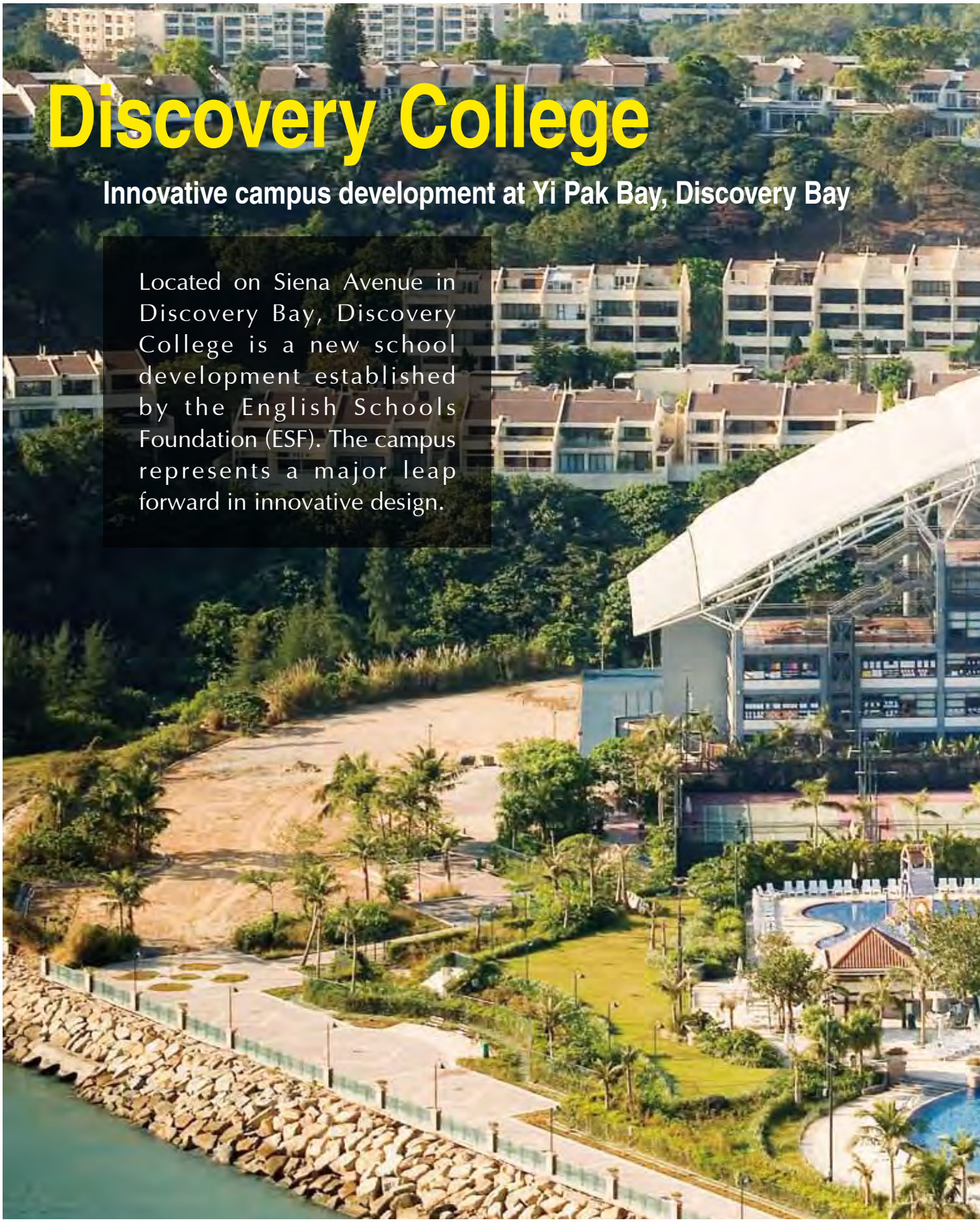
Discovery College

Innovative campus development at Yi Pak Bay, Discovery Bay

Located on Siena Avenue in Discovery Bay, Discovery College is a new school development established by the English Schools Foundation (ESF). The campus represents a major leap forward in innovative design.



The design of the new campus respects the context and natural environment surrounding the site. There are residential developments perching on the hilltops to the south and west. The new building form steps down towards the sea with a series of open terraces. This design approach aims at creating a building that blends in and harmonize with the surrounding natural terrain; and to reduce the visual impact of the structure. By integrating the natural environment with the building using open planning, landscaped terraces and roof-top gardens; framed views of the surrounding green hills and the sea, use of natural daylight and ventilation, the new school design will raise the students' awareness of environmental conservation.

The campus of Discovery College is organized into two main blocks in a horse-shoe configuration, that is, the Teaching Block to the north and the Specialist Functions Block that occupies the southern half. The Teaching Block houses all the classrooms, specialist teaching rooms (laboratories and workshops), faculty offices and main administration offices. This accommodation is generally more regular in size and requires much natural day-lighting and ventilation which is achieved by the north facing aspect. The Specialist Functions Block accommodates a variety of school facilities that are less regular in size, have large volumetric spaces and require long span structure. Major facilities include gymnasium, sports hall, performing arts centre, swimming pool and drama studios, etc.

To create a sense of place for all students and school staff, a core common area is formed within the school where group activities can take place around it. An internal courtyard has been created at the centre of the building. The courtyard is perceived

as a centralized social space for continued learning outside the classroom, conversation, special activities and community events.

A roof canopy using the innovative ETFE air inflated foil cushions as an environmental skin shelters all the external space of the school from inclement weather conditions. ETFE has been used in some iconic structures such as the Beijing National Aquatics Centre (Water Cube) in China; the Allianz Arena in Munich, Germany; and the Eden Project in Cornwall, UK.

The concept of the roof canopy is analogous to a tree canopy which offers protection from direct sunlight and creates a cooler micro climate shaded area underneath. This provides a significant amount of all-weather outdoor areas for play and social activities within the school. The light weight canopy also admits natural light

deep into the central atrium in a controlled manner, reduces radiant heat and increases air flow to improve thermal comfort for the occupants. It raises the environmental awareness by demonstrating the concepts of renewable energy and sustainability through life learning.

The unique design of Discovery College also reflects the new curriculum with emphasis on languages, drama and creative performing arts, and information and communications technology. Fitted out with a Performing Arts Centre with a specially designed studio theatre and drama studios, music recital room that can be used by professional groups, Design & Technology Workshops, a roof-top convertible swimming pool, etc, the new school development will set a new benchmark for future campus design.

The school area at Yi Pak Bay was awarded by Education and Manpower Bureau of the HKSAR Government to ESF in late 2001. The main contract was awarded to Hanison Construction Ltd in May 2006 with works commencing on site from May 2006. The building was designed by a local architect, Integrated Design Associates. The construction cost was approximately HK$200 million. Major works was completed in the first quarter of 2007, and the new campus starts operation from August 2008.

owner/ developer
English Schools Foundation

project manager
Ove Arup & Partners HK Ltd

project architect
Integrated Design Associates Ltd

main contractor
Hanison Construction Co Ltd

ETFE
Wise Dragon engineering Ltd

structural engineer
Maunsell Structural Consultants Ltd

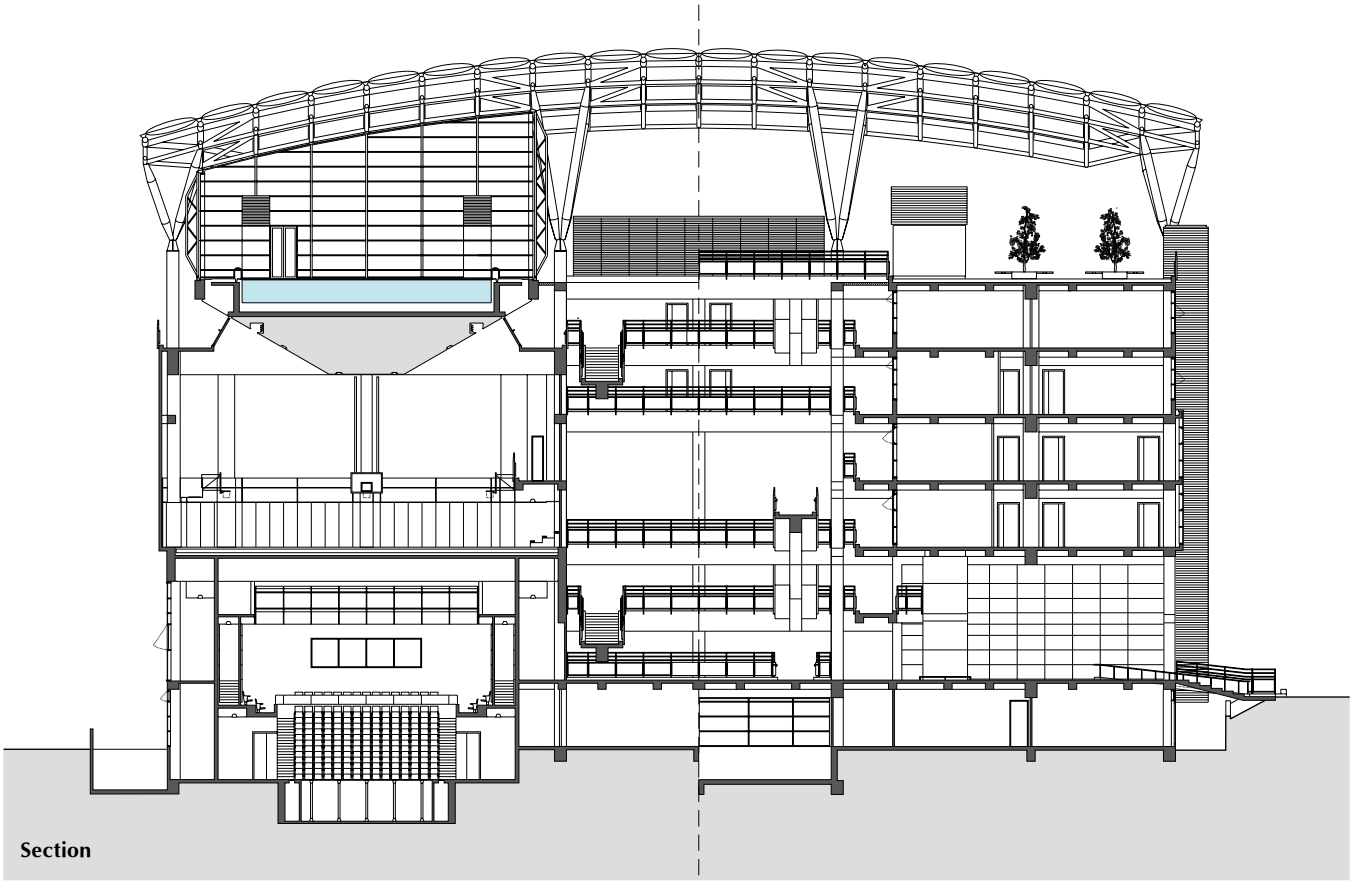
building services
J. Roger Preston Ltd

quantity surveyor
Widnell Ltd

landscape consultant
AXR Design / Austin and Rayner Design Ltd

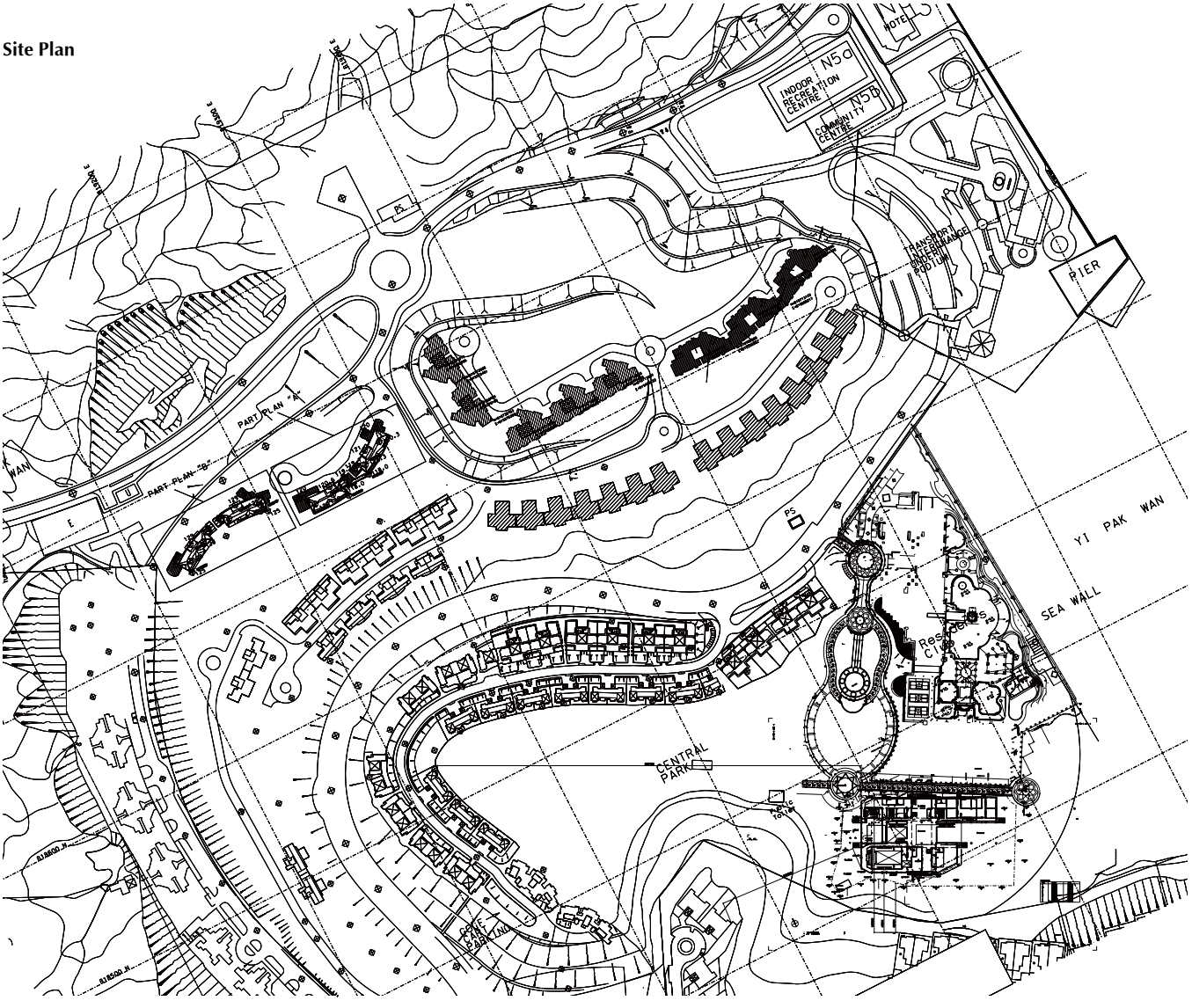
Fast Facts

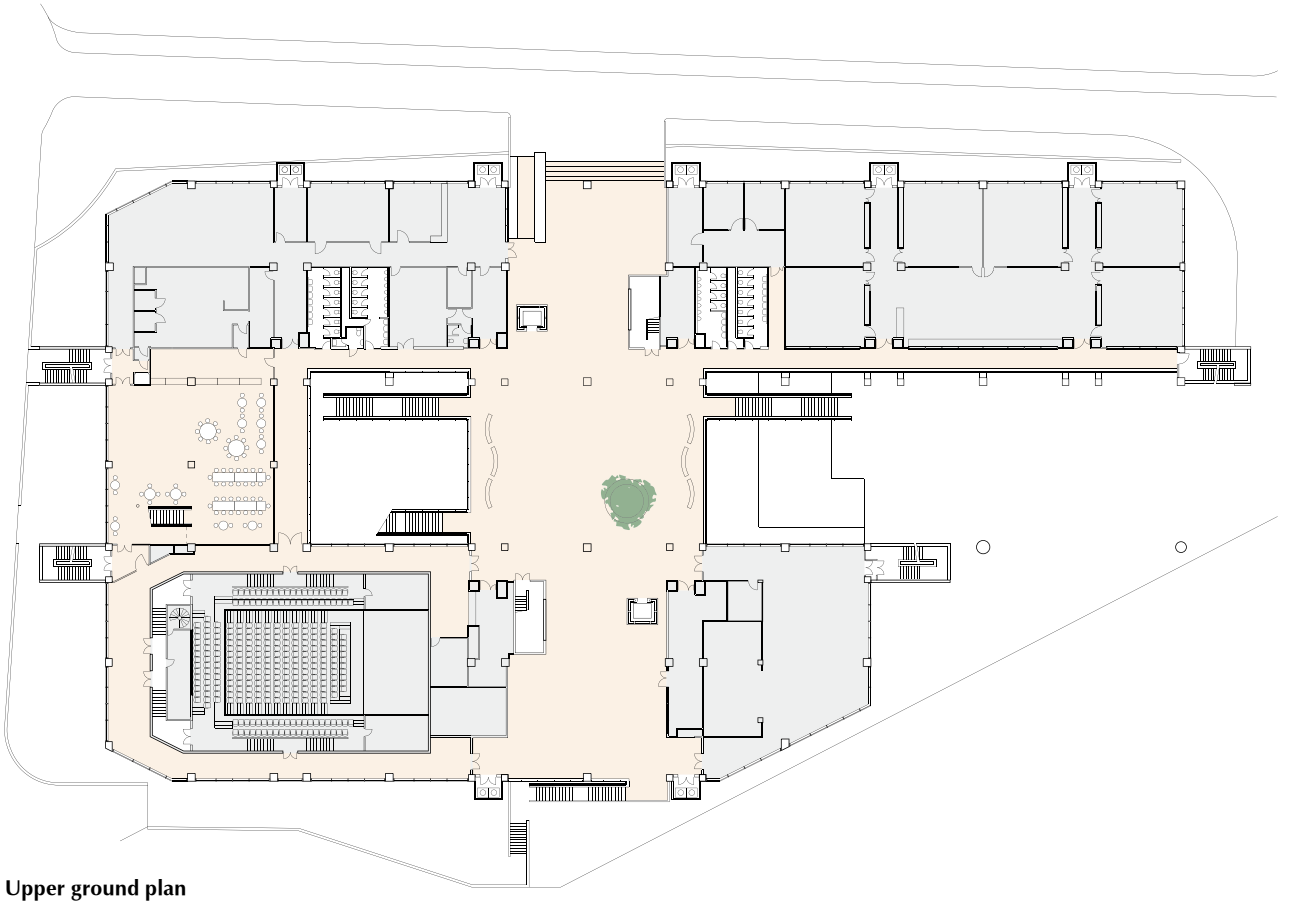
location	Siena Avenue, Discovery Bay
site area	6,900 sq m
total GFA excluding area under roof canopy	19,428 sq m
GFA under roof canopy	5,118 sq m
total GFA including area under roof canopy	24,546 sq m
number of storeys	Total 8 (From LG to 6/F)
construction period	commencement date - 2003 completion date - 2008
construction cost	Approx HK$200 million



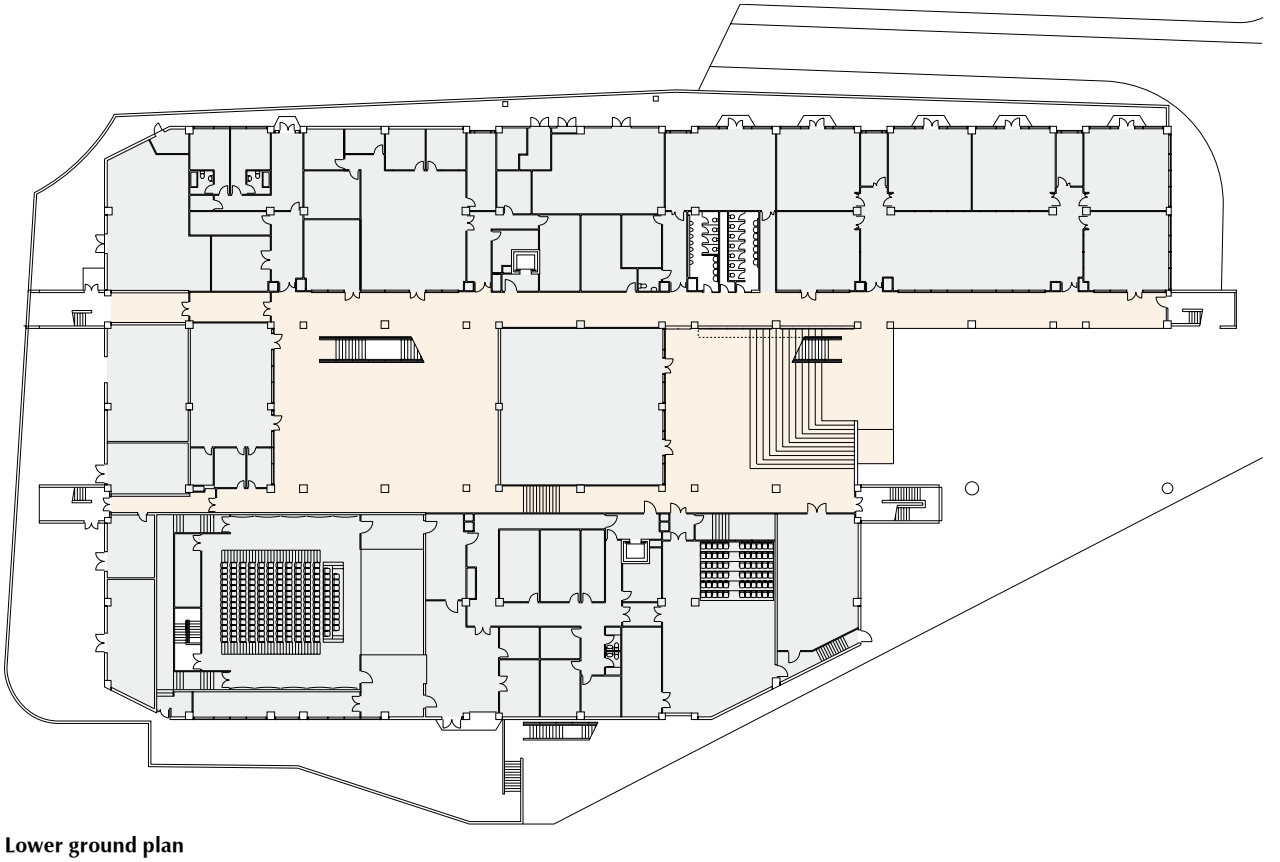
Section

Site Plan

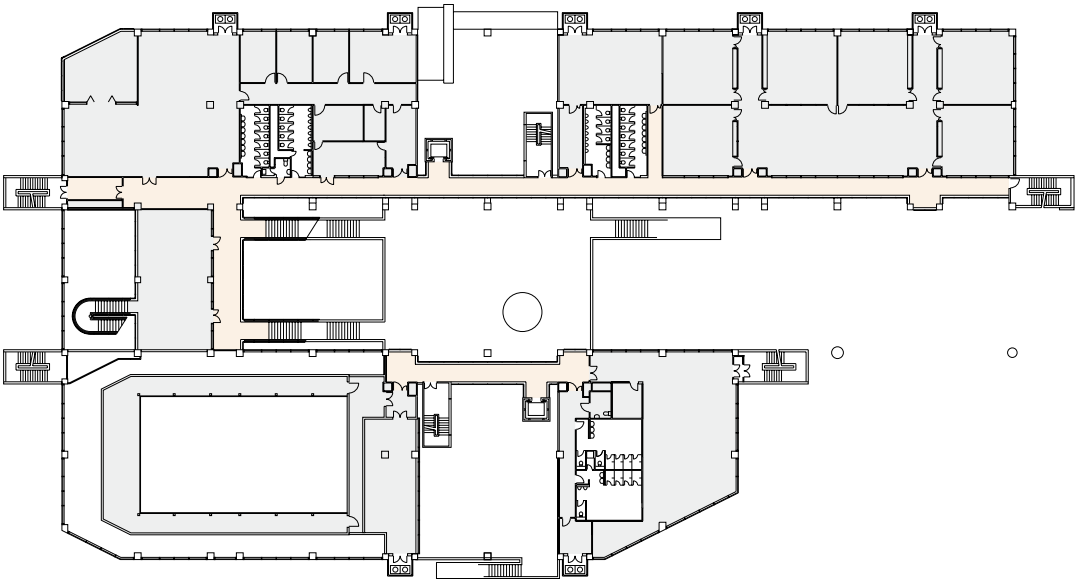

INDOOR RECREATION CENTRE
N5a
COMMUNITY CENTRE
N5b
HOTEL
TRANSPORT INTERCHANGE PODIUM
PIER
PART PLAN "A"
PART PLAN "B"
YI PAK WAN
SEA WALL
CENTRAL PARK
PS



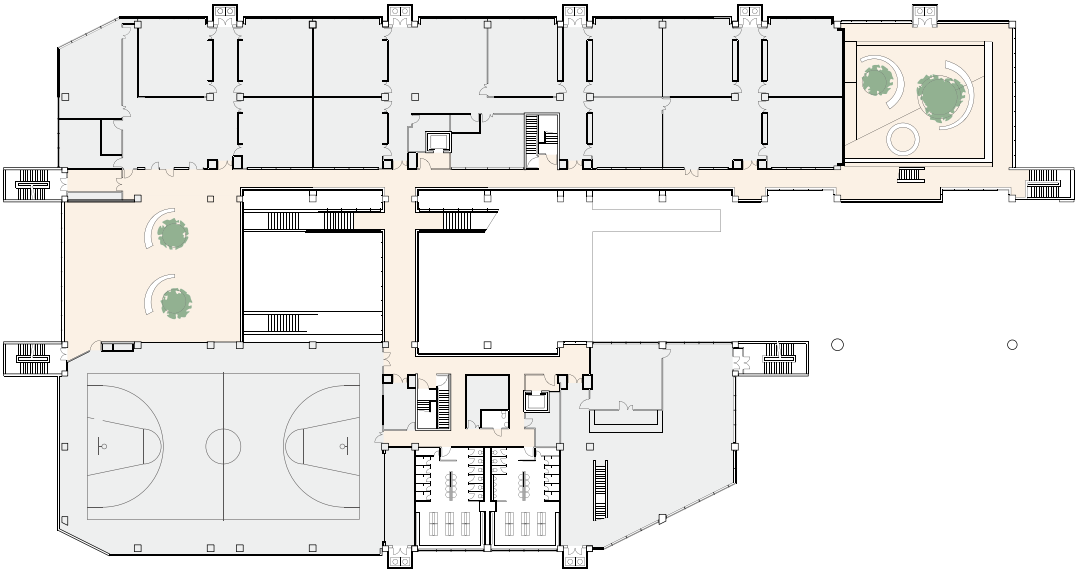
Upper ground plan



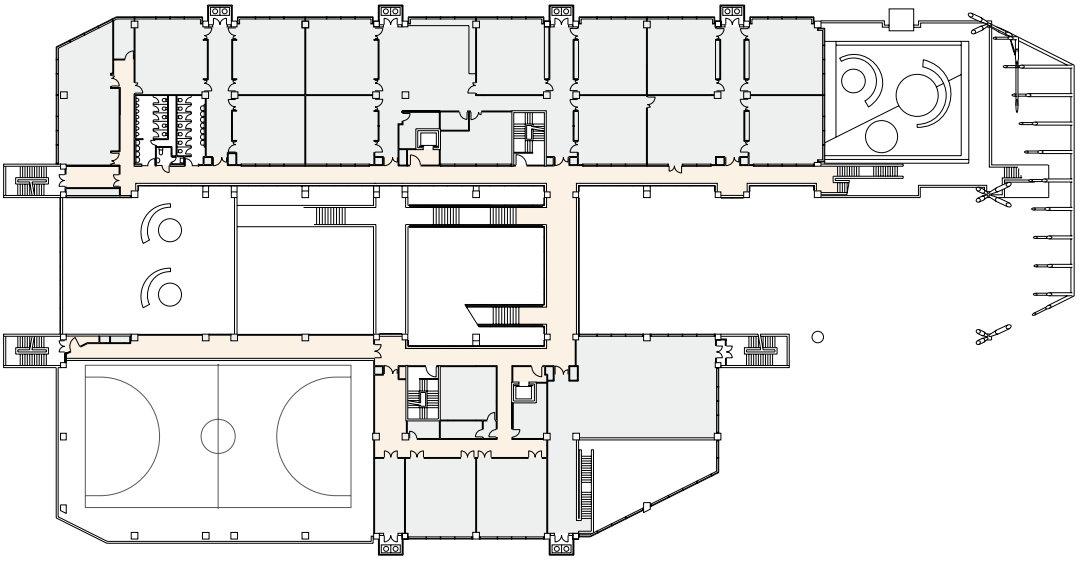
Lower ground plan



First floor plan

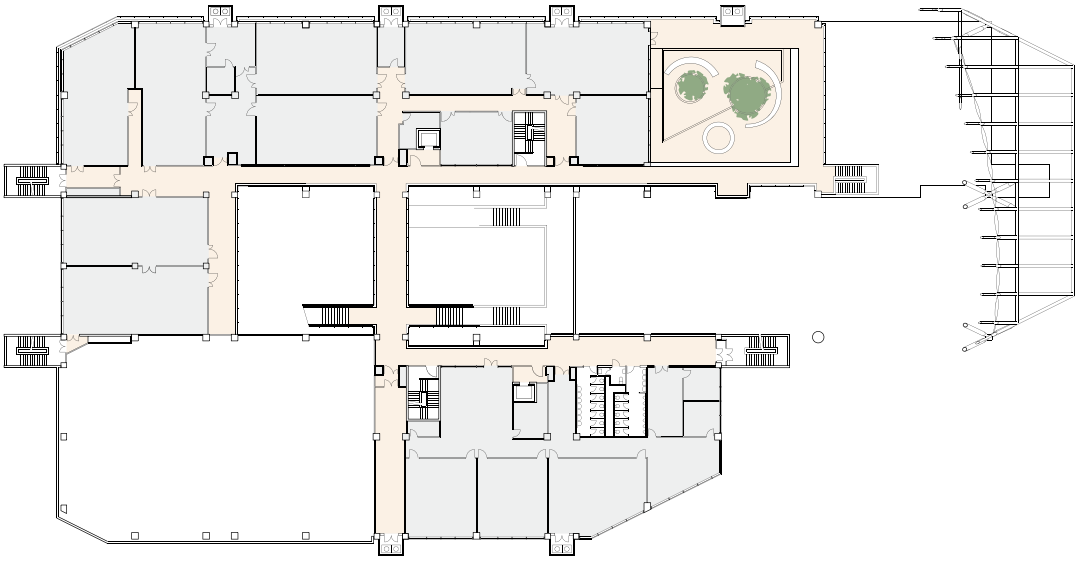


Second floor plan

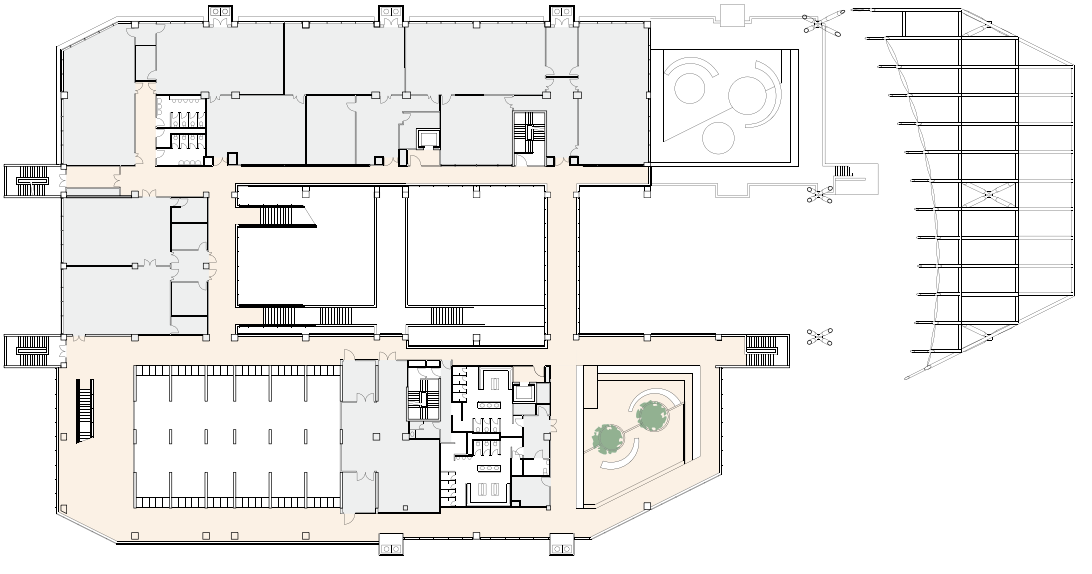


Third floor plan

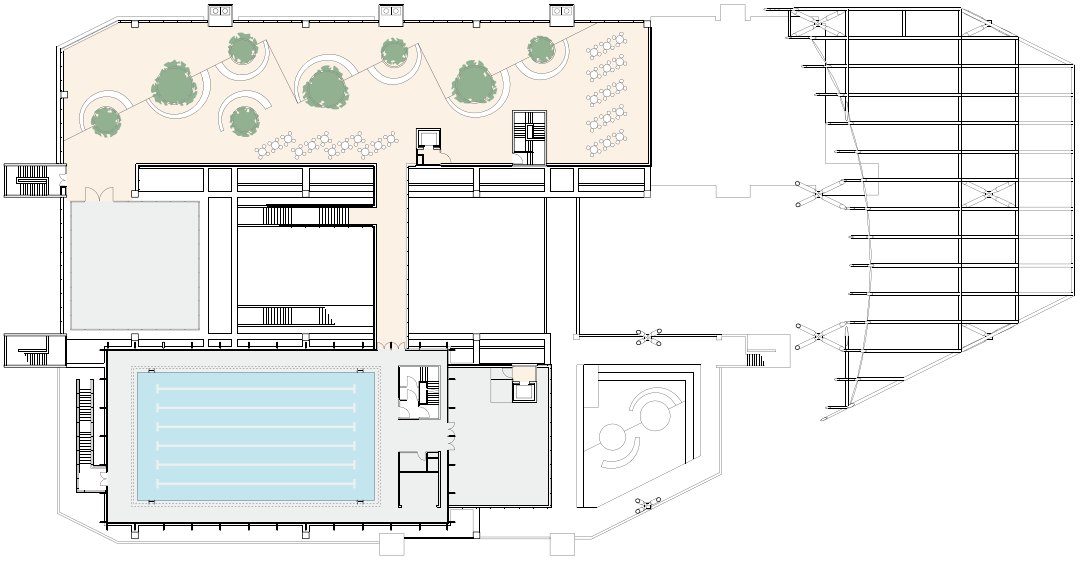
Fourth floor plan



Fifth floor plan



Sixth floor plan




Aerial

Contractor's Review – Discovery College

Everyone will be impressed at the first sight of the school building by its special outlook. A steel canopy in the shape of a segmental surface of a sphere covered the whole building at the roof level. The canopy was made up a steel frame and infilled with about 170 transparent plastic cushions. The cushions were made of a new transparent plastic material, ETFE. The whole system consisted of tailor made pillows framed by aluminum sections, supply pipes and an air compression system.

The reinforced concrete structure was in the U-shaped form and different floors set back in steps. Rooms, school facilities and different parts and levels of the building were linked by bridges and exposed staircases.

The construction of the steel frame structure and the ETFE system, which was

Unfurling

Fixing

sited at the uppermost level of the building, became the most challenging part of the whole project. In our construction work method and time planning, we can foresee the possible obstructions by the rainy weather in the wet season, difficulties of working at height, over 4,000 site welding joints and long site construction time involved.

We decided to prepare and submit the alternative design consisted of both welding and bolt joint connections. The whole roof was divided into smaller pieces which could be prefabricated and transported to site. The parts were welded or connected together to larger panels at floor level and transported by cranes to the upper roof level. The individual panels were then connected together by bolt joints. To ensure all joints or members were fabricate correctly within tolerance, the whole roof was fabricated strictly in accordance with the drawings and fully assembled once in the factory.

The ETFE pillows were prefabricated in factory according to the computer calculation where the tolerance are in plus or minus several mm out of 12 metre length of the pillows. Techniques in assembling of the steel

Inflating

Close-up

Pool

Underside

Underside

Performing arts centre

members and continuous monitoring of the dimensions or possible distortion during the whole roof construction was required. Due to limited jointing locations, making use of cherry pickers and some temporary platforms were sufficient for steel work already.

The ETFE canopy provided a shaded but with natural lighting and well ventilated environment frame was completed at minimum of 10 metres above the roof level and over 30 metres above the ground floor level. The provision and subsequent removal of the safe working platform to the soffit of the inclined canopy for the pillows installation become another challenge to the construction team. The project manager from Germany, who was an experienced engineer, worked with our site team closely and agreed on a method to lay, fix the platforms to the steel structure and subsequently remove them on work completion.

The completed canopy covered the whole roof or terraces areas at different levels. It sheltered the areas from severe weather but maintain a naturally lighted and ventilated environment.

Roof in progress