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THE CATERPILLAR

A Civil Engineering Association (CEA) Monthly Newsletter

STRUCTURAL ENGINEERING

- Building Information Modelling
- Techture

UPCOMING EVENTS

Talk on Entrepreneurship in Core Industry

Revit Workshop: Part II

AutoCAD Workshop

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STRUCTURAL ENGINEERING

Civil Engineering is a wide field which covers plentiful subjects and each of them having their own unique importance. However the core of every structure lies in its weight distribution and balance. Henceforth we would like to throw some light on this particular domain called Structural Engineering and give our readers the basic idea about it. Structural Engineering is the specialized field of Civil Engineering dealing with the analysis and design of structures that supports or resists loads and provide us with numerical data of stability, strength and rigidity of structures.

The theoretical aspect of Structural Engineering depends upon a detailed knowledge of applied mechanics, materials science and applied mathematics to understand and predict how structures support and resist self-weight and imposed loads. But, a Structural Engineer also requires detailed knowledge of relevant empirical and theoretical design codes. The role of a structural engineer also involves a significant understanding of both static and dynamic loading. With a considerable evolution from traditional pen-paper based designing to new computer aided software based designing like AutoCAD, StaadPro, Revit-Structure, Structural Engineering has come a long way with more efficiency and accuracy. With such software many more complexities can also be take into consideration such as seismic load, hydrostatic pressure from ground water, positive and negative wind load, just to name a few.

Here is a brief list about what all sections do come under Structural Engineering, however there are plethora of subsections as well which are not listed below :-

- Structural Materials
- Computational Mechanics: Seismic Analysis and Design
- Risk and Reliability
- Earthquake Engineering
- Design and Experimentation
- Seasoning and Monitoring
- Advance steel/concrete structures

However strength of any structure has always been the ultimate priority of any designer but considering the economic point of view for the structure is an uphill battle of a structural engineer. The fundamentals have remained the same for years, yet innovators always try to seek out for newer, cheaper and advanced designs everyday which are not only aesthetic to look but also remain viable and feasible to construct.

Structural engineering is also tasked with ensuring that materials and resources are used efficiently. For example, structural engineers must be able to determine the optimal material grade that ensures safety and function without unnecessarily raising costs. Structural engineers must also be able to work within the design aesthetics called for by the project. Thus, structural engineering plays a crucial role by marrying visual appeal, practical function, and budgetary resources in a way that satisfies all needs.

Milau Viaduct Bridge: An Engineering Marvel, the bridge connects the motorway from Paris to Barcelona. Each of its sections span 350 m in length and some of its columns are even higher than the Eiffel Tower

So concludingly, Structural Engineering is a very vast field belonging to Civil Engineering and has tremendous scope for advancements, innovation and future. Like it is said No subject is advanced enough that it can be ignored. Changes are taking place every second so why should we stop looking out for them.

BUILDING INFORMATION MODELLING

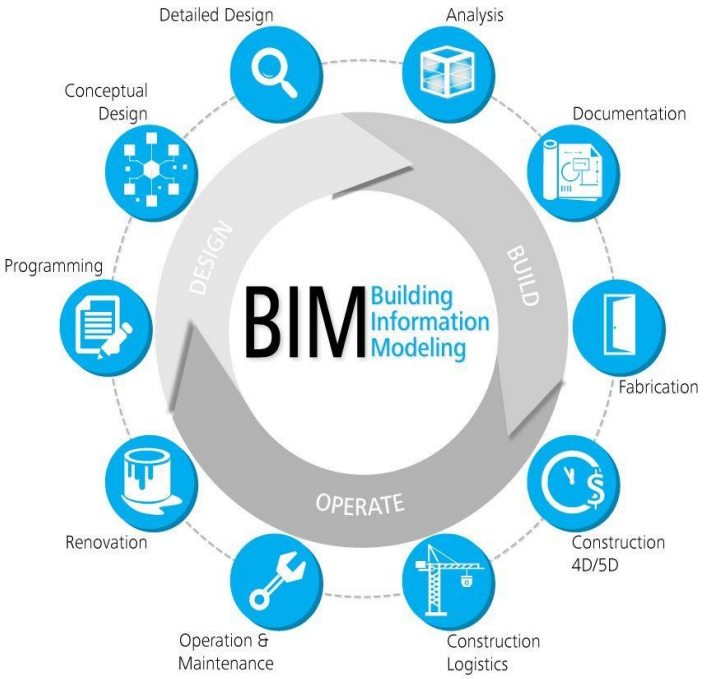
BIM BIM BIM! What is BIM? Is it just 3D model of buildings? Is it a software application? The Autodesk community defines BIM as '*an intelligent 3D model-based process that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure*'.

Another definition given by Wikipedia is 'a process supported by various tools and technologies involving the generation and management of digital representations of physical and functional characteristics of places'. So we infer BIM is not just a 3D model nor a software application. BIM is a process. The output of such process is called as BIM model. BIM is used to design and document building and infrastructure designs. Every detail of a building is modelled in BIM. The BIM model can be used for analysis to explore design options and to create visualizations that help stakeholders understand what the building will look like before it's built. BIM Models hold all the information about your building. Think of it as the intranet of the building. The model will have tons and thousands of tiny pieces of information, right from the smallest nut and bolt, to the largest concrete column in the building.

Now why is BIM important. To answer that, let's look upon the big picture. Civil Engineering sector is one of the most unorganised sectors. Engineers don't work in the field; rather uneducated labourers do. Since this link between an engineer and a labour is a chain held loose, the coordination among engineers becomes paramount. Hence the role of BIM comes into place. BIM has changed the working of the sector. The efficient working among the architecture, engineering and construction (AEC) professionals has increased drastically. According to the United Nations, by 2050 the world's population will be 10 billion. The global architecture, engineering and construction (AEC) industry is responsible for delivering the social and economic spaces for the global population, and for helping maintain and restore the buildings and infrastructure already in use. The industry must look to smarter, more efficient ways to design and build not just as a means to keep up with global demand but to help create spaces that are smarter and more resilient too. BIM not only allows design and construction teams to work more efficiently, but it allows them to capture the data they create during the process to benefit operations and maintenance activities. BIM data can also inform planning and resourcing on the project, city or country level.

Now let's look upon the applications of BIM. Some are,

- 3D renderings
- fire departments and other officials may use these models for their review of building projects
- time- or scheduling-related information (4D BIM)
- cost estimating features (5D BIM),
- model can be easily adapted to graphically illustrate potential failures, leaks, evacuation plans, and so forth
- facilities management departments can use it for renovations, space planning, and maintenance operations



The current effective usage of BIM in India is not up to the mark. It is mainly because of lack of awareness both among the clients as well as the companies. Many countries have now made BIM a mandatory usage on new building and infrastructure projects. These countries include: Brazil, Chile, Denmark, Finland, Norway, United Kingdom, South Korea, Singapore and Vietnam and UAE. While these countries are going all out in its adoption, countries like India are yet to catch up. Now

talking globally, as far as the future is concerned, BIM is likely to evolve in its form. Even BIM was a result of evolution in AEC technology. We'll now look upon the evolution part: It all started from hand drawings then CAD came into the picture, then parametrise, then BIM. But hold on, this doesn't stop here. This transformation will be passed on to algorithmic modelling then interoperability, then artificial intelligence BIM, then generative design, then robotic construction, then internet of things and so on. The future of BIM would be really fascinating!

TECHTURE- A PARADIGM OF CORE-ENTREPRENEURSHIP

Techture is a start-up by a group of BITSians. It's CEO Viraj Voditel, COO-CFO Arnav Jain and CBDO Dayesh Jaiswal are the ambitious BITSians because of who the company has now strengthened its roots in more than five countries and projects undertaken from more than twenty countries. In short, Techture is a consulting firm working to provide collaborative solutions in the field Architecture, Engineering and Construction (AEC) industry. They deliver extensive Virtual Design, Construction and Project Management services leveraging Building Information Modelling (BIM), a technology process which is revolutionizing the entire industry.

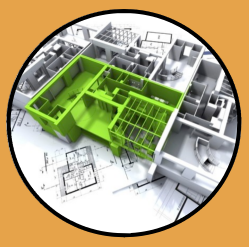
It began as an idea from a hostel room of BITS Pilani. What started as a company providing 3D modelling services has quickly grown to a diverse team of engineering and architecture professionals working round the clock to deliver projects across the globe. Their passion towards the construction industry is one thing common among all the members of the Techture team. When it began, they were fascinated about how massive an effort goes into any construction project. Whether the project was a small one or a megastructure, they were amazed at how complex things could get.

On the other hand, the realization of presence of a void in the industry were due to projects were not being managed well. There are so many parameters which go amiss. Traditional ways of working were failing to complete projects on time and as per their budgets. This was when they came across BIM. BIM was changing the way people worked. The benefits that they saw back then quickly attracted them to this technology. Little did they know that they were stepping into what would become the foundation of the future smart cities. Getting into actual projects provided a reality check. Adoption of technology was very slow, if not negligible. Processes were not set, there was no proper documentation in even the largest projects. Mindsets of people involved were conservative. People were averse not just to newer tools but even newer ideas. There was a dire need to improve this scenario. From the very beginning, they have always looked at it as a problem to be solved. Every day at work, they are always committed to finding newer ways to do what they do. There has been continuous learning from day 1 and this mindset has enabled them to tackle projects of large scales. Now, the industry is changing.

Today, Techture provides various services for the AEC industry which you can know more about in their website. Soon, there will be collaborative efforts to create a digital platform for all infrastructure projects, new as well as existing. These digitally connected virtual buildings will be the conduits to new ways of thinking, designing, building and living. They hope to be an integral part of this connected world and provide cutting edge solutions to deliver projects and solve the world's problems by relying on technology and innovation.

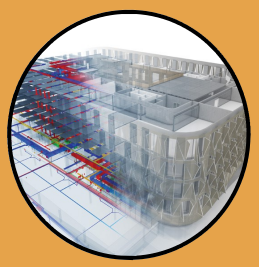
Evolution of BIM

Hand Drawing



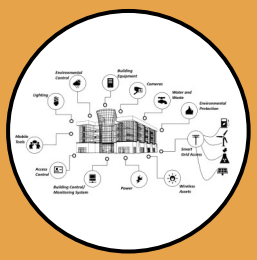
CAD

Parametricism



BIM

Artificial Intelligence BIM



Internet of Things