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Inside: Urban Portraits, Hong Kong: dynamic and shape shifting | Ying Chao Kuo; founding partner and principal architect, Bio-architecture Formosana, Taiwan | In Conversation with Loreta Castro Reguera and Manuel Perlo, winners of the Global LafargeHolcim Award, 2018 | Projects by BIG, Morphogenesis, Norman Foster and Renzo Piano

With projects from China, France, Hong Kong, India, Mexico, Taiwan, Thailand and Vietnam

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Hong Kong HKD72 RMB80 Indonesia IDR83,000 Malaysia MYR39 Philippines PHP500 Singapore SGD15 Thailand THB290 Vietnam 190,000

INDIA

Naturally ventilated interactive spaces

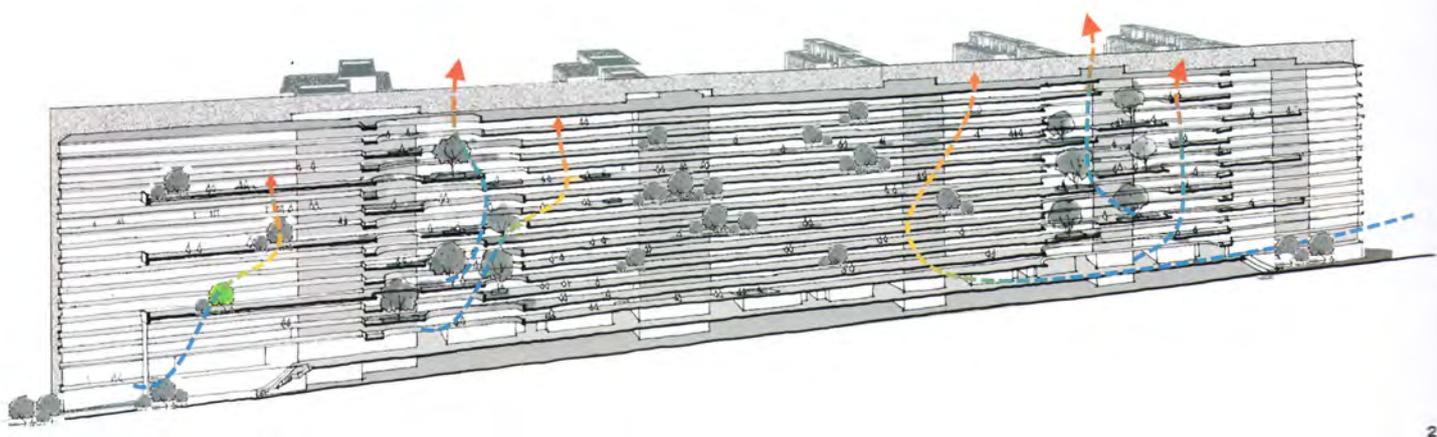
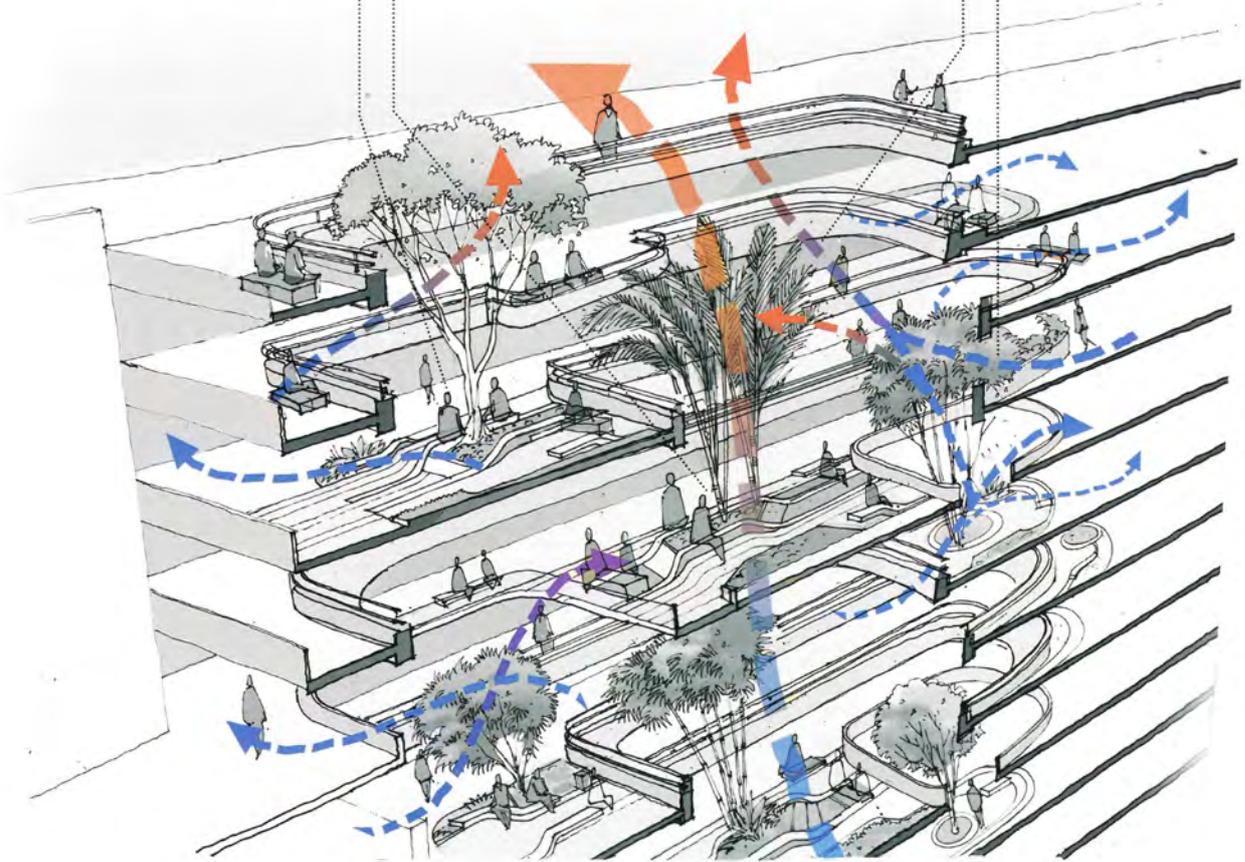
Visually connected break-out spaces across all floors

Indoor landscaping created as visual and psychological relief pockets

Passive day-lit corridors and transition spaces

Vertically distributed gardens create natural air filters enhancing indoor air quality

Staggered openings encourage air movement in common areas



SURAT DIAMOND BOURSE

India gives shine to 85 per cent of the rough diamonds sold globally, with Surat being the capital of this trade. Today, more than 92 per cent of the world's diamonds manufactured in Surat are traded in Mumbai and exported to countries across the globe. However, due to inadequate suitable office spaces and supporting infrastructure in the Bharat Diamond Bourse (Mumbai), traders are forced to travel every day from Surat to Mumbai. Thus the upcoming Surat Diamond Bourse—set to be the world's largest single office building—will accommodate over 4,500 offices of diamond traders, as it seeks to become the centre of the international diamond trade, ensuring that all activities of cutting, polishing and trading take place under one roof.

Situated on the national highway amidst the Diamond Research and Mercantile (or DREAM) City—an upcoming business district comprising offices, residential areas and allied facilities—the bourse aims to reduce the daily commute and be less disruptive to the social structure of the Saurashtra Patel community that comprises the majority of the traders. Forming the heart of the central business district, this project is not only an investment in the trade, but also in community dynamics. The project, once completed, hopes to provide employment opportunities and generate tourism in the area.

SPATIAL SCHEME

Given the scale of the development, the biggest challenge was to navigate large volumes of people within the trading time constraints. Functional proximities were governed by optimising travel distances from the site entrance till the farthest possible office module within seven minutes. The strength of the design strategy lies in ensuring that the building is truly unified both on the horizontal and vertical planes, through the ease of proximity to vertical circulation nodes. The approach employed is similar to an airport terminal, resulting in walkable corridors across 15 floors.

Establishing a strong connectivity, all nine towers are internally linked through a central spine with equidistant service cores. These cores ensure smooth integration and uninterrupted circulation, distributing services efficiently across all floors. The flow of people has been designed to minimise security such that once checked at the perimeter, traders are free to traverse the building multiple

times in a day. The architects' approach was to elevate the users' spatial and transitional experience across the building without highlighting the expanse of the structure. The central spine connecting all offices is designed as an interactive area comprising breakout spaces, green atria and a host of visual experiences. Dense vegetation within and around the building not only has a psychological advantage, but also improves the indoor air quality, purifying and adding to the oxygen levels. These large green atria act as relief pockets, creating natural air filters and passive day-lit transition spaces.

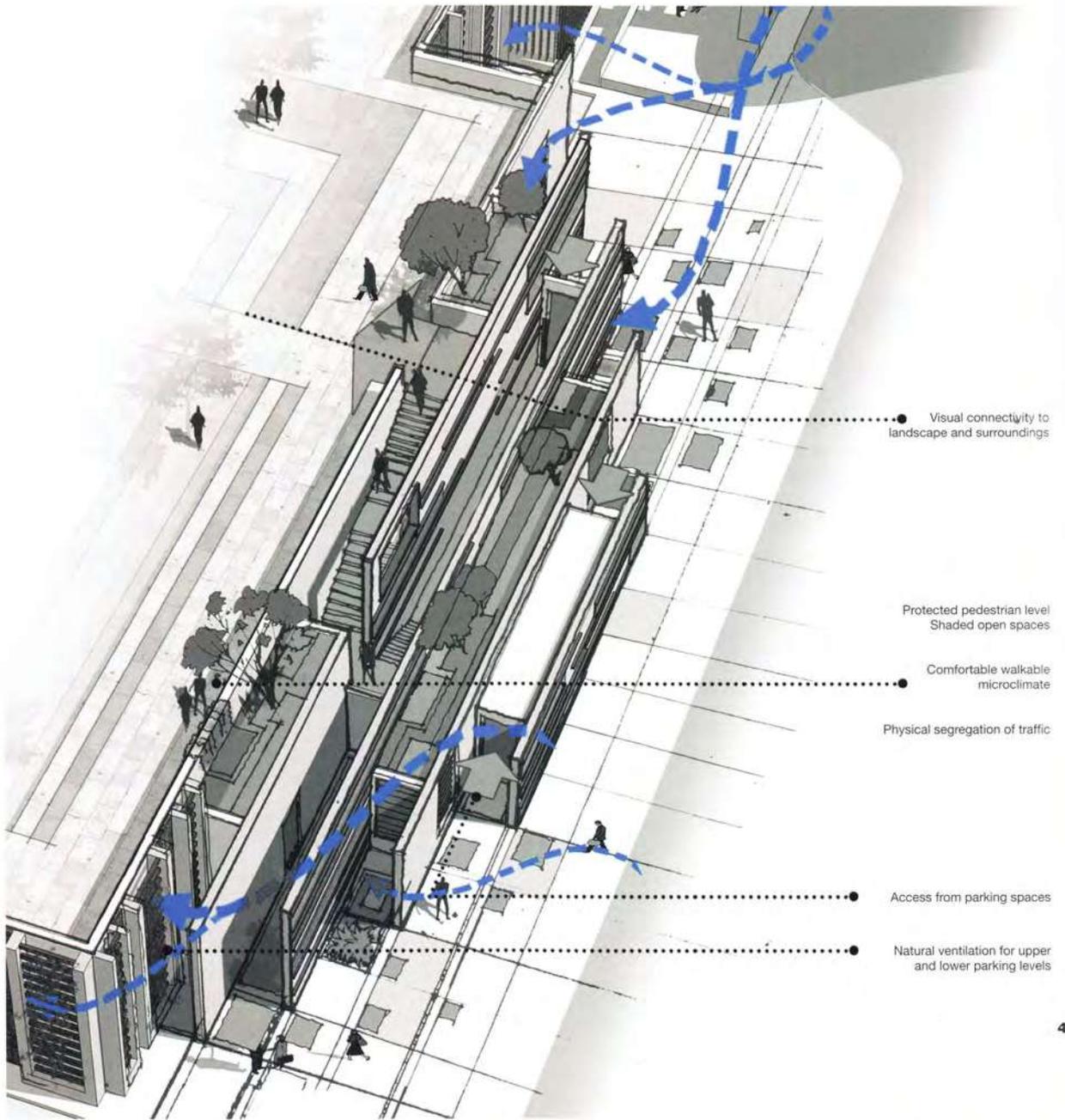
BUILDING & DESIGN

The design approach lays a strong emphasis on sustainability, the use of regionally sourced and manufactured materials, with minimal waste to landfill, and efficient fixtures for water and energy conservation as well as measures to improve occupant well-being. A robust and durable form is achieved by the use of red Lakha granite and Gwalior white sandstone that have been sourced and procured locally from the Deccan Plateau in India, a rich source of building materials.

1 Detailed cross section of the atrium **2** Axonometric section: Landscaped atrium enhances the cross ventilation of fresh air within the building and improves indoor air quality **3** Sunpath diagram



15 acres of landscape spread across nine courts



4



The project represents a smart approach to low-cost architecture designed with maximum spatial efficiency. Modular structural grids align efficient parking layouts, saving 25 per cent of the construction area. The naturally lit workspaces allow for flexible interiors, keeping in consideration any future changes in user requirements. The design of the two basements have structural innovations that help avoid the need for pile foundation, which would be typical in this area, thereby bringing the cost down.

The conceptual plan establishes a critical balance between efficiencies for structure, area, occupants and resources. Functions requiring specific space standards and a controlled indoor environment like office workstations have been designed with maximum spatial efficiency using an inside-out approach. A module was established based on the need of the traders, which was then replicated in various permutations and combinations across the entire structure. The designers followed an integrated design approach where the demand for resources has been reduced to a minimum by efficient passive design strategies and then catered to by highly optimised mechanical systems.

The firm's design employs passive strategies integrating solar control, air movement, orientation and creation of a productive microclimate. All offices have been oriented in the north-south direction. A combination of thermal mass and porosity in relevant areas results in low external heat gains and therefore lower cooling loads. Hybrid climate-systems integrate strategies for natural ventilation with energy-efficient mechanical cooling. Dedicated outdoor air distribution systems combined with heat-recovery wheel and passive dehumidification wheel will be used to supply fresh air. These systems will also help reduce the heat-purging load on mechanical systems by removing the latent heat load.

The embedded pipe system, in conjunction with dedicated outdoor air systems, is applicable where internal latent loads are moderate, providing excellent thermal comfort and energy conservation. Integrated HVAC systems involving radiant floor cooling and natural ventilation have been provided to achieve an efficiency of 700sqft/TR, consuming less than 1.0kW/TR of energy. Radiant floor cooling for office-enclosed corridors uses return chilled water of the conditioned office area, while cooling tower and condensate water are utilised in cooling the central spine. Elevated airspeed strategies enable higher thermostat temperatures without compromising thermal comfort. The transition from offices at approximately 24 degrees Celsius has been consciously raised to about 26 degrees Celsius in lift lobbies and common areas, and a further 30 degrees Celsius in the central spine.

The building, designed to IGBC Platinum standards, will feature rainwater harvesting, photovoltaic power generation, a grey water system, local construction materials, and other such efficient systems. A 600kW rooftop solar plant will generate up to 900MW of the annual energy demand, largely contributing to the net-zero targets.

GOALS

The Surat Diamond Bourse aims to be an exemplar for integrating high-density commercial architecture along with efficient climate-responsive design, as well as addressing various aspects of the United Nations Sustainability Goals, some of which are listed below.

Responsible consumption and production: The orientation optimises natural ventilation through air movement—an effective strategy for most of the year to induce physiological comfort all year round. Almost 30 per cent of the built-up area utilises radiant cooling, thereby reducing energy consumption and dependency on mechanical cooling systems by 30 per cent.

Life on land: The design incorporates an integrated landscape strategy that ensures comfortable microclimate during transition between various pedestrian zones while focusing on combating deforestation and reversing land degradation. Open landscaped areas shall reduce radiant heat by 10 degrees Celsius.

Partnership: This project is a shared vision of one community to make Surat one of the world's largest centres for the manufacturing and trading of diamonds. It is an inclusive partnership built upon the group's shared principles and values of a community. The Surat Diamond Bourse is a multi-stakeholder partnership, which is democratically run, and the project itself is being built with the committee as a client. The aspiration is to attract investment in the region to support the livelihood of all stakeholder companies.

No poverty: The local community has been engaged in the construction process. This has provided steady income and resources to ensure a sustainable livelihood. Building a project of this scale has led to a construction workers' colony that is enabling the informal sector. This is expected to multiply manifold as the project progresses. Care has been taken to employ local workers from the nearby communities. Materials such as stone used in the construction have been locally sourced. The stone working communities from the Deccan Plateau in India have been involved at all stages, from quarrying to dressing and application. The engagement hopes to eradicate social discrimination and increasing economic growth.

Sustainable cities and communities: The architects' approach aims at creating an all-inclusive, safe, resilient and sustainable centre. The project has been designed to be environmentally, socio-culturally and economically sustainable. The life cycle, trading patterns and complete circle of trust have been analysed. The trading patterns, being carried out in corridors and outdoor environments, have been considered. The culturally sustainability factor involves the understanding of how one single community runs almost the entire business of diamond polishing where cultural dynamics play a crucial role in their bonding. While it is one building, it is thought of as a city that supports the whole community.

PROJECT DATA

Project Name
Surat Diamond Bourse
Location
Surat, Gujarat, India
Status
Under Construction
Expected Completion
2021
Site Area
35.5 acres
Gross Floor Area
6,500,000 square feet
Building Height
81.9 metres
Client/Owner
Surat Diamond Bourse
Architecture Firm
Morphogenesis
Principal Architects
Manit Rastogi; Sonali Rastogi
MEP
AECOM, Mumbai
Civil & Structural Consultant
JW Consultants LLP
PMC
Masters
Vertical Transport
TAK Consulting Pvt Ltd
Traffic
TTEC
Cost
Gleeds Hooloomann Consulting (India) Pvt Ltd
Images/Photos
Morphogenesis

4 Concept diagram of podium
5 External perspective