



Campus for Infosys, Nagpur

## Green Architecture: Carrying Capacity as a Generator of Design Parameters

**Manit Rastogi and Rahat Varma**

Environmental design is deeply embedded in the conceptual framework and consciousness of the Morphogenesis design philosophy. Sustainability: defined as the ability to endure in local conditions and thrive in its lifecycle, the projects that are planned at the firm are maintainable in their individual ecosystems. Understanding that resources at most times are

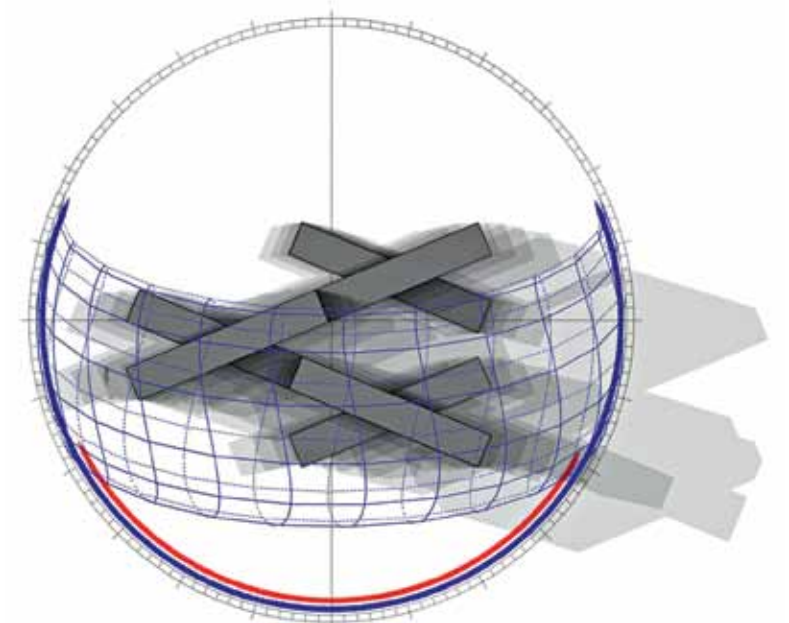
considered limited or depleting, the firm's guiding principle is 'no is more'. Constant emphasis is put on developing the practice of 'no energy and no water' and ideally, no waste.

Morphogenesis' approach to a project is to first estimate the energy needs of the building and subsequently question those energy needs. Passive design techniques are employed to

create a microclimate, which leads to a 10°C drop in the perceptible temperature on site. Following which the structure is passively designed with an optimised envelope, which then reduces the heat load by 50 percent or more, by adopting a WWR (wall to window ratio) that is lesser than 30 percent and an envelope load less than 1Watt/sq ft.

Orientation of the building and optimisation of form and envelope, are fundamental strategies deployed with the aim of maximising daylighting whilst controlling glare and heat ingress. Landscape design and horticulture selections are key design tools and play a significant role in creating environmental buffers. The focus and constant refinement of this approach over the years has resulted in Morphogenesis achieving EPIs (energy performance index) that are up to 70 percent lesser than the established Green rating benchmarks. Furthermore, all projects designed by the firm are enabled to switch to renewable sources of energy in the future.

For passive methods of sustainability to be implemented, each site needs to be examined for the availability of natural



Shadow range: June (9.00am – 7pm)

Overall massing shows effective mutual shading and creation of shaded inter-building spaces



1. CEREMONIAL ENTRY
2. LAKE
3. OPEN COURTS
4. AMPHITHEATRE
5. EMPLOYEE CARE CENTRE BLOCK
6. NATIVE TREE PLANTATION
7. MLCP AND SOLAR FARMS
8. EMPLOYEE ENTRY
9. UTILITIES
10. TURNSTILE BAY
11. PEDESTRIAN CANYON
12. SOFTWARE DEVELOPMENT BLOCKS
13. BOARDWALK

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SITE PLAN

All images and drawings carried in this article are of the Infosys campus, Nagpur. Architects: Morphogenesis

resources (such as rain potential and solar potential) in its local ecosystem. Based on the availability and ability to tap into these natural resources, an estimate of the carrying capacity of the land is evaluated. This estimated carrying capacity of the land, must be able to off-set the needs of energy and water consumption on site. Harnessing natural resources can be done in various ways, from construction of water reservoir or tanks that collect the surface run-off, to designate areas within the development for the installation of solar panels.

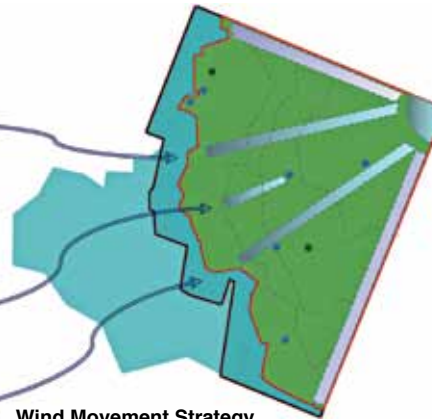
Let us take a case example of the Infosys campus in Mihan, Nagpur, where the client brief was simply 'to create the world's most sustainable office building'. Morphogenesis took this opportunity to test if a development of this scale (142 acres) could be net zero on water, net zero on energy and net zero on waste to landfill. The plan evolved from understanding the carrying capacity of the site; a capacity determined by functions like energy, water, geology of the land, along with essential rules of urban design pertaining to light, ventilation



## INFOSYS CAMPUS



Drainage Strategy



Wind Movement Strategy



Land Zoning



Land use Master Plan

and shading. Based on this, emerged a master plan for a working population of 20,000; which is net zero on energy, water and waste discharge.

The master plan relies on radial planning, in response to the natural topographical conditions and the prevalent wind directions specific to the region. This radial grid strategy

consumption of a typical office. This lowered requirement is serviced by a 30 acre on-site solar plant, resulting in zero energy from the grid. Zero water dependence is achieved by creating a reservoir on site. This reservoir is designed as a lake that adjoins the existing water tank in the west and is fed by effective rainwater surface run-offs.



aids in bringing down the perceivable temperatures and creating a micro climate on site. The  $\pm 22.5^\circ\text{N}$  orientation of the buildings stems from Nagpur's location on the Tropic of Cancer; this orientation combined with the building morphology allows for 90 percent of the building to be naturally day lit yet glare free. The building modules are largely column free spaces that are stacked on a four floor format and are vertically connected through an atrium and a staircase. The  $\pm 22.5^\circ$  rotation in the stacking structure, combined with geometrical transformation of translation, mirror and rotation, generates new grounds at elevated levels.

The development uses passive strategies to reduce energy and water requirements to one-fifth of the

The campus' performance remains at net zero at an EPI of just 25 kilowatt/sq m/year, the challenge to achieve this benchmark at such a large scale is enormous (the current typical EPI of buildings of a similar scale is 200 and The Bureau of Energy Efficiency (BEE) rating that GRIHA uses as a baseline is 140). This project has also been recognised through a publication; under the title 'Office in the Tropics'; for PLEA (Passive and Low Energy Architecture) Conference in 2014. ✚

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