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What is Tao Zhu Yin Yuan/Agora Garden Tower?

In November 2010, my company "VINCENT CALLEBAUT ARCHITECTURES" based in Paris was awarded as the successful tenderer for the construction of a new Sustainable Residential Tower located at Taipei. My firm was in competition against Zaha Hadid and Fernando Menis.

My project is currently under construction and completion is expected in September 2017.

The Tao Zhu Yin Yuan sustainable tower will carry 23,000 trees planted on the ground and balconies, which can absorb 130 ton CO2 annually in Taipei.

The Tao Zhu Yin Yuan is a prototype of « **Carbon-Absorbing Green Building** ».

Wednesday, Nov.16, a steel beam is lifted to the top of our Tao Zhu Yin Yuan Tower (Agora Garden Tower) at a ceremony marking a major step toward completing the construction of the apartment building in Taipei, Taiwan.

For this event, we take the following slogan as our main objective :

« **A small step of carbon absorbing, a big leap for anti-global warming** »

Global business sector is expected to be able to jointly promote and implement such action. With more hope that the government of Taiwan will be able to establish "absorb carbon and energy saving education" into the school's basic education.

Tell me about the inspiration behind this design.

The project is a perfect fusion of Western and Oriental Technology and Culture.

The tower is respectful of the Taiji Philosophy and is directly inspired by the structure in double helix of the DNA, source of life, dynamism, symbol of harmony revealing the notion of ultimate balance praised by the project.

Everything begin with poetry in 2010 during a walk in the street of Taipei by seeing a Samara fruit falling on this piece of land and drawing a spiralling movement from the sky to the earth.

Besides this moving geometry wearing a planted dress with sensual style, the project represents really a built ecosystem that repatriates the fauna and the flora in the heart of the city and generates a new nest of subtropical biodiversity.

My biomimicry leitmotiv is: "To Transform the City into an ecosystem, the districts into forests, and the towers is into urban trees"!

What challenges did you face in the design process?

The four main challenges was to create a SUSTAINABLE, GREEN, FLEXIBLE and ANTI-SEISMIC TOWER.

During the studies, the most important challenge was to develop with all the team all the structural, MEP, seismic, interior design and landscape concepts in order to reinforce these four initial concepts.

1. SUSTAINABLE

The tower presents a pioneer concept of sustainable residential eco-construction that aims at limiting the ecological footprint of its inhabitants by researching the right symbiosis between the human being and the Nature.

The tower is eco-designed to represent the perfect fusion between Climate, Landscape and Architecture. The sunlight, thermal and wind analysis have enabled us to improve the bioclimatic design of the project.

On the first conceptual section submitted for the competition, our intention was to design a vertical landscape from the sky lobby to the basement through all the inhabited levels.

2. GREEN

The floor area ratio preference of open space has been sacrificed by planting a green wall surrounding the residence. The area covered by plants amounts to 6,060m² for a green coverage ratio of 246%, which is equivalent to an urban forest park. A total of 23,000 trees and shrubs have been combined with grass areas, forest trails, artistic landscaping, and recreational areas. A natural waterfall is connected to a warm water pool in the basement. A modern healthy Feng Shui was created by employing natural elements to generate a breathing building and ensure the mental and physical health of residents.

3. FLEXIBLE

The objective of the Client, BES, was to develop 2 big units, of 550 square meters each one, completely free of columns, pipes and walls presenting a maximum of flexibility for the interior layouts of each tenants.

We have thus developed two typical plans:

The typical uneven floor plan with vierendeel beams along longitudinal facades

The typical odd floor plan without vierendeel beams.

The cross sections through floors presents the integration of the planting beds in the thickness of double decks to maximize the indoor-outdoor connectivity towards the skyline.

The spiraling mega-columns, located at both ends of the storey, are doubled by oblique shafts wrapping the skew pipes.

These skew shafts are transformed into continuous vertical skew green walls all along the height of the tower.

During all the year, the species selected by our landscape architects for the landscape balconies will create various scenery with the seasons change.

With the hyper-flexibility of the typical storey free of columns, walls and shafts, all the interior layouts are possible!

For example, it is possible to locate the living spaces longitudinally along the south facade, transversally along the core or in the axis of the apartment or in double height.

All the layouts are always in connexion with the surrounding suspended gardens.

For the swimming pool and the fitness center located in B1, for the parking levels and for the entrance lobby at ground floor, it is for each facilities the same philosophy to strengthen the indoor/outdoor connectivity with the Nature.

The central core has been designed to separate totally the vertical circulations into two housing units on the same level. This core is fixed (it does not pivot). But in order to ensure the rotation of the storeys floor by floor, it is surrounded by a (naturally lightened & ventilated) horizontal circulation loop welcoming the entry foyer dedicated to each unit. This buffer loop enables thus to set the main entrance always in the axis of each apartment and this despite of the 4.5 degrees rotation storey by storey.

The core is wrapped by a double skin, developed with our facade consultant, enables to temperate passively the vertical circulation inner spaces.

4. ANTI-SEISMIC

Finally, one of the most important challenge was to create an anti-seismic tower. To ensure a completely safe environment, EPS isolation cushions, of the same grade is used for US roads and bridges, have been employed in accordance with the shock resistant design of the 4th nuclear power plant in taiwan. The design can resist a peak ground acceleration of 400gal and provide maximum protection against 7 grade earthquakes (maximum strength in Taiwan).

The structure remains elastic and does not incur damage.

What are the benefits of this unique, double-helix building structure?

According to the point of view of the pedestrian from the 4 surrounding streets, the tower changes of face and proposes 4 amazing profiles:

The "V" profile, the "X" cross profile, the elliptical profile, and the pyramidal profile.

This twist of 90 degrees answers to four major objectives:

1. The first objective is to be perfectly integrated in the North / South pyramidal profile of the Building Volume and to respect all the urban setbacks.
2. The second objective is to generate a maximum of cascades of suspended open-air gardens, not part of the F.A.R. (floor area ratio). Thus, the planted balcony surface area can easily exceed the limit of the required 10 percent.
3. The third objective is to offer to the residents exceptional panoramic views on the skyline of Taipei by multiplying the transversal views, especially towards the very close Taipei 101 tower and the Central Business District.
4. The fourth objective is to generate from a flexible standardized level a progressive geometry with luxuriant green corbels which assures the intimacy and the confidentiality of each apartment by avoiding the indiscreet vision axes.

From the simple and standardized element of the double helix of housing superimposed vertically and put in successive rotation of 4.5 degrees level by level, a multi-facial morphology appears all in convex and concave curves.

You call yourself an "archibiotect." What does that mean to you?

Archibiotic is the new transdisciplinary approach invented by myself in 2008.

« ARCHIBIOTIC = ARCHitecture + BIotechnologies + Technologies of Information and Communication »

The oldest living beings appeared 3.8 billion years ago. In terms of durability, the human societies are thus far behind the nature that made its proofs.

Based on these billions of years of Research and Development by Nature, an Archibiotect studies new innovation approaches aiming at modifying the carbon balance, guide us to three additional scales operated by the contemporary biotechnologies: the shapes, the strategies and the ecosystems.

1.1. **The Biomorphism** : is based only on shapes from the Nature.

Ex : The vertical wings of the Steppes Eagle, the spiralling and hydro-dynamical shape of the nautilus, the ventilation of the termite mounds.

1.2. **The Bionics** : is based on living strategies, natural manufacturing processes.

Ex : The plasticity of the lily pads or dragonfly wings, the hyper-resistant structure of the hives in bee nests.

1.3. **The Biomorphism** : is based on mature ecosystems and tends to reproduce all the interactions present in a tropical forest such as : the use of waste as resources, the diversification and the cooperation, the reduction of the materials at their strict minimum.

Ex : the autogenerative agriculture, the reproduction of the photosynthesis process (main energy source of humanity), the production of bio-hydrogen from green algae.

Whereas the primary reason of architecture is since time immemorial to protect Man against Nature, the contemporary city desires by its emergent methods to reconcile finally human being and the natural ecosystems! The architecture becomes metabolic and creative! The facades become as intelligent, regenerative and organic epidermis. They are matters in movement, recovered by free plants and adjust always the shape to the functionality. The roofs become the new grounds of the green city. The garden is no more placed side by side to the building; it is the building ! The architecture becomes cultivable, eatable and nutritive. The Architecture is no more set up in the ground but is planted into the earth and exchanges with it the organic matters changed in natural resources.

How has reception to this style of ecological architecture changed over the years?

The ecological architectural is not a trend. It's a necessity!

For this project, I realized energy conservation, carbon reduction, and eco-friendly concepts through exceptional and novel green building design concepts with the goal of perpetuating the Confucian spirit of generational succession, continuation of the past and ushering in of the future, and long life and prosperity.

My objective is to build a prototype of green, dense, smart city connected by the TIC and eco-designed from biotechnologies!

The Tao Zhu Yin Yuan presents pro-active objectives to answer to the following nine major items:

1. **Planting Green** : Encouraging more production of Oxygen, greater absorption of CO₂, cleaning the air, achieving the homeostasis for urban climate warming effects
2. **Water Conservation**: Improve the capacity of the land to store water, to provide the ground with a rich microbial environment able to support organic life and to reduce the need of drainage.
3. **Daily Energy Efficiency**: Reduce the amount of energy needed by the air conditioning system and lighting, Encourage re-use applications of waste energy.

4. **Carbon Dioxide Reduction:** Use the design and construction processes to achieve improvements whereby reductions in CO2 emissions result, and by lightweight minimized architecture, resiliency, and re-usability of materials to accomplish reduces CO2 emissions.
5. **Waste Reduction:** Refers to the production during the construction process of Cut and fill non-Balancing Design, wasted soil, building materials waste, and easily dissipated dust particles.
6. **Water Resource:** refers to the ratio of the building's actual water use to an average water use, or the "water consumption conservation ratio".
7. **Wastewater and garbage Improvements:** establish tools to certify a hygienic environment control and improve impact assessment.
8. **Protection of the Biodiversity:** Improve the ecological quality with porous environment encouraging ecological ponds, water ponds, permitting multi-scaled biodiversity, protecting native species and flora. This index is organized into 5 thematic categories: "Ecological Network", "Micro-organism Resting Place", "Vegetation Diversity", "Soil Ecology", "Ecologically Symbiotic Architectural Design".
9. **Refinement of the Interior Environment :** refers to evaluating the indoor environmental quality for noise protection, ambient lighting, air flow, interior design, air quality, and environmental factors which may impact on occupant health or comfort.

The eco-friendly project is eco-conceived by the integration of bioclimatic passive systems (as natural lighting and ventilation for the core and the basement, rain water and grey water recycle, e-low glass, wind chimney in the double curtain wall for the natural ventilation) but also by the renewable energies (as the big photovoltaic solar roof and canopies, the automation for the energy saving, and lifts utilizing energy-saving regenerative drives, green walls, landscape balconies, HVAC control Communication Systems, and smart home user interface facilities).

The Tao Zhu Yin Yuan sustainable tower will carry 23,000 trees planted on the ground and balconies. All these trees and shrubs can absorb 130 ton CO2 annually in Taipei like an urban forest.

In addition, the intrinsic CO2 has been reduced by using high performance steel (developed in Japan) for the anti-seismic structure and adopting the use of biosourced materials "cradle to cradle" for the architectural interior layouts.

The green certification of this project is:

1. U.S. Green Building Council, LEED Gold
2. Low Carbon Building Alliance, Diamond Level

There are a number of notable vertical gardens in Asia... Seoul's "Skygarden" for example. Is this a bigger trend?

In 2050, we will be 9 billion of human beings on our blue planet and 80% of the world population will live in megacities.

After the COP21 in Paris, it's time to be in action face to the climate changes, to invent new eco-responsible lifestyles and to bring Nature in our city in order to increase the quality of our life with the respect of our environment.

Of your many eco-concepts, how many have been/are being built? Which are your favorites, and why?

Currently we develop the following green projects. They are under studies or under construction :

- TAO ZHU YIN YUAN, TAIPEI :
http://vincent.callebaut.org/object/110130_taipei/taipei/projects
- THE GATE RESIDENCE, CAIRO :
http://vincent.callebaut.org/object/141029_thegate/thegate/projects
- HYPERIONS, NEW DELHI :
http://vincent.callebaut.org/object/160220_hyperions/hyperions/projects
- THE BOTANIC CENTER, BRUSSELS :
http://vincent.callebaut.org/object/160929_botaniccenter/botaniccenter/projects

The most ambitious project is the new masterplan for PARIS 2050.

Following the Climate Energy Plan of Paris aimed at reducing 75% of the greenhouse gas emissions within 2050, the « 2050 PARIS SMART CITY » project is a research and development work on the integration of high-rise buildings with plus-energy (BEPOS) producing by solidarity all together energy for the surrounding areas. In order to fight against the urban heat-island phenomenon by increasing in the same time the density of the city in the long-term, this study presents 8 prototypes of mixed towers. These towers repatriate the nature in the heart of the city and integrate from their design the rules of bioclimatism and the renewable and recyclable energies in short loop through innovative systems. Turned to new social innovations, they invent first new eco-responsible ways of life to implement the quality of life of the city-dwellers in the respect of the environment.

This R&D masterplan is a commission of the Paris City Hall. This masterplan is developed by « Vincent Callebaut Architectures » agency with the green engineering consultant «Setec». The history and the evolution perspective in 2050 of the high-rise buildings in the context of Paris Climate Energy Plan and the 8 plus-energy and/or energetically connected prototypes are presented below :

- PARIS SMART CITY 2050, PARIS :
http://vincent.callebaut.org/object/110130_taipei/taipei/projects

How does the city of Taipei benefit from this building?

Taipei is for me the « New Asian Silicon Valley ». The Taipei 101 tower was the symbol of our 20th century and I hope that the Tao Zhu Yin Yuan will become for the City of Taipei at the beginning of our 21th century the new ecological symbol of the right symbiosis between Humanity and Nature.

The project was approved after only one review and highly praised by the Taipei Urban Design Review Committee.

The projects gets the Recognition with the Golden Stone Top Award in the Taiwanese Architecture planning and design category presented by China Educational, Scientific and Cultural Development Association (CESDA).

This remarkable building represents a life journey. Its value not only lies in its outstanding design or technologies but also in its spiritual and artistic achievements and breakthroughs. Tao Zhu Yin Yuan conforms to green building indicators and goes beyond current trends of Asian-Pacific housing, providing a glimpse into the future.

