Architecte Mandataire / Chief architect and Principal consultant
studioMilou architecture, studioMilou singapore
Jean François Milou, *principal architect and lead designer*
Wenmin Ho, *team manager and senior architectural associate*
Nguyen Thanh Trung, *senior architectural associate*
Charmaine Boh, *senior architectural associate*
Janis Goh, *senior architectural associate*
Jiarong Goh, *architectural associate*
May Leong, *architectural associate*
Jason Tan, *architectural associate*
Eudora Tan, *architectural associate*
Jean-Loup Baldacci, *architect - competition phase*
Lise Macdonald, *architecture/exhibition coordination*
Karim Ladjili, *architect - competition and schematic design phase*
Cecile Strauss, *architectural assistant - competition and schematic design phase*
Delphine Miel, *architectural assistant, interior design - schematic design phase*
Yann Follain, *architect - schematic design phase*
Luther Seet, *architect*
Siow Zhi Xiang, *architect*
Pamela Choo O'Neill, *senior architectural associate*
Mikael Teh, *architectural associate*
Waihon Tham, *architectural associate*

Agueda de Urruela, *competition phase coordination*
Philip Burns, *museum system specialist*
Suzanne Ogge, *museum and international projects specialist*
David Tresilian, *research and documents*
Iola Lenzi, *curatorial interface*

Coordination Locale / Project Administration
CPG Consultants pte ltd (architecture group)
Lee Soo Khoong, *executive vice president*
Tan Hooi Ong, *vice president*

Co traitants / Technical consultants
CPG Consultants (civil and structural engineering), Leong Meng Sun, structure
ARC, Garth Sheldon, conservation
ICN Design, landscape
Lighting Planning Associates, Kaoru Mende, lighting
SMW, John Burris, AV/IT and acoustics
The Press Room, Kelley Cheng, signage and graphic design
Batiserf Ingénierie, initial structural studies
SECM, initial glass facade studies
INEX, initial M&E studies
CSTB, initial roof studies

Maître d'oeuvre / Main Contractor
Takenaka Corporation - Singapore Piling and Civil Engineering Pte Ltd Joint Venture

Maîtrise d'ouvrage / Client
National Gallery, Singapore

Surface / *Area*: 60,000 m^2
Montant des travaux / *Construction cost*: 530,000,000 SGD
Livraison / *Completion date*: November 2015

National Gallery, Singapore
National Gallery, Singapour

Vue du Padang, du City Hall et du Supreme Court dans les années 1950
View of the Padang, the City Hall and the Supreme Court in the fifties

National Gallery, Singapore

National Gallery, Singapour

In 2008, studioMilou architecture in Paris won the international competition to convert two of Singapore's most significant heritage buildings – the former Supreme Court and City Hall – into one major regional institution dedicated to modern and contemporary visual arts. With a budget of over 500 million Singapore dollars and a surface of over 60,000 square metres, the project places Singaporean and Southeast Asian at the nation's city centre and will become one of Asia's largest arts institutions when it opens in 2015.

The larger of the two monuments, the City Hall, formerly housed British colonial administration offices, and witnessed many of the key events in the history of Singapore, notably the Japanese army's official surrender to the Allied forces in 1945.

After the colonial administration's departure, the Singaporean government moved its own offices into the City Hall, and it was in this imposing structure, in 1959, that the first independent government of Singapore led by Lee Kuan Yew was officially sworn in. As the Prime Minister of Singapore, Lee Kuan Yew then established his offices in the building.

Meanwhile, the Supreme Court was built and completed a few months before the outbreak of the Second World War. This impressive building with a dome dominating the historic city centre, was one of the last major neo-classical buildings built by the British worldwide. Together, these monuments constitute a unique architectural ensemble and one that until the 1990s represented the key political institutions in the centre of Singapore.

En 2008, studioMilou architecture à Paris remporte le concours international visant à convertir le monument historique le plus important de l'héritage de la ville de Singapour, la Supreme Court et le City Hall, en une institution régionale majeure dédiée à l'art moderne et contemporain. Avec un budget de plus de 300 millions d'euros et une surface dépassant les 60 000 m² , le projet proposera l'une des plus grandes institutions d'art dédiée aux arts de l'Asie du Sud-Est quand le musée ouvrira ses portes en 2015.

Le plus grand des deux bâtiments, le City Hall, fut construit entre 1926 et 1929 et accueillait les bureaux administratifs de la colonie britannique. Il a été le témoin des événements clefs de l'histoire de Singapour, en particulier la reddition officielle des armées japonaises aux forces alliées en 1945. Après le départ de l'administration coloniale, le gouvernement de Singapour déménage ses propres bureaux dans le City Hall. C'est dans ce bâtiment imposant que Lee Kuan Yew procède à la cérémonie d'investiture du premier gouvernement indépendant de Singapour en 1959.

La Supreme Court fut construite et achevée quelques mois avant le déclenchement de la Seconde Guerre mondiale. Ce bâtiment impressionnant, dont la coupole domine le paysage du centre historique de Singapour, est l'un des derniers bâtiments néoclassiques anglais majeurs construits au monde. Avec le City Hall, les bâtiments constituent un paysage architectural unique qui a marqué visuellement, jusque dans les années 90, la permanence des institutions politiques dans le centre-ville de Singapour.

CITY HALL

Date of Construction: 1926 – 1929

Site Area: 10,396m²

Existing Gross Floor Area (GFA): 23,800m²

History Designed by the British municipal architect F D Meadows, the City Hall building was built between 1926 and 1929, and was originally known as the Municipal Building. It used to house the offices of the Municipal Council, later known as City Council, which was responsible, among other things, for the provision of water, electricity, gas, roads and bridges and street-lighting. In 1963, City Hall was occupied by the Public Utilities Board and various other government departments including the Prime Minister's Office. Extensive renovations were carried out on the City Hall Building between November 1987 and May 1991 and the building came to house, at various times, offices, courtrooms, a registry and library for the Supreme Court, as well as offices for the Public Service Commission.

The City Hall building has been the focal point of many important events in the history of Singapore. It was in the City Hall building that Admiral Lord Louis Mountbatten accepted the surrender of the Japanese forces on 12 September 1945 on behalf of the Allied forces (the signing of the surrender papers was held in the City Hall Chamber, while the formal ceremony took place on the City Hall steps) and Singapore was proclaimed a city by the Royal Charter granted by King George VI in September 1951. The first Prime Minister of independent Singapore, Mr Lee Kuan Yew and members of his Cabinet, took their Oaths of Allegiance and Oaths of Office on 5 June 1959 in the City Hall Chamber. On 28 November 1990, the then-Prime Minister, Mr Goh Chok Tong, and members of his Cabinet also took their Oaths of Allegiance and Oaths of Office in the City Hall Chamber.

The City Hall steps have regularly played host to the President, the Prime Minister, Cabinet Ministers and Members of Parliament during the annual National Day Parade, whenever it has been held at the Padang.

Architecture The general layout of the City Hall is a typical example of neo-classical British architecture, characterised by its clarity, symmetry and harmonious proportions.

The four-storey City Hall building has a rectangular, symmetrical planning layout in a figure of eight, with two open courtyards encircled by continuous open passageways. A central staircase connects all four levels, with four more stairwells located at the corners of the building. The building's interior is modestly proportioned but its front façade is distinguished by 18 three-storey high Corinthian columns facing the Padang.

Australian War Memorial negative no. 116239. Courtesy of National Archives of Singapore

MICA collection, courtesy of National Archives of Singapore

TOP:
Admiral Lord Louis Mountbatten signs the surrender for Great Britian, 12 September 1945

BOTTOM:
National Day Parade, 9 August 1967

Pages extraites du programme de concours, National Gallery du Singapour, MICA, 2007
Pages extracted from the Architectural Design Competition Guide, National Gallery, Singapore, Ministry of Information, Communication and the Arts, 2007

FORMER SUPREME COURT

Date of Construction: 1937 – 1939

Site Area: 6,733m²

Existing Gross Floor Area (GFA): 16,862m²

History The Former Supreme Court building was built on the site of the former Grand Hotel de l'Europe, in its heyday one of the most palatial hotels in Southeast Asia, that was demolished in 1936. Designed by Frank Dorrington Ward, Chief Architect of the Public Works Department, the Supreme Court was declared open by Sir Thomas Shenton Whitelegge Thomas, Governor of the Straits Settlements, and handed over to the then Chief Justice, Sir Percy McElwaine, on 3 August 1939. It was to be the last classical building to be built in Singapore. United Engineers Ltd were the contractors for the building, and the Corinthian and Ionic columns, sculptures and relief panels were the works of Italian artist Cavaliere Rudolfo Nolli.

Built to house the Supreme Court offices and courtrooms, the building underwent major internal renovations in the 1960s and 1980s. The Supreme Court recently relocated to a new building designed by Lord Norman Foster. The new distinctive Supreme Court building is located behind the original Supreme Court building, separated only by a narrow lane, Supreme Court Lane.

Architecture The architecture of the former Supreme Court building was intended to harmonise with that of its neighbour, the City Hall.

The general layout of the building exemplifies British colonial architecture. The four-storey building consists of four blocks surrounding a central rotunda with a dome, originally used to house a circular law library. Symmetrically placed galleries with vaulted ceilings and courtrooms flank the central domed rotunda on the second floor. The other floors are more modestly proportioned. A large part of the ground floor is given over to loading and parking. A second, higher dome, accessible only by a narrow spiral staircase, dominates the front façade of the building that faces the Padang.[1]

1 Refer to Section (C) 4.3 The Padang

TOP:
A game of tennis at the Padang, in front of the Supreme Court

BOTTOM:
National Day Parade, 9 August 1967, with City Hall and the Supreme Court to the right

Image courtesy of Singapore Tourism Board and National Archives of Singapore

MICA collection, courtesy of National Archives of Singapore

Pages extraites du programme de concours, National Gallery du Singapour, MICA, 2007
Pages extracted from the Architectural Design Competition Guide, National Gallery, Singapore, Ministry of Information, Communication and the Arts, 2007

La National Gallery, nouvelle entrée créée entre les deux monuments sur le Padang / *View of the National Gallery of Singapore from the Padang (field)*

Perspective intérieure sur l'atrium d'entrée / *Interior view of the entrance atrium*

A veil draped over the buildings, a gentle wave of light

Un voile de lumière

studioMilou's design links these two buildings with a filigree metallic veil draping over each at roof level, uniting them as one institution. This sweeping gesture – the signature element of the design – has meant that interventions into each building are minimal, with the design developing around the original structures so as to respect their architectural authenticity and character.

At times conjuring images of finely woven rattan, at others, a smoother luminous surface, all reflecting soft shadows, the new roofing structure has also been designed to give visitors visual pleasure when accessing the buildings' highest points.

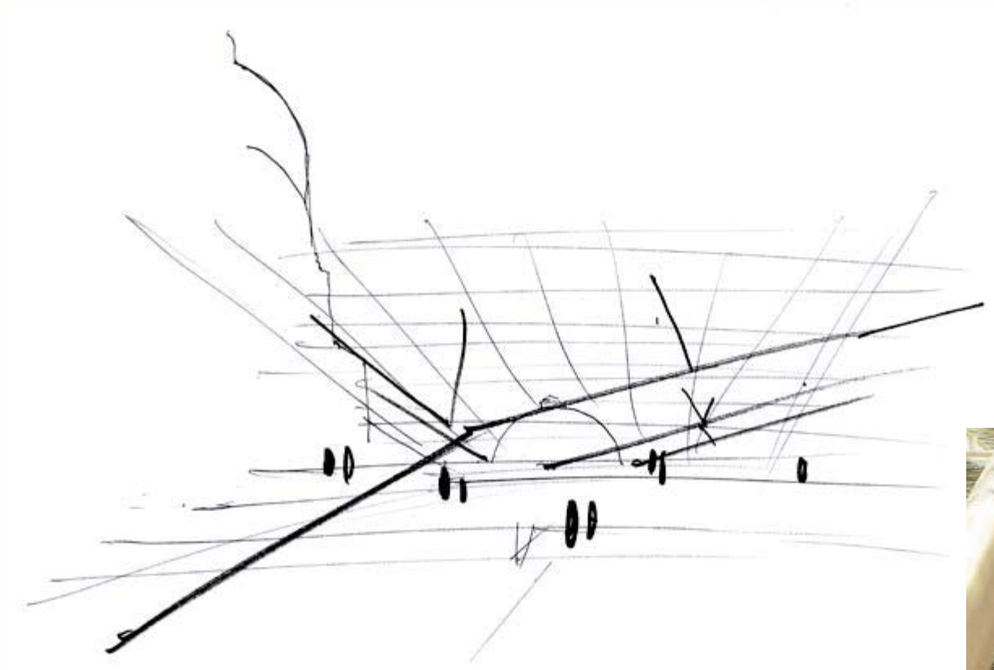
Behind the need to ensure the perfect design of this refined and sophisticated structure lay the challenges of its great technical complexity when it comes to visitor comfort and conservation elements in particular.

Controlling the way natural light plays upon the architecture of the buildings was one of the central aspects of the design work. The intensive studies carried out by the studio led to a reliable system of softening and filtering the natural light through the roof-top veil and the screens used on the windows, so as to allow natural light to enter throughout the building, including most of the exhibition spaces.

Le projet du studioMilou proposait de relier les deux monuments par un voile flottant au-dessus des toitures-terrasses des deux monuments et les réunit comme une seule institution. Cette intervention architecturale ambitieuse n'impacte pas l'architecture des deux monuments historiques, mais se développe autour en respectant l'authenticité et le caractère des deux monuments.

D'un côté, le voile donne une impression de rotin finement tressé, d'un autre, celle d'une surface plus lumineuse, reflétant des ombres légères. La structure de la nouvelle toiture est aussi créée pour donner aux visiteurs une impression enveloppante et chaleureuse dès l'entrée.

Derrière l'exigence et l'ajustement parfait de cette structure raffinée et sophistiquée, se cache un projet d'une grande complexité technique : il s'agit d'un véritable défi en termes de dessin architectural et de conservation du patrimoine. Contrôler la manière dont la lumière naturelle joue sur l'architecture est au centre de la démarche du projet architectural. Les études effectuées sans relâche par le studio permettent d'élaborer un système fiable de filtrage fin de la lumière, à travers le voile de toiture et les écrans des fenêtres, afin d'inviter la lumière partout dans le bâtiment y compris dans les espaces d'exposition.



Le public sur les toits de la Supreme Court, croquis 2007
The public on the rooftop of the former Supreme Court, sketch 2007

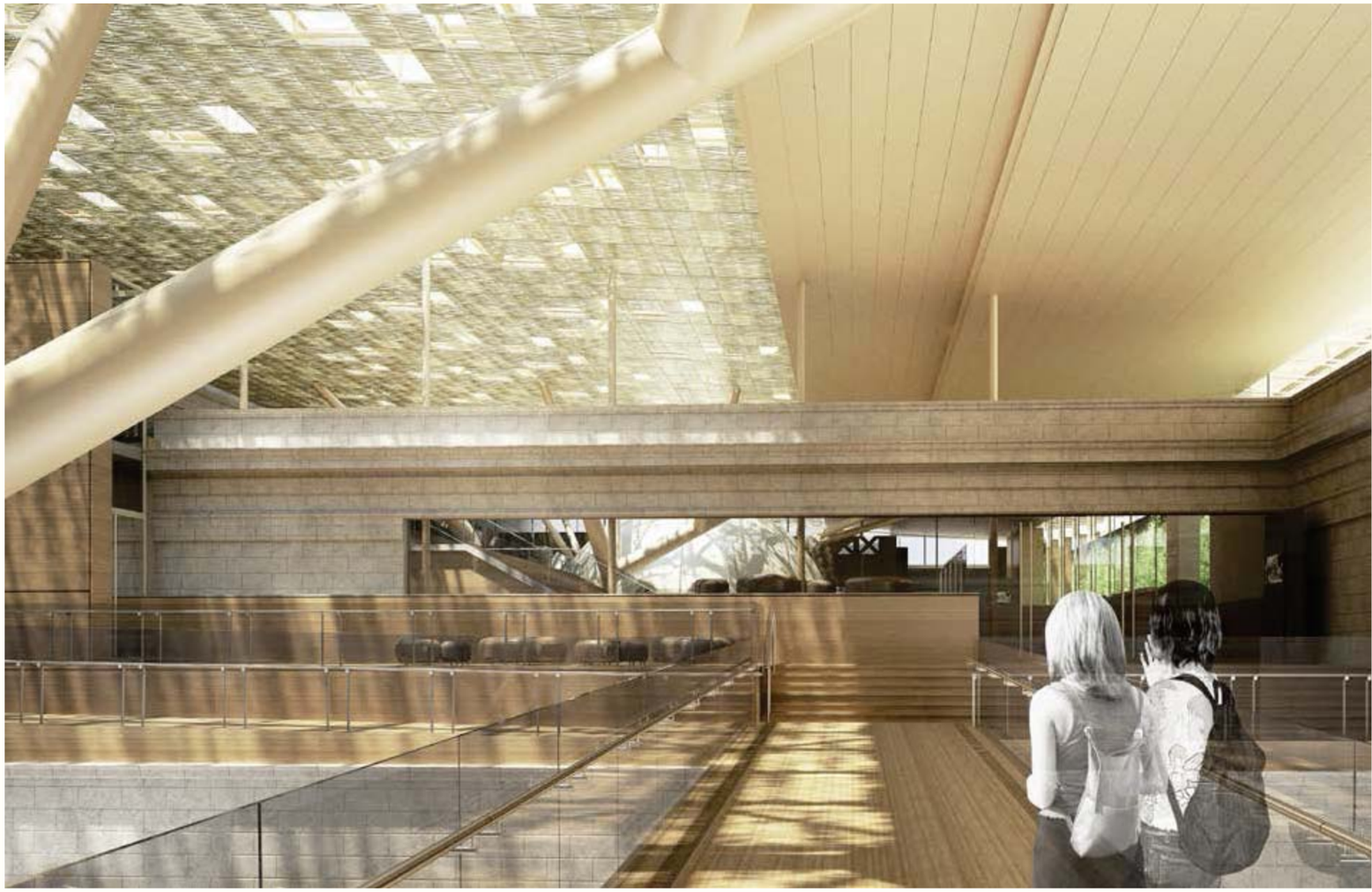
This project also marks a turning point in the development of studioMilou, which established a new branch in Singapore in 2009 to work closely with the project teams on all design and construction elements, from the outset to completion. Among the key competition criteria for the project was that the design should be spectacular while minimizing architectural interventions on the two monuments, both of which have great historical significance for Singapore. In many ways, this requirement sat well with studioMilou's design approach and philosophy, which has always combined an elegant architectural gesture of great simplicity with a deep respect for conservation and the context of a site. For the Gallery, this is evident in the signature element of studioMilou's design: an elegant roofing of filigree metal, gently placed over the monuments and supported by tree-like structures which serve to unite the monuments without major interventions. The design also serves to alter the identity of the monuments' discretion. While the new roofing and the views over Singapore and the sea are spectacular, they are low in height and avoid stark contrasts with the surrounding cityscape.

Ce projet marque également un tournant significatif dans le développement du StudioMilou, qui établit une nouvelle équipe à Singapour en 2009 afin de travailler au plus près du site à la fois sur le dessin et les détails de construction, et cela de l'esquisse à l'achèvement du bâtiment.

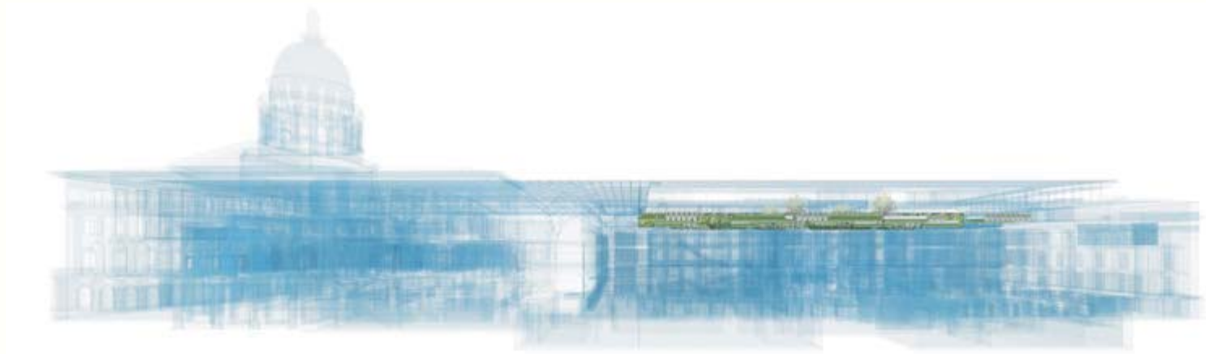
Le programme du concours, demandait au projet d'être spectaculaire et peu intrusif en minimisant les interventions architecturales sur les deux monuments historiques qui marquent tous deux l'histoire de la ville de Singapour de manière significative.

Sous divers aspects, cette attente convenait à la démarche architecturale du studioMilou où se retrouvent toujours associés un geste architectural élégant et une grande attention au contexte historique de chaque projet.

Dans le projet proposé pour ce concours, l'empreinte stylistique du studioMilou est notable dans la toiture élégante en filigrane de métal blond, délicatement posée au dessus des bâtiments et supportée par une structure en forme d'arbre unifiant les édifices sans impacter les deux monuments. Bien que la nouvelle toiture offre des vues impressionnantes sur Singapour et la mer, la structure reste basse et permet un contraste saisissant avec le paysage urbain des tours de bureaux alentour.



La lumière naturelle dans les espaces ouverts sur le toit de l'ancienne Supreme Court / *View of the former Supreme Court roof terrace from connecting sky bridge*



Les jardins suspendus sur le nouveau musée / *The rooftop gardens over the new museum*

Accès public principal au jardin haut / *Main public access to the rooftop garden*

This large structure, carefully set above the two buildings, also hosts an extensive garden resembling an open clearing looking out towards the sky and the main dome of the former Supreme Court. Reflective pools placed within this garden area are surrounded by restaurants and cafés, providing visitors with peaceful and refreshing pauses.

By creating this beautiful public space on the roof and establishing bridges between the two monuments, visitors will have access to new perspectives of both buildings and the surrounding city and seascapes.

Cette grande structure lumineuse délicatement posée sur les deux monuments, accueille également, comme dans une clairière ouverte dans le toit, un grand jardin ouvert sur le ciel et sur la coupole de la Supreme Court. De larges bassins sont disposés dans ces espaces de jardins autour desquels des restaurants et des cafés s'ouvrent au public. Ce jardin est offert comme un entracte rafraîchissant et paisible au cours de leur visite du musée.

En ouvrant tout un paysage de toitures au public et en créant des passerelles entre les deux bâtiments, les visiteurs ont accès à de nouvelles perspectives sur les édifices environnants ainsi que les paysages urbains et maritimes.

Vue du jardin et du bassin sur le toit du City Hall / *View of garden and reflective pool on the City Hall rooftop*

Vue de la National Gallery depuis Coleman Street / *View of the National Gallery from Coleman Street*

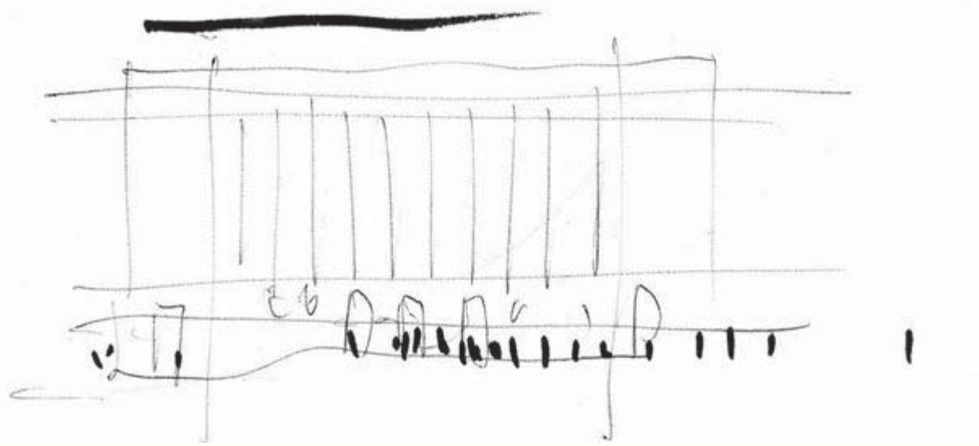
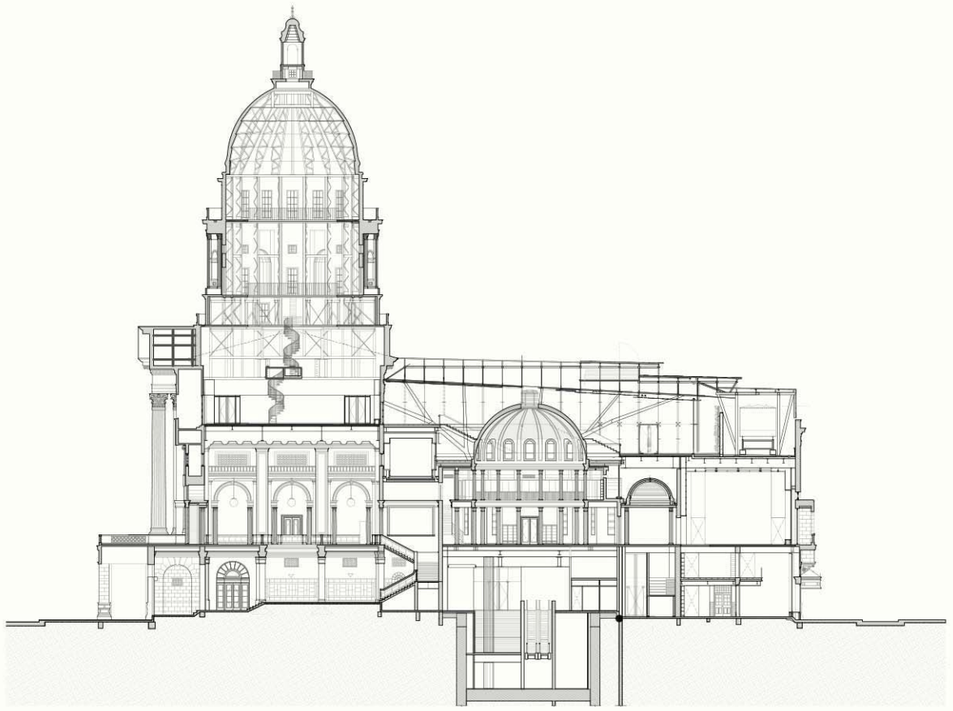


Schéma conceptuel, Jean François Milou, 2007 / *Concept sketch by Jean François Milou 2007*



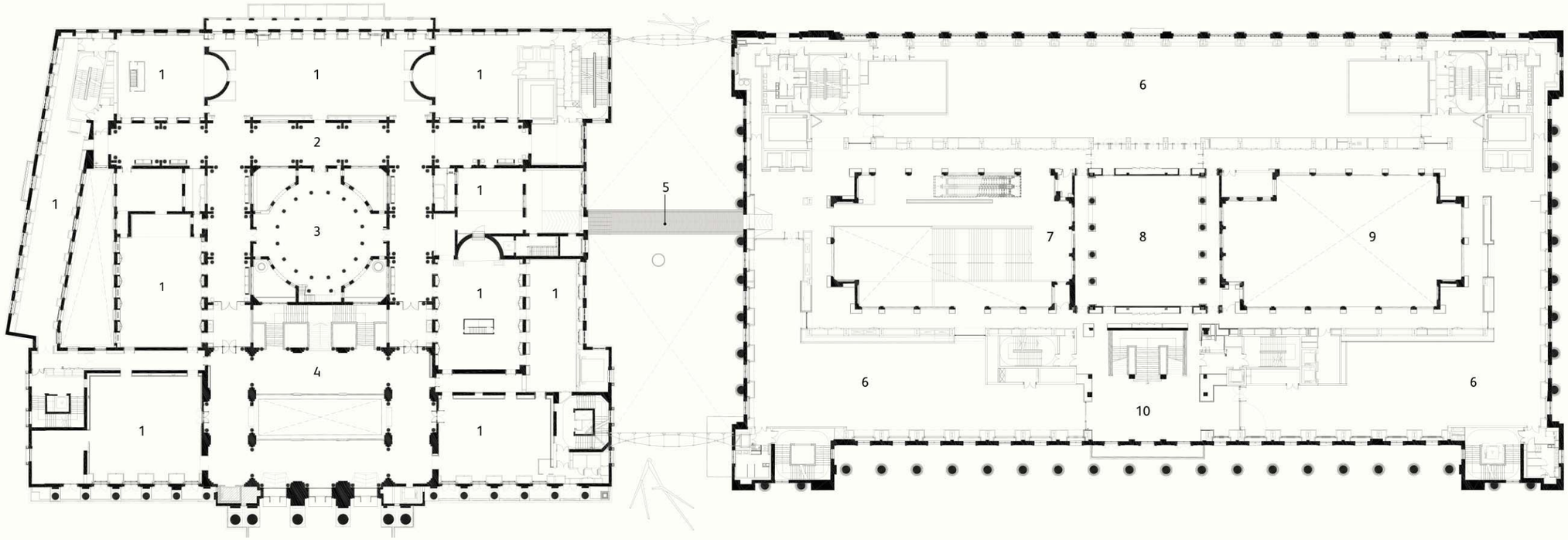
Coupe sur la Supreme Court / *Section of the Supreme Court showing interior of the dome*

Plan du deuxième étage / *3rd storey plan*

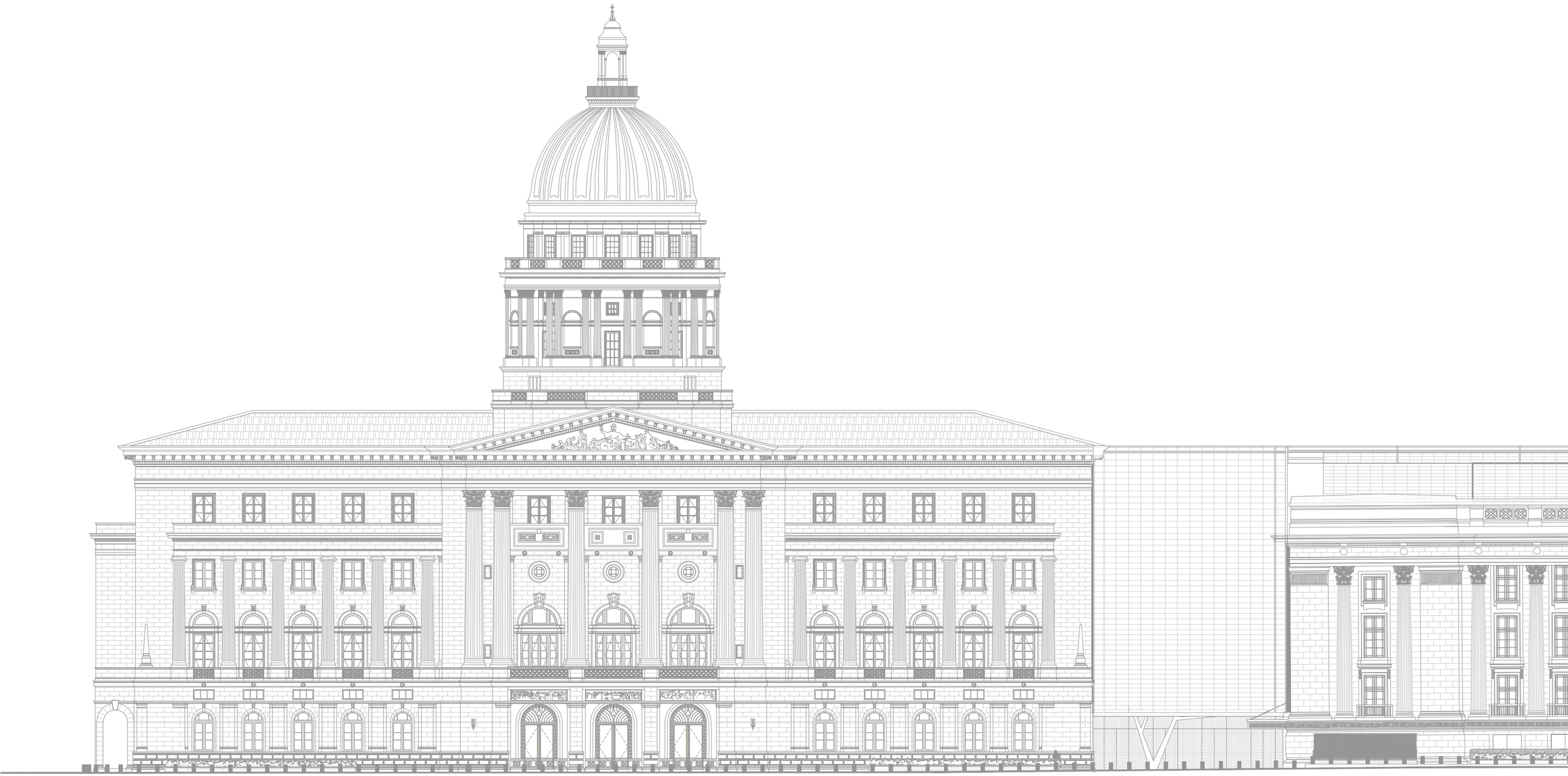
Former Supreme Court
1 Gallery
2 Corridor
3 Multimedia rotunda library
4 Historical staircase and lobby

Atrium
5 Sky bridge

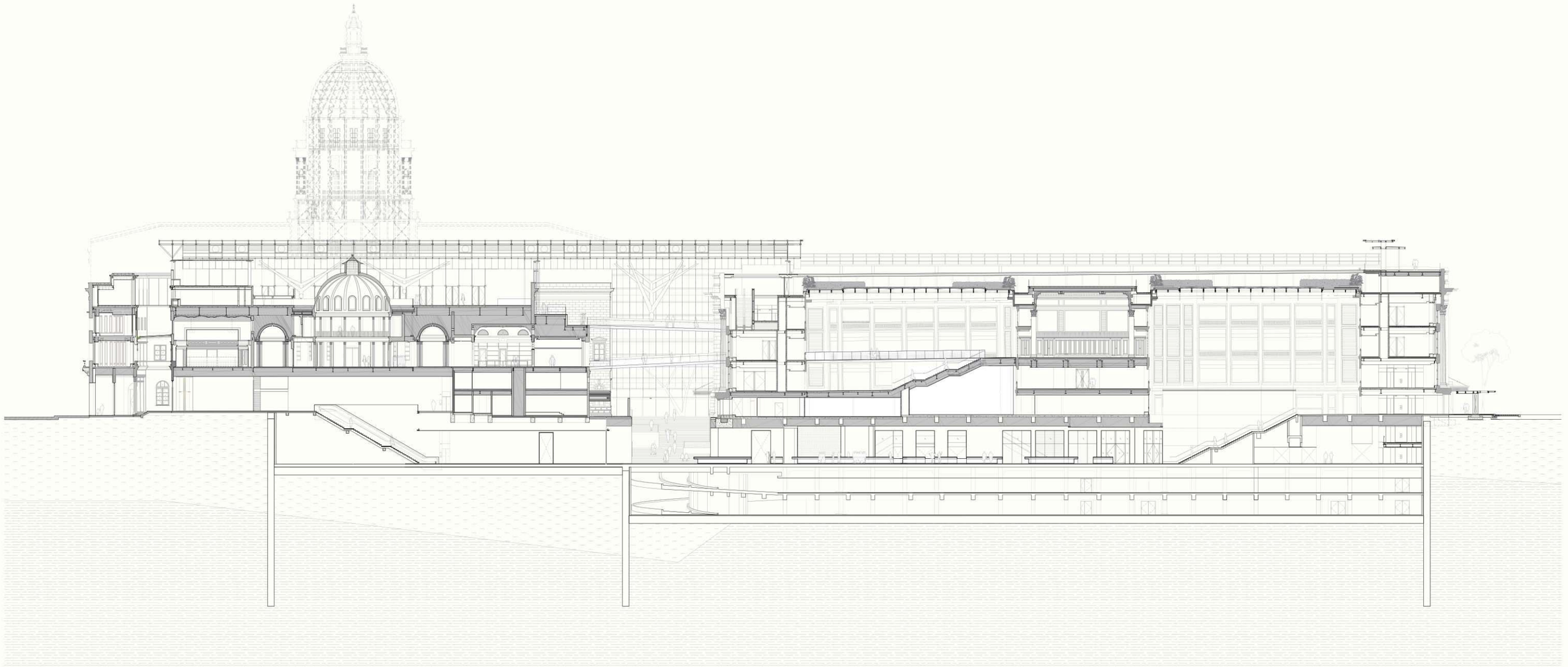
City Hall
6 Gallery
7 City Hall courtyard
8 Surrender Chamber
9 Coleman Street courtyard
10 Historical staircase and lobby



Plan du 3ème étage de la National Gallery / *Third storey plan of the National Gallery*



Façade principale sur le Padang / *Part elevation of the National Gallery*



Coupe longitudinale de la National Gallery / *Longitudinal section of the National Gallery*

Jiarong Goh et Jean François Milou, juillet 2014
Jiarong Goh and Jean François Milou, July 2014

Trung Nguyen, Wenmin Ho et Janis Goh, juillet 2014 / *Trung Nguyen, Wenmin Ho and Janis Goh on site, July 2014*

Janis Goh, May Leong, Wenmin Ho et Jason Tan, juillet 2014
Janis Goh, May Leong, Wenmin Ho and Jason Tan, July 2014

Interview with Jean François Milou

Les enjeux du projet

par Jean François Milou

What is the goal of your design of the National Gallery?

Our goal was to offer an elegant and welcoming art gallery that deeply respects the historical importance of the existing buildings and creates new architectural layers, each placed upon the monuments with minimal intervention, to create exhibition and other spaces for sharing and nurturing Singaporean and Southeast Asian visual arts. The key, or 'signature' of the design reflects our desire to add layers rather than to alter essential aspects of the monuments in the name of creating one institution. This signature element is the new roof structure, a kind of metallic but intimate veil that seems to float above the roof level of the two independent buildings, unifying them elegantly without any major changes to their existing structures. This layer is one of many placed upon and within the monuments to create one institution in ways that avoid undoing the original buildings. This roof is a complex invention, a draping of glass-and-steel that also filters the intense light of Singapore, bathing spaces in gently dappled natural light. Again, the design complements rather than modifies the existing system of levels of the façades of the former Supreme Court and City Hall buildings. Interestingly, the design is ambitious in terms of creating new entrances, new rooftop piazzas and spaces of repose under a sophisticated fabric of metal and glass, while on the other hand, the design remains a modest restoration of two existing historical buildings. These two aspects of the design share one major aim: to offer the community of Singapore the existing buildings in such a way that they can recognize their monuments, walk through their original structures, but for new and more creative purposes entirely.

What kind of museum, what atmosphere, what aesthetic do you hope the Gallery will achieve once it is completed?

We would hope that the atmosphere and aesthetics convey, with ease, the feeling of a Gallery for all Singaporeans alike, as well as an institution on par with the most ambitious international standards. We feel this is being achieved, through a combination of design aims that prioritise ease of visitor circulation and comfort, as well minute attention to both the beauty and details of all architectural elements. As for the aesthetics in more specific terms, we have sought to create a certain unity throughout the Gallery, so that these two very different structures may feel as one institution through great attention to a coherency in the materials used, the lighting and all finishings. Each window, for example, has been crafted as if by an artisan, and offers an elegant seating arrangement for guests to rest, to reflect on the artworks, and to simply enjoy the Gallery.

What has been your biggest challenge (either in concept, design or construction) in the National Gallery project?

Among the many challenges, perhaps the greatest was to find a way to unify these buildings in such a way as to give them a clear identity as one institution, while respecting their historical autonomy, and the attachment of Singaporeans to their existing monuments. To create what will appear as a light, even poetic and simple veil resting over the two buildings and creating one spectacular entrance was something of a design and engineering feat. It also required a real faith in our vision and our belief in the place of modesty and beauty in architecture over and above any abrupt or highly personal architectural statements. Another noteworthy challenge was to incorporate the technical complexity of a world class gallery (climate control, light control, security, fire safety, environmental requirements, …) in the fabric of the two monuments without destroying their character and integrity.

How did you address or adapt to this challenge?

Through sheer and relentless hard work with our partners: CPG, the client team and our dedicated consultants. With this challenge, as with others that are part of any project of this scale and importance, great tenacity and a real belief in the design is essential. The National Gallery Singapore will be a very large institution, comparable in size and ambition to some of Europe's foremost art galleries such as the Prado Museum or the Musée d'Orsay. Only the dedicated work of a sound team can address simultaneously the myriad of challenges raised by a project of such a magnitude. We overcame many of the design challenges with the support of our partner CPG, and the constant and loyal team of competent Singaporean architects who have now worked with studioMilou singapore for five years, mastering the craft of working on the conversion of these unique monuments.

What are some of the technical and design difficulties in this conversion which members of the public might not be aware of?

Again, the challenges are multiple, and in some respects, at this stage of the construction, the difficulties now reside in the details. These two colonial buildings, the Former Supreme Court and City Hall, were designed at the end of the thirties and for very different uses than presenting artworks! So, the technical demands (lighting, air conditioning, fire, security…) of a modern Gallery necessitate enormous complexity, notably if you try, as we have, to keep these more infrastructural aspects out of public view for the sake of maintaining existing structures and prioritising a certain spatial elegance. Another aspect the public may not be aware of is the fact that the two building, while sharing some resemblances, such as the façade finish, are in fact structurally completely different. By way of example:

- The City Hall is founded on shallow foundations, on surface a marine clay layer. As a consequence, there is one metre difference of level from one part of the City Hall to the other end of the building. This situation obliges the architect to design for complex adjustments to all floors of the building, so as to fit with the variation level of all the windows of the historical façade.
- On the other hand, the Supreme Court is founded on very deep piling anchored in the "bouldery clay bed" and is not subject to soil settlement at all, even if the surrounding terrain is settling significantly with time.

This difference of structures has been key in the development of the design of the basements of the new Gallery.

Please explain why it is a difficult conversion or not.

Aside from the issues of working to convert monuments of such historic and even sentimental value into a world class art institution, the complexity of the project is mainly related to the fact that over time, and gradually, most of the rooms, windows, and other elements, have shifted. The original geometry of the buildings has altered to a point where each architectural element has required specific attention. No two windows on the same level in the City Hall, for example, are the same. Time has altered their form and like other features, their restoration and conversion has required specific attention due to settlement, patina, the layering of previous interventions, etc.There is an archaeological dimension in the craft of reusing these types of historical monuments. Each specific element needs to be taken into account, an all-consuming process if we are to assure decisions are balanced and no harm is to be made to the monuments.

Was the National Gallery's collection taken into account when designing specific spaces?

All Galleries are containers of arts pieces, with various scales of exhibition spaces, connected with public spaces and efficient back of house for storage, delivery, and moving of exhibitions… The display of the collections in this spaces will evolve over time, as is perfectly normal for any major art institution in particular. The Gallery spaces should retain a certain neutrality, and be a flexible logistic and curatorial platform for both the permanent and many exhibitions to come. The National Gallery is designed like an architectural promenade made of spaces with different characters and scales. This diversity of spaces will be a constant surprise for the visitor and cater for forms of art, in ways that reflect the great diversity of this region's art.

What element are you most proud of?

The studioMilou team dedicated a great deal of time to the craft of detailing all elements of the design and ensuring they are carefully adjusted to the historical monuments. This attention to detail will be felt by the visitors in all the different spaces. An example of this approach is the adjustment of the new roof to the fabric of the existing buildings. Designed like a veil draped gently over the roof of each building, it has been perfectly adjusted to all the cornices and facets of the monuments, like a lace dress perfectly adjusted to the body of beautiful old lady. We are all touched by the different colours this veil will capture at different hours of the day, from a lightly golden silver veil during the day, to a rattan-like design by night, all occurring in a very sensitive lighting scheme developed in collaboration with the Japanese lighting designer LPA. And I would like to point out that we are a Singaporean company and proud to be so. All of our senior architects and managers for this project are Singaporean, as are our younger staff, and I am both touched that they have stuck with us for the past five years, and greatly impressed by their competence and creativity.

"More than any other feature, it is the simple line of the roof which defines the National Gallery Singapore.

Starting at the Supreme Court building, extending over the former alleyway between the buildings and running atop the length of City Hall, the flat glass, steel and aluminium structure not only links the two monuments as one institution, but it is also emblematic of studioMilou's minimalist approach to design...

Though the idea is simple, its execution is complex. More than 15,000 perforated aluminium panels will be used to construct the roof and veil, a sloping extension of the roof which runs down the museum's main entrance between the two buildings..."

- extracted from The Straits Times, *"Going for Gold"*, 9th August 2014

Un toit comme un voile filtrant la lumière

Construction of the roof, filtering the natural light

Composition de la façade du toit, comme une voile / *The roof surface composed like a veil*

Construction of the roof, filtering the natural light

Un voile filtrant la lumière naturelle

The task of filtering and softening the natural light was at the heart of the architectural design. The complicated veil of glass and steel placed above the two buildings filters the intense Singapore light, and it has been carefully positioned in order to respect the facades of the Supreme Court and City Hall. As a result of daily study and of the challenges thrown up by work on the site, behind the need to ensure the perfect design of this structure there also lay the challenge of its great technical complexity.

Controlling the way the natural light plays upon the architecture of the buildings was at the heart of the architectural design. A system of softening and filtering the natural light through the roof-top veil and the screens used on the windows allowed natural light to be used throughout the building, including in most of the exhibition spaces.

Le travail sur le filtrage de la lumière a été au cœur du travail architectural. Le voile complexe de verre et d'acier qui est posé sur les deux monuments invite et filtre la lumière intense du ciel de Singapour. Ce voile vient délicatement s'ajuster sur le jeu de niveaux des façades de la Supreme Court et du City Hall. Au contact du quotidien des études et du chantier, on comprend très vite que derrière cette exigence de parfait ajustement géométrique se cache un projet d'une très grande complexité technique.

Dans cette démarche, le jeu de la lumière naturelle sur l'architecture est au centre de la démarche du projet architectural. Tout un travail de contrôle et de filtrage fin de la lumière naturelle (voile de toiture et écrans des fenêtres) a permis d'inviter la lumière en tout lieu du bâtiment y compris dans la plupart des espaces d'exposition.

Jeu de lumière sur le dôme intérieur de la Supreme Court et sur les espaces du plateau supérieur de la toiture-terrasse
The smaller lantern dome sits in the heart of the interior roof deck of former Supreme Court, bathed in natural daylight

La progression du chantier sur le toit du City Hall, juin 2014 / *Site progress on the City Hall rooftop, June 2014*

Vue d'ensemble du chantier en juin 2014
Aerial view of the construction site in June 2014

Le grand arbre de l'atrium principal en attente de la pose de la toiture, juin 2014
The large tree truss of the main atrium pending installation of the roof structure, June 2014

La progression du chantier sur la toiture de la Supreme Court, juin 2014 / *Site progress on the former Supreme Court roof*

CONNECTION BETWEEN SUNSCREENS

- (A) Sunscreen-to-sunscreen connection on veil
- (B) Veil member support for sunscreens and fish beam connection to veil
- (C) Glass canopy support
- (D) Diagonal cable connection to spider clamp
- (E) Roof edge at the top of the veil and lighting interface
- (F) Veil edge detail
- (G) Veil corner detail
- (H) Veil member support for sunscreens
- (I) Tree structure end branch member connection
- (J) Fish-beam connection to existing facade
- (K) Vertical cable and glazing connection to floor
- (L) Sliding doors mechanism and lighting interface
- (M) Independent truss supporting vertical glazing
- (N) Fish beam connection to vertical glazing
- (O) Tree structure end member connection to veil
- (P) Apex of roof connecting sunscreen and glazing & lighting interface
- (Q) Siphonic drainage system below sunscreen
- (R) Sunscreen-to-sunscreen connection
- (S) Metal grating-to-metal grating connection
- (T) Metal grating-to-sunscreen connection
- (U) Glazing-to-glazing connection
- (V) Sunscreen-to-sunscreen ceiling connection
- (W) Acoustic panel-to-sunscreen ceiling connection

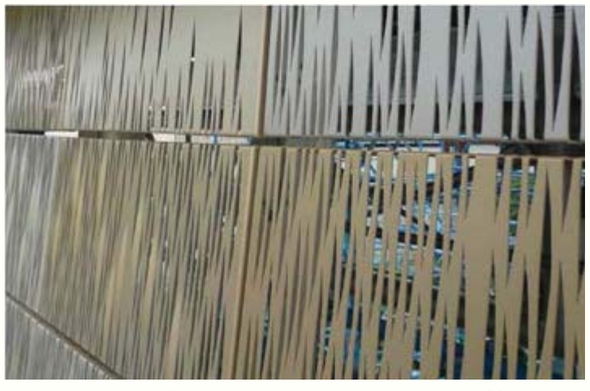
Détail du prototype du toit et du voile, 2011
Roof and veil visual mock-up, 2011

Perspective du voile de toiture sur l'atrium et de sa structure
Design intent for atrium veil and roof structure

Ramification de la structure, 2011
Tree structure end branch member connection, 2011

Détail de l'assemblage d'une branche avec la toiture, 2011
Tree structure interface, 2011

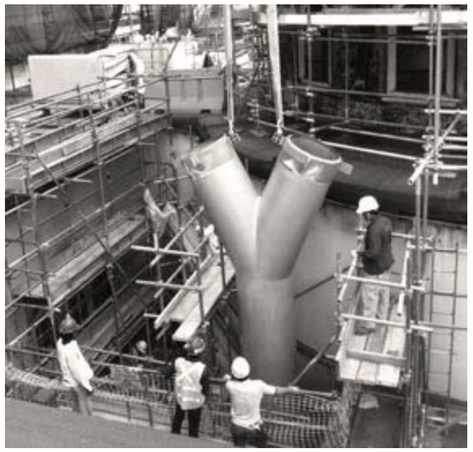
Différents jours de toiture, 2011
Grating to sunscreen interface, 2011



Variation des failles au niveau des écrans du voile de toiture, 2011
Sunscreens on veil, 2011

Les différentes couches composant la toiture / *The different layers of the roof*

La structure entre le verre et le plafond ajourée / *The structure in between the glass and sunscreen ceiling*



Installation d'une structure à ramifications, 2013
Installation of a tree structure, 2013

Prototype, 2012
Visual mock-up, 2012

L'architecte Jason Tan, 2014
Architectural associate Jason Tan on site, 2014

Différentes teintes des écrans, 2014
Different colours of the screens, 2014

Interview of the studioMilou **singapore** team

Jean François Milou, Jason Tan, Trung Nguyen and Janis Goh

How many panels make up the roof and veil?

There are a total of 15150 panels on the roof and veil.
Roof – 9650 aluminium panels and 450 glass panels
Veil – 1980 aluminium panels
Ceiling – 3500 aluminium panels

What are the panels made of?

The roof and veil comprise mainly perforated aluminium panels and fritted glass panels. The perforated aluminium panels of the veil not only give the impression of a light filigree structure marking the main entrance into the Gallery, it also creates a visual continuity from the main atrium to the Padang. The laminated fritted glass panels together with the perforated aluminium ceiling panels form part of the roof which filters the harsh sunlight to create a soft ambience within the interior spaces.

What is the size of each panel?

The size of a typical perforated aluminium panel is 1 x 0.5m which allows for easy removal and access if maintenance is required on the roof. The laminated glass was designed to its maximum size 2 x 2m to reduce the number of sub-frames on the roof.

What is the size of the surface area they cover?

13150 perforated aluminium panels and 450 glass panels covers a total area of 6600m^2 on the roof. The total surface of both veil and roof is 975 m^2 and it is made up 1980 perforated aluminium panels.

What is the colour range of the panels?

Gold was chosen as the main colour to complement the sombre exterior of the existing building façade. There are a total of three different shades of gold colour for the perforated aluminium panels, ranging from silverish-gold to saturated-gold. This creates a subtle texture and visual intrigue for both the new roof and the veil when viewed from afar.

Where are the panels made?

The laminated fritted glasses on the roof were fabricated in Germany and the perforated aluminium panels were made in Guangzhou, China. Both the glass and aluminium panels were assembled under the supervision of Beijing Jangho Curtain Wall Co. Ltd.

Why were these panels and this material chosen for the roof?

In the early stages of the competition, we worked with SECM (façade engineers from France) to develop a series of perforated panels for the roof and veil, which underwent rigorous tests to ensure their suitability for the Singapore climate. This was further developed with ARUP (façade engineers from Singapore) when we were awarded the tender. Aluminium was chosen due to its light-weight and rust-resistance. A further development of these perforated aluminium panels resulted in a series of three-dimensional aluminium panels. When these different aluminium panels are assembled together, the intended effect is for the veil and roof to resemble a handcrafted rattan tapestry.

What kind of effect do you hope the panels will have?

When these different aluminium panels are assembled together, the intended effect is for the veil and roof to look like a fabric covering the two buildings and unifying the new institution…

Have there been any challenges or surprises with the design, selection, or installation of the panels so far?

One of the many challenges of the project was dealing with the different interfaces where the new roof meets the existing building. A precise site survey of these interfaces was done and translated into a detailed 3D model. From there, we tried and resolved all the various details of the new roof with sensitivity and respect to the existing building. An example would be the modification of some of the façade panels to fit and avoid the existing façade cornices.

How many trees support the roof?

There are three big tree structures which support the roof and two small tree structures which support both veils.

What are the trees made of?

20-50mm thick steel plates are cut and rolled to form the tapering branches and trunks of the tree structures.

How tall are the trees?

The height of the tree structures ranges from 12 to 30 meters, with the tallest tree structure located in the main atrium.
Tree Structure 05: 30 meters
Tree Structure 06/07: 23 meters
Tree Structure 08/09: 12 meters

Who designed the trees?

We collaborated with Batiserf (civil & structural engineers from France) in the early stages of the competition to design the ideal geometry for each of the tree structures. After being awarded the commission for the Gallery, we worked with CPG Civil & Structural engineering team to further refine the connections and interfaces between the tree structures and the new roof.

Why were they selected to hold up the roof?

The National Gallery is essentially a conservation project consisting of two national monuments. Hence, we wanted to minimise the impact of any new structures within the existing buildings. The tree structure was the perfect solution as it was able to create maximum support for the new roof with minimal footprint within the empty spaces and courtyards of the existing building.

Vue d'ensemble de l'espace crée sur le toit de la Supreme Court / *Overall view of the space created on the roof of the former Supreme Court*

Travaux de Conservation sur les monuments

Conservation work on Supreme Court and City Hall

The conservation work has rigorously balanced the objectives of maintaining the buildings' original structures to the greatest degree, while accommodating the new functions of the Singapore National Gallery. Consisting of thousands of decisions, small and large, the conservation work has been carried out with the greatest care at all stages of the project realization, as has the restoration work carried out by the Japanese company Takenaka under the supervision of studioMilou's Singapore partner, CPG.

The need to ensure that the buildings met the stringent new construction regulations could have posed a threat to character and authenticity of these historic buildings when converting them into a contemporary Gallery; these regulations – acoustic and energy performance, fire safety, anti-terrorism and museum-standard conservation norms – each required interventions into the existing buildings.

studioMilou worked in close collaboration with CPG and the client in order for the new Gallery to fully meet the relevant energy, acoustic and security regulations while at the same time retaining its historic character. As is the case in all major projects of this sort carried out in historic areas, there was a careful balance to be struck between conservation and adaptation needs, with decisions requiring thousands of hours of meticulous design work.

Le travail de conservation consiste à équilibrer les objectifs de restitution du bâtiment au plus près de la structure existante tout en aménageant les nouveaux espaces nécessaires aux opérations de la National Gallery of Singapore. Dans ce contexte, le détail de la construction se compose de mille petites interventions mises en œuvre avec attention et soin. Ces travaux de restauration sont réalisés avec attention et exigence par l'entreprise japonaise Takenaka Singapore Piling sous la supervision du partenaire local de studioMilou Singapore, CPG, et du consultant en charge de la conservation Garth Sheldon.

Dans le travail de reconversion de monuments en musée moderne, l'intégration des nouvelles normes de construction dans le projet (performances acoustique et énergétique, sécurité incendie, de sûreté, de conservation muséale, etc…) présente le risque de dénaturer progressivement le caractère et l'authenticité d'un bâtiment ancien. Le studioMilou a travaillé sur l'intégration de toutes ces contraintes pour conférer au nouveau musée toutes les performances attendues en matière énergétique, acoustique, sécuritaire, muséale et en même temps conserver son caractère historique. Comme dans tous les grands projets de ce type en milieu historique, la négociation des compromis entre la logique de conservation et cette logique de modernisation a demandé à l'architecte des milliers d'heures de travail de conception.

Element de façade prefabriqué, atelier Nolli, Singapour, 1926
Prefabricated Ionic column captial of the former Supreme Court. atelier Nolli, Singapore, 1926

A gallery within the historic buildings: conservation

Un musée dans deux monuments

The competition jury commended the project design for its offering a radically new experience of these monuments while having a minimal impact on the buildings' structures, and all efforts have been made by studioMilou to conceptualize and design spaces giving visitors the impression that the buildings' structures have remained largely intact.

The conservation work depended on the thorough study of documentary record and of the history and construction of the buildings, these being the only way to develop a sound conservation strategy respectful of the monuments' nature and historical significance.

As has been the case for other studioMilou projects, finding answers to the innumerable daily challenges raised by the conservation work necessitated a constant presence on the site, and was one of the key motivations in opening studioMilou's branch in Singapore. The permanent availability of its architects from the design to the construction phase has been key in ensuring the highest standards of architectural work and notably, minute attention to all conservation aspects.

Tout est fait dans le projet pour que le visiteur ait l'impression que les deux bâtiments n'ont effectivement pas changé, et qu'ils sont restitués tels qu'ils ont toujours été. Le jury du concours a apprécié cette solution élégante consistant à changer radicalement l'expérience du visiteur sans changer les deux monuments eux-mêmes.

Le travail de conservation architecturale s'appuie sur un travail documentaire et sur un travail d'analyse de l'histoire et de la construction des deux monuments. Ce travail seul permet de dégager une stratégie technique de conservation respectueuse de la nature et de l'importance des deux monuments.

Comme pour d'autres projets de studioMilou, la résolution au quotidien d'innombrables défis relevés par les monuments existants demande à l'agence une présence constante sur le chantier et représentait une des motivations majeures de l'ouverture d'une branche de l'agence de Paris à Singapour. La disponibilité permanente des architectes, de l'esquisse à la construction, forme l'atout principal qui permet d'assurer la qualité architecturale et d'atteindre un haut niveau d'exigence, notamment dans les divers aspects de la conservation des bâtiments.

Nettoyage du béton granitique de la façade à l'eau, 2012
Jet-cleaning of the Shanghai plaster with water, 2012

Climatic conditions in Southeast Asia have meant that the Shanghai-plaster facades built in the region have often been better preserved than those built at the same time in Europe, and for this reason the restoration of these facades has been relatively straightforward, and consisted of:

- *the restoration of superficial damage using cement and granite aggregate in-fill after tests were carried out to ensure a perfect match in terms of colour and texture;*
- *the cleaning of the facades by water jet, a gentle technique preserving the original patina of the facades.*

On notera que les conditions climatiques en Asie du Sud-Est ont permis que les façades en « Shanghai Plaster » soient finalement mieux conservées qu'elles ne le sont en Europe aujourd'hui. Pour cette raison, la restauration de ces façades en bétons architectoniques a été assez simple et a consisté simplement en :

- la restauration des désordres superficiels par reprises au ciment à agrégats granitiques après une série de nombreux essais et prototypes (couleur, granulométrie, ...).
- le lavage de la pierre au jet d'eau qui est une technique non agressive préservant le support.

Détail de l'ornement de façade de la Supreme Court après nettoyage
Assessment of the Shanghai plaster finish of the former Supreme Court façade after jet-cleaning

Restoration of the facades

The facades of the former City Hall and Supreme Court buildings were built in the 1930s using prefabricated concrete sections and pale-grey granite cement facing clad onto a reinforced concrete and steel frame. This way of constructing the facades, in Asia called 'Shanghai plaster', was also used in the reinforced concrete public buildings built in Europe in the 1920s and 1930s. In the case of the Supreme Court, concrete sculptural elements were also produced by the sculptor Nolli. The restoration of these sculptures, part of the facades of the Supreme Court, is one of the major restoration tasks of the project.

Restauration des façades

Les façades du City Hall et de la Supreme Court ont été réalisées dans les années 30 en posant sur une ossature en béton armé et en acier des éléments préfabriqués en béton architectonique avec un parement en ciment granitique gris pâle. Cette technique de parement de façade, connue en Asie sous le nom de « Shanghai Plaster », a été utilisée dans l'architecture publique en béton armé des années 20 et 30 en Europe. Pour la Supreme Court, de larges éléments sculptés en béton ont été réalisés par le sculpteur Nolli. La restauration de ces sculptures monumentales intégrées aux façades est une partie importante du travail de restauration des façades de la Supreme Court.

Inspection du travail de conservation sur le fronton de la Supreme Court / *Inspection of the conservation works on the pediment of the former Supreme Court*

Interview of the studioMilou **singapore** team

Jean François Milou, Charmaine Boh and Wenmin Ho

Why did studioMilou decide to retain the patina and signs of wear on the façade?

The conservation works on the façade and on all the historical elements of the monuments did not aim to give the impression that the building is renovated and looks like a perfect new building. The building is cleaned, stabilized, protected, but some signs of natural erosion or patina of some elements are kept as part of the current reality of the monuments.

How many friezes are on the façade of the Supreme Court?

There are three friezes on the front and two at the sides above the porch drop off of the Supreme Court. The tympanum sculpture with the figure of Justice and sculptural manifestations of supplication, thankfulness, deceit, violence, prosperity and abundance can also be found on front façade. The frieze panels with intricate sculptural motif reliefs are mainly located in the former Supreme Court. The pediment with allegorical sculptures, which characterised the Supreme Court, and the panel with figurines and the sculptural relief panels around the elevated front porch, are likely the most familiar to general public. Also, there are three exterior façade panels where, specifically in the shade below the tympanum of the former Supreme Court, the Singapore crests had been mounted onto the centre front façade. These frieze panels were encased in plain face plaster finishes at the time when the building was taken over for construction. The team had uncovered damaged remnants beneath the loose plaster finishes which were carefully removed. The project team concurred not to create a replica without proper archival reference thereby retaining these exposed remnants of the façade.

How many on City Hall?

City Hall does not have any friezes on the façade.

How big are the friezes on each building?

The three Former Supreme Court front frieze panels measure 4.65x0.92m each and the two side frieze panels measures 3.5x0.9m each. The tympanum is triangular with a base of 19.22m and height of 2.37m.

What are the friezes made of?

The frieze and tympanum are in concrete with a coating of plaster. With the passage of time, the coating of plaster has been erased by weathering, hence exposing the aggregate underneath.

Who was the American conservation specialist who came to Singapore to help with the façade's conservation?

Following the requirements and recommendation expressed by the Preservation of Sites and Monuments, the conservation consultant for the project, Mr. Garth Sheldon, managing director of Architectural Restoration Consultant (ARC), and Ms Sandy Liew, Senior Architectural Associate of CPG worked closely with the studioMilou singapore project team, from the early stage documenting the conditions of the two existing monuments and specifying the conservation method statement for each historical element of the preserved monument. During the construction, the contractor worked to ensure that the restoration methods are suitable for the sensitive building finishes. Mr. Gustavo Vazquez, an artisan specialist based in the United States, personally carried out the restoration works of the sculptural motif reliefs found on the former Supreme Court building.

What was the façade cleaned with?

The façade was cleaned using a jet cleaning technique with a rotating nozzle, without applying chemical and using only a blasting agent with water and air. Surface staining and contaminants were removed from the exterior Shanghai plaster surface by this method. A consolidant and water repellent was subsequently applied post cleaning. Specialist artisans, like Mr. Gustavo Vazquez, were on site for a few months for the delicate restoration works to the tympanum and friezes.

How many Corinthian columns are along the façade?

There are six Corinthian columns (14.52m high) on the lower front façade and 16 (also 14.52m high) beneath the dome at the Former Supreme Court. There are 22 Corinthian columns (12.65m high) on the City Hall façade.

How many Ionic columns?

There are 12 Ionic columns (9.15m high) on the front façade of Supreme Court.

Why was it important for any conservation or renovation to be done to the Supreme Court dome?

The existing copper sheet cladding of the dome was partially exposed by careful removal of the fixing to investigate the condition of the timber backing. The copper sheets would be inspected for holes and tears, and then patched if required. An accelerated patination agent was then applied.

Restauration des couvertures des dômes de la Supreme Court, 2012
Restoration of the copper roof of the former Supreme Court dome, 2012

Restauration des toitures et coupoles

L'utilisation du cuivre pour les éléments architecturaux majeurs du monument est un trait caractéristique de l'architecture publique et coloniale anglaise. Le travail de restauration de la couverture en cuivre de la coupole a été fait dans le respect de la tradition de la construction traditionnelle sur ossature bois en utilisant des plaques de cuivre repatinées pour se fondre dans les tons vert de gris de la couverture existante.

Restoration of the roofs and domes

The significant use of copper in the buildings was a feature of British public and colonial architecture of the time. The restoration work on the copper covering of the dome was carried out with full respect given to the tradition of wooden framework construction and using copper sections that had been repatinated in order to blend in with the green-grey colour of the existing covering.

Détail de la restauration des dômes de la Supreme Court, 2012 / *Detail of the restoration of the former Supreme Court dome*

Différentes vues des dômes de la Supreme Court / *Different views of the former Supreme Court dome*

Le plafond et les lambris d'une cour de justice existante / *The timber ceiling and paneling of an existing justice court*

Restauration des lambris dans la Supreme Court
Restoration of the timber paneling in the Supreme Court

Restoration of the interior finishing and furniture

The restoration of the interior finishing and furniture made full use of the skills and savoir-faire of the Takenaka company and of the local carpenters, locksmiths and other artisans working in Singapore. The interior polished-concrete facing, including that of the columns and on the main floors, was washed using techniques to preserve its patinated finish.

Restauration des parements intérieurs et du mobilier

La restauration des finitions intérieures et du mobilier a fait appel à l'ensemble des savoir-faire de l'entreprise Takanaka Singapore Piling et des artisans locaux de Singapour (menuisiers, serruriers, etc…). Les parements intérieurs en béton poli (colonnes, parements des étages nobles, …) ont été lavés avec des techniques soigneuses restituant aux parements historiques une finition douce et patinée.

Détail des éléments à conserver et à restaurer dans la Supreme Court / *Detail of the elements to be retained and restored in the Supreme Court*

Vue de la salle des pas-perdus dans l'ancienne Supreme Court / *View of the main lobby of the former Supreme Court*

Interview of studioMilou **singapore** team

Jean François Milou, Wenmin Ho and Charmaine Boh

How many rooms are there in the museum?

It is indeed a very large Gallery, as an example, the third floor of the Supreme Court which is the historical level has about 20 different spaces with different sizes and varying significance. On the same third floor of the City Hall building, there are around 10 spaces of various scale, which can welcome exhibitions and programmes of the Gallery. There will be eight public floors in this Gallery, so one can imagine the number of different rooms and spaces that such an institution can accommodate. Additionally, it is the very nature of such a Gallery that the rooms are interconnected and linked, so one can flow from one space to another as you freely wander along an architectural promenade. In addition to the exhibition and art-orientated spaces in the Gallery, many other spaces such as auditorium, event spaces, gardens, restaurants, cafes, retail, artwork support areas, offices, etc. are also open to the public.

How many of these rooms will retain their original wood furniture and wood panelling?

The existing timber finishes are conserved in all courtrooms, in the Chief Justice's chamber and office and in the historical lobby of the former Supreme Court. The City Hall Chamber will also feature existing timber finishes. In detail, all timber ceilings are conserved in the courtrooms and historical lobby in the former Supreme Court. Timber wall finishes and fixed cabinetry works are conserved in the Courtrooms, Chief Justice's chamber and office and City Hall Chamber. Existing floor finishes are retained in courtrooms 1 and 4 and City Hall Chamber. The existing freestanding timber furniture is retained in courtroom 1, rotunda library and Chief Justice's office. The intricate timber cabinetry fitment and ceiling finishes are one of the most prominent features in the four existing courtrooms of the former Supreme Court building that are retained. The timber ceilings of the courtrooms are composed of octagonal shapes and squares. In total, there are about 120 octagonal ceiling panels in each of the courtrooms. Each octagonal ceiling panel is made up of several timber elements that are joined together with elaborate and detailed connections, as discovered during restoration works. These timber works are largely retained to avoid extensive dismantling works, which may cause damage to the intricate timber finishes. The timber finishes are sanded new varnish is applied. Replacements were carried out only for localised areas for missing or damaged parts.

Can you provide some examples of the wood furniture and detailing which will be retained in these rooms?

Unless absolutely necessary, the existing timber finishes are restored in situ and dismantling works kept minimal to avoid damage to joinery. The existing varnish is first removed with sanding, existing conditions of repair works determined, repaired and re-varnished. For example, the octagonal ceiling panels, existing cabinetry and timber wall finishes undergo this process. The main contractor, Takenaka Corporation Singapore Piling, together with their subcontractor Foo Wood work on this together with the consultants and the Gallery to achieve the conservation requirements. The existing loose furniture is restored by Cheng Carpenters.

What types of wood are found in the Supreme Court and City Hall?

The existing timber species in the former Supreme Court and City Hall buildings is mainly teak.

Why is it important to keep these wood pieces?

The existing timber ceiling, wall panels, furniture and cabinetry are important historical features of the Monuments. As much as possible, existing materials and features are retained and restored such that these spaces retain their unique architectural character. These spaces are re-purposed without altering their architectural character, and conserved so that they can also be experienced by the public, when the National Gallery opens in 2015.

What is the purpose of their conservation, of conserving the City Hall Chamber, for example?

The City Hall Chamber is a significant place for Singapore as important historical events took place in it. It is a container of memories, which needs to be conserved and respected. The City Hall Chamber is also architecturally rich, with original finishes intact. The marble-clad columns with bronze capitals and bases, timber wall finishes, light fittings, brass railings, cornices and decorative ceiling are all carefully restored and repaired.

What instruments, machines, or technologies were put into the ceiling?

The existing ceiling had to take on requirements with its new use, as well as compliance to current building codes. New services such as gallery lighting, fire protection (sprinklers, smoke detectors) emergency lighting, etc. had to be integrated carefully so as to not dramatically affect the existing geometric patterns of the timber ceiling. They had to be as invisible as possible and unless absolutely necessary, fixtures will be concealed or mounted on less precious surfaces.

Did you experience any challenges or surprises during this process?

For example, as the timber ceiling's structure was only revealed during the site investigation by the Contractor, the location of fixtures had to be reconfigured, to avoid structural fixing points while maintaining a quiet presence without upsetting its geometric patterns.

How many wooden window frames are in the Supreme Court?

The external façade windows of both the monuments will be largely retained. The external windows of the former Supreme Court are in timber, while the external windows of City Hall are in steel casement. The restoration works were carried out by the main builder Takenaka Corporation Singapore Piling. Upon studying the existing window conditions, the main builder decided to send the approximately 160 steel casement windows to a Japanese workshop for restoration to be carried out by the local specialist. The repair works include replacement of window parts with localised cutting and welding. These delicate repair works were carried out by skilled craftsmen, in Japan. The approximately 180 timber windows frames of the former Supreme Court are largely retained intact except for localised portions, which are damaged. All the existing windows are restored to retain their operable functions. There are also installations to provide weather-seal functions to the windows. The windows will remain closed in the new Gallery, except for utility functions such as maintenance or access openings for fire-fighting.

What function do the windows serve now?

The windows form an ensemble with façade lighting and blinds to control the amount of daylight into galleries, and also become natural alcoves to create integrated gallery sitting areas.

Please describe the size of each window-seating area.

Window seating areas vary in sizes from 2-3.5m in length, 0.5-1.0m in depth.

What purpose do they serve?

The structural reinforcement and running of all services in both buildings have obliged studioMilou to provide for thickening the existing walls of the historical buildings, in order to provide the performance required for such a Gallery (climate control, loading capacity, etc). As a result, each window reveal became a space, a kind of bay window where the visitor can sit, reflect and have a look at the surrounding cityscape. The treatment of this window reveal is very carefully designed to incorporate the many services needed to control the light, the temperature, the security, the fire safety required for the operation of the Gallery. The many window reveals proposed along the visitor route will provide the visitor with many sitting areas as places for meditation and reflection as part of the experience of the visit.

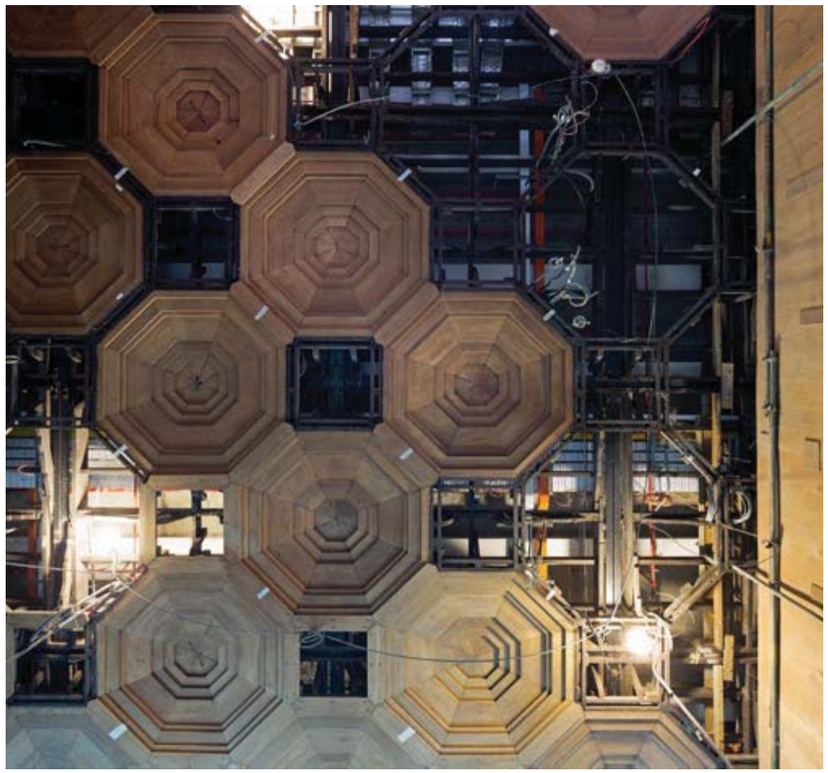
How many will there be in the entire museum?

Just on the second storey of the City Hall building alone, there are about 40 window reveals of varying sizes. In the entire Gallery, there will be more than 200.

Travail de restauration du plafond dans l'ancienne Supreme Court
Restoration works on the ceiling in the former Supreme Court

The decorative timber ceilings of the court rooms require detailed survey for purposes of repair and reinstatement. Services such as lighting, air-conditioning, fire protection etc, for the gallery are also being coordinated to allow fixings or fittings to be respectfully installed.

Éclairage dans les plafonds historiques / *Lighting fixtures integrated within the historical ceilings*



Passage de réseaux derrière le plafond d'une cour de justice
New technical services within the ceiling of the justice courts

Vue d'une salle d'exposition dans une cours de justice */ View of an exhibition space in a justice court*

The City Hall was built at the end of the 1920s, using a concrete-frame with facades made of a mix of prefabricated concrete sections and masonry produced on site. With only shallow foundations supporting the building above the marine clay, any movement in the ground has implications for the building itself, notably as a result of compaction. Around one metre of differential compaction can be observed between one area of the City Hall and another, for example. As a result, the conversion of the City Hall necessitated the creation of a new set of foundations able to support the additional load expected from the building's new function.

The Supreme Court was built some years later in 1937. Unlike the City Hall, the building uses a mixed reinforced concrete and metal frame, and its facades are entirely made of prefabricated concrete cladding. It is supported by deep foundations going down to the bouldery clay bed 20 metres below ground level. As a result, the Supreme Court is a more stable building with rigid foundations, and is unaffected by peripheral compaction. As such its foundations require little reinforcement work.

Le City Hall a été réalisé à la fin des années 20. C'est un bâtiment dont la structure est en béton armé avec une façade mixte en maçonnerie et béton architectonique préfabriqué réalisée in situ. L'immeuble est fondé sur un sol de faible portance constitué d'argiles marines sur un mètre de profondeur. Les fondations étant légères, tous les mouvements du sol (affaissements) se sont répercutés dans le bâtiment . À titre d'exemple, on observe environ un mètre de tassement différentiel entre un point du City Hall et un autre. La reconversion du City Hall en musée nécessite la création d'un nouveau système de fondation capable de porter les surcharges attendues pour l'exploitation d'un musée moderne.

La Supreme Court a été réalisée quelques années plus tard en 1937. Il s'agit dans ce cas d'un bâtiment à structure mixte en béton armé et ossature métal avec un jeu de façades entièrement faites d'éléments en béton architectonique préfabriqués et fixés à la structure. Il est posé sur un jeu de fondations profondes ancrées dans le «bouldery Clay Bed» à 20 mètres de profondeur. C'est donc un bâtiment stable, qui reste raide sur ses appuis et qui semble plutôt émerger du sol au fur et mesure que les tassements périphériques s'accusent. Il nécessite quant à lui peu de travaux de renforcement structurel au niveau des fondations.

Création d'une galerie publique en sous-sol

Creation of a public concourse in the basement

An underground gallery linking the two buildings

Une galerie souterraine reliant les deux bâtiments

To further preserve the architecture of the two buildings, a public-circulation system was built beneath them in the shape of a large underground concourse. This has left the ground-floor level and public spaces free of ticketing, reception and circulation areas, freeing them for the gallery's core activities. This basement structure, hosting a public reception area as well as technical facilities, drew inspiration from those used in many major historic buildings adapted to house distinguished art institutions worldwide, among them the National Gallery in Washington, the Musée du Louvre in Paris, and the Prado in Madrid.

The National Gallery Singapore's spectacular underground concourse extends longitudinally across the entire site and is, like the roof structure, one of the design's signature elements. The concourse can be accessed by four monumental flights of stairs, each leading from one of the gallery's facades, allowing access from every side of the institution. In this way, the design also facilitates any future changes or new access needs and creates a closer relationship with the immediate surrounds.

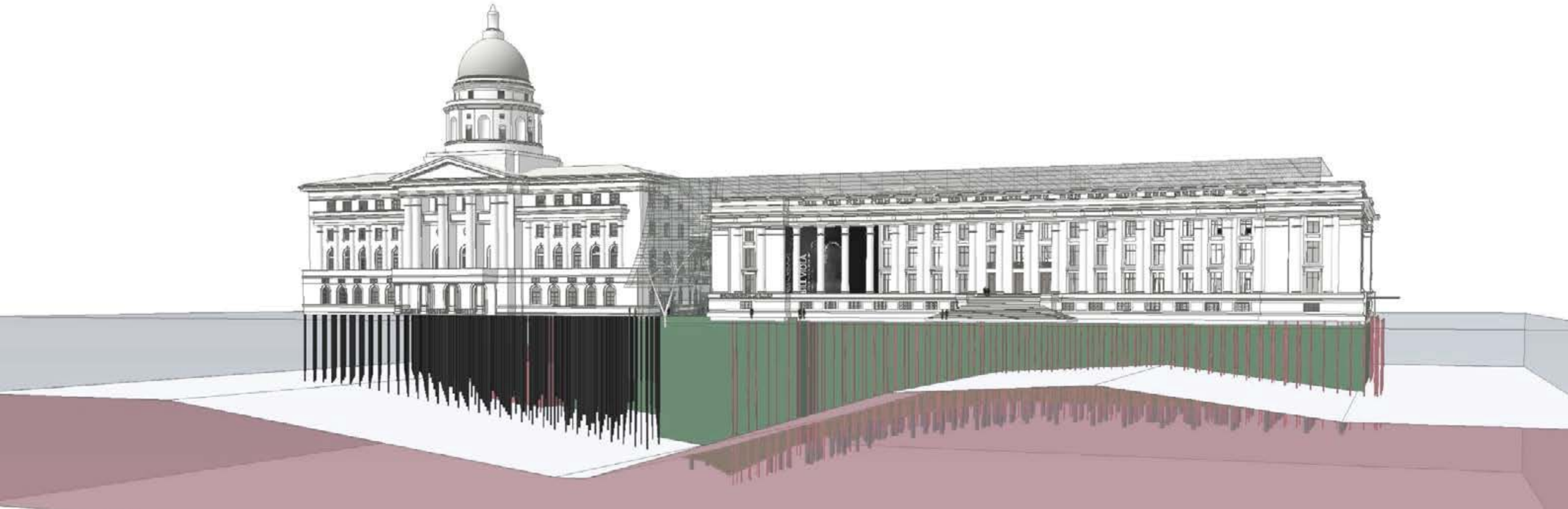
Behind the apparently simple basement design, and indeed the design as a whole, lies a far more complex technical reality, which presented tremendous challenges relating to the foundations of each monument. While both were built at almost the same time and form a homogeneous ensemble in architectural terms, structurally they differ greatly.

Le parti pris architectural du projet de concours était de laisser quasiment intacte l'architecture des deux monuments et de chercher à étendre les surfaces soit sur les toits des deux monuments soit en sous-sol sous les deux monuments. Pour répondre à cette contrainte, studioMilou développe un système de desserte du public par un grand passage en sous-sol qui libère les rez-de-chaussée de plain-pied avec l'espace public de toute servitude technique et de desserte et les restitue aux activités et aux programmes du musée. Cette solution, qui consiste à accueillir en sous-sol les publics et les espaces techniques, a été retenue pour de nombreux projets de musées dans des monuments historiques majeurs (National Gallery of Washington, Musée du Louvre, Musée du Prado, …).

À Singapour, la spectaculaire rue souterraine proposée par le projet parcourra tout le site dans le sens longitudinal et sera un des éléments forts du projet. Elle sera reliée par quatre grands escaliers monumentaux ouvrant sur les quatre façades périphériques du projet et permettant l'accès de toutes parts. Cette disposition permettra dans le futur toutes les évolutions d'ouverture du musée vers la ville.

Derrière cette très grande simplicité de parti pris architectural se cache une réalité technique plus complexe. En effet, les deux monuments réalisés presque au même moment et qui forment un ensemble homogène sur le plan architectural sont en réalité des bâtiments dont les structures sont complètement différentes.

Une galerie publique en sous-sol permet l'accès aux expositions dans les deux monuments
The public concourse in the basement, leading the public towards the exhibitions in the two monuments



Vue du complexe système de fondation, d'origine et moderne, qui soutient la nouvelle National Gallery
View of the complex system of old and new foundations supporting the new National Gallery

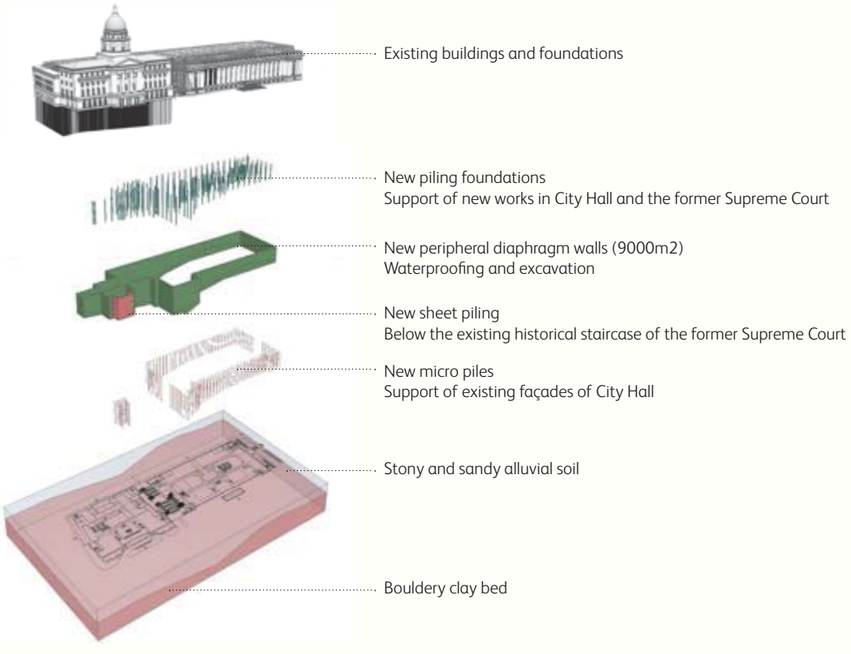
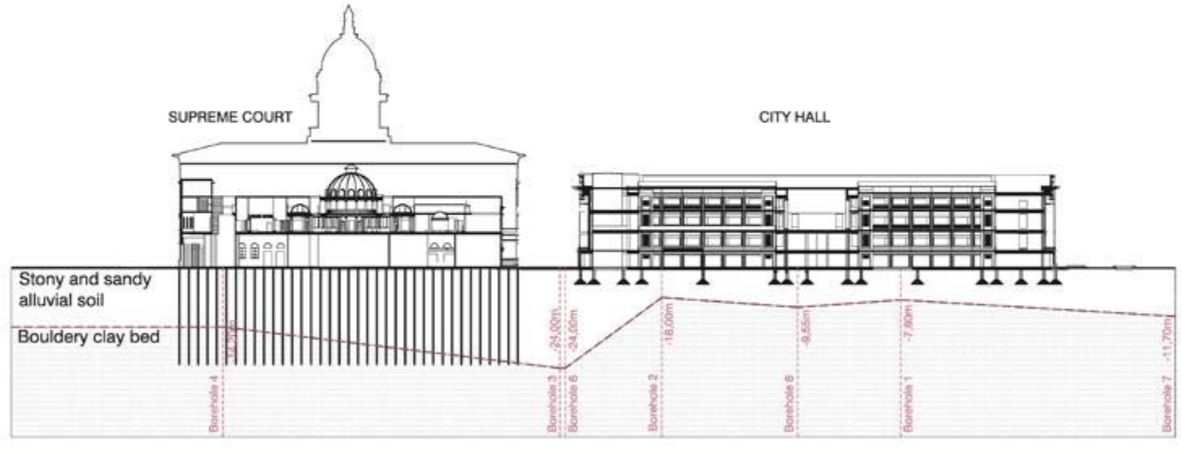


Schéma des différents éléments structurels formant le nouveau sous-sol / *Schematic diagram showing the new underground infrastructural works*



Vue des fondations d'origine du City Hall et l'ancienne Supreme Court
Schematic diagram showing the different foundation systems of City Hall and the former Supreme Court

Le travail de réalisation de pieux avec des équipements de taille réduite dans les bâtiments existants
Bore piling machine suitable for low headroom used in the former Supreme Court

Aside from the underground concourse, the other basement-level areas such as the technical areas, collection treatment spaces, and underground parking, could only be built once major infrastructural works to stabilize the foundations had been carried out. These included:

- *Reinforcement of the facades of the former City Hall by a system of micro-piles designed to ensure that the walls had the load-bearing capacity required for the Gallery, and to reinforce the building's stability;*
- *Construction of an underground waterproofed area faced with prefabricated sections to ensure that the underground parts of the project would be sealed off from water.*

This work, and the excavation work that followed it, was carried out by the company Takenaka under challenging circumstances linked to the constraints of working on an existing site.

Le chantier doit, avant de réaliser les ouvrages enterrés projetés (locaux techniques, rues intérieures souterraines, locaux de traitement des collections, garages souterrains,...), mettre en œuvre les travaux d'infrastructure suivants :

- Réaliser les ouvrages de renforcement des façades nécessaires pour la stabilité du City Hall grâce à tout un jeu de micro-pieux pour assurer la portance des murs requise par la nouvelle institution.
- Réaliser l'enceinte des parois moulées étanches capables d'assurer la mise hors d'eau des ouvrages enterrés.

L'ensemble de ces travaux, ainsi que les travaux d'excavation qui s'ensuivent, ont été réalisés sous la direction de l'entreprise japonaise Takenaka, dans des conditions de chantier particulièrement complexes liées aux contraintes d'opération sur site existant.

Excavation dans la Supreme Court, Février 2013
Excavation works in the Supreme Court, February 2013

Enchevêtrement des structures temporaires,
dans la réalisation des sous-sols
Complex extrication of temporary structure
in the basement works of the gallery

Structures métalliques temporaires pour étayer les façades du City Hall
Temporary metal structures to brace the existing facade of City Hall

Structures temporaires métalliques et réalisation des structures définitives en béton armée dans l'atrium d'entrée
Temporary structure and realisation of the new structures in reinforced concrete in the entrance atrium

Mise en place des nouvelles structures porteuses des planchers du City Hall / *New supporting structures in City Hall*

Interview of the studioMilou **singapore** team

Jean François Milou, Charmaine Boh, May Leong and Wenmin Ho

Why did a basement need to be installed?

The decision to preserve the architecture of the two buildings led to the creation of an underground public concourse, serving from below both of the two monuments. The National Gallery's spectacular underground concourse extends longitudinally across the entire site and is one of the signature elements of the design. The gallery can be accessed by four monumental flights of stairs leading down from the four sides of the building and allowing it to be reached from every side on the site. This design means that any future changes in the museum's relation to the surrounding city can be easily accommodated. The basement areas of the project include the underground gallery, the technical areas and collection treatment areas for handling of artwork delivery, and two levels of parking spaces.

How many levels is the basement for?

Under City Hall, the basement comprises three levels, along with a mezzanine level at basement 1 level. Under the former Supreme Court, the basement is limited to one level.

Does the basement sit under both the Supreme Court and City Hall?

The basement footprint resides largely under the City Hall building, with a small portion under the Supreme Court.

How many square feet is the basement?

Approximately 8500sqm for the basement 1 level
Approximately 1600sqm for Basement Mezzanine level
Approximately 5500sqm each for Basement 2 and 3 levels

When did construction of the basement start?

Works for basement commenced in mid 2011.

Please describe the difficulties of constructing the basement?

The main challenge in the basement construction is the protection of conservation building elements such as the external façade and the historic spaces within the buildings. Tolerances to movements become very tight. The sequence of works is also critical to the overall stability of the building structures hence, very careful planning is required to stiffen, brace and strengthen the existing building parts before any basement construction commenced.

How did the type of soil affect the buildings above it?

Due to the presence of soft marine clay found under most of FSC, we had adopted a shallower basement. Contrary to City Hall, where stiffer soil are encountered, a deeper basement can be accommodated without too much risk on excessive soil movement when digging down below. This was how the type of soil affected the number of basement floors under the buildings.

How did the soil affect the construction of the basement?

One of the main challenges of the project was to reinforce the shallow foundation of City Hall and to give at the same time the loading capacity which enables the City Hall floors to support the operation of the Gallery's programmes and exhibitions. All the foundation of City Hall has been reinforced by micro-piling to the boulder clay bed. At the same time, all the floors of City Hall were demolished and replaced by new floors in order to carry the requirements of the Gallery's operation. The demolition of the floors of City Hall has created the ideal conditions to build the basement levels within the footprint of the City Hall. This basement is created within the perimeters of the diaphragm wall precinct, which has been realised after the micro-piling work and before excavation. Under the former Supreme Court, and due to the presence of the existing piling, no extensive basement works were possible. The basement here is limited to one basement level only, and confined to a limited area. The sequencing of these works: micro-piling, demolition of existing slabs, creation of a diaphragm wall, strengthening of existing façade, transfer of foundation of the City Hall Chamber, excavation, creation of new slabs, etc. has been a very complex sequence of operations, which has been proposed by the French engineering company Batiserf, and developed by the structural sector of our partner CPG. The constraints of the soil have obviously been for the contractor Takenaka Corporation Singapore Piling one of the most difficult challenges of the project.

How were you able to get machines into the building to dig out the basement?

The contractor needed to enlarge existing wall openings so that their construction machineries could enter the building. Even then, the enlargement of the wall openings were controlled very strictly to respect conservation guidelines so much so that the contractor had to strip down the machines into smaller components before they can fit through the tight openings. To dig out the basement, a strong and sturdy vehicle deck has to be constructed first to support all the lorries and excavators that need to move within the building. Hence, a top-down construction approach was adopted; whereby the ground floor structures were constructed first before any digging started. These ground floor structures also serve as the vehicle deck from where all the heavy lorries and trucks move around. Openings were left on the ground floor and these are used by the excavators to start the digging of the basement.

How did you bolster the buildings so that you could dig below them?

The buildings must firstly be supported vertically. Hence, the foundation has to be installed first. That was where underpinning was installed to the existing foundation to support the buildings above, but even this was not sufficient. Secondly, the buildings must also be supported laterally; in other words, we must prevent the building from tilting. To provide the lateral supports to support the facade, horizontal struts were needed to be installed tying all the wall facades together, thus stiffening them. The sequencing of all these works: micro-piling, demolition of existing slabs, creation of diaphragm wall, strengthening of existing façade, transfer of foundation of the City Hall Chamber, excavation, creation of new slabs, etc. has been a very complex sequence of operations. At all stages, temporary strutting was in place to maintain the façades and the historically significant elements of City Hall in place. Progressively, new structures/foundations were created to support the load of the new floors and the efforts of the operations of the new gallery.

Were there any concerns about the stability of the buildings?

All precautions were taken to prevent the settlement of the works. Stability of the buildings is the primary concern of all the architects and engineers working on the project. With all the various stiffeners and supports provided, movement should be minimal. Nevertheless, the buildings were closely monitored with many instruments to check for movements. Sufficient measures have been taken to maintain the stability of the buildings. The very complex sequencing of work, and sometimes the slow progress of the basement work is a consequence of the constant attention given to the safety of the monument.

If so, please describe what your fears or concerns were and what did you do to mitigate or address them?

The more stable the building, the less it moves. Hence, movement is the main item to monitor closely. As mentioned above, sufficient measures have been taken in that weak foundations have been underpinned and building facades have been shored appropriately to maintain the building's stability throughout construction.

How did you suspend the City Hall Chamber and why was this necessary?

In order to create the basement concourse, the design obliged us to transfer the column supporting the City Hall Chamber away from the existing foundations. A new system of foundation was created, a very dense network of beams were installed under the floor of the City Hall Chamber to transfer the weight of the structure of the chamber to the new system of foundation. Only after the new support beams were connected to the new system of foundations, the contractor dismantled the original system of piles and foundations to free the way for the new public concourse. The City Hall Chamber needs to be preserved intact. The creation of the new public concourse in the basement obliged studioMilou to relocate the foundation of shallow footings of the City Hall Chamber. With the new basement under the City Hall Chamber, these existing shallow footings could not function anymore and a new system of pile foundation structures had to be installed to transfer the weight and the supporting structure of the City Hall Chamber to the new system of foundation that allowed the basement to work functionally at the same time.

What floor is the City Hall Chamber on?

The City Hall Chamber resides on the third floor of the City Hall building; it had been centrally located between the two courtyard spaces that give its overall character to the City Hall building.

What is the size of the chamber in surface area and height?

The City Hall Chamber is approximately 400 sqm and 9m in height.

Was it suspended intact, with all furniture inside?

The City Hall Chamber is considered, architecturally and historically one of the most significant spaces within City Hall. It had to be kept intact and restored to its original condition. As such, the decision was made with the architect and the contractor not to remove any of the existing interior architectural fabric: the intricate wood panelling, the ceiling and the marble columns, but to keep suspended the City Hall Chamber as a whole over the excavation during the initial stage of the project.
At a later stage of the site progress, the internal finish was restored in situ by the main contractor. Only the delicate chandelier lighting had been removed from this space to be restored to its original beauty.

Until recently, the monuments were used for official purposes, with entrance to them strictly controlled. For most Singaporeans, they may have been intimidating buildings, notably the Supreme Court, with its levels of decorum, courtrooms and cells.

The studioMilou design has sought to give an inviting entrance and ambiance which encourages local residents in particular to cross the threshold of their new National Gallery and to feel a sense of belonging and comfort.

With this aim in mind, studioMilou's design for the public spaces between the two buildings, while spectacular, offers a peaceful and unified architectural landscape bathed in natural light and open to the surrounding cityscape.

As has been mentioned, the light and materials used in the project aim to give the interior spaces the unified, but varied, character of a set of grand public rooms or of a landscape that are open to visitors to wander through as they wish, stopping off to learn more about regional history, about the collection of works of art, or about the many in-set narratives and documents that accompany the presentation of the collection.

Jusqu'à aujourd'hui la Supreme Court et le City Hall étaient des bâtiments associés à des fonctions officielles et dont l'accès était très codifié. Pour la plupart des Singapouriens, ils étaient vécus comme des bâtiments intimidants, protocolaires, plus ou moins fermés au public.

Un des principaux objectifs du projet est d'inviter, par un geste architectural clair, le public de Singapour à franchir la porte de ce nouvel espace, de s'y sentir bien et d'en prendre possession.

Le travail de studioMilou a été de créer pour la National Gallery de Singapour, en plus des espaces spectaculaires qui relient les deux monuments, un paysage architectural paisible et unitaire, ouvrant partout des vues sur le paysage de la ville, et invitant la lumière naturelle.

Le travail architectural de la lumière et des matériaux, tel qu'il est clairement exprimé par les dessins, vise à donner à l'ensemble des espaces le caractère unitaire et varié d'un grand salon-paysage public, ouvert à la promenade où le visiteur viendra à la rencontre de son histoire, d'une collection d'art, et des multiples facettes narratives qui accompagnent la présentation de la collection.

Une collection telle une promenade à travers les espaces historiques

An inviting promenade through unified historic buildings

Salon d'angle dans les circulations publiques du City Hall
Corner lounge in the public circulation areas in City Hall

L'atrium central du City Hall desservant les expositions au deuxième étage / *Central courtyard in City Hall serving the exhibition spaces on second storey*

Connecting spaces through materials and the use of natural light

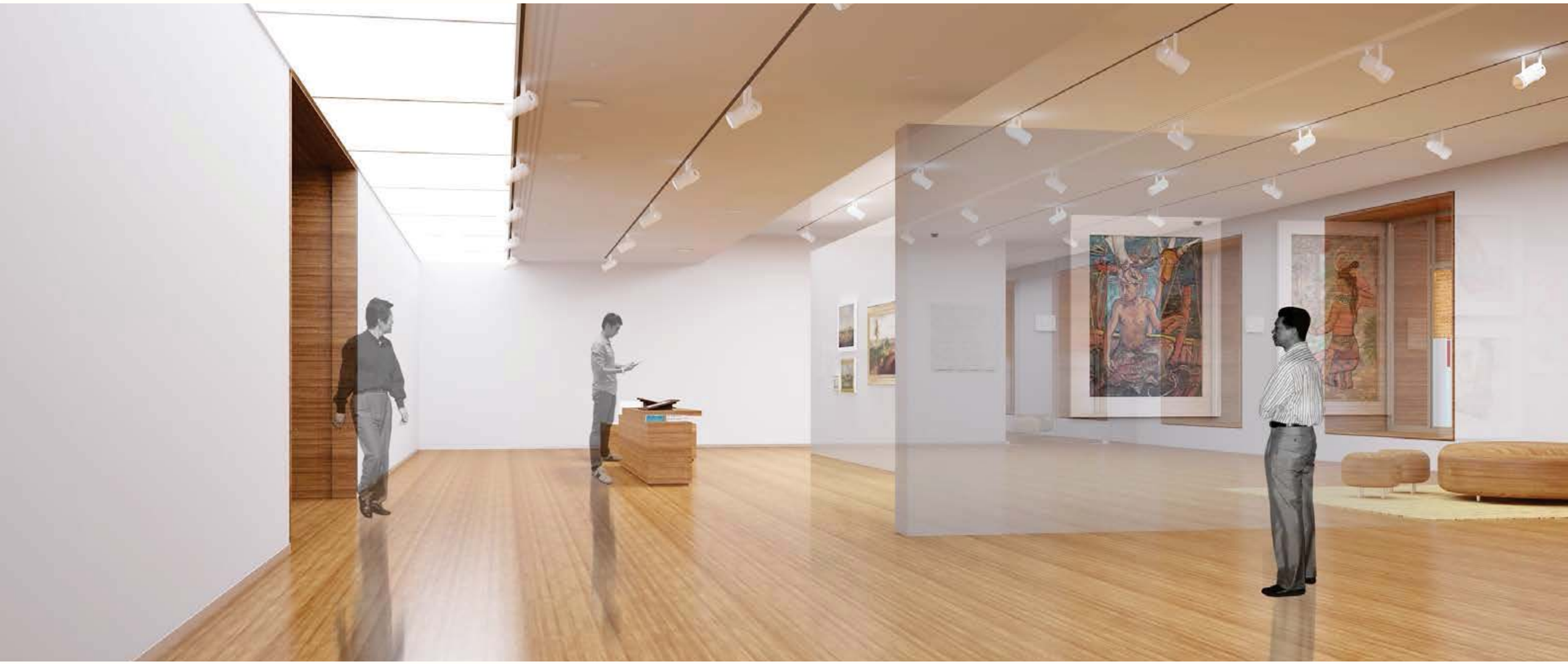
Des espaces unifiés par la lumière

The softened and filtered light entering the Gallery through the great veil of glass and steel draping over the roof plays an important role in unifying the spaces and visitor experience, while allowing for variations necessary in such a large institution hosting diverse artworks, exhibitions and events from the region and further afield. This overall unity with subtle degrees of variation – a significant characteristic of the design – is further reinforced by the restricted palette of colours and materials, among them teak wood, grey and white walls, and light-grey concrete. These drawings illustrate the unified, monochrome, almost landscaped character of the design, a deliberate choice intended to support rather than to compete with the new, diverse and evolving nature of the Gallery's exhibitions and events.

Grâce à ce geste architectural que constitue le grand voile de verre et d'acier qui invite et en même temps filtre la lumière sur le nouveau musée, le projet donne à la lumière naturelle un rôle important comme unificateur de l'espace et de l'expérience de la visite. Le filtrage de la lumière permet une variation d'intensité nécessaire au sein d'une si grande institution abritant aussi bien des expositions que des événements divers et venus d'environs proche ou lointain. Le projet s'attache à renforcer ce sentiment d'unité donné par la lumière naturelle en n'ayant recours qu'à un nombre réduit de matériaux et de couleurs (bois de teck, murs blanc et gris, béton gris clair, ...).

La lumière naturelle dans l'espace d'exposition du City Hall / *Natural light within the exhibition hall in City Hall*

Exemples d'aménagements dans les espaces d'expositions du City Hall / *Examples of exhibition design fit-out in City Hall galleries*



Lumière naturelle, lumière diffuse et artificielle, lumière directe artificielle dans les espaces d'expositions
Natural light, diffused artificial lighting, direct artificial lighting in the exhibition spaces

La tombée de la lumière naturelle sur l'atrium central au deuxième étage du City Hall
Beams of natural light falling into the courtyard on the second story of City Hall

Escalier d'accès entre le 4ème et le 5ème étage vers les jardins suspendus du City Hall
Access from 4th story to 5th storey, towards the roof garden at City Hall

L'accès au jardins sur le rooftop du City Hall / *Access to the rooftop gardens on City Hall*

Les jardins sur les toits du City Hall / *The rooftop gardens on City Hall*

Les bassins, les jardins, le dôme de la Supreme Court depuis le rooftop du City Hall
View of the reflective pools, the gardens, the former Supreme Court dome from the City Hall rooftop

Jeu de lumière sur le dôme intérieur de la Supreme Court et sur les espaces du plateau supérieur de la toiture-terrasse
The smaller lantern dome sits in the heart of the interior roof deck of former Supreme Court, bathed in natural daylight.

Étude de l'espace d'exposition du 5ème étage de la Supreme Court */ Spatial simulation for fifth storey exhibition space on former Supreme Court*

Étude de l'espace d'exposition au 5ème étage de la Supreme Court */ Study on the fifth storey exhibition space in the former Supreme Court*

Circulation publique dans le 3ème étage de la Supreme Court / *Public circulation on 3rd storey of the former Supreme Court*

Vue de la galerie basse menant aux expositions dans les deux bâtiments historiques
View of the public basement concourse leading to exhibition spaces in the two historic buildings