ADVANTAGES OF PRECAST

Advantages

Better Quality

The most important advantage of precast is the opportunity to achieve consistently high quality end products. In recent years, the increasing shortage of skilled workers in Singapore has threatened to lower the standard of workmanship in many of our building projects. In precast construction, factory-controlled conditions and the use of state-of-the-art manufacturing techniques enable the desired dimensions, shapes, colours and texture of precast concrete to be more easily achieved. Precasting also makes it possible to inspect the surface finish prior to installation.

Design Freedom

Contrary to popular belief, precast concrete does not necessarily restrict design freedom. Diversity of expression and unique buildings can result from custom-made solutions and the intelligent use of industrialised production techniques. A wide variety of forms and shapes are possible with architectural precast concrete. Architects can also select different colours, texture and sizes to fit their aesthetic expressions. Also, precast concrete can harmonise with other building materials.

Economic Advantage

The economy of precast is maximised with high repetition in production. Careful planning can achieve good repetition in the design without sacrificing design freedom. Economic production leading to lower unit costs can be achieved when the recommended preferred sizes of precast components in this Guide are widely used in the industry. Productivity improvement is possible in the factory through design and tooling innovations. Further cost savings can be derived from the speed of construction. Production of components can proceed while foundation and site work is going on. They can then be erected quickly on site. Delays in concreting due to time required for curing, formwork removal and re-erection can be reduced. Financing cost will also be reduced as a result of the shorter overall construction time.

Manpower savings

Another important benefit is the saving of on-site labour. With the elimination of 'wet' trades, the need for skilled workers is also greatly reduced. This is especially important in Singapore due to our shortage of manpower and the rapidly shrinking pool of skilled workers from traditional sources.

Neater and Safer Sites

The use of precast concrete and other prefabricated components will help to reduce material wastage during construction. The elimination of formwork, scaffolding and 'wet' trades means that the site can be cleaner, neater and better organised. This should lead to increased safety.

Maximising The Benefits Through Teamwork

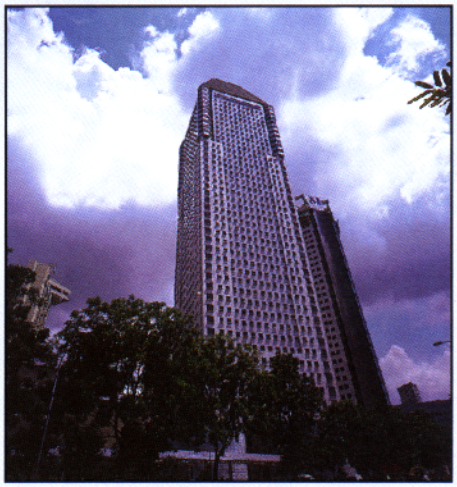
The advantages of precast can be enhanced when the entire design team and the contractor have the opportunity to jointly develop the project from the initial design stage. The time spent in planning and design always pays off in accelerated construction and consequent cost savings. The Architect and Engineer should therefore seek the advice of the Precaster in the early design stage. Maximum economy, optimum utility and high quality can then be achieved through a coordinated team effort.

Examples of Precast Projects

The following pages present examples of projects using precast components.

- ***Millenia Tower***
- ***The Bayshore***
- ***Xpress Print***
- ***Republic Plaza***
- ***2 Finger Pier Buildings, Passenger Terminal 2, Singapore Changi Airport***
- ***Henderson Secondary School***
- ***Jurong West N3 C25***
- ***Ngee Ann City***
- ***CityCab***
- ***K.P.M.G. Building, Netherlands***
- ***Technical School of Magnanville, France***
- ***"Venus 18" Social Housing, France***
- ***High Rise Apartments in Yachiyo City, Chiba Prefecture, Japan***

Millenia Tower



MAIN FEATURES

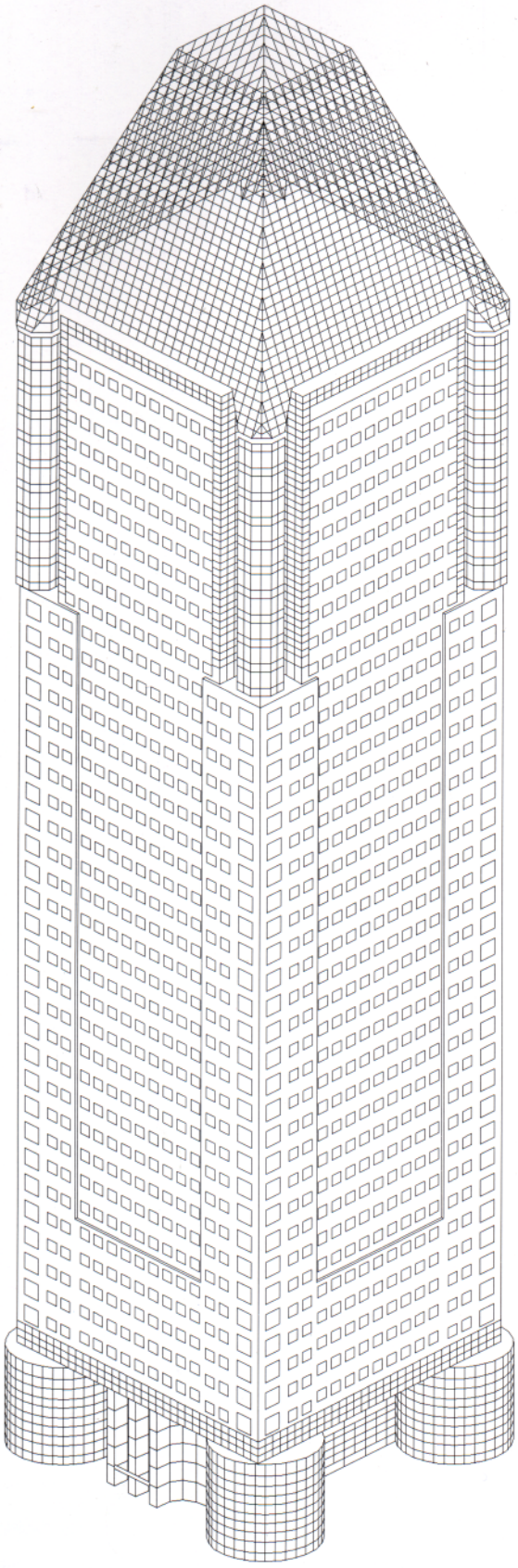
A simple, efficient yet attractive design. Precast post - tensioned beams, precast staircases and prefabricated beam cages were used. A special feature was the design of the external walls as structural walls; this enabled the walls to be cast and completed in one operation, leaving only windows and external skin panels for decorative effect. A climbing formwork system was mobilised for the core wall construction. System formwork was used for all vertical elements such as facades, columns and peripheral beams. The project achieved a 6-day floor cycle compared to the norm of 10-14 days.

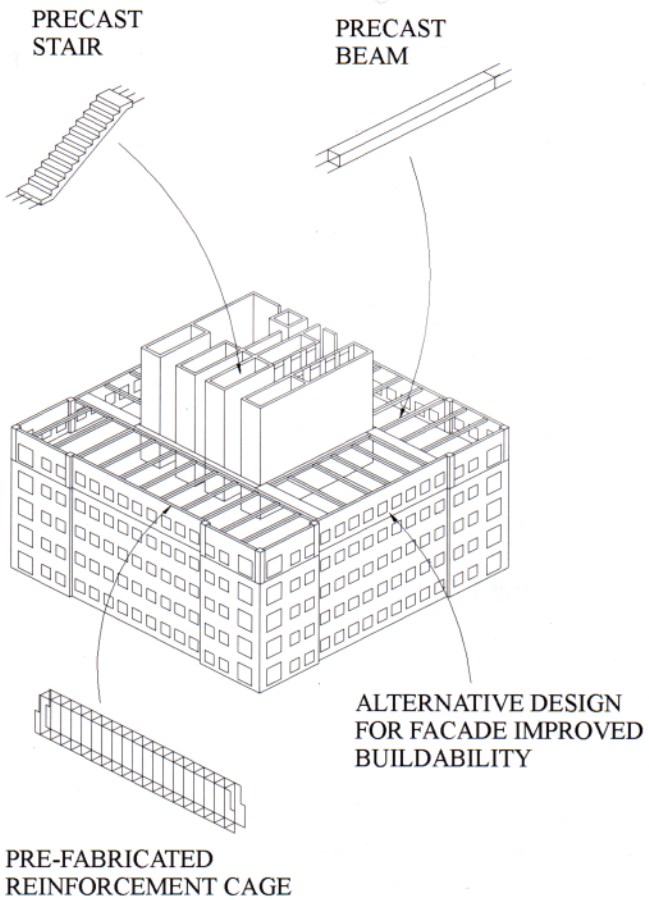
Client : *Pontiac Marina Pte Ltd* • ***Architectural Consultant :*** *DP Architects Pte Ltd, Kevin Roche & John Dinkeloo & Associates*

Structural Consultant : *Meinhardt (S) Pte Ltd* • ***Contractor (Alternative Design) :*** *Dragages Et Travaux Publics Project*

Cost : *$179.57 million*

Project Duration : *34.5 months* • ***Gross Floor Area :*** *78,428.37 m2* • ***No. of Storeys :*** *42*




PRECAST
STAIR
PRECAST
BEAM
ALTERNATIVE DESIGN
FOR FACADE IMPROVED
BUILDABILITY
PRE-FABRICATED
REINFORCEMENT CAGE

The Bayshore

MAIN FEATURES

The use of precast load bearing walls enabled the project to be completed on time. This project called for two precasters to supply the large number of required precast components. Another feature of this project is its cast-in-place flat slab. It highlights that precast and cast-in-place concrete can be used for the same building.

***Client** : Bayshore Park Pte Ltd • **Architectural Consultant:** DP Architects Pte Ltd • **Structural Consultant** : KPT Ho & Partners Consulting Civil & Structural Engineers • **Contractor (Alternative Design)** : Mitsui Construction Co Ltd*

***Project Cost** : $162 million • **Project Duration** : Phase I - 24 months, Phase II - 28 months • **Gross Floor Area** : 112,632 m2*

***No. of Storeys** : 4 no. 30-storey blocks and 2 no. 12-storey blocks*

***Total No. of Units** : 1038*

MAIN FEATURES

This eight-storey light industry factory adopted several standardised precast concrete structural elements — precast concrete main beams, hollow core slabs, precast planks, precast stairs and precast curve edge beams with balconies.

***Owner** : Xpress Print Pte Ltd* • ***Architectural Consultant** : Kumpulan Architect* • ***Structural Consultant** : T H Chuan & Partners*

***Main Contractor** : JDC-Santarli JV*

***Project Duration** : 10 months (including piling)* • ***Gross Floor Area** : 7670 m2*

Republic Plaza

MAIN FEATURES

The steel framed building was efficiently designed to achieve maximum structural economy in terms of tonnage of steel per square metre of floor area. This, with unitised glass and granite curtain wall, made the building very buildable. Another notable feature was the composite steel decking floor complete with supports /connections for building services. Pre-assembled staircase forms with reinforcement and riser plates were also used.

***Client :** CDL Properties • **Architectural & Structural Consultant :** RSP Architects Planners & Engineers*

***Contractor :** Shimizu Corporation • **Project Cost :** $273 million • **Project Duration :** 47 months*

***Gross Floor Area :** 102,282 m2 • **No. of Storeys :** 66*

2 Finger Pier Buildings

MAIN FEATURES

Construction of the 2 Finger Pier buildings, each 2-storey high and about 500m long, was to be carried out completely on the air-side which was a very busy operational area in the airport. To minimise disruption to airport operations and to meet very stringent operational and safety requirements, the PWD designed a structural system which enabled a fast and highly mechanised method of construction to be adopted. Standardised precast concrete structural elements comprising precast columns, prestressed precast beams, hollow core slabs and precast stairs were widely used. This reduced on-site activities and labour to a large extent.

Owner : *Civil Aviation Authority of Singapore (CAAS)* • ***Consultant :*** *Public Works Deaprtment (PWD)*

Main Contractor : *Singapore Technologies Construction Pte Ltd* • ***Project Cost :*** *$145 million*

Project Duration : *South East Finger Pier - 15 months , North East Finger Pier - 23 months*

Gross Floor Area : *70,000 m2*

Passenger Terminal 2, Singapore Changi Airport

Henderson Secondary School

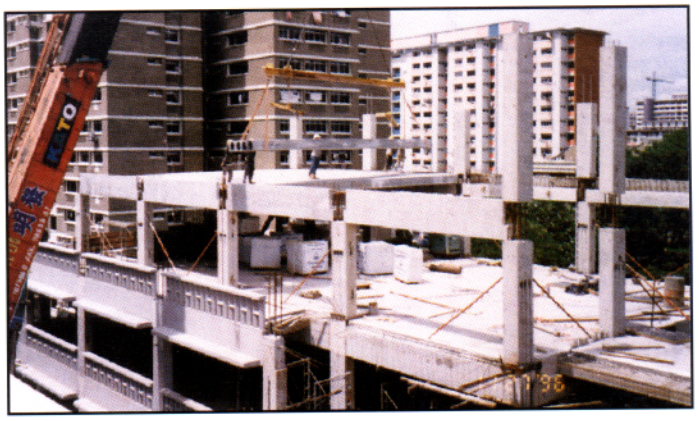
MAIN FEATURES

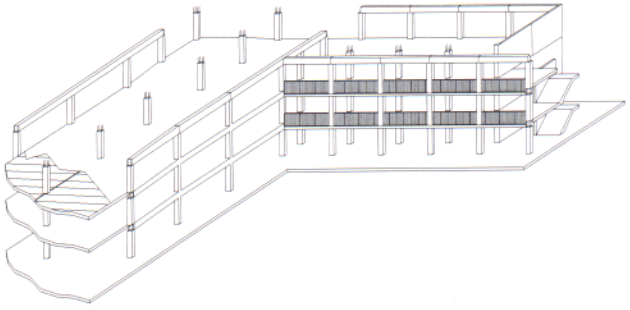
The building adopted a precast structural frame. Precast beams were standardised to three sizes. Some beams had parapets and sunshades integrated to form a single element. Three-storey high precast columns were used together with other precast components such as precast hollow core slabs, shear walls and concrete planks. Modular grids and standardisation of design enabled easy fabrication and installation of both structural and architectural components.

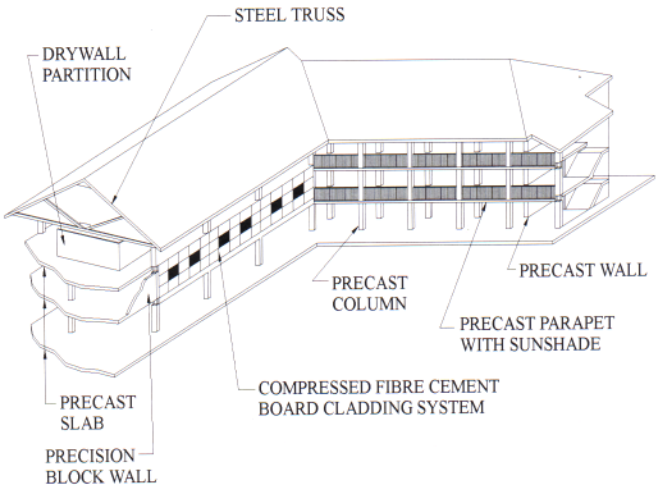
Client : *Public Works Department/Ministry of Education* • ***Architectural Consultant :*** *Kumpulan Akitek*

Structural Consultant : *S. M. Wan* • ***Contractor :*** *Neo Corporation Pte Ltd* • ***Project Cost :*** *$16.2 million*

Project Duration : *19 months* • ***Gross Floor Area :*** *18,400 m2*






STEEL TRUSS
DRYWALL PARTITION
PRECAST COLUMN
PRECAST WALL
PRECAST PARAPET WITH SUNSHADE
COMPRESSED FIBRE CEMENT BOARD CLADDING SYSTEM
PRECAST SLAB
PRECISION BLOCK WALL


Jurong West N3 C25

MAIN FEATURES

The use of prefabricated beam cages, column link cages and welded wire fabric for both walls and slabs eliminated the tedious process of tying reinforcement on site. Architectural precast components for the project included internal lightweight concrete parapets, external concrete facades, gable-end walls and secondary roofing slabs.

The wide application of standardisation and precast components enabled repetitive sequence of work to be carried out. The productivity of the project is almost twice that of private sector's residential projects.

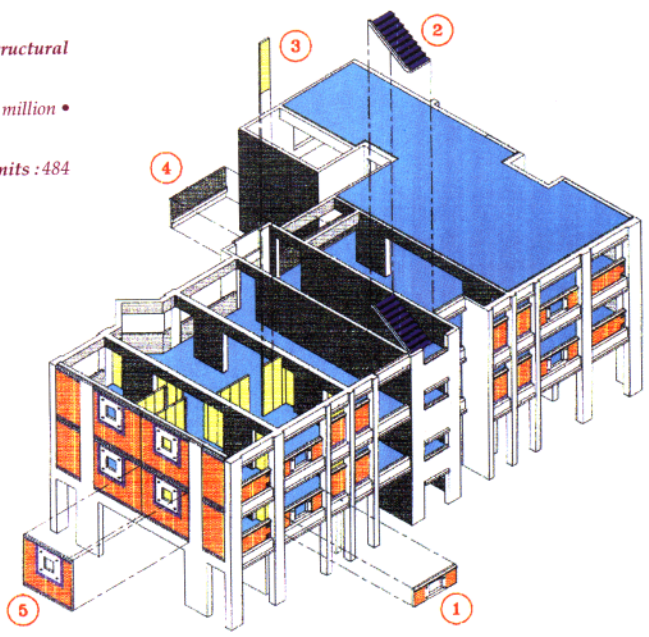
***Client** : Housing & Development Board* • ***Architectural and Structural Consultant** : Housing & Development Board*

***Contractor** : Tiong Aik Construction Pte Ltd* • ***Project Cost** : $36.5 million* • ***Project Duration** : 32 months*

***Gross Floor Area** : 76,771 m2* • ***No. of Blocks** : 6* • ***Total No. of Units** : 484*

Precast Components:

① Facade
② Staircase
③ Lightweight Partition
④ Parapet
⑤ Gable-End Wall



Ngee Ann City

MAIN FEATURES

Regular column grids for both the podium and tower blocks and the use of standardised column dimensions made the project very buildable. Reinforcement cages for columns and precast staircases were used to reduce on-site work. A prominent feature was the richly hued pre-finished precast wall panels. Each precast panel was cast together with the polished granite and aluminium window frame in one process. This shortened the installation time. A high standard of finish was also achieved.

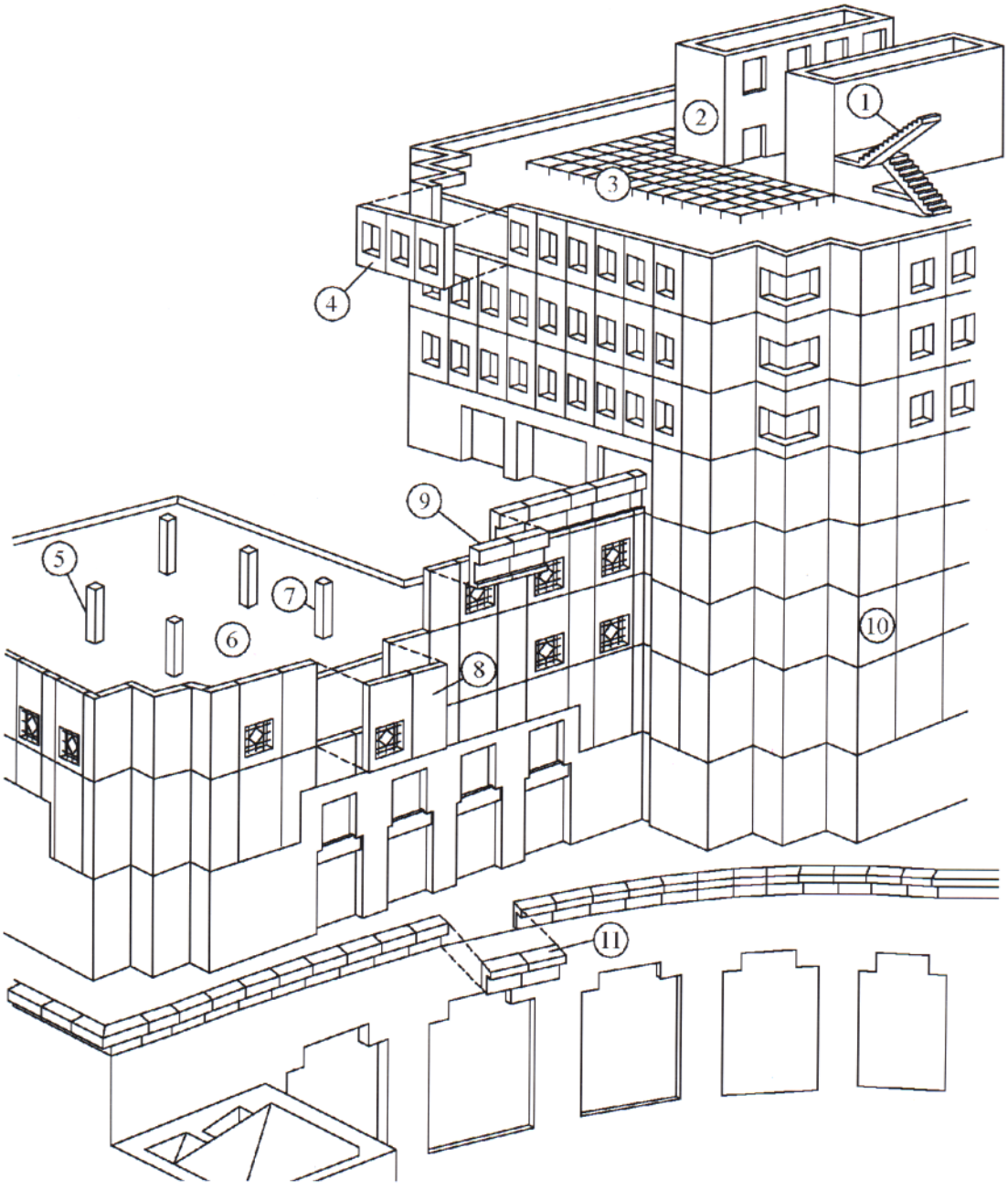
Owner : *Ngee Ann City Pte Ltd & Orchard Square Development Corporation Pte Ltd*
Architectural Consultant : *Raymond Woo & Associates Architects* • ***Structural Consultant :*** *Chong & Lee Consultants*

Contractor (Alternative Design) : *Shimizu Corporation* • ***Specialist Contractor :*** *Shimizu Precon Pte Ltd*

Project Cost : *$391 million (excluding piling)* • ***Project Duration :*** *42 months* • ***Gross Floor Area :*** *258,375 m2*

No. of Storeys : *3-storey basement, 7-storey podium and 28-storey twin towers*

① PC Steps with nosing tile finish
② Slip-form system for lift cores of towers
③ Lightweight concrete access floor system
④ Granite pre-finished external walls including window frames and glass panels
⑤ Prefabricated reinforcement cement cage columns
⑥ Flat plate/table form system
⑦ Standardised column grid
⑧ Granite pre-finished PC external walls with window grilles
⑨ Granite pre-finished PC parapet walls
⑩ Granite pre-finished PC external walls
⑪ Granite pre-finished curved parapet walls



citycab

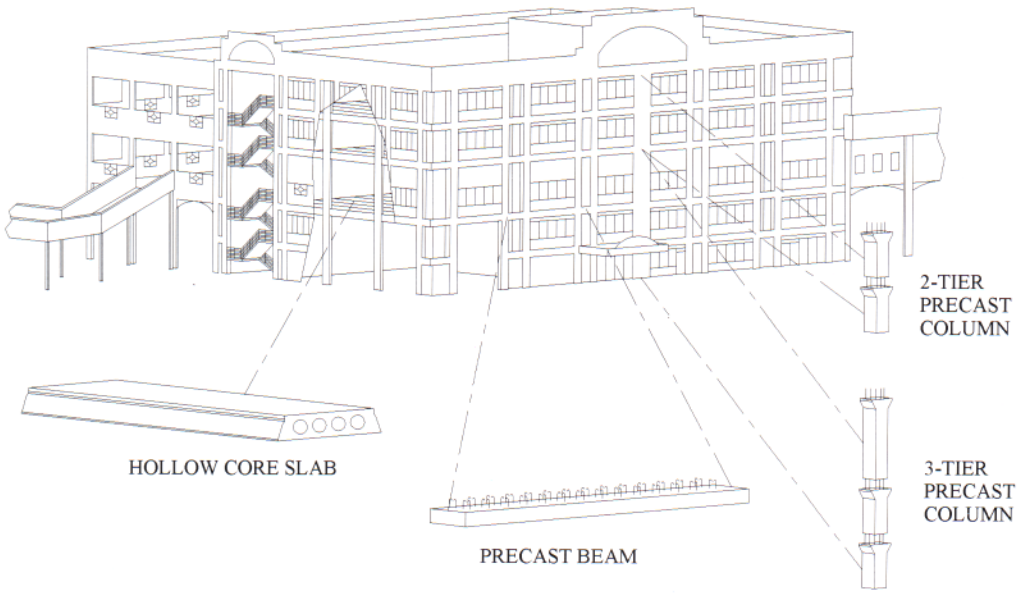
MAIN FEATURES

Precast structural components used for this vehicle and maintenance centre included 12m long standardised columns, beams and hollow core slabs. The use of precast components facilitated fast-track construction, allowing the project to be completed 2 months ahead of schedule. Vertical repetition was incorporated in the design to attain easy construction and economies of scale. In addition, use of standardised windows and dry wall system for internal walls increased the speed of construction.

Owner : *ST Automative Pte Ltd* • ***Architectural and Structural Consultant :*** *ST Architects & Engineers Pte Ltd*

Contractor (Design & Build) : *Singapore Technologies Construction Pte Ltd* • ***Project Cost :*** *$21.8 million*

Project Duration : *13.5 months* • ***Gross Floor Area :*** *25,362 m2* • ***No. of Storeys :*** *4*

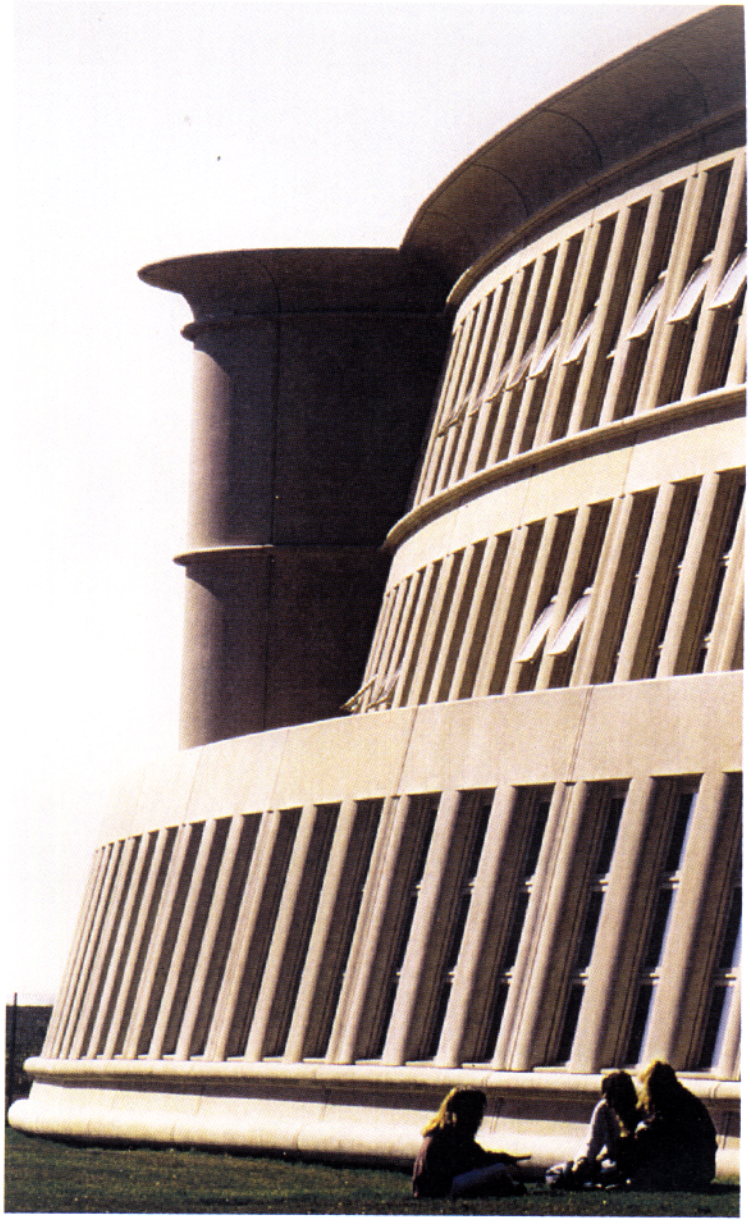

2-TIER
PRECAST
COLUMN
HOLLOW CORE SLAB
3-TIER
PRECAST
COLUMN
PRECAST BEAM

K.P.M.G. Building, Netherlands

An entirely precast circular shaped office building.

***Architectural Consultant** : Bakker en Verhoeff, Rotterdam*

Technical School of Maganville (France)



Innovative use of precast for curved design.

Architect : *Sade Sarl*

Contractor : *Region Ile De France*

Venus 18" Social Housing (France)

Classical precast column & elevation treatment add a touch to conventional precast social housing.

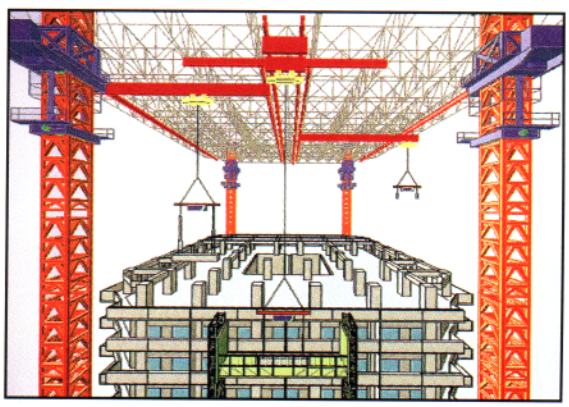
Architect: *Sade Sarl*

Contractor: *Logement Francais*

High-Rise Apartments
Yachiyo City, Chiba Prefecture, Japan

MAIN FEATURES

Obayashi Corporation developed the "Big Canopy" automation system for high-rise building construction. Below the canopy, modular construction materials are moved into place by several hoist cranes. This allows different types of work such as assembly of beams and columns to take place at the same time. This mechanisation and automation of work process increased productivity on site, shortened the construction period of this 26-storey building by 4 months and reduced labour requirement by 60%.



Main Contractor : *Obayashi Corporation*