THE WALL STREET JOURNAL.

SPECIAL ADVERTISING SECTION

SPONSORED BY TAKENAKA

Reviving historical buildings

A new National Gallery for Singapore by Takenaka Corporation

In 2015, two buildings that had played important roles in Singapore's 50-year history — the former Supreme Court and City Hall, dating from 1939 and 1929, respectively — were integrated and reborn as one of Asia's largest visual art museums.

On Nov. 23, at the opening ceremony for National Gallery Singapore, which coincided with the 50th anniversary year of Singapore becoming an independent nation, Prime Minister Lee Hsien Loong said, "The buildings have been immaculately conserved… we have injected new life and purpose into them…the (new) building itself is a work of art." He expressed his gratitude to the French architect, who designed the gallery, and to Japan's Takenaka Corporation, which worked on the difficult 53-month construction project from January 2011 to June 2015.

In the three years since opening, the gallery has attracted over 5 million visitors, and is beloved by Singaporeans as well as visitors to the city-state.

Heir to a more than 400-year-old legacy of craftsmanship since its founding in 1610 by a shrine and temple carpenter, Takenaka Corporation has developed and honed a comprehensive array of technical skills while working on construction projects throughout Japan, including historical buildings, as it strives to realize its corporate mission to "contribute to society by passing on the best work to future generations." Many of these capabilities were put to the test during the project in Singapore.

We spoke to three staff members involved in the creation of National Gallery Singapore about the special challenges the project posed: Shoichiro Shibuta, Managing Officer and General Manager of the International Department in Takenaka's Head Office, Hideki Izumi, General Manager of the Asia Region, International Department, and Tamotsu Takao, Senior Manager and Head of the Construction Engineering Division in the Asia Region, International Department.

From left, Shoichiro Shibuta, Tamotsu Takao and Hideki Izumi

The two historical buildings are integrated by a connecting glass roof, two skybridges and a three-level underground space.

Unparalleled preservation and regeneration project

Shibuta: Located on the shore opposite the Marina Bay Sands and standing in the Civic District, the former City Hall and Supreme Court are important national cultural properties that have been the settings for many historic events in Singapore. This project involved preservation and restoration work in which the exterior and important rooms of these two buildings would be retained, and the interior would be rebuilt for gallery use. A restoration project of this complexity and size — a building with a floor space of around 64,000 square meters — was without parallel in the world.

Takao: In order to integrate the two buildings and revive them as an international museum, we used a connecting glass roof, two skybridges and a three-level underground space. Since we were required to perfectly preserve the iconic exterior walls, which were finished with Shanghai plaster, and the national treasures inside such as the courtroom, the library and the City Hall chamber, we needed to maintain these rooms in situ while dismantling the interior structure and constructing the new floors, including three newly built underground floors. The first underground level would provide room for a concourse with secure parking on the lower levels. It was really an unprecedented piece of work.

Izumi: We had experience with interior-only or exterior-only restoration projects abroad, but we had never been involved in the restoration of a whole building, including underground space. Although the buildings in this project had severely deteriorated in the more than 80 years since their construction, we had to avoid any damage during the work to the sections that were to be preserved. As the level and standard of preservation were decided on a case-by-case basis for each section, moreover, the approval process and the checks on the completed work took a tremendous amount of time and effort. In addition, the construction environment was very challenging, in particular the soft ground at the site. It was a very complex and difficult project.

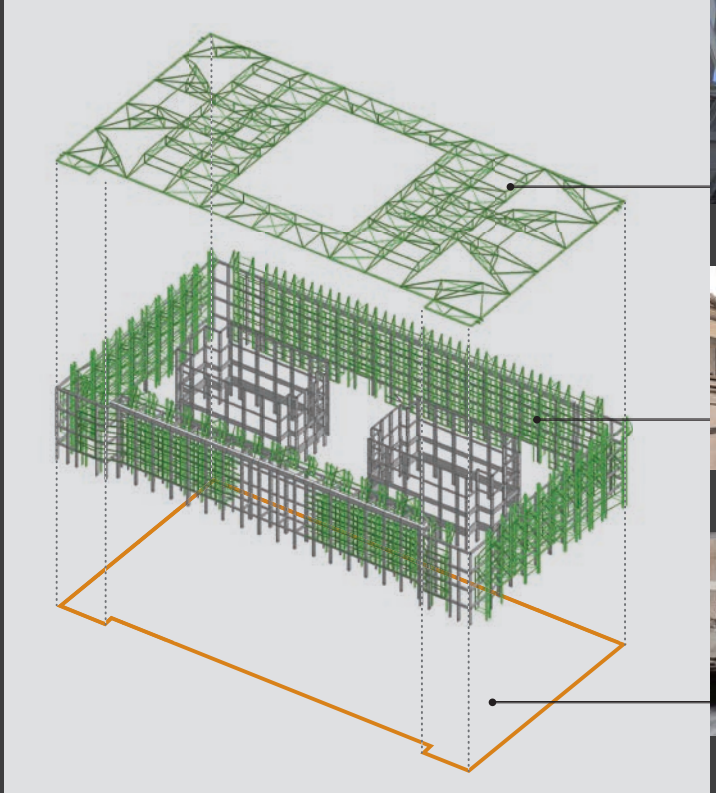
Past achievements paved the way to Singapore contract

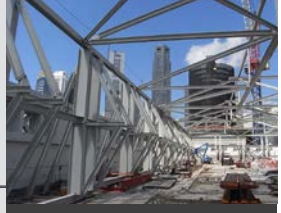
Takao: To date, Takenaka has handled large-scale preservation and regeneration work of historical buildings in Japan so that they could continue to be used. Some of these include the Akasaka Palace (State Guest House) and Meiji Seimei Kan in Tokyo, and the Yokohama Red Brick Warehouse, all of which were built in the early 20th century. Through such construction work, our company has developed the engineering capabilities and competence to solve difficult challenges. To these are wedded the technologies we have inherited throughout our history that allow us to pass on the historical value of precious finishing materials such as stone, brick, copper plate and plaster.

Shibuta: Takenaka won the National Gallery Singapore contract because our technical capabilities are highly regarded worldwide. These strengths are backed up by our managerial ability to mobilize companywide capabilities such as preliminary surveys for preservation and regeneration work, technological analysis at our Research & Development Institute and the construction know-how that has been cultivated locally in Singapore. Since Takenaka won the contract for Changi International Airport Terminal 1, which was completed in 1981, we have undertaken a large number of construction projects in Singapore such as skyscrapers, hotels and commercial facilities. Recently we participated in Changi International Airport Terminal 4, which was completed in 2017. In addition, we have been involved in the design and construction of production facilities for Japanese companies expanding their presence in the city-state. In this way, our

High-level preservation and regeneration technologies turned the Courtroom One of the former Supreme Court into a gallery to exhibit archival materials of the court.

Construction methods to counter vertical forces (underpinning), to reinforce single walls (jacketing) and to transfer horizontal forces (flying strut), were developed to support the outer walls to be preserved.





Flying strut

Jacketing

Underpinning

company has established a secure business foundation in the country in the 45 years since we opened our Singapore Office.

New space creation technology does not damage preserved sections

Izumi: The client wanted us to construct three new underground floors while leaving the external walls untouched and the historically important rooms in their original position. It was enormously complicated to maintain the preserved sections where they stood, dismantle the structure around them, and then erect the new structures connected to the preserved sections.

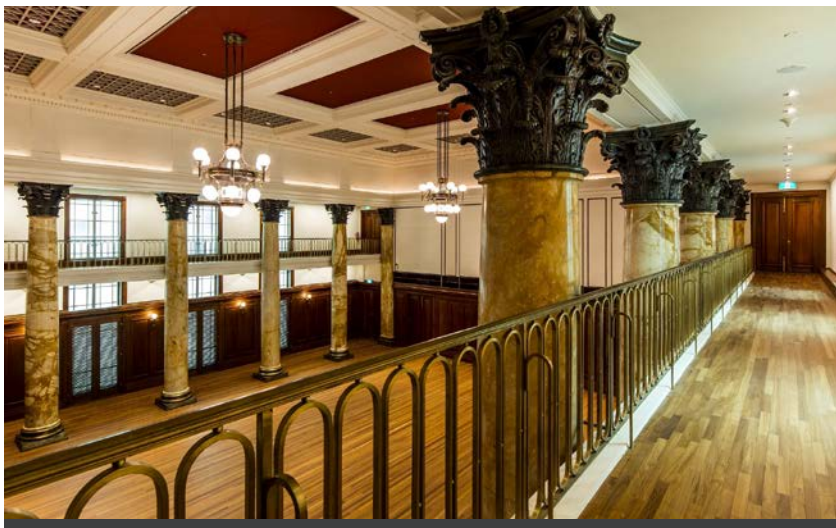
Takao: The entire underground section was newly built while leaving the outer walls in place and hollowing out the interior, but in order to create space for the heavy pile-driving machinery, it was necessary to dismantle the existing columns. Thus, for work on the rooms that were to be preserved, we developed a construction method to cut the existing columns while entire loads were applied to temporary support columns beforehand. The rooms themselves were also important, and with the City Hall chambers and others, it was necessary to keep them level at all times so as not to damage any of the marble columns inside these rooms. The dismantling and new erection of the surrounding framework was construction of the highest difficulty requiring displacement control in units of millimeters. Upon dismantling the interior, moreover, the exterior became independent with only a single outer wall, so it was necessary to prevent these walls from being tilted by wind or sinking under their own weight. Vertical forces were countered by a first floor that had been constructed earlier with a top-down construction method*. With regard to horizontal forces, we developed a construction method that reinforced single walls by jacketing them in a temporary steel-frame structure and provided them with further support by transferring forces via temporary steel joists to a temporary steel-frame tower that had been erected in the courtyard.

Shibuta: In a restoration project where the basic structure of the building is still in place, the external walls will not lean or fall, and it's not difficult to remove the external walls and replace them with new ones. The Singapore job was different from completely rebuilding a new structure as the external walls remained. Other than the sections to be preserved, we dismantled the interior structure and erected a temporary structure to support the remaining exterior walls.

** A construction method that constructs the upper and underground floors simultaneously after first building the ground floor.*

Comprehensive capabilities that overcome difficulties

Shibuta: We carefully inspected the condition of the ornamental areas on the exterior such as reliefs, and retained them as far as possible while cleaning, repairing and restoring where necessary. The client's intention was not to make these areas beautifully brand-new, but rather to preserve them with an "origi-



The City Hall chamber was kept level at all times, a construction challenge of the highest difficulty requiring displacement control in units of millimeters, so as not to damage any of the marble columns inside.

Takenaka Corporation took the lead in determining the preservation and restoration standards for the iconic exterior such as these reliefs finished with Shanghai plaster.

nal" finish.

Takao: Nevertheless, it was difficult to quantify the preservation specifications, and having no clear criteria to achieve was a challenge. Accordingly, we devised a new decision-making process. We carried out preliminary inspections of each part based on the specifications we had, and we, the contractor, took the lead in deciding the preservation and restoration specifications, the basic guidelines and the execution plans for preservation, which were proposed and approved. This is completely different from normal new construction work overseas or preservation work in Japan. Some of the Shanghai plaster, the finishing material used for the exterior, had deteriorated quite badly after 80 years exposed to the elements, but some areas were usable without any work. After a prior site inspection, a plan was created for the cleaning, the repairs and the restoration. Specific proposals were made one by one, and test construction was carried out. After seeing the finished products and reaching agreement, we set in motion the procedures for starting the work while sharing with the client the exact degree of the desired finish.

Izumi: That was the way preliminary verification and technical examination were carried out. As might be expected, however, we could not quantify the degree of the required finish on the building, and this made the preservation and regeneration difficult. In a few instances, we literally had to get out hands dirty to confirm this. As there were so many client consultants, it took time to gain understanding of our proposals to establish clear-cut specifications. There were also many uncertain factors. During physical inspections of the building, we found that parts of it had decayed more than expected or sometimes the physical reality was different from what was in the drawings. Thus, problems that could not be handled in preliminary verifications were taken care of at the site. At the peak of work, there were around 2,000 local staff members and workers at the site from various countries such as India, Bangladesh, China, Thailand, Europe and the U.S. Daily morning meetings were held in three languages as we tried to convey to the workers what had to be done. In the first half of the construction, we invited craftspeople from Japan to provide technical guidance and instruction on how to carry out the repair work; we made complete mock-ups for both the required degree of the building's finish and for setting work standards; and we hoped to nurture the feeling among the site team that "we are all engaged in producing quality work."

Significance of the project's success and future prospects

Izumi: The end result was that the project was a success, and the gallery was widely acclaimed at home and overseas. In Singapore, our company won a URA (Urban Redevelopment Authority) Architectural Heritage Award for preservation in 2015. We are going to document our work on the National Gallery Singapore to create guidelines for similar projects, and we want to offer such construction services at home and abroad, especially in Southeast Asia, where the demand for restoring old buildings is expected to increase.

Shibuta: Our company has always worked on challenging projects in a spirit of craftsmanship, which could be said to be "Takenaka's DNA." I feel that being involved in projects that have breathed our company's "spirit of craftsmanship" into the very fabric of Singapore has deep significance, and it has made us feel immensely proud. Along with leaving something of value for future generations, the preservation and regeneration of historical buildings is a part of our efforts to build a "sustainable society" that makes good use of quality things that last a long time. We will continue to work at improving the appeal and practicality of historical buildings using the latest technology.

THE WALL STREET JOURNAL.
jp.wsj.com
SPECIAL ADVERTISING SECTION

TAKENAKA
OSAKA 1-13, 4-chome, Hommachi, Chuo-ku, Osaka 541-0053, Japan Tel: +81-6-6252-1201
TOKYO 1-1, 1-chome, Shinsuna, Koto-ku, Tokyo 136-0075, Japan Tel: +81-3-6810-5000
www.takenaka.co.jp