Govt. College of Technology, Coimbatore 13

Technical Magazine from the Department of Civil Engineering

CE-Build info

Theme: Heavy Equipments

January 2021

Editorial Team:

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HODs message

I am very happy to bring out the Technical Magazine "CE-Build Info". This magazine throws light in technical advancements in the field. This particular issue is released with the theme of Heavy equipments. This issue also focuses about the various activities of our faculty members involved in Consultancy also. It is great to find a considerable number of articles, and general useful information to students that certainly prove that our staff and students are adequately equipped and possess necessary skill sets to express their talent. Sincerely congratulate the editorial team of the department for their unrelenting efforts in compiling this Magazine.

About the Institute:

Government College of Technology started in 1945 is one of the premier Engineering Institutions of the Country having a very large contribution to the academic and technological developments. Ever since that prestigious moment, it has set the standard of recognition standing out as outstanding Institutions with technical expertise. This Institution offers nine UG programs and eleven PG programs with recognized research supervisors to pursue M.S. (by Research) and Ph.D. Programs in all the above disciplines. All departments have well qualified staff members and excellent infrastructural facilities. This institution was granted autonomy from the academic year 1987-1988 by the University Grant Commission. It is affiliated to Anna University, Chennai. This Institute is supported by TEQIP funding; now it is provided with fund of Rs.7 Crores by TEQIP-III.As a green energy initiative, this institution has installed solar power panels under CoE- Alternate energy.

About the Department:

The Department of Civil Engineering offers UG programme and PG programs in Structural, Environmental and Geotechnical Engineering. The UG programme was accredited with 5 years and PG Structural Engineering with 3 years by NBA under Tier I. The department is provided with a Centre of Excellence in Environmental studies with funds of about Rs.5 Crores under TEQIP-III. The long term goal of CoE-ES is to develop a centre which is conducive for R&D activities and to enhance revenue generation through better Industry – Institute Interaction. The short term goals are to impart better education through continuing education programs to carry out academic and sponsored research leading to Masters and Doctoral degrees in Environmental Biotechnology and Nanotechnology. The research is carried out on a wide range of topics in Structural, Geotechnical and Environmental Engineering. The department is actively engaged in testing and consultancy activities.

Vision and Mission of the Institute

Vision

To emerge as a centre of Excellence and eminence by imparting futuristic technical education in keeping with global standards, making our students technologically competent and ethically strong so that they can readily contribute to the rapid advancement of society and mankind.

Mission

- To achieve Academic excellence through innovative teaching and learning practices.
- To enhance employability and entrepreneurship
- To improve the research competence to address societal needs.
- To inculcate a culture that supports and reinforces ethical and professional behaviour for a harmonious and prosperous society.

Vision and Mission of the Department

Vision

Marching towards the centre of excellence in Engineering and Technology with sustainable development to bring out professionals with futuristic vision.

Mission

- To mould the students to be good planners, designers, executers and ethical Engineers to serve the society and strive for the development of the nation.
- To make Civil Engineering department a renowned high-tech consultancy centre for various Civil Engineering activities.
- To create a nodal centre for providing consulting services during natural calamities.
- To make this department a centre for research and development activities with field interaction.

Program Educational Objectives

PEO 1: Graduates will achieve a high level of technical expertise in the subjects related to Civil Engineering and also good in communication skills that help them to achieve and succeed in various positions.

PEO 2: Graduates will have a strong understanding in Mathematics and Sciences which are needed for the application of Civil Engineering principles to do Post Graduate programmes and competitive examinations.

PEO 3: Graduates will get interest on the learning processes and inculcate in them professional ethics, moral values and social concern.

Technical Article: Equipment use in construction

General:

There are several equipment that is been used in the Construction Industry. These are used for both large and small scale purposes. Various types of Equipment are been used for Building & structural Construction, Road construction, underwater and other marine construction work Power projects etc.There are various operations that are involved in construction projects , whether it's a large scale or a small scale; Excavation and digging of large quantities of earth, Placement of construction materials (eg:-Bricks, concrete) Compacting and leveling, Dozing, Grading, Hauling etc… The different types of equipments are listed below.

1. EARTH MOVING EQUIPMENT

1.1 Excavators
1.2 Graders
1.3 Loaders
1.4 Skid loader
1.5 Crawler loaders
1.6 Backhoe
1.7 Bulldozers
1.8 Trenchers
1.9 Scrapers
1.10 Wheeled loading shovels

2. CONSTRUCTION VEHICLE

2.1 Tippers
2.2 Dumbers
2.3 Trailers
2.4 Tankers

3. MATERIAL HANDLING EQUIPMENT

3.1 Crane
3.2 Conveyors
3.3 Hoists
3.4 Forklifts

4.CONSTRUCTION EQUIPMENT

4.1 Concrete Mixture
4.2 Compactors
4.3 Pavers
4.4 Road Rollers

5. TUNNELING EQUIPMENT

5.1 Road Headers
5.2 Tunnel Boring Machines (TBM)

6. OTHER CONSTRUCTION EQUIPMENT

Compaction Becoming More Advanced

Source: NBM & CW

Modified drums and intelligent compaction are the new value engineered add-ons that promise higher productivity at a lower operating cost. However, the higher initial cost of these machines can be offset by enhanced post-sales support and services by the manufacturers to ensure their higher availability. Compactors are required to work on different types of terrains and within a very tight time schedule. Hence, the vital features required in compactors are higher levels of productivity with fewer numbers of passes, and right frequency settings. As the market becomes more competitive now, soil and tandem compactor manufacturers are coming up with new solutions like pneumatic tyred rollers and are developing more advanced products that give value for money to the buyers.

How 3D Printing Has Transformed the Construction Industry

(Source : https://www.giatecscientific.com/education/8-ways-that-3d-printing-has-transformed-the-construction-industry)

Introduction

Construction 3D printing is **a method for manufacturing construction elements or entire buildings by means of a 3D printer printing concrete, polymer, metal, or other materials, layer-by-layer**. The most common type of printer is based on a robotic arm that moves back and forth while extruding concrete.

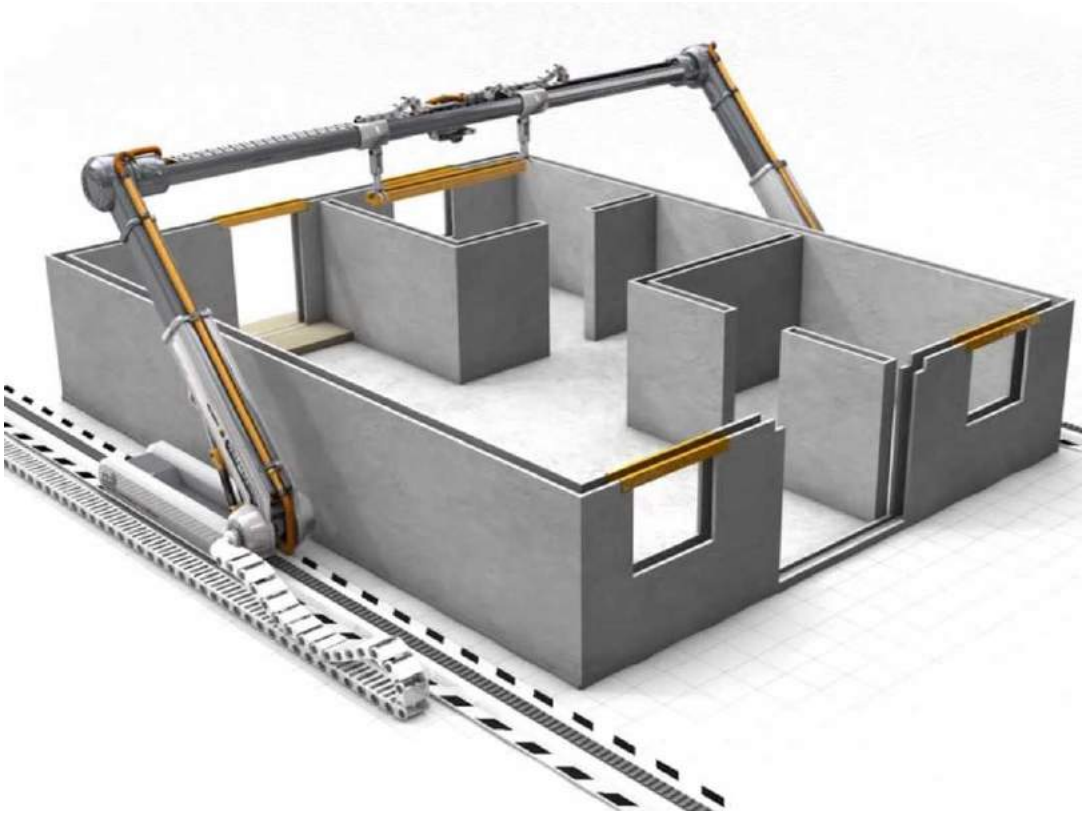
Considering the competitive nature of the construction industry, 3D printing offers contractors an innovative way to set themselves apart from their competitors.

Advantages of using a 3D printer in construction field.

1. Reduced Injury
2. Reduced Material Costs
3. Quicker Construction
4. New Markets
5. Cheaper Construction
6. Improved Form
7. Better Durability
8. Brand Improvement

What is a 3D printed house?

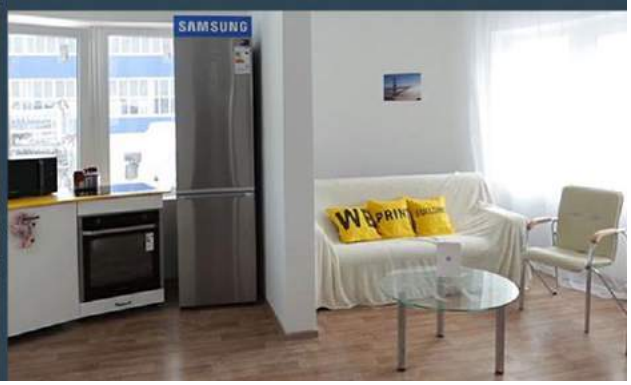
Houses that are designed and built using construction technologies that use the 3D printing method are known as 3D printed homes. 3D printed homes are faster to build and are superior to the traditionally constructed structures in many ways.



India’s first 3D-printed home, built by alumni of IIT-Madras,

3D PRINTING

THE FUTURE OF CONSTRUCTION



Faculty Contribution in consultancy

Verification of Structural Soundness

Housing Board Colony in Tirupur: Behind C- Block

Verification of Structural Soundness

Housing Board Colony in Tirupur : Distress in roofs

Structural Damage Assessment of Dilapidated 54 Nos. of TNGRHS Flats at Moolapalayam, Erode

Robotics in Construction Industry in 2022

Source:

(https://www.linkedin.com/pulse/robotics-construction-industry-2022-use-benefits-types-reetie-multani)

The construction industry is a labor-intensive industry. The construction business is way behind in adopting robotics, automation and digital technologies as it is one of the least automated industries of all.

The latest technologies and advancements in the building construction industry such as Artificial Intelligence and robotics are currently the talk of the town. Implementation of such technologies facilitates accuracy and quicker construction, saving time, money and other resources.

With a fast-paced construction process, the incorporation of robotics technology in construction facilitates construction professionals with quality-assured outcomes and reduced human errors.

Brick Laying Robot

Robots Assisting In Site Security

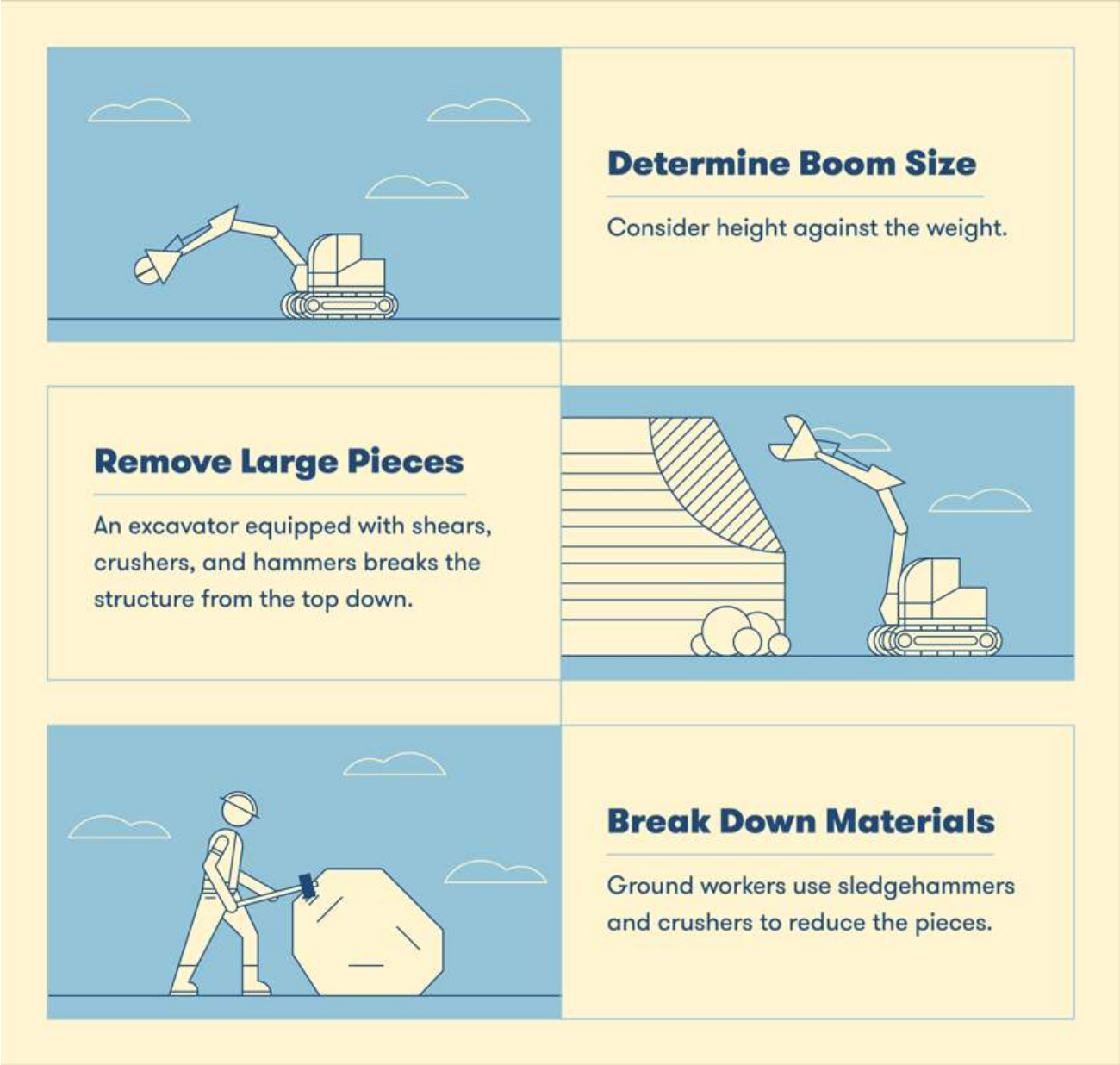


Fig. Robots for Demolition of Structures

Advantages of Using Robotics in Construction

Advantages of robots in construction

1. **Construction site safety** – Implementing robotics and automation on construction sites enables enhanced safety measures for the workforce. The robots can be controlled from a safer area, eliminating the need to physically access the unsafe location.

2. **Increased efficiency** – It results in greater work efficiency as the construction robots are designed and programmed for greater efficiency.
3. **Enhanced accuracy** – As compared to human labor, robots are highly accurate. The incorporation of robotics technology eliminates the probability of human errors, delivering highly accurate results.
4. **Time and Cost efficacy** – As learnt, robots are faster and productive when compared to manual labor. It results in the completion of the task real quick, eventually resulting in saving overall time and cost of the construction project.

Disadvantages of Using Industrial Robots

The disadvantages of robots in construction and civil engineering are as discussed below.

1. **High initial cost** – Though robotics are cost-effective in the longer run, the equipment and machines do require a high investment initially.
2. **Fear of unemployment** – There is a fear of unemployment amongst laborers and robotics and automation has started replacing a notable amount of the workforce in the construction business, eliminating the manual processes.
3. **Better suited for repetitive tasks** – Construction robots are basically programmed to perform several repetitive tasks and can perform a single task at a time.
4. **Maintenance** – Robotics is after all a technology. At some interval, like every other technology, robotics requires maintenance to maintain its efficiency. It may sound easy but maintaining several robots can result in higher expenses.
5. **Requires professional training** – Robotics and automation is a vast subject, requiring professional training for implementing it in the industry. Adopting robotics for your project, you need to hire trained professionals/operators.

Useful Tips for a site Engineer

(Ref: IS codes/standards/Hand books/Practicing Aids)

Basics of Civil Engineering:

1. **Height** of **building** = **3.15m**.
2. **Height** of **Parapet wall** should be **1m**.
3. **Height** of **window** = **2.1m**.
4. **Minimum thickness** of **slab** = **125mm**.
5. **Minimum thickness** of **lintel** = **15cm**.
6. **Thickness** of **DPC** = **2.5cm**.
7. **Maximum diameter** of the **bars** used for **lapping** is **36mm**. **Bars** having **more than** this diameter are **not allowed**.
8. **Minimum diameter** of **bars** used in **Slab** = **8mm**.
9. **Minimum diameter** of **bars** used in **Column** = **12mm**.
10. **Minimum number** of **bars** used in **Square** or **Rectangular Column** = **4 bars**.
11. **Minimum number** of **bars** used in **Circular Column** = **6 bars**.
12. **Maximum diameter** of **bars** used in **Slab** = **1/8 × thickness of slab**.
13. **Maximum Chair spacing** = **1m**.
14. **Chairs minimum** of **12 mm** diameter **bars** to be used.
15. **Minimum diameter** used for **Dowels Bars** is **12mm**.
16. **Longitudinal reinforcement** should not be **less than 0.8%** and not be **more than 6%** of **gross area** of **cross section**.
17. **Binding wire** required in **steel reinforcement** is **8kg per MT**.

18. **Weight** of **1 cement bag** = **50kg**.
19. **1 bag** of **cement** = **1.25 cubit feet** = **0.0347 cubic meter**.
20. **No.** of **Cement Bags** in **1m3** = **28.8 bags**.
21. **Initial setting time** of **Cement** = **30 minutes**.
22. **Final setting time** of **Cement** = **10hrs** = **600 minutes**.
23. **PH value** of the **water** should not be **less than 6**.
24. **Riser** of **staircase** = **150mm to 200mm**.
25. **Tread** of **staircase** = **250mm to 300mm**.
26. **Angle** of **staircase** = **25° to 40°**.
27. **Tensile** or **Flexural strength** of **concrete** = **0.7√fck**.
28. **Modulus of elasticity** of **concrete** = **[Ec=5000√fck]**.
29. **Young's modulus** of **steel** = **[Es=2×10^5 N/mm2]**.
30. **F.O.S** for **steel** = **1.15**.
31. **F.O.S** for **Concrete** = **1.5**.
32. **Standard size** of **Brick** = **190mm×90mm×90 mm** = **19cm×9cm×9cm**.
33. A **good brick** clay contains **20 to 30%** of **alumina**, **50 to 60%** of **silica** and the remaining constituents are **Lime**, **Magnesia**, **Sodium**, **Potassium**, **Manganese** and **iron oxide**.
34. **Colour** of **good brick** is **deep red**, **cherry** or **copper colored**.
35. **Compressive strength** of **bricks** is **3.5 N/mm2**.
36. **Maximum water** absorption of **first class brick** is **15%** of its **dry weight**.
37. The excess of **silica** in the clay makes the **brick brittle** and weak.
38. Process of **manufacturing of bricks** consists of **Preparation of brick clay**, **Moulding**

38. Process of **manufacturing of bricks** consists of **Preparation of brick clay**, **Moulding bricks**, **Drying of bricks** and **Burning of bricks**.
39. **Moulding of bricks** may be **hand moulding** or **machine moulding**.
40. The **burning** of **dry bricks** is done either in **clamp** or in a **kiln**.
41. The **ingredients** of **ordinary cements** are **Lime, Silica, Alumina, Calcium sulphate, Iron oxide, Magnesia, Sulphur & Alkali's**.
42. **Ordinary Portland cement** consists of **62 to 67%** of **Lime**.
43. The **initial setting time** of **ordinary Portland cement** should not be less than **30 minutes**.
44. The **final setting time** of **ordinary Portland cement** should not be more than **10 hours**.
45. **Initial** and **Final setting time** of **cement** is determined by **Vicat's apparatus**.
46. The normal **consistency** of **Portland cement** is about **25%**.
47. When **concrete** is to be **laid under water**, **Quick setting cement** is used.
48. **Maximum** free **fall of concrete** allowed to **1.50m**.
49. **Test On Fresh Concrete**
    - **Slump Test** – Workability.
    - **Compacting Factor Test**.
    - **Vee-Bee Test**.
50. **Test On Hardened Concrete**
    - **Rebound** (Schmidt) **Hammer Test**.
    - **Ultrasonic Pulse Velocity Test**.