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"A Study of Innovative Trends and Technologies in Construction Management."

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Abstract:

In this research paper I have tried to throw light on the residential construction industry in Pune as overall industry is facing the challenges to achieve the quality of the work, meet the dead line of the project and more importantly complete the project within the specified budget as post covid the construction material cost has shoot up surprisingly high so wastage or overconsumption of it should be avoided, as residential construction industry is mostly labour intensive industry and to meet the demand of skill labour work force is almost impossible so most of the work is done from the seasonal labours who migrate to the city from villages during the uncultivable period of the Year. Due to this unskilled labour the quality and speed of the work is hampered. This article has made all round representation of tools, equipment's andmaterial which can be used to "kill the skill" in order to retain the quality, speed and budget of the residential projects.

Introduction:

With the continuous innovation by engineers and researchers in the construction industry this has lead to the advancement of technology which has revolutionize the industry and the way of performing the work. Emerging construction technology is just not a fad or a fun new toy. There are real, practical applications and benefits to modernizing the current processes.Construction companies want to remain competitive and not be left behind, and they are finding ways to integrate new approaches into their strategy and workflows.These cutting-edge technologies in construction are drastically changing how the industry operates and how future projects will be performed. This high end technologies willsave time, resources and cost for the complex projects but the initial costing for the procurement of this

technologies is very high and technically advance staff is required to operate it and interpret the data acquired.

Here the main focus will be on the technically tools, equipment's and material that will save the man hour, time required and will simply replace the traditional methods at present in use in Construction Industry which is too inadequate to meet the speed and quality requirements of the Current Situation.

Reason for technical advancement in construction industry:

With advancement of modernization and technicalization, various new technologies have emerged and expanded and the reasons behind this are as follows.

Continuous changing in client expectation:

With changing market and rapidly changing technology in other industries like automobile, IT, communication due to which the clients are expecting the innovative homes, commercial spaces which has given rise to modular technology.

Powerful Software's and IT:

With the advancement in software made for 3D modelling software, hologram technology using in conjunction with hardware like high resolution camera, drones, lasers taking measurements, generating 3D view of any structures has been possible also by using software's the architects, contractors can make the virtual structure for presentation before client.

Tech savvy Techies and Architects:

As any other industry the construction industry is also resistance to change but the new generation techies and architects being tech-savviness helps them in adopting digital tools, new technologies and only they are using them but giving feed back for development of new technologies.

Supportive Legal Frameworks:

Government rules and regulations support and promote the use of new alternate building material under the green building initiative saving the environment by innovating the material which can be readily use reducing wastages and minimizing time for construction.

Due to above reasons below mentioned are the emerging trends in construction industry.

Emerging Trends InConstruction Industry:

As the economy continues to drive growth, construction firms are beginning to master new digital trends that are shaking up the industry. With increasingly scarce resources there is a necessity to create more with less and construction industry will need to operate more efficiently and focus on sustainability. Few of the emerging trends in construction are mentioned below.

Building Information Modelling (BIM):

BIM is a process incorporating digital representations of the physical and functional aspects of a building that can lead to better collaboration during design and construction on projects. BIM helps contractors, architects and all other agencies involved in the project in early clash detection if any which helps in reducing wastages, reworks and proper planning and scheduling of project.

Virtual Reality (VR):

VR is mostly used in conjunction with BIM to have better understanding of the complex projects even before it is started at actual. VR allows the owners to see how will their project actually look by having a virtual walk through around the project, the designer can identify the unseen hurdles and flaws in design before the project is commenced and rectify it early.

3D Printing:

3D Printing is the technology which allows the complicated structures and sections to be prefabricate at the factory and move it to the site which helps in reducing the time drastically also it can be printed on site which reduces material wastages, cost and time.

Drones :

Unmanned aerial vehicle known as Drones are popularly used in mega projects to inspect the work in progress, to take the measurements, to inspect the safety and to detect the accidentwhich use to take weeks early is now just a matter of hours.

Advance Uses of GPS:

GPS was used before in construction site to just locate the site but now it is used more productively, GPS is used to gather all geographical data of the prospective site also the site

connectivity and locality can be studied using the GPS technology, also GPS is widely used to track the position of construction equipment in real time.

Autonomous vehicles:

Autonomous vehicles mostly the construction equipment's like excavator are programmed in such a way which can achieve the desired level as per requirement also autonomous vehicles are used to do the movement of material on predetermined path.

***Artificial Intelligence*:**

Artificial Intelligence in conjunction with BIM, GPS, Wearables, Drones, laser scanner gather information, AI is programmed in such a way that the data collected from various sources is gathered and processed whose out come is used to streamline the process, identify the potential safety hazards and improve it. Construction project planning and scheduling is one area where AI can really shine, simulating the projects millions of times in a matter of minutes and making small adjustments each time to deliver the ideal schedule to maximize efficiency and productivity to reduce timelines and save money. AI is powering construction robots and drones to monitor jobsite progress and deliver real-time, actionable data to improve jobsite productivity.

Technological trends in residential construction industry in Pune:

The latest technologies and trends discussed above are few of the technologies which are being used by many construction companies, contractors around the world and mostly this technologies are used in developed nation for their mega projects due to availability of IT network, advance hardware's, continuous R & D in material and making breakthrough innovations, development of new process and validating it and also availability of human resource trained for operating and interpreting the data gather from the software's.

But when we talk about the residential construction industry in Pune the penetration of technology is very less,Residential construction industry in Pune does not only have to meet the requirements but also has to fulfil the required quality and parameters. Adopting new technology and methods in construction industry has become very crucial as the traditional methods just cannot speed and quality requirements of the current situation. The construction as already mentioned is labour intensive industry and is mainly dependant on the skill of the

labour in order to meet the quality requirements of the project and it is very difficult to achieve as the labours are seasonal labours and doesn't acquire the necessary skill to perform the work.Here we will be discussing the latest trends followed in Residential construction industry in Pune region.

Auto Cross Laser ACL Automatically leveled Crossline Laser:

The ACL Crossliner laser is new generation laser level for the construction & engineering industry. The instrument is ideal for level & plumb, layout and positioning applications andwith a high accuracy of 2mm. Crossline laser comes in various models by different manufacturers.

Following are the uses of ACL

Slab formwork (shuttering) levelling:

ACL is used to level the form work used for casting of the slab, a horizontal beam is emitted from the ACL and it is perfectly horizontal as it has the self-levelling mechanism. The labour can measure the level of the shuttering at required points and ensure the level of the shuttering is perfect horizontal. The ACL also ensures the perfect level of the slab thickness after casting which further ensures the minimal thickness of screed used for laying of the tiles thus saving a huge amount of natural resources also the dead weight of the structure is saved considerably which indirectly leads to saving in steel used in slab.

Brick Masonry Plumb and Level:

Brickwork is the most time consuming work in residential building and is also most tedious as the quality and finish of the structure mostly dependant on it, if the mason performing the work is not skilled it further gives rise to complication in external plaster, internal plaster and even it results in affecting the measurement of rooms also many times it leads to rework which results in affecting the schedule and budget of the project. By using the crossline laser the mason can perform the work speedily, with required specifications and with minimal skill as the laser does most of the work of levelling and Plumb tremendous amount of time is saved as the mason does not required to hold the level line for each layer of the brick and also he doesn't have to check the plumb, also the crossline laser helps in getting perfect 90 degrees in laying the bricks.

Fixing Wall Tiles & Floor Tiles:

ACL is also useful in fixing wall tiles and floor tiles as it helps mason in setting the start line, getting the plumb of the tiles also setting the 90 degrees for wall tiles, it increases the speed, accuracy and quality of the work.

Advance automated equipment's / machineries:

In residential construction the plaster activity can be semi automated by using plaster applying machine which is mostly used for internal plaster this increases the speed of the work reducing the time and costing of the project as man hour is saved and the quality of the work achieved is uniform.

Alternate Materials innovated for sustainable buildings:

M- Sand (Artificial Sand):

M-Sand is plaster sand which is used instead of river sand as excessive mining of the river sand is affecting the eco system of the river leading to the river erosion and reducing the water holding capacity of the river. M-sand used has the properties similar to the river sand and it can be used 100% as against river sand as almost 10% to 15% of river sand gets wasted after screening.

Siporex wall panels:

Brickwork using the conventional bricks takes lot of time in constructing walls and even after constructing the walls plaster is required for smooth finish of the surface, but by using Siporexwall panels the time is saved in construction and even the material and labour is saved as plaster is not required for internal walls.

Conclusion:

In this Paper, we have tried to look into various factors in which Selection of Advance tools, Equipment, and Materials for achieving the following targets:

1. Reducing the cost of project by speeding the activity and improving quality.

2. "Kill the Skill" here by using the technology even a semi skilled labour can perform the activity without compromising the quality and speed of project.

3. Alternate sustainable material reduces wastage of material and environmentaldeterioration of nature.

4. Same technology can be used for various projects which justifies initial cost of technology, equipments.

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