Issue XXIV September 2012 FOR PRIVATE CIRCULATION ONLY

Relationships

Civil Engineering Construction Contractors

Dear Colleagues,

Recently the **Cost Control Department** (C.C.D.) was formed with a healthy mix of experience and youth. The main purpose for the formation of this department was to more stringently monitor costs against those budgeted and present reports on the same in a more stream-lined fashion.

With the current economic climate, clients are becoming more and more demanding. The pressure on the site team to achieve timely execution is much more intense. As such they cannot give the much required attention to the budgeting and project monitoring aspects. It is precisely for this reason that the importance of the C.C.D. cannot be understated.

As the name suggests, the primary function of this department will be to "**control cost**". This would be done by the budgeting and periodic monitoring of Core Resources which constitute a major portion of the project cost. By doing this, checks can be put in place to manage costs before they are accrued and not in the "post-mortem" fashion as we used to.

In our opinion, the C.C.D. would work as the link between the H.O., R.O. and the project sites. Our secondary function would be to ensure smooth flow of accurate data between these three units. The new E.R.P. called **Xpedeon Enterprise** will be a valuable tool which shall enable us to perform this function.

However, for successful project monitoring, the support of the Project Core Team along with the Project Co-ordinators is a must. Our storekeepers, who are the guardians of the major resources (material) and do a fantastic job day after day, require the support and expert guidance of the Project Core Team to perform their jobs competently.

Through the introduction of **Xpedeon**, we have placed a greater responsibility on the Quantity Surveyors. While we have some of the most capable and proficient QS's in the industry, they still require the guidance of their respective Project Managers and Project Controllers. Without their guidance, all the work the QS's perform will not receive that polishing touch it needs to achieve fruition.

The Project Manager / Project Controller is (P.M./P.C.) the head of the site family. It is under their capable guidance and time tested expertise that the project can flourish. It is their responsibility to guide, direct and nurture the storekeepers and QS's under them. This is where the buck stops, where the responsibility lies. Every step of the Project life cycle involving virtually every member of the Project Core Team requires the approval and expert insight of the P.M./ P.C. Without their guidance, the project becomes like a captain- less ship in a storm; headed for certain disaster.

A lot of importance needs to be given to the Prestart Budget as it becomes a reference for all future Project Monitoring. On award of the project, the Site Core Team under the guidance of the P.M. along with local C.C.D should jointly analyze the Tendered Budget. This joint exercise is a must to bridge the gap in data and reporting that currently exists between the H.O., R.O. and project sites.

Appropriate modifications need to be made to this budget as per site conditions and as per the expertise of the P.M./P.C. After consensus is reached that the revised budget created is practical and achievable, the same should be sent to the Regional Head (C.O.O./C.E.O.) and the Directors for their final approval.

Upon their approval, this budget then becomes the Prestart Budget which would become the Bible for that particular project.

Along with the budget, the Site Core Team and C.C.D. shall also prepare a Work Plan and monthly cost and revenue projections which shall act as a basis for all future monitoring throughout the life of the Project. These too shall be approved by the Regional Head (C.O.O./C.E.O.) and the Management before being finalised.

On a finishing note, we would like to extend our continuing support to all the Project Core Teams. There seems to be an increasing trend of distinguishing between "Office Staff" and "Site Staff" in our organisation. Personally, we hope to completely eradicate such trends.

We are all part of the same family and we should not lose aim of our final goal.
And that is to successfully and profitably deliver a Contract.

Navile Shroff & Devdatta Sanzagiri
Cost Control Department

In retrospect... 1927 - 2012

A BAI Stalwart passes away . . .

Mr. Beji Edulji Billimoria aged 85 passed away on 18th June 2012. He was the founder of M/s. B. E. Billimoria & Co. Ltd., a leading construction company having a pan India presence. He was a pillar of strength to BAI. The Billimoria family are traditional supporters of BAI - Mr. Beji Edulji Billimoria's father Mr. E. M. Billimoria was President of BAI during 1944. Mr. Beji Edulji Billimoria was Chairman of BAI Mumbai Centre during 1982-83. He was a Founder Member of National Institute of Construction Management and Research (NICMAR), which was founded in 1984 and was on the Founding Board of Governors. He was the Secretary of the Organising Committee of the IX All India Builders' Convention, held in Mumbai in 1981. He was also Secretary General of International Federation of Asian and Western Pacific Contractors Associations *i.e.* IFAWPCA during 1990-91. Under his stewardship BAI successfully hosted the 25th Convention of IFAWPCA in February 1991 at Mumbai and BAI created a surplus of Rs. 14 lacs. Mr. Beji Edulji Billimoria was a stickler for quality, but he was like a coconut - hard from outside and soft from inside. His landmark constructions dots the Mumbai city skyline.

'Indian Construction' prays to the almighty to rest the departed soul in peace and grant fortitude to the bereaved family.

INDIAN CONSTRUCTION July 2012

....courtesy: 'Indian Construction' magazine dt. July 2012

Implement the management skills taught to you in your field of work for economical & effective completion of projects

....B.E.Billimoria

BEB addressing an award ceremony on 19th February, 1999 for the 4th batch of students of the **'Management Development Training Programme in Construction Management'**

....courtesy: 'Indian Construction' magazine dt. February 1999

Shri Billimoria is seen addressing the gathering at the certificate awarding ceremony for the course on Construction Management. Others seen from left are : Shri D. L. Desai (Shankarbhai), Chairman, Mumbai

Relationships

BEBL can be made a great success and placed in the league of other major players in the Construction Industry Sector

Achyut Joshi, *Commercial Officer*

Construction industry globally contributes a significant percentage of GDP ranging from 15% to 25% across countries. It is one of the significant employment generators after agriculture in India. In fact one of foundations of Keynesian economics laid their principles of its General Theory of Unemployment and Prices on housing stock of a nation and links recession/growth directly to the activity in the construction sector. Construction is an activity going on since thousands of years, unknown to mankind as it fulfills one of the basic needs of human beings i.e. shelter. It is as a result of this that we see historical monuments and architectural marvels with so many heritage buildings around the world. Probably our work in this industry just represents a snapshot of activity in space and time across the world. Every day you can wake up and be sure that somewhere in the world one brick is laid down in terms of creating a structure that is expected to stand the test of time. Construction industry is the backbone of any economy and a slowdown in these sectors does not augur very well for the overall economy. If one looks at the past recessions across the globe they are inadvertently related to two industries i.e. Banking and Construction

In fact construction is so generic in nature that one will hardly come across a person who has never witnessed it in his lifetime either at his home or somewhere in the vicinity. Travel to any corner of the world and one will witness some minor or major construction activity going on there. The key pillars on which construction industry rests are Civil Engineering, Architecture, Project Management and Enterprise Resource Planning. These are the key success factors of any company in construction/construction contracting industry and they determine the success of the company to a great extent. For an industry that has been operating for myriad years, there has been a change in the way it has operated in the past few years. With new technologies and management patterns replacing the old ones, the time to erect a structure is significantly shortened.

How does a construction contracting firm earn profits? It is simple. A contractor, in the general sense of that word, is any entity/person that executes a contract based on a written/oral contract. This contract could be of any nature, e.g., it could be a contract to serve pizza at your doorstep in half an hour, or it could be a contract to drive you home in a cab for a specific rent. The general nature of contracting work has made it the blue-eyed baby in many sectors under the fancy term we keep hearing called Outsourcing. The underlying principles of the business everywhere remain the same except the way of execution of a contract that is entered into between the two parties who agree to conduct the business and work in a certain manner. How do a contractor and especially a civil general contractor earn profits? Again the answer is very simple – The profits of a civil general contractor are the differences between the amount charged to the client and amount incurred as an expense, either through own or subcontracting. Revenues and profits are not generated on a monthly, quarterly or annual basis. They are generated every day, every minute and rather every second of execution of work. While on a large period, they just get accumulated either as profits or losses and reported either for statutory reasons or managerial decision-making. It is necessary to make sure that for a Civil General Contracting company, everyone focuses all energies in making sure that our attention is on generation of revenues and cutting of costs on a continuous basis with the help of ERP. This is how BEBL can be made a great success and placed in the leagues of other major players in the sector.

REAL ESTATE

This article has been published in the 'Construction Industry Review' dt. July 09, 2012

Challenges in high-rise buildings

For high-rise structures, the wind force becomes a major concern in design of the structural frame.

Post World War II, there has been an increasing influx of people to cities from rural hinterland. This has created a situation where high rise buildings have become a necessity in cities due to a number of contributing factors, the principal among them are an acute scarcity of land in urban areas, increasing resistance of farmers on the fringes of urban agglomerations to land acquisition and rising demand for housing stock and various facilities and amenities.

The planning and design of high-rise buildings presents a host of challenges. This article is an attempt to enumerate these challenges. While some of the challenges are peculiar to high-rises, some are independent of height of the structure, but assume critical importance in case of high-rise structures.

Embodiment of Community

Since the boom in high rise construction in Indian cities is recent, a high-rise structure stands out automatically. But at the same time it should not look intimidating for onlookers as well as residents of surrounding properties.

On the contrary, it should be a kind of structure that professes to serve its neighbourhood. This is particularly true for older localities in cities which have several heritage structures.

The high-rise, no doubt, will look imposing but it should not give a feeling of visual aggression or aesthetic oppression. In other words, it has to be in harmony with its streetscape. This could be achieved only by drawing on the architectural heritage and culture of the place.

At the same time, a high-rise edifice should not only be aesthetically pleasing but should also combine practicality.

Thus evolving a coherent design concept becomes a challenge in itself.

Technical Challenges

The columns and shear walls of lower walls carry progressively higher loads increasing their size progressively as one moves downwards. In order to get maximum usable space and preserve the usability of rooms, it becomes necessary to restrict the size of columns and thickness of shear walls. This leads to adoption of higher grades of concrete and reinforcement steel as you come to the lower floors.

Beyond a certain height, composite structure incorporating structural steel becomes inevitable as RCC columns will be too large as to make a room unusable with large corner projections.

The use of higher grades of concrete is necessitated, which calls for closer quality control.

Since the size of columns and thickness of shear walls is restricted, there will be increasing congestion of reinforcement bars in lower floors. This presents challenges in placing and compacting of concrete, and workability of the concrete mix needs thought.

Higher cement content of higher grades of concrete entails higher evolution of heat of hydration and higher shrinkage.

As the structure rises higher and higher, it takes longer for lifting or pumping the concrete to the required height and use of appropriate admixtures becomes inevitable.

As the structure rises upwards, it takes longer for all other materials to reach the working floor and the personnel also require more time to reach there and for coming down at the end of the day's work. This results in lesser output as the structure progresses upwards.

There is a need to factor this in while working out the time period for a project.

Personnel lift/s installed will have to be retained till at least one of the regular elevators is operational. This affects completion of external finishes and site development in the portion occupied by the personnel lift/s and delays final handing over.

Expansion and contraction

Problems associated with daily and seasonal expansion and contraction of the structural frame need to be taken into account in structural design as well as in installation of various services like pipelines. Integrity of various architectural finishes also assumes greater importance.

For high-rise structures, the wind force becomes a major concern in design of the structural frame. The tilt induced by wind force has to be taken into account. Apart from the design of the structural frame, this tilt can affect architectural finishes and the alignment of various services.

Because of the strong winds to which high-rises are subjected, watertightness of the building envelope in general and watertightness of the windows and balcony doors and rattling of shutters needs consideration.

The pumps required for water supply for (for human consumption for fire fighting and for air-conditioning) have to be of high capacity. The pipes, fittings and fixtures are also required to withstand this high pressure.

Since there is an economical limit to the high pressure to which these can be subjected, introduction of break-pressure tanks at certain interval becomes a necessity. This in turn requires provision of service floors at intervals.

Working at height makes safety a paramount concern. Thus the scaffoldings, staging, safety curtains, barricades, railings, etc. all have to be planned and designed carefully. This applies to subsequent maintenance and repairs of the building during its service life.

Furthermore, access for maintenance and repairs will have to be planned in advance and the building should be designed to facilitate maintenance and repairs. This is particularly so in case of the building envelope and its accessibility.

Safety for all

Enclosing the structure under construction with safety curtain also needs to be planned with due care not only for the safety of the personnel, but to protect surrounding properties and their occupants as well as vehicular and pedestrian traffic in the adjacent streets.

One should bear in mind that even a small piece of stone falling from great height can prove fatal and therefore the safety curtain should be such as to arrest even a small piece of aggregate that goes into concrete.

Problems of safety and rescue of the occupants in case of emergencies is very important irrespective of the height of the structure. However, in case of high-rises, this assumes critical importance due to the time required to bring people down to safety. Therefore, apart from provision of fire lift, rescue chutes, planning and design of passages, corridors and staircases need careful planning.

Constructing a high-rise in place of an existing smaller building using extra FAR, significantly increases load on the local infrastructure – particularly water supply and sewerage system.

Therefore, it is necessary to provide a sewage treatment plant for treating the entire sewage from the building and recycle it for flushing, gardening, etc. so that the demand on the municipal supply is kept to the minimum.

Similarly, the design of the building and particularly its envelope should be such that it reduces the requirement of air-conditioning and artificial lighting, thereby reducing the demand on the power utility.

Commercial considerations

The cost of structural frame, the cost of services and cost of construction does not bear a linear relationship with height of a structure. It increases rapidly with height.

Besides, as pointed out above, the productivity declines as the structure rises higher and higher and raises the cost of construction. Longer construction period pushes the overheads apart from impact of rising inflation.

By its very nature, a high-rise building will require more time for completion as compared to a low-rise group of buildings having the same total built-up area, in which case, work can be expedited by opening more work fronts.

Thus, the probability of changes in regulatory environment, changes in taxes, changes in public policy and a host of such imponderables are higher and can impact the cost of a project.

To minimise this impact, it will be prudent to adopt innovative design concepts and construction methods which can help in reducing the time required for construction.

Regulatory issues

A high-rise structure has to confirm to a host of stringent norms, notably those stipulated for fire safety.

Complying with all the rules and regulations of a host of authorities is a challenge in itself. Two examples could be cited.

In airport zone, there is restriction on height of a structure depending on the distance of the structure from the airport reference point. It is in the form of a number of concentric circles, with lesser and lesser permissible height for each successive inner ring.

Here, the designer must plan to utilise the permissible FAR fully and yet stay within the permissible height. At the same time, there is a limit to which footprint of the building could be extended, as one has to provide mandatory open spaces on all the sides and proper access around the building/s.

Similarly, there is height restriction for properties abutting a railway line. Here also, utilising the FAR fully becomes a challenge.

Simultaneously, the structure has to be designed to meet the needs of end-users. In case of mixed development (which is often the case with many high-rise buildings), this is quite complicated. And all the while, the designer has to aim at utilising fully the permissible floor area ratio.

Therefore, it will not be an exaggeration to say that planning and design of high-rise structures requires an all-encompassing approach to overcome the challenges in order to deliver a project that will lead to satisfaction for all the stakeholders.

Jeet Kapadia
The author is Management Executive, B.E. Billimoria & Co. Ltd.

Upgraded Version of Existing ERP system

Manish Gupta, *D.G.M - Cost Control Dept.*

Ultimate aim of implementing New ERP system is to make our company SYSTEM Driven

As you are already aware that from Year 2006, we have started implementing ERP (SiTE) system in our group of companies. With ERP system we were able to integrate various department process like HR/Payroll, Accounts, Purchase, Inventory, Stores, Client & Contractor Invoices as well costing process.

Considering ever changing enhancement in the field of technology our Management have decided to upgrade existing ERP system. Now we are in process of Implementing New ERP system called **"XPEDEON".**

All the existing ERP user will be provided training in Xpedeon, so that after existing ERP (SiTE) is discontinued (probably by October 2012) they should be ready to work in New ERP software.

Some of the Xpedeon Software key features are as under:

Ease of use: Xpedeon has more user friendly screens as compared to the currently used SITE ERP. The look and feel of the screens is similar to Microsoft Outlook.

Xpedeon is built using current **Microsoft technology 'dot Net'** (.Net) and works best with Microsoft's own database called SQL Server although it can work with Oracle as well. As a result of use of .Net platform, Xpedeonis expected to adapt itself to future Microsoft versions with ease. So fear of ERP becoming obsolete is taken care of.

Xpedeon comes with its own report writing tool which enables making of **customized reports**. The tool is user-friendly so far as modification of existing reports is concerned and creation of new reports based on already defined schema is concerned.

Xpedeon work flow system is **modified** since earlier package called SiTE. **Xpedeon** enables defining business process stepwise by introducing appropriate steps required in the process as per business requirement. This has enhanced the **flexibility and configurability** of the package substantially. It is now possible to create **informal workflow** in the system to suit specific conditions in the organization.

The package **enables transactions** in 3 different currencies in parallel e.g. **AED, USD and INR**. This added feature could be beneficial to our organization if it requires to execute projects overseas.

Architecture of **Xpedeon** is **multi-tier** in contrast to client-server (two-tier) architecture of the earlier SITE package. Two-tier architecture forces enhancement of server capacity especially database server, whenever load on the server increases, whereas multi-tier application enables **distributing the application load on different servers** without affecting the performance of the application. So in short it can be said that architecture of the new package is better scalable in a cost-effective manner.

All **tax** related parameters are **made configurable** in the package and these can be modified with ease. Software Vendor has identified all the various types of taxes that can exist and has made it easy to enter their types as well as actual rates through Global Tax Management feature. This makes it easier to change the application when tax rules change.

Tendering module is segregated from the rest of the software and it can be installed on a separate and stand-alone PC and thus information regarding tendering process can be **kept secure and protected** and inaccessible to other package users even by accident, since its database itself is different from the main ERP database.

Planning can now be done at two levels viz. **Basic and Advanced**. This feature was not available in the earlier package.

There is a special **document management system** available to keep **track of various important drawings, sketches, documents, worksheets etc**.

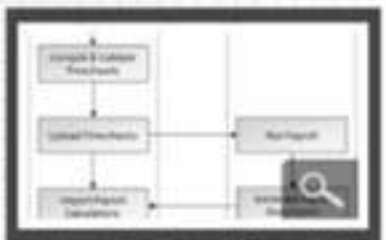
Xpedeon has a feature to handle external relationship through ERM **(External Relationship Management)** portal. This feature enables external agencies to interact electronically. E.g. clients and suppliers can access specific features through the portal and see status of transactions etc. Thus package is **future proof** in terms of newer functionality that may become the norm as times change.

Ultimate aim of implementing New ERP system is to make company SYSTEM Driven instead of INDIVIDUAL driven.

Plant Process

Resource Diary

Plant Profit & Loss



Timesheet and Payroll Process

Total Hours / Labour Category

Employee Hours / Week

Lean Construction
- Developing a "concept" store.

Background:

With fewer and fewer prime sites available, contractors in order to have an edge over the competition need to be more proactive to withstand the changes in market conditions. To make this possible, we need to develop techniques of building economically and quickly without compromising on the standards. In short maintain the same quality but construct for less money and in less time.

Success Step by Step

1. **Planning to Achieve Savings :**
   Much planning is needed to achieve the objective. This is possible with the concept of partnering wherein the Owner along with the multi-disciplinary groups of designers, contractors and specialist contractors challenge every aspect of design and construction and develop new ideas. Brain storming sessions and group thinking will lead to evolution of new techniques. This team work approach fosters a 'can do' attitude, generating new ideas at every stage of the Project.

   In partnering workshops, team players start thinking afresh and understand each other's requirements better which enables focus in one direction or otherwise it will be radial thinking. This leads to an environment of trust and confidence that makes the project a success.

2. **Key Concept Savings :**
   Requirements are listed and its necessity is evaluated based on the project requirement and marketability. This leads to omission of many elements which otherwise would have only added to the cost but not to the value of the project. Specifications of items and its substitutions are also elaborately discussed based on its availability and pricing which can make a lot of difference to the overall cost and viability of the project.

   Other cost savings include the steel work design, re-engineering of mechanical, electrical and refrigeration requirements and rethinking for space utilization to make best use of the building.

3. **Further Scope for Savings :**
   Wastage norms in the resources deployed have a substantial impact on the project cost. This can be reduced only by proper planning, identifying the right resources, good construction practices and documented methods statement.

4. **Key Management Issues :**

- As a team, challenge every aspect of design and construction and be willing to consider new ideas to generate a 'can do' attitude.
- Do the conceptual thinking first and then apply it in the field.
- Look beyond the conventional and available - if a product does not exist, develop one by bringing in a vendor who is willing to undertake the task.
- Involve the clients' agencies for bulk order supplies to achieve best price benefits.
- Avoid dilution of ideas once adopted.

GANESH UTSAV
at North Eye, Noida

We have been working on a prestigious project **'North Eye'** at Noida, which comprises of a **Central Tower** having Basement + Lower ground + Ground + 66 Floors + Helipad. The **North wing** will have a Basement + Lower ground + Ground + 47 floors. The **East & West wing** will comprise of a Basement + Lower ground + 6 floors each. Our project work is going on in full swing. Currently we have reached the 3rd floor which is a typical floor. From this floor onwards we will use pre-engineered aluminium formwork.

We are celebrating the 2nd year of Ganesh Utsav at North Eye to unitedly seek the divine blessings from Bhagwan Ganesh in order to complete our project well on time.

Project Update

S. N. Bhat, V. P. - Operations

RESIDENTIAL

NEW **'ORB Tower'** at Noida- 2 residential towers with double basement, ground + 43 upper floors and 1 residential tower with double basement, ground + 47 upper floors *(model pic. below)*

'Ashford Palazzo' at Breach Candy, Mumbai - 1 residential tower with basement, stilt+ 6 level podium and Service floor + 11 upper floors

'Mantri Serenity' at ISKCON, Bangalore - 1 residential tower with double basement, ground + 21 upper floors + Terrace and 2 residential tower with double basement, ground + 25 upper floors + Terrace

'North Eye' at Cape Town, Noida - residential tower with double basement, ground + 66 upper floors + Terrace

'RA Residency' at Dadar, Mumbai - 2 residential towers with ground + 5 level podium + 42 floors each and 1 commercial tower with ground + 5 floors having 5 level common podium

'Raheja Waterfront' at Mangalore, Karnataka - 2 towers with ground + 23 floors

'Lotus Complex' at Lower Parel, Mumbai - 2 residential towers with 34 Floors, 1 commercial building with 17 floors & 1 service apartment with double basement, ground + 7 level podium + 38 Floors

'Mahindra Splendour' at Bhandup, Mumbai - 5 towers with 2 level parking and stilt. 2 towers having 32 floors each and 3 towers having 21, 23 and 25 floors each

'Bougenvilla' at Sarjapur, Bangalore - 4 towers with ground + 11 floors

'IREO Victory Valley' at Gurgaon, Harayana - 1 tower with double basement, ground + 25 floors and Row Houses G+1 - 1 nos, G+3 - 2 nos & G+7 - 2 nos

'New Haven Township' at Boisar, Thane - 33 buildings with ground + 2 floors & 49 buildings with ground + 3 Floors

'Salarpuria Greenage' at Hongasandra village, Bangalore - 3 towers with 21 floors and 1 tower with 25 floors

'Salarpuria Phase II' at Hongasandra village, Bangalore - 6 towers with double basement, ground + 21 floors

'Manjeera Residential' at Kukatpally, Hyderabad with three basements, ground + 23 floors

'Alliance Orchid Springss' at Korattur Lake, Chennai, with 5 Towers having ground + 18 floors

Residential Tower at Bhavini Township, Anupuram, Kalpakkam, Chennai, with ground + 17 floors

'Embassy Residency' at Perumbakkam, Chennai - 4 towers with ground + 8 floors

'Gulmohar Villas' at Perambur, Chennai – 110 villas with ground + 2 floors each

'Mayflower Caladium' near PSG Technology & Krishnamal College, Coimbatore – with basement, ground + 10 floors

'Crescent Court' at Greater Noida, U.P. - 3 towers with double basement, ground + 22 floors and 2 towers with double basement, ground + 6 floors

COMMERCIAL

NEW **'Reliance Mall'** at Surat, Gujarat - with ground + 7 floors and 3 upper floors

'Amanora' Mall at Hadapsar, Pune - 2 blocks with basement, ground + 3 floors

'Rubix Mall' at HMT layout, Bangalore - with single basement, ground + 11 floors + terrace

'Manjeera Commercial' at Kukatpally, Hyderabad - with three basements, ground + 8 floors

UTILITY

NEW **'Chartered Hotel'** at Lucknow with three basements, mezzanine, ground and transfer floors + 12 upper floors

'Namaste Hotel & Office Tower' at Mumbai with three basements + 67 floors

'P. D. Hinduja National Hospital and Medical Research Centre' at Mumbai, - additional 20 floors above existing

'ASB Mold Factory Building' at Ambernath, Thane with ground + 2 floors

'Amul Dairy Plant' at Virar, Thane with basement, ground + 1 floor

'Sri Sathya Sai Hospital and Medical College' at Chennai with ground + 3 floors and ground + 4 floors respectively

'Vedanta Cancer Hospital and Research Centre' at Raipur with numerous low rise structures housing various departments & facilities

'Pondicherry Convention Centre' at Kalapet, Pondicherry - Auditorium with 2500 seating capacity and ancilliary building

'Centre of Excellence for Training in Energy Efficiency' at Chennai, Block D with ground + 1 and Block E & F

'IGCAR' (Head End Cell Building) at Kalpakkam, Chennai – ground + 3 floors

'GSO Annexe' at DAE Township, Kalpakkam, Chennai – ground + 3 floors

'Garden Galleria Shopping Complex' at Bangalore with three basements, ground + 6 floors

'GBJ Radisson Hotel' at Peelamedu, Coimbatore – with double basement, ground + 9 floors

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