



Harnessing nature Energy-efficient office complex Hyderabad, India

Regional competition Holcim Awards Bronze 2008 Asia Pacific; jury appraisal page 112

A new office complex on the outskirts of the Indian city of Hyderabad harnesses a resource the country is rich in, but which many architectural solutions have sought to escape in the past – the sun. In so doing, it manages to meet two seemingly conflicting objectives – to maximize shading as well as the use of daylight. The result is a significant reduction in energy consumption.

New York-based Skidmore, Owings & Merrill (SOM) is one of the largest architecture firms in the world. They built the Sears Tower in Chicago, New York's Time Warner Center and the world's tallest building at a height of over 800, the Burj Dubai. The SOM design for One World Trade Center, the first office tower to rise on the World Trade Center site is also currently under construction.

With seven offices worldwide, it is no surprise to learn the firm is active in India. SOM Director Mark Igou leads the firm's practice in India and currently oversees the Hill Country Special Economic Zone (SEZ) Office Complex project – a sustainable office complex in Hyderabad that sets new standards on the sub-continent. Mark Igou is a passionate ambassador for his work in India. "The country just buzzes with life," he explains.

"The focus here is on development. It's a rewarding experience because combined with a can-do attitude are rich traditions and a unique culture." Mark Igou

Global thinking, local action

Part of a global firm, Mark Igou has his feet firmly rooted in the soil where he works. "You can apply the old adage – think global, act local – to what we're doing here," he says. Although SOM is an international practice with global expertise, it also possesses a deep understanding of the cultural, environmental and political issues which are most relevant to India. "We can bring all this global thinking together to develop

solutions which best suit local conditions. Collaborating with some of India's foremost academics and research specialists to develop a meaningful understanding of local issues combined with the firm's legacy of design and technical innovation delivers architecture seamlessly integrated to local conditions and needs," Mark Igou explains.

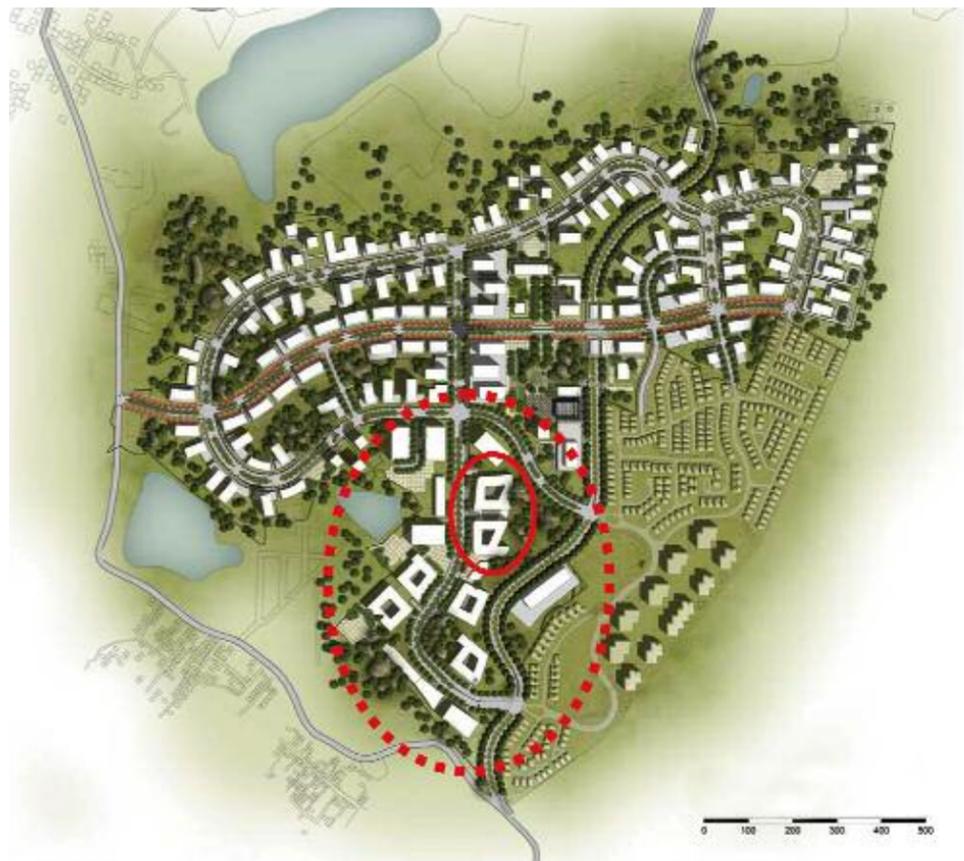
The solution proposed by SOM for the Hill Country Special Economic Zone (SEZ) office complex



the outskirts of Hyderabad is a case in point. SEZs are government-backed export processing zones to fast-track economic development and foreign investment. Some 100 such zones already exist; a further 250 are in development. As well as designing an iconic building for Hill Country’s developer, Maytas Properties, SOM are responsible for the zone’s overall master plan.

Enhancing the quality of life

The master plan takes into account local living and work practices together with an analysis of the current state of the region’s infrastructure. “People generally come to work by bus in India,” Mark Igou explains. “But the roads here don’t have the capacity to support all of the proposed development.” The SEZ, therefore, will only be able to function optimally if workers live in its vicinity – “otherwise they would



The new office complex is only one part of the overall master plan for the Hill Country Special Economic Zone.

“‘Walk to work’ is the tagline for the concept.” **Mark Igou**

be stuck in traffic chaos, which is neither economically nor environmentally sound.” The master plan envisions a mixed-use development programmed with public amenities such as parks, plazas and community centers. Living and recreational space for up to 30,000 people is anticipated. “Walk to work” is the tagline for the concept – and encouraged by an attractive streetscape design, higher quality of life is the goal.

Sustainable design in a contrary climate

Currently under construction, the Hill Country SEZ Office Complex will house around 3,000 workers across 110,000 square meters of space in the IT and IT-enabled sector. Its intriguing design

reduces energy consumption compared to the average Indian office building by 35-40%. This effectively reduces the building’s overall carbon emission, a concern emphasized by the government of India in



Mark Igou.

2007 when the Energy Conservation Building Code was established. The new office complex is on target to achieve LEED Gold rating, and promises to pioneer a change a new standard for sustainable design on the sub-continent. “This climate isn’t mild,” Mark Igou points out. “The design can be relentless – but an understanding of the harsh local climate informs the building’s numerous sustainable innovations.”

Natural or artificial lighting?

The SOM Team had four objectives for the design concept: to reduce energy consumption, improve worker comfort, ensure low maintenance costs over the life of the building, and decrease reliance on public infrastructure. “All our objectives were a response to the situation, for example to improve worker comfort.” Mark Igou explains that in many IT company offi



workspaces are cramped and there is little natural light. “To minimize direct sunlight turning the building into an oven, most offices have heavily tinted windows,” he says. The effect, however, is not just an issue of worker comfort – it means the

energy balance is disturbed. By keeping sunlight out, office spaces must be artificially lit, and in India, this accounts for some 60% of all energy consumption. “The load this places on power infrastructure is massive, and growing,” Mark Igou explains.

Outages are a common occurrence, disrupting work days and schedules, and a major problem for a country that wants to continue to grow. On the contrary, it contributes to decentralization and a desire to minimize reliance on government

infrastructure. “We are developing our own sustainable solutions.” Strategies to increase both worker comfort and building performativity include interior courtyards and light wells, and exterior shading devices based on vernacular Indian architecture.

cept, they will reconnect those who work within with the wider world outside. Yet, the idea is not new. The concept originates from India’s ancient architectural philosophy Vastu Sastra which seeks to create harmony between the built environment and the five natural elements – earth, water, fire, air and space.

by bridges. The layout is organized around a series of interior courtyards which allow sun-light to penetrate down into the building’s core – a solution which is optimized to harness the sun’s energy and decreases dependence on electric lighting. In this way, the design successfully meets two seemingly conflicting objectives – to maximize shading as well as the use of daylight.



Extruded model – east and north façades

Minimal reduction in solar radiation →



Stepped model – east and north façades



Extruded model – west and south façades

30% reduction in solar radiation →



Stepped model – west and south façades

Connecting inside and out

The building’s design is energy-efficiency in action. For its own sake, and beyond. “Nature is not the enemy,” Mark Igou says. “We spend much of our lives disconnected from the real world – moving from our air-conditioned houses, to air-conditioned cars, to drive to air-conditioned offices.”

As a result, the SOM team challenged this paradigm by understanding climactic challenges and developing design strategies that harness their potential. By harnessing the sun’s energy in their con-

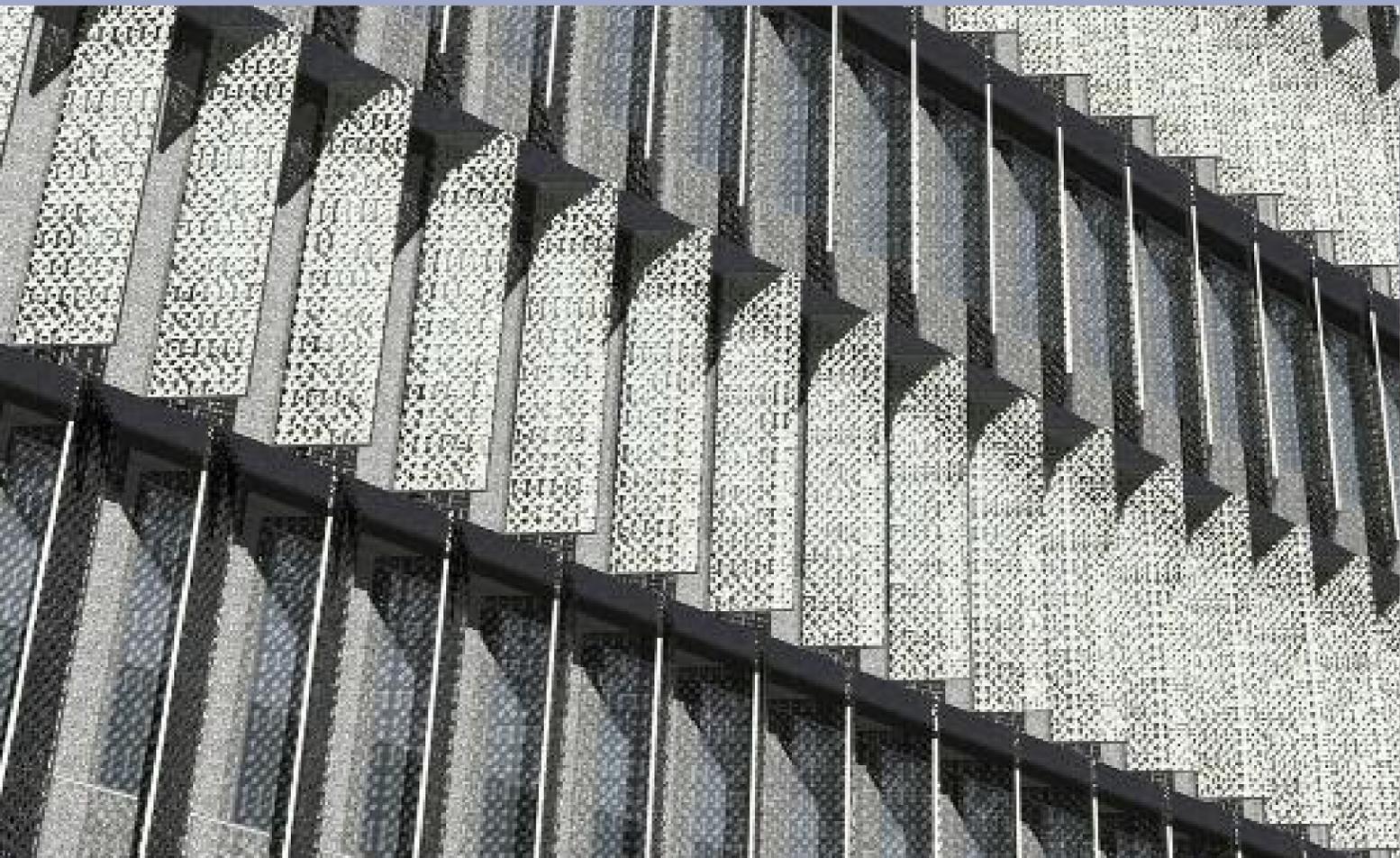
In SOM’s case this meant feeding a plethora of data concerning rainfall, wind direction, sun exposure and temperature into their computers. The modeled climatic conditions and analysis significantly informed the building’s overall design.

High impact, low-tech

The office complex is lean, and low-rise. It is constructed in two sections, connected

While this strategy is low-tech, the result for energy savings and building comfort are high-impact. The building workspaces are contained in the north-south wings in relatively narrow floor plates, 22 meters in width. The east and west wings, subject to high radiation levels, are occupied by cores containi

“Nature is not the enemy.” **Mark Igou**



Vertical shading fins are positioned at varying but fixed angles – they are inspired by the traditional perforated stone screen jali.

elevator shafts, stairs, toilets and other service rooms. Self-shading effects are achieved from stepping the building up,

outwards toward the south to reduce solar gains. However, it is the façade design which particularly stands out.

A system of vertical shading fins runs the full length of the building. The fins are

fixed to the building but the angle of their positioning, determined through extensive shading coefficient analysis, varies. “The ideal would have been to constantly vary the angles of the fins throughout the year – but that needs too much additional



The building is stepped-up towards the south – self-shading is the result.



“A good project is the product of a well-developed process.” **Mark Igou (pictured above)**

energy. This then became the most sustainable solution – achieving an 88% optimization with this method,” Mark Igou says. The fins are aesthetic as well as functional. They are inspired by the jali, a vernacular perforated stone screen, and incorporate the traditional Kolam pattern.

Better atmosphere, less turnover

Other contributions to the sustainable performance of the building focus on water use. Rainwater is harvested for irrigation and aquifer replenishment. Onsite sewage treatment enables the processing and re-use of grey-water for non-potable uses, including chilled water for air handling units. In addition, local materials and techniques are used in the

construction of the complex. The design aims to ensure low maintenance costs over a long building life as well as being flexible enough to not require structural adjustments over time.

According to SOM’s calculations, the higher capital costs to realize construction will be amortized in two years by the reduced energy consumption. Mark Igou is pleased with the progress. “We have created a better atmosphere in which people can work,” he says. Higher employee satisfaction is a welcome by-product of improved working conditions. India’s IT industry experiences significant turnover rates, not least because of this reason.

Passively and virtually green

The belief that cutting edge architectural design and energy efficiency cannot be combined is shattered by some contemporary office building designs. Skidmore, Owing and Merrill (SOM) has completed China’s first zero-net energy skyscraper in terms of operating energy in 2010. The Pearl River Tower façade captures wind to power turbines that help to reduce dependence on conventional energy sources. The building will also tap into sun, geothermal water aquifers and other available natural energy streams. But how is a design tested before the foundations are placed?

Passive energy design from computer generated modeling is a big part of the solution. Individual buildings are modeled with solar orientation and their exteriors to keep out the summer heat and allow warming light in winter. Interiors use parametric modeling to heighten passive solar access for maximum office productivity, and thermal imaging software to optimize energy efficient performance. Combined with geothermal heating and cooling designs, and integrated active photovoltaic skins.

Structure reflects the landscape

The complex takes full advantage of the contoured and rocky terrain, elevating the building as extensions of the contours themselves. A ribbon effect is created as the structure reflects the landscape into which it is grafted. “We’ve taken the opportunity to interpret traditions and harness the optimism of the country as much as the energy of the sun in our design.”

“Red thread of sustainability”

Coupled with that optimism is the red thread of sustainability that binds the whole together. Or as Mark Igou simply says: “A good project is the product of a well-developed process.”