# STERLING

## ENGINEERING CONSULTANCY SERVICES PRIVATE LIMITED

Newsletter Issue : 14 | April 2017

## Editorial

## INNOVATION IN ACTION!

Our April Issue brings you a repertoire of projects that have been recently completed - many of which are Award Winning. From the organically shaped Titian Office in Bangalore to the clean cut lines of Lodha Altamont, in Mumbai, we have been able to deliver quality projects on time to Clients with varied needs. Projects like the 1000 smartly designed homes for Brigade Panorama, the PBEL Housing Complex in Hyderabad and Ahad Euphoria in Bangalore have pushed the envelope for us in order to achieve great quality and design.

There is no doubt though, that we constantly look at our leaders to guide us at every stage with their refreshing ideas, often coming up with “out-of-the-box” solutions. They in turn promote a culture in the organisation where creativity and innovation take centre stage, ensuring that we remain agile and flexible to cater to the ever changing need of our fast paced projects. Do read through the article on the cantilevered auditorium for Adani Corporate House and the one of it’s kind PBEL project in Hyderabad. At the end of the day, we are grateful to be able to provide technically apt solutions.

The importance of teamwork and team spirit has never been felt greater than in present time. While the office environment is fast paced and demanding, there is a strong human connection and a bond between colleagues. The design studio is buzzing with activity and action. Our staff are more than just co-workers; they are part of our extended Sterling Family!

Last but not the least, forming the core of our professional practice is our CODE of ETHICS and in this issue we present an extract from the Paper presented by Girish Dravid at Mysore which highlights the importance of our value systems and integrity as human beings as well as an organisation. After all, our work does reflect our core values which are about “Human Engineering” as much as they are about Structural Engineering!

**Dr. Deepali Hadker**

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## ADANI CORPORATE HOUSE, Shantigram, Ahmadabad *Manish Negandhi*

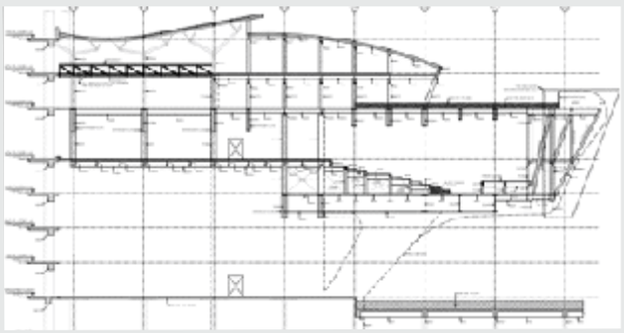
View from east

Ariel view of project

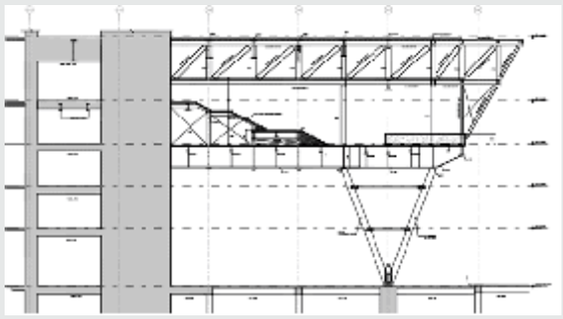
Designed by Archgroup International, the project was sub-divided into North and South Wings and a West Wing and an Auditorium on the East. North and South Wings house various group companies and consist of Ground and 4 Office Floors with a Roof top Cafeteria. The West wing houses a stilt parking for executives, a triple height executive atrium, data centre floor, 7 office floors and an exclusive Director's floor at the top. The Auditorium is planned with executive dining on it's roof. A separate entrance and elevators provide access to the Chairman. A large two level basement caters to the parking requirements of the whole development and also houses the services.

**Structural Scheme :** The major highlight of the structure is the Auditorium. As per the original design, the Auditorium was planned as a cantilevered structure supported on inclined shear walls on the fixed end. The approximate size of the auditorium is around 32 m x 30 m. Cantilevered trusses 10 m deep were proposed on the two edges anchored to the shear wall. Steel plate girders were planned to support the floor deck of the Auditorium floor and also supporting the floating columns for the roof of the Auditorium.

Subsequently, a pair of tree columns were introduced to facilitate the speed of construction and to economise the structure. Main public drop-off for the office is below the Auditorium. Auditorium structural system comprises of Plate girders at the floor level and trusses at the roof level to support the executive dining area. Due to large spans, structural steel became an obvious choice. Plate girders spanning from core to the arms of the tree columns formed the primary supporting system. Secondary beams spanned between girders to support the auditorium floor and raking slab. Trusses were fabricated using B/up box sections. The depth of the truss is approximately 4.5 m. Plate girders spanned between the trusses. Secondary beams spanning between plate girders were provided to support the deck slab construction.



The other interesting aspect of the structure is the four floor high Public atrium spanning 30m, and triple height Executive atrium spanning 16 m which supports a heavily loaded Data centre above it. In the public atrium area, Architects wanted large column free space. However some utilities had to be housed over the atrium at fourth floor. Hence, deep girders spanning 30 m were proposed and the 4th floor was suspended from these girders.



**Section Through Public Atrium**

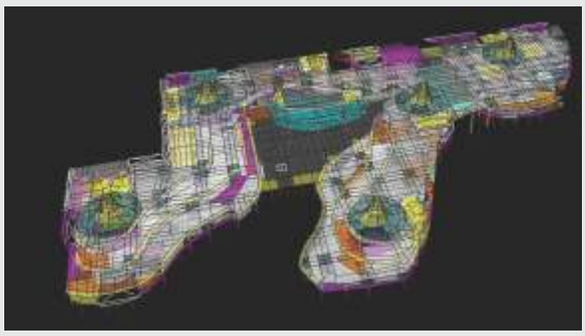
In the basements, a Flat slab system with drop panels has been used. In the extended podium area at ground floor, conventional beam slab system was proposed to take care of landscape loading and for fire tender movement. For the North and South office wings, conventional Flat slab with drop panels was used to maximise the clear height of the structure. The roof of North and South Wing supports the Cafeteria on the 5th floor. The roof of the cafeteria is supported on a space frame which is supported on four tree columns.

As the West Wing is the tallest, it has been separated by an expansion joint along the perimeter where it meets the North and South Wings. In the West Wing, large column free spans were required on account of triple height executive atrium from first floor to Fourth Floor. Data centre for the group was proposed to be housed at the 4th Floor. To support large spans, heavy loads and expedite the speed of construction, steel beams along with deck slab construction were used. This enabled the site team to ensure that construction of the floor was completed without resorting to triple height staging and avoid substantial back propping requirements. The flooring system for the office floors in the West Wing is Post-tensioned flat slab with drop panels. This was found to be the most economical solution for the large spans.

**Co-ordination :** This was a fast track project hence, the Schematic stage and Tendering stage were completed within two months and work on site commenced within six months from the conception. Continuous co-ordination with the design team and site team ensured smooth execution. Rigourous co-ordination with fabricators ensured that minimum time was lost and the fabrication commenced parallely.

## TITAN CORPORATE OFFICE, Bangalore *N. N. Nagendrakumar*

This Corporate office building in Electronic City is located on a 6.17 acre site which has a lake on the eastern side and the road towards north. The three storied building profile is very organic and each floor of the structure has a terrace garden. These terraces are connected through external staircases giving a feeling of "stepped rice fields". Columns are floated at every floor to achieve this cascading effect. These floating columns are made of 350mm diameter pipes with concrete fill and are supported on RCC girders below. The floated metal columns at the edge of each floor are connected by doubly curved R.C.C beams to the profile of the building. A special detail has been worked out to address the junction of metal column and R.C beams.



Another unique feature of the project is the design office, which is a completely glazed island unit and appears as though it is floating in a water body along the central spine. This is designed as a steel structure with deck concrete above and the entire unit is supported on V shaped columns below. This island unit is connected to the main building at terrace level through a composite beam to achieve lateral stability. Steel plates are introduced at the center span of these beams where they cross over the court yard below. Only the steel plate is seen from below giving a clear view around.


The design office is accessed from the main building through a bridge at first floor level, which is suspended from the Terrace. The central spine along the clear water body edge is a linear double height space with 500 diameter circular composite columns.

The various departments like watches, jewellery, eye ware, etc have their own zones but are connected to the other departments through voluminous atriums, with double conical (Cone in cone) skylights above. These skylights bring in light and allow hot air to escape - they also house lifts and metal spiral staircases. A green wall is proposed on the western side of the building to shield the usable spaces from the harsh western sun.

The lake and green terraces create an adequate micro-climate, thus minimizing mechanical cooling. Solar panels are planned above the terrace along the western side and above the service yard on the ground floor to generate on-site energy.

### Sterling's Team

Design Engineer - Prashanth P Asst. Design Engineer - Balaji
Site Engineer - Udayashankar QS - Srivathsa Draftsman - Sreedhara, Archana

## PBEL-INCOR City, Hyderabad

*Nilesh Karmalkar and Chandrashekhar Tambe*

This huge project is spread over 24 acres of land in Hyderabad and Sterling has been working on this project since May, 2008. The large residential development is divided into various phases (I to V). There are 15 Residential buildings of 21 stories each, a sprawling landscaped podium over the entire 24 acre land as well as Clubhouse and Centralized STP. The Podium is a RCC framed structure with beams, slabs and columns and is designed for heavy landscape and Fire engine loads.

Residential tower structures are designed with reinforced concrete shear walls connected to each other with slabs which act as in-plane rigid diaphragms for each of the floors. The construction of all towers above podium level is done by using Aluminium Formwork system for faster construction.

Each tower has an impressive double height entrance lobby. There are ten apartments on each floor and they have views from three sides. The apartments are connected with a narrow passage to the lift core, hence, in order to have better behavior under lateral loads, diaphragm slabs and tie beams were introduced after every five floors. Cantilevered shear walls spanning up to 2.5m from main building's shear walls and columns supporting decks are important elevational features of the project.

As built material consumption was matched to the initial quantities given at tender stage and these quantities were well optimized in consultation with Israeli Consultant during Phase I.

Clubhouse roof slab panel size is 15.6m x 11.3m for which a waffle slab system with 600 deep rib beams spaced at 2.0 m in either direction is used. Centralized STP is an underground structure of 1600 KLD size.

So far, construction has been completed for 7 buildings, the podium around 10 acre lands, and almost 50 % of the clubhouse and STP while the construction for the 8$^{th}$ building and balance part of the clubhouse is under progress. The towers of PBEL City have been recognized by the Indian Concrete Institute as the most outstanding structures of Andhra Pradesh in 2012.

**Sterling's Team**

Chandrashekar, Panchal, Rahul, Nilesh, Pradeep, Anand and Ketan

## Code of Ethics *Girish Dravid*

### Introduction

Think of the millions of visitors to the New Empire State Building in New York or the innumerable footsteps of the stock brokers running up the fish-bone staircases of the Stock Exchange Building in Mumbai, for all these numbers of years! Think of the monumental bridges crossed by millions of travelers all across India since last 150 years. The hallowed halls of education, commerce and administration have been instrumental in shaping the history and economies of nations. Engineers are the craftsmen of civilizations facilitating progress and ensuring welfare. The ultimate responsibility of an engineer lies in recognizing the monumental impact of his creation on the life and times of the present day and many more generations to come.

There has been a spate of building collapses in the recently completed year 2016 causing many casualties and loss of property. There have been other instances of major fires breaking in the buildings, killing several lives. There were news of railway accidents due to faults developed in the tracks and other media reports where innocent two wheelers succumbed to death due to potholes on the roads. In most of the cases, the indication a professional engineer can identify, is that there could have been instances of negligence on account of poor quality of engineering planning, design, execution and administration. It is time for the professional engineers to introspect and review their own code of professional ethics, in order to uphold the increasingly falling dignity in the eyes of public.

### Model Code of Ethics for Engineers

Engineering societies worldwide have published and adopted their own Ethical Standards since then, notable among them are The Royal Academy of Engineers, National Society of Professional Engineers, Association of German Engineers, Association of Professional Engineers, Scientists and Managers and Engineers Australia. Today, almost every engineering association has its own code of ethics, mission and vision statements which are imposed on its members. Institution of Engineers India also has a code of conduct. Engineering Council of India formed a special Code of Ethics Committee in 2002 and has come up with a Code of Ethics for professional engineers in 2003. On the state level, professional engineers are required to obtain a working license, which demands adhering to certain rules and regulations while practicing as a professional engineer.

### Fundamental Principles of Code of Ethics

Upholding and advancing honesty, integrity, honour and dignity of the engineering profession is the fundamental objective of forming a code of ethics. The principle stresses the need for using the knowledge and skill for the human welfare and environment, being honest and impartial, serving the public, employers and clients with fidelity, striving to increase the competence and prestige of the engineering profession and supporting the professional and technical societies of their disciplines. As can be deduced from the above, the primary concern behind the principle is that of survival of the profession with dignity in the eyes of the public. This becomes the backbone to ensure the perpetuity of the profession and for acquiring credibility in order to survive as a respectable service provider to the public.

### Fundamental Canons of Code of Ethics

The following seven canons form the gist of all Codes of Ethics, adopted by various organizations.

1 Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.

2 Engineers shall perform services only in areas of their competence.

3 Engineers shall issue public statements only in objective and truthful manner.

4 Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.

5 Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

6 Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.

7 Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

### Overlap of Business and Professional Ethics

Business strategies of an organization can override the professionally ethical demand, such as securing a contract at unreasonably lower fees, at the same time making the client believe that the scope of services mentioned in the Request For Proposal can be fulfilled in such low fees. It is but common sense, that it is not possible to deliver the wholesome services that a professional engineer is expected to provide within fees below a certain threshold. Even if the consultant strives to provide minimum required services mentioned in the RFP, it is expected for him to work out the profit and loss for each of the projects that he undertakes. The expenses towards salaries of employees, software and hardware costs, establishment maintenance, conveyance and travel, communications - are becoming increasingly disproportionate to the remuneration that a practicing engineering organization can receive. In such a case, the business policy of picking up projects by bending Canon No. 5 in the above table may take precedence. What may follow later during execution of the assignment, can be imagined - not enough option studies, no thought to optimization by applying different techniques and theories, less attention to details and buildability, employing cheaper and consequently inexperienced and less-skilled resources, avoiding internal review processes and other methods of cutting costs, that result in sub-standard work. This is but one scenario that could ensue out of business policy taking over the ethics of fair competition.

### Communications and Whistle blowing

A client appoints a consultant to act as his agent, to build an engineered product which conforms to accepted standards, industry practices, that is safe to use, is a quality product and is sustainable, at the same time consumes optimum resources and finances and can be delivered within the practically assigned period of time. In all this, the focus of the engineer must be on the creation of the product which conforms to the design brief. In case, the engineer feels that any consequence of his actions or non-actions, during the execution of the assignment may affect the project adversely, it becomes his duty to inform the relevant officials promoting the project immediately about the factors affecting the project, their causes, their effects on quality, time and cost, and remedial measures if already thought of. This requires an inherent integrity and honesty in the engineer to communicate such news promptly to the client without regard to possible backlash on him personally.

The professional must have the integrity to put the ethics of profession ahead of personal interest. While the client may be upset with the knowledge that he will have to undergo unplanned additional spending and time on the project, in the long run, he will be thankful to have avoided a probable mishap, ruining his reputation permanently.

### Agent of Client

A professional engineer is appointed by the client to serve his need to build an engineering product that is performance-perfect, aesthetic, useful and economical to produce. Canons of Code of Ethics for engineers prescribing continuous upgrading of knowledge and skills imply that the engineer knows the best possible techniques of design and manufacture of the engineered product with quality, speed and least cost. For this purpose, it is expected that the professional engineer invests time and money in subscribing to various knowledge sharing organizations, magazines, books, purchases latest official software, spends on buying powerful computing machines and communication and printing accessories, sets aside budget for attending educational and informative seminars and in general be in the forefront of design, production and maintenance technology. But being updated has a cost - both in terms of time and money, which are least available for a practicing engineer in our country.

Another important responsibility of an engineer is to take the right decisions irrespective of whether the client feels them to be in his immediate interest or not. Sometimes, the engineer may choose not to guide the client with the fear that it may create unpleasantness or he may lose client's favour. However, such actions are contrary to the integrity of the engineer. Guiding the client in the correct manner, asking him to follow the laws of engineering, abide by the rules and laws of land pertaining to the development of the engineered product - are certainly the primary responsibilities of the engineer and will truly define him as the agent of the client.

### Field of Expertise

Although a canon says that the engineer should restrict his services in the field of his expertise, it becomes necessary to learn some other subjects just to assuage the pressure from the client. A good example is that of structural engineers, who are expected to provide consultancy on waterproofing and fire resistant treatment. Author does not wish to comment on such transgressions, as he himself is not an expert in other fields to judge others who resort to such practices.

### Peer Review or Value Engineering

While appointing a peer reviewer is a welcome move by the client, the conflict may arise depending on the attitudes of the players - the designer and the peer reviewer. Generally, the peer reviewer has a different set of procedural beliefs than the designer's and this creates situations where a sort of compromise is reached in the end rather than an agreement. Example

can be given in cases where a structural design engineer wishes to be conservative based on his past experience in the field and wishes to resort to manual calculations since he believes in them. On the other side, a peer reviewer belonging to a new order, solely believing in analytical software and insisting on removing any margins over and above the software based design requirements may lure the client with comments that promise economy in designs, often portraying the designer as committing a monumental blunder and acting against the interest of the client. Here, both are surely acting as agents of the client and intend only well. However, the conflict may lead to compromise or sub-quality product with respect to belief systems of both the individuals.

In some instances, there have been perceptible efforts on one or both the parties to project themselves superior to the other, resulting in erosion of mutual obligation of respect to professionals. There have been examples, where a peer reviewer ended in being appointed as a designer on the same project on which he was a peer reviewer. This becomes a transgression of scope, even if it was the client who was instrumental in bringing about such a change of role.

Professional ethics becomes all the more important when one is asked for his opinion on someone else's designs and detailing. It surely is unethical to deal with such requests without the knowledge of the original designer.

### Relationship between mishaps and Code of Ethics

Mishap is an outcome of extreme negligence or ignorance towards technical appropriateness of the engineering designs and documents. Not having enough updated technical expertise, lack of communication, absence of integrity and honesty, not performing a whistleblower's function, not acting as agent of client in true sense and defaulting on other such codes of ethics can be easily tracked to be attitudinal and non-material reasons towards such incidents.

### Last words

It is important for all professionals to be aware of their responsibilities towards public, clients, customers, associate professionals in allied and supplementary fields, employers and employees. Having a Code of Ethics for the organization for which one works and is associated with, will bind the practicing engineer in the responsibility towards the public. An engineer must nurture and undertake the responsibility of serving the public and the nation with the confidence that the fraternity is equipped with such moral and ethical values that defines courage and pride in their truest sense.

## KALPATARU INSPIRE, Mumbai *Amit Surlekar*

"Kalpataru Inspire" is a landmark office space located in Santacruz East, Mumbai and designed by renowned architect - Aedas from Singapore. With 9 levels of office space, aesthetic landscaped gardens, grand entrance lobby with ample space for parking this has become a delightful office space in the heart of the city.

The plan footprint of this building is 38m x 48m with floor to floor height of 4.2mts. Three levels of basements accommodate parking as well as MEP services. Column positions are co-ordinated not only to match the parking layout but also the office planning thus avoiding the need to use transfer girders. Some of the structural highlights of this building are:

- Large column spacing of 8.4m x 13.5m which gives freedom and flexibility for planning interior spaces. Only 6 columns have been provided in a carpet area of 12,000 sq.ft.
- Combination of strong RCC shear core and moment resisting frame symmetrically located on either side of the office space gives lateral stability to the structure.
- Post-tensioned flat slab with drops and wide band beams on periphery is chosen as gravity structural framing after comparing different flooring systems.
- Isolated column footings resting on rock having SBC of 120 MT/sq.m. connected with stitch raft serve as foundation for the building. Raft has been designed for buoyancy effect considering water table upto ground level. Pre-stressed rock anchors have been provided to optimise the counterweight on raft to negate uplift water pressure due to buoyancy.

Large overhangs for office space at 5th and 8th floor level have been supported by introducing "Hanger" columns from the floor above . Composite transfer girders spanning almost

### Sterling's Team

Louisa, Saurabh, Rohan, Nishant and Amit Surlekar

## AHAD EUPHORIA Sarjapur Road, Bangalore

A luxurious apartment complex, Ahad Euphoria boasts of using 78% of the plot area for walking, open spaces, parks, swimming pool, health club, meeting rooms, mini theatre, water bodies, amphitheater etc., and has only 22% of actual building area. The lavish 40,000 square feet club house is situated at the focal point of the development.

There are 12 wings of 16 floors each and 685 flats with each wing accommodating a combination of 1,2 and 3 BHK homes. The top floors of 8 towers have a pent house with a large space for a private terrace on the 16th floor.

Each wing is interconnected by a connecting bridge at alternate floors, which gives freedom of access to any wing without getting out of the building. Structurally, the buildings are RCC framed structures with shear walls and columns connected to each other through a network of RCC beams and slabs. The slabs act as in-plane rigid diaphragms for each of the floors. The Lifts and the staircases are the key lateral load resisting elements.

The concrete grade used for construction was M40 and M35 for columns and M25 for beams and slabs with Fe500 as steel grade. The structure was designed in accordance with IS 1893-2002 as an earth quake resistant building for seismic zone – II.

Due to poor soil conditions, pile foundation was proposed – mainly using diameters of 450mm and 600mm. Large diameter piles were ruled out, since driven cast insitu piles were used. Initial and routine load tests were conducted along with pile integrity tests to ascertain and reconfirm the pile capacities. Expansion joints were provided at appropriate locations to take care of temperature changes without disturbing architectural intent.

**Sterling's Team** Design Engineer - Sunil Kumar Draftsman - Shalini & Santhosh Site Engineers - Udayashankar & Nagaraj Quantity Surveyor - Srivatsa

## OUR MEN IN BLUE!

### Sterling at the Engineer's Premier League

A very exciting cricket league was organised by Shanghvi Associates and Consultants Pvt Ltd. The event had over 16 participating teams from all over Mumbai.Our engineers and draftsman practiced very hard and won their first match against – SACPL.

Our 14 players were led by captain Amit Surlekar and they were – Sujit Patil, Amit Shinde, Mubeen Lambe, Rohan Hadgal, Saurabh Prabhudesai, Asif Khan, Vishal Thakur, Diptesh Mhatre, Nishant Mhatre, Dhawal Patoliya, Jitendra Kini, Kunal Thakur and Anand Raut. Our engineer Dhawal Patoliya was declared "Man of the Match"!

The Poster for Sterling Cricket Match


Our Cricket Team


Man of the Match Dhaval

## Lodha Altamount, Mumbai *Santosh Kadam*

Lodha Altamount - is a prestigious residential tower recently completed by Sterling, on plot - One, Altamont Road, Mumbai for Lodha Developers. Designed by German-Iranian architect – Hadi Teherani, the property consists of 52 residences fully serviced by hospitality experts, St. Amand.

The 40 storied structure comprises of 3 Basement floors, ground floor and 8 parking levels in which, 4 podiums are for residential parking purpose and the rest for GCP parking. The roof of the podium level houses a garden, club, swimming pool and fitness centre. There are 32 residential floors above the top podium level with 2 service floors and 2 fire check levels.

The total height of the structure is approximately 197m, from ground which also includes a 29.7m tall steel Crown Structure above the roof. The building has a T-shape plan with projected widths of 31m by 24.5m about the main structural axes for the typical levels.

An all glass facade maximizes the panoramic views, of the Arabian Sea and the city. The building structure is built around a RCC core which provides the primary lateral force resisting system. The basement slabs, ground floor and first 5 parking floors are planned as RCC flat slabs with drops supported on RCC columns. The floors above, from 6th to 8th floors (for mechanical parking) are structural steel floors with M.S. plate decking. Thereafter, the residential floors are of composite metal deck and structural steel beam framing supported by composite columns of steel and concrete.

As it was unavoidable to extend a few typical floor columns through the parking floors to the raft foundation, steel transfer trusses had to be introduced to support such columns. Above 5th floor, the RCC core, in conjunction with two columns inter-connected to the core by outriggers resists the lateral loads in the Y direction since it is necessary to stiffen the building in that direction to control drift. In the X-direction the RCC core alone resists the lateral loads. These two columns are composite columns. Below 5th floor, the RCC core and RCC columns are acting as a combined unit to resist the lateral loads.

The structural composite columns are designed as gravity columns to take up the total gravity load with encasement including the outrigger columns. The column supporting outriggers have been designed for axial forces arising due to lateral loads. The significant challenge in this project was designing the embedded connections of the outrigger steel trusses with the RCC core walls. Sequential analysis was used to evaluate the realistic design loads in the members of Outrigger trusses and the columns supporting Outrigger trusses.

The building is completed in record time, due to advance construction technique of composite structure along with climbing RC core and the construction cycle followed for 9 levels was

- Concreting for Lower 3 level metal deck.
- Laying Metal deck, laying reinforcement mesh and welding studs at middle 3 levels.
- Erection of steel column and beams for Upper 3 levels.

The RCC slabs and composite metal deck slabs act as in-plane rigid diaphragms for each of the floors, connecting the columns and the RCC core. The founding strata is hard rock with SBC of 3500kN/m2. The foundation is RCC raft foundation of varying thickness, under the entire building footprint, designed to transfer the loads to the founding strata and resist upward water pressure due to perched water during rainy season.

**Girish Dravid** who is the Chairman of **CTBUH, India**
was one of the speakers at the conference in Sri Lanka.

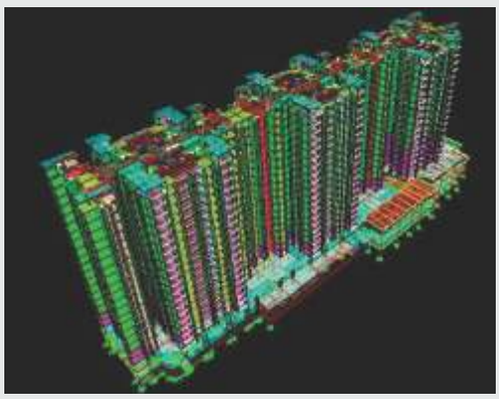
This was the first time that CTBUH chapters from two different countries joined hands to organize a tall building event. Note the STERLING logo which appears in the sponsors' list, which is being circulated worldwide.

CTBUH Sri Lanka & CTBUH India Present - The Regional Tall Buildings Forum – 2017

## BRIGADE PANORAMA, Bangalore *Ramesh B*


Brigade Panorama, is the perfect example of how form and function complement each other to accommodate all the necessities of modern living, while ensuring the efficient use of space. This is a 11 acre development with 1000 smartly designed 2 and 3 Bedroom Apartments across seven G+18 towers, ranging from 1030 – 1650 Sq. ft.

There are two wings called north parasol and south parasol which are separated by a stream running through. Architecturally there are four towers in south parasol and three in north parasol. The buildings have separate basements and podium with landscape and drive ways for Fire engine movement around the two wings.



All the external and some of the internal walls are considered as structural walls. To accommodate the car parking, driveways and club house are proposed within the foot print of the building, load transfer girders are proposed at first and third floor level to float the structural walls keeping both architectural design intent as well as Client's requirements in mind.

The building is essentially a R.C.C. framed structure with walls and columns, which are floated on girder beams at first floor level in tower A, B, E, F and G and on third floor in tower C and D.

The columns and shear walls are connected to each other with a network of R.C.C. beams and slabs with the slabs acting as in-plane rigid diaphragms for each of the floors.

### Sterling's Team

Design Engineer - Ramesh B Asst. Engineer - Sudish K T
Draftsman - Rashmi S, Anitha T V Site Engineers - Srivathsa, Mallikarjunappa
Quantity Surveyor - Srivathsa

## Dhirubhai Ambani International Convention And Exhibition Centre, Mumbai *Hemali Iyer*

DAICEC is a Multi utility project, coming up at BKC on a large 75,000 $m^2$ plot. The highlights of this 8 million sq. ft. built-up area project are the State of the Art Convention and Exhibition Centre (CEC) and a theatre with a seating capacity of 2000 people! The other facilities include High End Retail, Cinemas, Offices and Residences. A winding Hill Road is another unique feature of the project.

The construction was put on Fast-track which reflected in the drawing delivery schedules. The first GFC of the foundation for this mammoth project had been given out in January 2014 and the foundation works at the pre-excavated site started by May 2014. Today, we can proudly say that due to the diligent effort of the entire team, Phase I, which consists of 70% of the Shell and Core construction has been completed. The CEC and the Theatre are both in Structural Steel and were always in the critical path of construction. The entire Structural Steel system of the CEC and the Theatre, along with the deck slabs and Level 7 Podium slab (barring one bay), fire-proofing works is complete and the secondary steel works for the Interiors and the façade related works have already started. The Basements which house the parking, utilities and MEP services are also complete and the interior works are in progress. The secondary steel work, to receive the MEP services is also in progress in the Basements. The shell and core works of the North and the South Retail blocks (Level Ground to Level 4) is complete and the interior works are to commence in those areas.

Phase - II consisting of the Residential Towers and the Office Tower has undergone Design changes following the Clients direction. After many coordination workshops and design changes, Sterling has managed to complete the Detailed Design stage of Phase II and the construction is about to commence immediately. Meanwhile, the Office Tower construction is already in progress. Given the frantic pace of construction and the expected delivery schedules for Phase II, we are expecting the shell and core works of the entire project to be completed by June 2017.

**Sterling's Team**

Nitisha, Saurabh, Rasika, Jitendra, Vincent, Vinayak, Dinesh, Vinod, Ahsaan, Somnath, Ravindra, Amit, Shrikant and Hemali Iyer



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