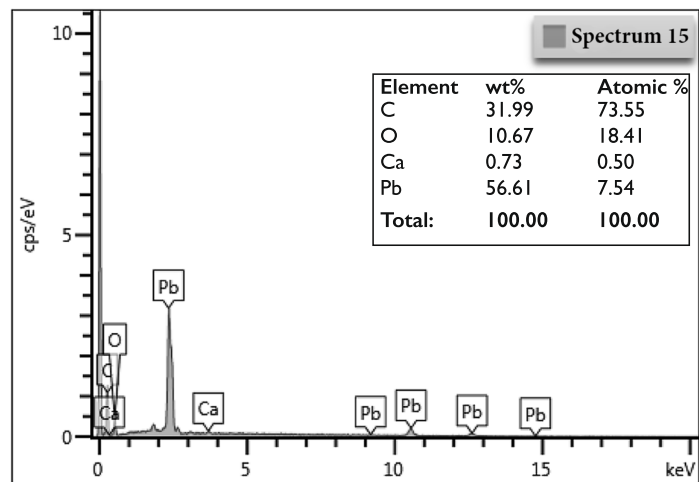
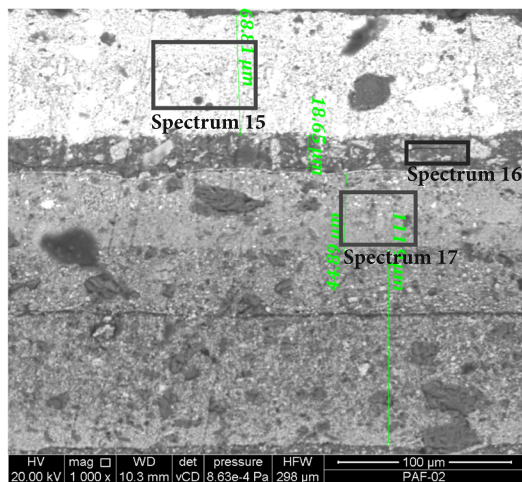


Fig. 11 **a** SEM micrograph of a section with gold leaf with corresponding EDS analysis showing gold. **b** SEM micrograph of a cross section with a red paint layer (red layers in the centre at spectrum 16 and 17) with corresponding EDS analysis showing lead in the white layer below the red layers. It should be noted that unlike common presentation of paint cross sections, both SEM images are inverted: the older layers appear uppermost, and so the gold ground appears above the gold leaf. Ba, S, Ca, and Zn in the red layers indicate filler materials. (Source: analysis of samples commissioned by Tongji Architectural Conservation Laboratory, analysed at the School of Chemistry of Xi'an Jiaotong University by Junyan Liang)

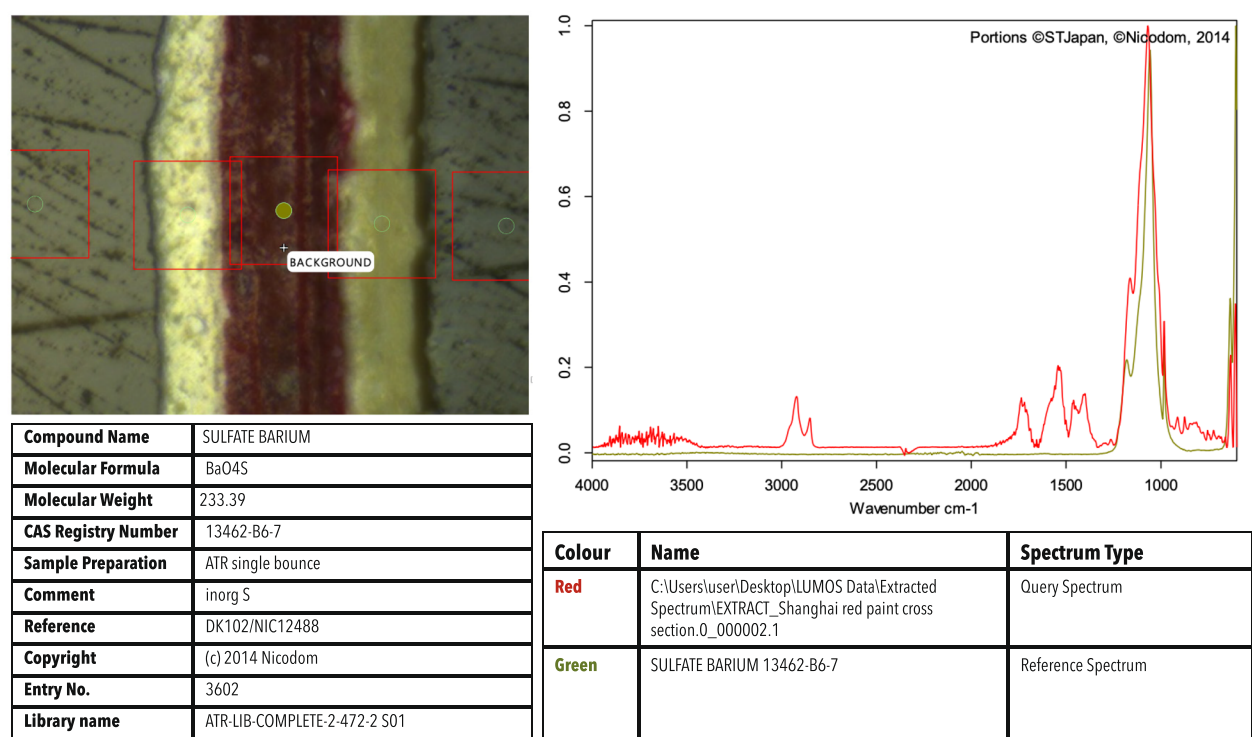


Fig. 12 FTIR ATR point measurement of a red paint cross section and example reference showing that the paint contains barium sulfate (most likely included as a filler). (Source: preliminary FTIR analysis of samples collected by the author, analysis conducted at the Architectural Conservation Laboratory at The University of Hong Kong, Alison Trachet)

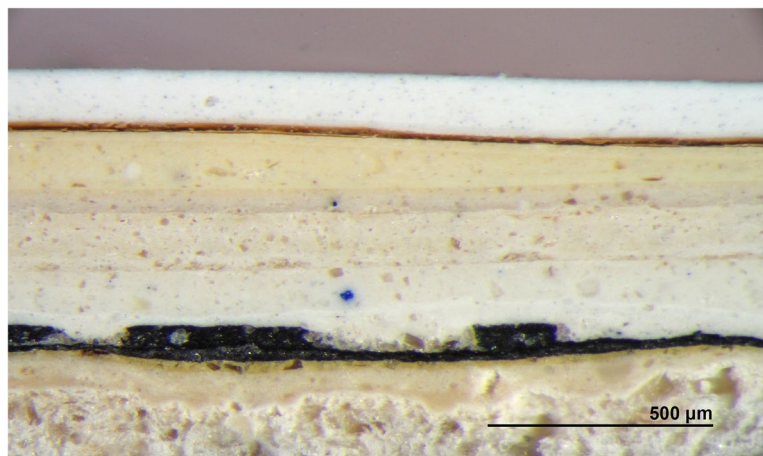


Fig. 13 Black paint layer. The cross section shows incomplete layers, indicating the previous scaling of the paint before applying white covering finishes. The beige or off-white primer is visible under the black finishes. (Source: the author)

In a cross section of the black paint, missing parts of the black finish could be observed (Fig. 13). The subsequent layer of white primer levelled out the uneven, damaged surface. This finding indicates that the paint finish—at least locally and in the black areas—showed signs

of deterioration and scaling before being covered. Lead was evident in the white base layer under the colour finishes and also in some of the white covering layers; this may signify the use of lead white pigment. Historically, this would be an obvious choice: finishes with lead white

pigment have particularly high hiding strength or hiding power²; this means that the paint finish would be able to fully cover over the strong colour decoration beneath. As a base layer, lead white pigment forms a bright white base for enhanced brilliance of the subsequent colour layers. However, in 1923 (when the building was completed: all paint finishes in this hall postdate 1923), many alternatives to poisonous lead paints were already on the market, such as zinc oxide and titanium white. It appears, however, that in early-20th-century China, there were no restrictions on using lead-containing pigments. In the author's previous experience when investigating and analysing paint finishes in public colonial buildings in Hong Kong (maintained by the government), lead-containing finishes were often evident. Identifying lead as a component in room decoration is important regarding plans for further interventions. Any paint removal would have to be conducted with proper care.

Apart from some minor cracks, the plaster beneath the paint finishes appeared in good condition. However, a detailed investigation of the stability of the entire ceiling has not yet been carried out.

4 Possible conservation approaches

Detailed investigation and analysis of the materials and condition of an original decoration are directly related to selecting an appropriate conservation approach. To conserve the Chinese Banking Hall, there are primarily four possible options:

1. Exposure, repair, and retouches of the original decorative finishes;
2. Exposure (and repair) of a small section of the room to be presented as a 'window on the past';
3. Detailed colour and paint application studies (further exposure for research only) followed by a recreation of the colour scheme of the historically painted decoration; where possible, the original decoration is retained beneath; where it is unstable, it is removed;
4. Keeping the room white: with this option, if further study is recommended and following detailed documentation and recording of the original finishes, the information (including visualisation of the full decoration with realistic renderings) could be presented on exhibition boards in the main lobby. Where stable, the original painted decorative finish would be retained beneath; it would be removed where necessary to apply the new finish.

Those four options are examined below. The discussion considers the heritage value of the banking hall, the condition of materials, the feasibility of interventions, the ethics of conservation interventions, and the local context versus international practices.

4.1 Option 1: exposure

As explained above, the decoration in the Chinese Banking Hall has high historic and aesthetic value. The vibrant decoration was specifically designed for this room: it creates a breathtaking impression, as evident in the journalist's description quoted above, comparing it with the 'wonder-halls' of 'the palaces in Peking'. The design was unique and bold for its time and context. Restoring the entire original room decoration would clearly be an impressive, magnificent attraction for people interested in Shanghai's Bund architecture. However, option 1 (exposure and careful restoration of the original) is not a simple task; some of its obstacles may be so considerable that meticulous restoration of the room's painted decorative finishes may not be possible. First, as found during this investigation, the condition of the original painted finishes is inconsistent. As described above, several areas show flaking (within the original layers), scaling and separation (of all finishes starting from the substrate), and tension cracks. Before any exposure can be conducted in areas with scaling, those areas would have to be softened, levelled, and consolidated. Second, the finish immediately above the coloured decoration layer strongly adhered to the surface of that layer. Thus, removal could not be carried out in a large-scale manner: it would have to be executed incrementally—square centimetre by square centimetre. The combination of these two issues would result in extremely slow, meticulous work. Even if the work could be implemented (which for a room this size would appear to be a challenging, exorbitant task), the final condition would still require considerable restoration and retouches to some missing and reduced areas. If this work were not properly undertaken (i.e., no repair and leaving the surface in its current impaired state and with missing layers), the result would not reflect the room's original beauty and impressive decorative effects; it could lead to the remaining original fabric being vulnerable to further deterioration.

4.2 Option 2: window on the past

This option, with detailed exposure and meticulous conservation of a selected area, is very feasible. It would give visitors the opportunity to view part of the original room decoration. However, given that all the viewer could see would be a colourful spot at the top corner of a high-ceiling room, it is questionable

² Hiding strength or power is the ability of a finish to mask the surface of an object. The hiding power of paint measures its ability to obscure a background of contrasting color.

whether it would be worth the effort. The small size of the opening and its location on a high ceiling of decorative finishes could not convey an appropriate ‘wow effect’; likewise, it would not transport visitors back to the early 1920s and walking through a room in a ‘wonder-hall’ palace. Option 2 would simply offer some visible information about the former decoration. This point is especially relevant considering that the Chinese Banking Hall is not normally open to the general public: it is part of the everyday back-office business of the bank. It is necessary to ask what change the presence of a small colourful corner of the room would make and who could be expected to appreciate that conserved corner. In any event, option 2 should ideally be combined with detailed interpretation panels so that both conservation specialists and laypeople could grasp details about the room’s historical decorative finishes. It may be that a large, well-designed poster with architectural renderings showing the original room decoration and detailed information about the room’s history could serve the same purpose. This component is also suggested for inclusion with option 4, where no partial exposure is presented. The area selected for partial exposure should be an area of the room in comparatively good condition. If the information panels conveyed more information than the ‘window’ itself, this exposure could place unnecessary stress on the original layer of painted decoration; the area could be much better protected by preserving it beneath modern finishes.

Finally, it would have to be decided how the original painted decoration should be treated. It was clear from the preliminary investigation that after exposure, the condition of the original paint would have reduced areas or losses. It may be possible to find a decorated area with minimal missing sections of the original painted surface; however, it would never look like a close, intact finish. It is necessary to ask whether the window should be left in its current state simply to show its present condition and whether retouches should be made to the cracks and losses. The former would show the pure original fabric; the latter would provide a better idea of the original finish as it formerly appeared. These decisions may simply be choices related to personal preferences by the project leader and schools of conservation.

4.3 Option 3: recreation of the original decoration

The architectural decorations of early-20th-century interiors with repetitive patterns of coloured stucco differ from murals with free artistic expression. Therefore, recreation of a decoration has to be viewed differently. With murals, reconstruction of missing areas in situ is usually

unacceptable from a professional conservation perspective. The term ‘recreation’ here refers to inpainting of large areas of a mural that have been lost to damage or vandalism. This is in contrast to reconstruction, whereby a copy of the mural is produced in a different location—a common method to protect valuable murals from visitors. A copy of an artistic work can serve for appreciating the artwork while limiting or prohibiting access to the original piece, thereby protecting it.

For mural conservation, recreation is unacceptable owing to the fact that the conservator is not supposed to make any creative additions to an artwork; the conservator must follow strict rules in terms of compatibility and reversibility (of materials) and distinguishability (through specific optical techniques, such as *tratteggio*, or using lighter colour tones). For an architectural decoration, however, the position is slightly different. In the Chinese Banking Hall, the artwork includes repetitive coloured decorations on stucco ceiling elements. Colour reconstruction here carries far less risk of changing the artistic expression or falsifying the design. There is, however, the issue of the great variation in visual impressions that paint finishes can have, such as plane, structured, glossy, matte, deep, and faint. There is considerable variation in how a single paint layer applied to the same ground can create different results for the appearance of an entire wall or column depending on the following: thickness of the paint; whether the paint is applied in one or multiple layers; type of brush used; and how regularly the paint is applied.

In the history of restoration interventions in the West, recreating decorated rooms (such as art deco and baroque church interiors, where all the architectural decorations have large repetitive design sections) has been common. However, such work has to be undertaken by expert decorative painters and restoration specialists; otherwise, there would be a high risk of improper execution of the decorative painting. Such decorative painting experts—especially for Western-influenced 20th-century art and architecture—are rare in Asia. This is evident in many examples of over-painted decorations, sculptures, and historical facades; they appear either dull and lacking depth or too striking and lurid. To re-create the uniqueness of the lively, colourful room decoration in its bold mix of Western and Chinese styles, option 3 also requires a very detailed examination of paint materials used in the 1920s and studies of paint application. Restoring the decorative colour scheme in the Chinese Banking Hall as a significant character-defining element of the original room design would be extremely interesting. However, for such an endeavour to succeed, it would be necessary first to conduct further in-depth study of the paint consistency and application. Detailed scientific analysis of

the paint finishes could provide additional insight into the reproduction of historical paint finishes. Creating finishes with a similar brilliance, depth, and degree of gloss to the original would be essential for authentic restoration results.

4.4 Option 4: documentation and white cover

This option focuses specifically on detailed interpretation of the room for the public. There would be no visible evidence of the decoration in situ; however, a comprehensive record of the findings could be displayed on information boards in the large main lobby. The Chinese Banking Hall is not normally accessible to the public, so this option may be preferable to the others. After additional paint research to complete the documentation of the original room decoration, a new white interior finish could be applied; the Chinese Banking Hall would remain visually as it is now. With this option, the original painted finishes would be kept intact beneath the new white finish where possible.

5 Discussion and conclusion

With the above four options, one question has not yet been addressed regarding the condition of the paint materials: would keeping the original finishes in most of the room with options 2–4 cause any problems during the renovation? All the options—presenting one corner with the original painted decoration, maintaining the room as it is with a plain, white finish, or reconstructing the colour scheme with a new additional colour finish—should aim to preserve as much as possible of the original underlying finish. In that way, at some point in the future, conservators could go back to study, reveal, or restore the original finishes. However, given the instability of the layer package noted above, over-painting a weakened, aged finish could result in tensions and peeling when applying fresh paint or in the course of its drying or curing. On-site test areas would have to be selected to investigate this problem. Large-scale consolidation of the entire ground may be necessary to preserve the original in situ; however, it could result in sealing and impregnating the finish, which would impede any further investigation or intervention regarding the original finishes. For the sake of future research, a compromise may be possible in areas where large sections in good condition remain in place and are preserved underneath. At a future time, it would be feasible to investigate and analyse the original decorative paint finishes. Other areas with brittle finishes could be removed. A separation finish and levelling filler would additionally be required to cover the original painted finish. Thus far, tests for over-painting and stabilisation have not been undertaken.

As evident from the above discussion on possible options for conserving the painted decorative finishes in the Chinese Banking Hall, both the condition of the paint materials and significance of the architectural finish equally influence decision making for conservation. This paper advocates the importance of paint analysis for conserving the built heritage to gain a better understanding of the materials involved. It also emphasises that assessment of cultural significance and material analysis together provide vital information for informed decisions about the most appropriate conservation approach; analysis results do not automatically deliver the perfect solution. Furthermore, the results of instrumental analysis are not always unequivocally conclusive: they require considerable context study to be properly interpreted. It should also be noted that high-end instrumental analysis is not absolutely necessary for all investigative conservation. Where budgets are limited, it is essential to understand that simple on-site optical analysis or practical tests conducted by experienced conservators can provide valuable information about materials and conditions.

The study underlines the complexity of conservation decision making and the lack of general single best solutions. Finding an appropriate approach when conserving a site giving due consideration to all heritage values is a complex task; decisions may also be culturally diverse and dependent on a school of thought within conservation.

No further efforts have been made to investigate options for conserving the vibrantly painted decorations of the Chinese Banking Hall. Following the preliminary investigations, further laboratory analyses on the collected samples confirmed the presence of a synthetic binder of the colour layers. Owing to interest in and appreciation of the room design, the project team consisting of the Tongji University Architectural Conservation Laboratory, the Shanghai Architectural Design and Research Institute Co., Ltd., and representatives of the Shanghai Pudong Development Bank/Public Relations Office further discussed option 2 in detail. There was some hesitation about moving toward the more innovative approach of option 3 because of the limited availability of specialist restoration workers in Shanghai having sound experience of 20th-century decorative finishes.

The room was repainted white in summer 2021 without further detailed investigation by conservation specialists. The impact of the renovation measures on the current condition of the underlying historical finishes has yet to be investigated. It is hoped that at some point, a detailed record of the investigations into the design of the former room decorations will be displayed on-site. That could

aid in promoting the importance of analysing finishes as a significant step in conserving China's built heritage.

Abbreviations

FTIR: Fourier transform infrared spectroscopy; NCS: Natural Colour System; HSBC: The Hongkong and Shanghai Banking Corporation; SEM-EDS: Scanning electron microscope with energy dispersive spectroscopy.

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Authors' contributions

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Availability of data and materials

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Declarations

Competing interests

The author declares that there are no competing interests.

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