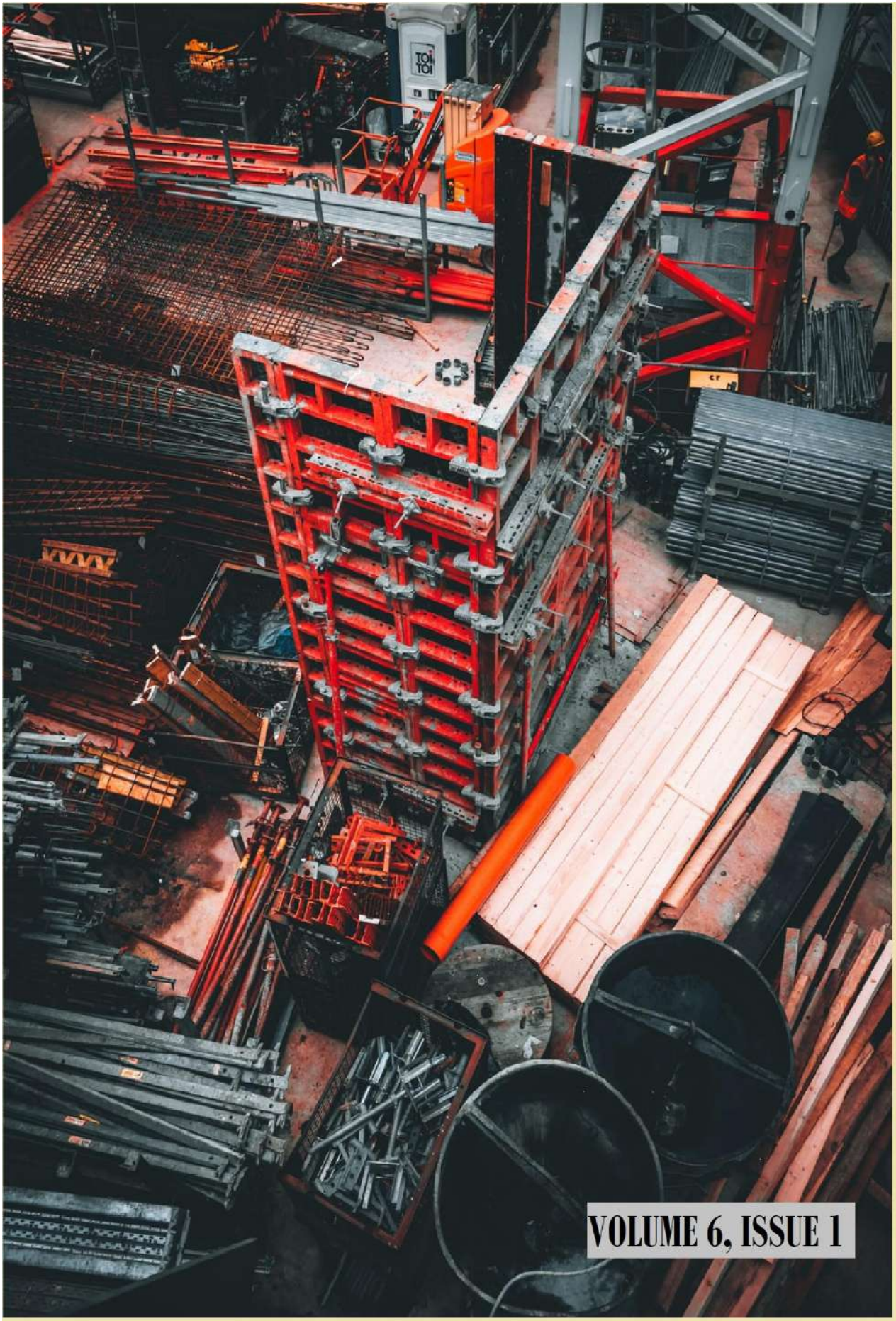

NIRMAAN

VOLUME 6, ISSUE 1

DEPARTMENT OF CIVIL ENGINEERING

DR. AKHILESH DAS GUPTA INSTITUTE OF TECHNOLOGY & MANAGEMENT

FC-26, PANDUK SHILA, SHASTRI PARK, NEW DELHI- 110059

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The Department of Civil Engineering has always been a gem of Dr. Akhilesh Das Gupta Institute of Technology & Management. The perennial zeal of the Department has never left the achievements stagnant. The Department not only gives students the exposure to the regular engineering curriculum but also to the aspirations of today's corporate World, thus in culcating a professional aptitude in them.

The dedication of the faculty members has strengthened the learning process ensuring an environment of collaboration, experimentation, imagination and creativity. It is such a prodigious delight in watching the student's cutting edge in technical exploration, enhancing their analytical skills and brushing themselves up for the rapidly changing sector and establishing themselves as entrepreneurs and engineers.

The Department has always reached new heights and I am looking forward to more wonders and achievements. I wish the very best to the Department of Civil Engineering in the next edition of NIRMAAN, the official magazine of the Department. The magazine beautifully provides an overview of academic programs, research activities, various laboratories, training and the other fields explored by our faculty members and students.

Mr. Viraj Sagar Das
President
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After the success of the previous five volumes of NIRMAAN, I am extremely happy to witness the shaping up of the sixth volume. A special mention to the Editorial Board, who were able to capture the noteworthy proceedings of the Civil Department of Dr. Akhilesh Das Gupta Institute of Technology & Management and were also able to present it in an alluring manner.

I thoroughly enjoyed myself going through the pages of this magazine. I hope students and faculty members find this edition as sound as, I did. I congratulate the Department and the Editorial Board for this achievement.

Shri S.N. Garg

CEO, ADGITM

A teacher is a person who mends the mindset of a student, nurtures and wing it, on the other hand a student believes his teacher and gives his future in hands of his mentor. No responsibility is as big as molding a life. As CEO of Dr. Akhilesh Das Gupta Institute of Technology & Management, I ensure at every step to strengthen this teacher-student relationship.

Civil Engineering Department of the Dr. Akhilesh Das Gupta Institute of Technology & Management is another satisfying establishment I witness on a regular basis. There is nothing more gratifying than to see all the unstoppable avidity collected and preserved in a book. The SIXTH volume of NIRMAAN is a commendable work done by the sedulous team of faculty members and students. They were able to present not only the achievements of the department but also the inspiring examples which will galvanize the amateurs to achieve big than their dreams.

Prof.(Dr.)SanjayKumar

Director, ADGITM

"Engineering is not only the study of the technical subjects, but it is about living an intellectual life."

As the Director of Dr. Akhilesh Das Gupta Institute of Technology & Management, I strongly believe that education is not only about imparting knowledge but more about opening the individual's mind to self-expression. I saw an overwhelming response by the students not only in the technical domain but also in the branch of sports, arts, photography, music and a lot more. I am confident that with such a positive and progressive attitude they would be able to justify the credibility of the Department as well as the college by bringing laurels and accolades.

I am immensely proud to observe a team of such enthusiasts. The sixth volume of the magazine of the DEPARTMENT OF CIVIL ENGINEERING, NIRMAAN, has been able to make account of all the achievements, hard work and dedication of the faculty members and students alike. I wish them luck.

Dr. Ankur Mudgal
Head of the Department

Dear Readers,

The story of progress of civilizations is intertwined with the story of progress of Civil Engineering. It is important to remember that our engineers have always been involved in the process of building a new world with innovative materials into complex shapes to withstand forces of nature beyond their control. NIRMAAN is introducing its latest edition that showcases all the events of the odd semester. It showcases the technical and creative writing skills of the students and a few articles by the faculty members.

I congratulate the editorial team and hope that the readers will enjoy the insight into the world of Civil Engineering.

ABOUT THE DEPARTMENT

- The Department of Civil Engineering was established in the year 2011. The department offers a four-year course for Bachelor's Degree in Civil Engineering. The present student intake of the department is 120.
- The Department consists of well-equipped laboratories with modern instruments in the field of Structural Analysis, Concrete Testing, Geotechnical Engineering, Environmental Engineering, Remote Sensing and GIS, Computer Aided Designing, Transportation Engineering, Surveying, Building Materials and Hydraulics Engineering.
- Survey Camps, Field Visits and Projects being a part of the curriculum, are practiced to prepare students for industrial readiness. Students are monitored and strengthened to meet the demands of industrial as well as research and development sector. The Department regularly organizes guest lectures, seminars and workshops by distinguished personalities from the field and industry. Technical training on various software is arranged for students.
- The Department consists of a well-qualified team of faculty and staff members. The department participates in several faculty development programs, conferences, workshops and online courses to ensure quality education.

VISION & MISSION (Institute)

Vision of the Institute

To produce globally competent and socially responsible technocrats and entrepreneurs who can develop innovative solutions to meet the challenges of 21st century.

Mission of the Institute

1. To provide value-based education through multi-grade teaching methodologies and modern education facilities.
2. To sustain an active partnership programme with industry and other academic institutes with an aim to promote knowledge and resource sharing.
3. To conduct value-added training programme to enhance employability.
4. To provide conducive environment for development of ethical and socially responsible technocrats, managers and entrepreneurs.

VISION & MISSION (Department)

Vision of the Department

To produce civil engineers equipped with excellent technical research and leadership skills for globally competent environment.

Mission of the Department

M1: To impart quality education through veracity of academics and practical applications.

M2: To develop research attitude in students to solve civil engineering Problems.

M3: To create a conducive environment that promote project-based learning and industry-based skillsets.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduate shall have strong fundamentals in Civil Engineering to deliver sustainable and economical solutions to real life problems.

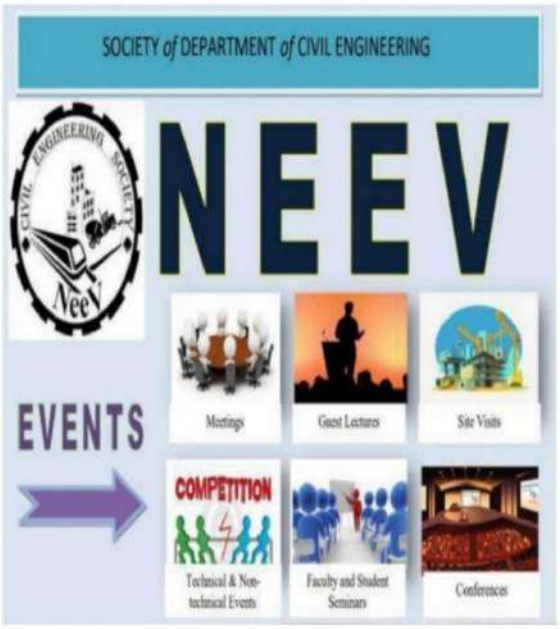
PEO2: Graduate shall develop excellent communication, technical and leadership skills in interdisciplinary environment as team players and responsible citizen.

PEO3: Graduate shall, apart from excelling in Civil Engineering, exhibit high human values and professional competence.

NEEV

Civil Engineering Society

The students of Department of Civil Engineering present to you an official Civil Engineering Society, NEEV.



NEEV is established on 11th March 2014. It is formed and governed by the students of ADGITM, New Delhi itself under the supervision of faculties of civil Engineering Department.

NECESSITY OF NEEV IN ADGITM

Engineering is the application of scientific as well as practical knowledge. Scientific knowledge is something one can attain through books, lectures and other sources, but practical knowledge requires us to expand the periphery of learning.

MISSION

- To assist the department in improving the quality of education.
- To promote empirical knowledge through events.
- To promote professionalism.
- To get associated with the American Society of Civil Engineering (ASCE)

Restorative & Regenerative Building Design

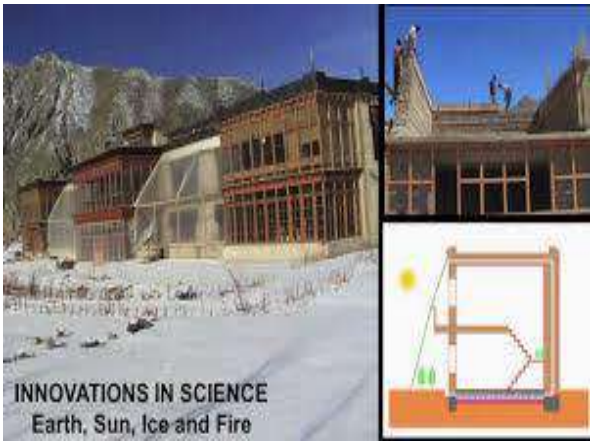
By: Ekta Dwivedi, Assistant Professor (ADGITM)

Sonam Wangchuk, an innovator entrepreneur from Ladakh, developed this living concept. Wanchuk received the acclaimed 2017 World Award for Sustainable Architecture in recognition of the paintings of the "Ice Stupa Challenge on Passive Solar-heated Earth Houses and Sustainable Structures". Wanchuk is one of the founders of the Ladakh Student Education and Cultural Movement (SECMOL). Founded in 1988 to reform Ladakh's educational institutions, the SECMOL Alternative School is a green campus near the city of Leh. Facility apartments are heated without the use of traditional energy sources that burn carbon dioxide. However, the heating is so good that the temperature inside the main building in Fi village (near Leh) remains comfortable even in winter weather without electric heating or burning firewood.

The southern face of the main building of SECMOL. Alternative School is all windows as it gets maximum sunrise to sunset exposure in winters.

The most important feature of the concept – the south side of the building is the most noticeable from sunrise to sunset in winter, so we want to be all the windows of the house. On the south side of the SECMOL school building, there is a large, thick plastic sheet diagonally connected to the windows of these houses. It stops strong cold winds, but takes in sunlight and warmth in winter. This sheet is rolled up in the summer to take in clean air and prevent overheating. There is a glass opening at the top of the building that illuminates the interior of the building beautifully all day long, providing even more warmth in the winter. Basically, these are the south-facing aisle windows (plastic film and glass or glass) on the double walls of the main building and the dormitory. The various side walls are made of thick dust with insulation in between. Insulation is partly air and partly a combination of recycled paper and dry grass. "A beautiful example of insulation is a room with a water tank," Norgay advised "We can fill these at night with the help of runoff from nearby spring, or even in the middle of winter to prevent it from freezing." "The concept of a passive solar system is to absorb and trap all the heat from sunlight without delay, a structure that we can sustain for a long time," he said. "Even without the hassle of synthetic heating methods, we stayed here and graduated from school in winter weather every year for over a decade."
Indian troops in Ladakh Sonam Wangchuk I was invited to a seminar on heat habitats in such bloodless areas.

Two years ago in the winter, Wangchuk and his group prototyped a low-cost, sun-



Army spends a lot of money and carbon to keep the army warm in cold places like Ladakh, but Ladakh is one of the sunniest places," Wangchuk said. I told the net. He emphasized that this is a way to prevent the state treasury from being used to buy oil abroad. "You can be fair in every aspect of using the sun. The version is certified.

Source of article:Nivedit Khandekar

The First Skyscraper

By: Niharika Sharma, Assistant Professor (ADGITM)

In the late 19th and early 20th centuries, the first skyscrapers—tall commercial structures with iron or steel frameworks—were built. The Home Insurance Building in Chicago is widely regarded as the first skyscraper, despite its low height of only ten floors. Later, a series of architectural and engineering advancements, including the discovery of the first mass-production steel process, enabled the construction of ever-higher structures. The world's tallest skyscrapers now have more than 100 floors and reach heights of 2,000 feet or more.

Chicago's Home Insurance Building is widely considered to be the world's first modern skyscraper.

History of Skyscrapers

A skyscraper is a tall commercial building with an iron or steel framework.

They were made possible as a result of the Bessemer process of mass production of steel beams.

The first modern skyscraper was created in 1885—the 10-story Home Insurance Building in Chicago.

Early extant skyscrapers include the 1891 Wainwright Building in St. Louis and the 1902 Flatiron Building in New York City.

The First Skyscraper: Chicago's Home Insurance Building

The first building that could be considered a skyscraper was the Home Insurance Building in Chicago, which was finished in 1885. The building was 10 stories tall and reached a height of 138 feet. Two additional stories were added in 1891, bringing the height to 180 feet. The building was demolished in 1931 and replaced with the Field Building, an even taller skyscraper with 45 stories.

Early Skyscrapers

Although the first skyscrapers were relatively small by today's standards, they marked an important turn in urban construction and development. Some of the most notable structures in the early history of skyscrapers were:

Tacoma Building (Chicago): Constructed using a riveted iron and steel frame, the Tacoma Building was designed by the major architectural firm Holabird & Root.

Rand McNally Building (Chicago): The Rand McNally Building, completed in 1889, was the first skyscraper built with an all-steel frame.

The Masonic Temple Building (Chicago): Featuring commercial, office, and meeting spaces, the Masonic Temple was completed in 1892. For a time it was the tallest building in Chicago.

Tower Building (New York City): The Tower Building, completed in 1889, was the first skyscraper in New York City.

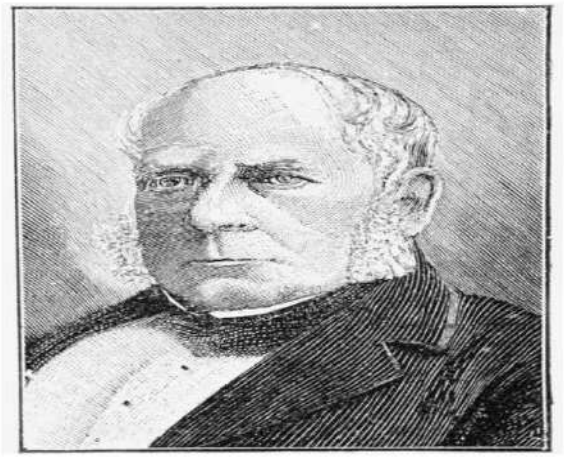
American Surety Building (New York City): At 300 feet tall, this 20-story building broke Chicago's height record when it was completed in 1896.

New York World Building (New York City): This building was home to the *New York World* newspaper.

Wainwright Building (St. Louis): This skyscraper, designed by Dankmar Adler and Louis Sullivan, is famous for its terracotta facade and ornamentation.

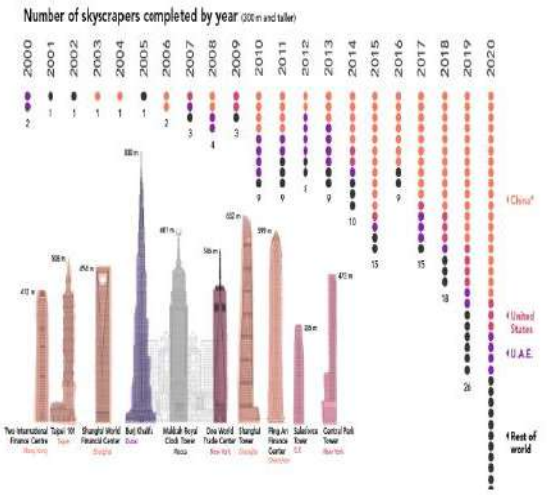
Flatiron Building (New York City): The Flatiron Building is a triangular, steel-frame marvel that still stands in Manhattan today. In 1989, it was made a National Historic Landmark.

Mass-Produced Steel Allows for Construction of Skyscrapers



Portrait of Henry Bessemer, British inventor. clu / Getty Images

Skyscrapers were made possible thanks to Henry Bessemer, an Englishman who created the first technology for mass-producing steel at a low cost. A patent for "a system of air blowing the carbon out of pig iron" had been held by an American, William Kelly, but poverty compelled Kelly to sell his invention to Bessemer, who had been working on a similar process for creating steel. Bessemer patented his own "decarbonization technique with a burst of air" in 1855. This innovation in steel production allowed architects and builders to construct ever-higher structures. Bessemer's technique is still used to manufacture modern steel today.



Source of article- :Mary Bellis

Concrete: a most suitable and universally adopted construction material

By: Jitender Kumar, Assistant Professor (ADGITM)

Looking around the world, concrete structures are seen everywhere such as commercial to residential buildings to road, concrete is used as major material in construction because it helps to save our natural resources. The concrete has its importance in modern society which cannot be underestimated. As the availability of resource of concrete constituent product, concrete play an important role to the environment. Concrete is supposed to be in tune with the environment.

Concrete has an ability to withstand the action of water without serious deterioration which makes the concrete an ideal material for construction of structures. The ease with which structural concrete elements can be formed into a variety of shapes and sizes is one of the reasons for concrete's success. This is because green concrete has consistency when it is plastic, which enables the green concrete to completely fill the prefabricated formwork. After some specified time, the prefabricated formwork can be dismantling for future benefits when the concrete gain its maximum strength and look like a harden material.

Concrete, acts as a solid material that gains its maximum strength over period of time. It provides prevention of resources by mean of reduction in maintenance as well as reconstruction problem. Plain concrete has relatively high compressive strength but significantly lower tensile strength. Hence any appreciable tension will lead to rupture and consequent failure. For this reason, the use of plain concrete is limited to a structural member subjected to bending or directs tensile action.

Since the beginning of the use of concrete, strength has been regarded as one of its most significant and important concrete may be defined its ability to restrained against failure. It may be determined in many ways, such as compressive strength, tensile strength, shear strength and flexure strength. Lackness of durability in harden concrete is very common problem now a day. Permeability is very important measure which affects the durability of harden concrete. The estimation of permeability of concrete can be easy by the intrusion of some liquids, various gases and inbuilt deleterious matter such as carbon dioxide or chloride ions into the harden concrete. The permeability is one of that property of harden concrete which is mainly affects the life of reinforcement of concrete. Due to the adoption of various admixtures affects this durability property of concrete and as a result protects the reinforced bars in concrete from corrosion.

Light Weight Construction Technologies

By: Shikha Sachan, Assistant Professor (ADGITM)

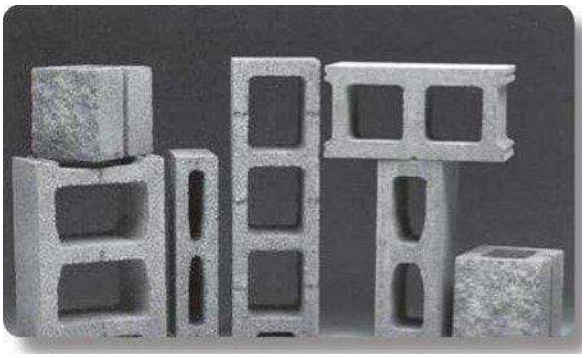
The light weight concrete can be produced by various methods. All depends on either the presence of air voids in aggregates or in the matrix, or by committing fine aggregates. Light weight concrete can be classified as follows:

- Light weight aggregate concrete
- Aerated concrete
- No fines concrete

Lightweight aggregate concrete is produced using light weight aggregates such as pumice, expanded slag, clinker, etc. Aerated concrete is produced using foaming agents such as aluminum powder that produce low unit weight through generation of gas while the concrete is still plastic. No fines concrete made with gravel aggregates is not strictly light weight concrete though its weight is about 70% of normal concrete.

Lightweight concrete is now an established building material. It is used not only on account of its light weight but also because of high thermal insulation compared with normal concrete. Lighter the concrete larger is the insulation properties in general. An earliest application of light weight concrete was in building industry and for producing insulating screeds. The principal structural use of light weight concrete is in construction of under bed of floors and bed slab, where substantial economy can be achieved by decreasing the dead load.

Indirect saving in steel and decreasing size in foundation are advantages. The disadvantages are greater cost, need for care in placing, greater porosity and greater drying shrinkage. Structural light weight aggregate concrete can be produced with the strength in excess of 310 MPa and even strengths have been attained in certain cases, although at the expense of increased densities. The aggregates used include sintered pulverized fuel ash, expanded of these aggregates absorb considerably quantities of water (up to 80% by volume), the effect on workability within a few minutes of mixing is such that a wet mix can become too dry. It is therefore necessary to wet, but not saturate, the aggregate before mixing. A good portion of the mixing water is also best added before introducing the cement. Rich mixes containing 350 kg/m3 cement or more are



usually required to give a satisfactory strength.The cover to reinforcement when using light weight concrete should be 10 mm more than that used for normal dense concrete. The increased cover is necessary because, besides being more permeable, light weight concrete carbonate more quickly than dense concrete and the protection affordable to the steel by the alkaline lime is cost.

Properties of light weight aggregate concrete

A density of kg/m3 may be considered as the upper limit for a true light weight concrete although this value is sometimes exceeded. Lower densities than those stated will be obtained in cases where the concrete is only partially compacted.

In general, the lower densities can only be achieved at the expense of lower strengths. The range of strength in each case are typical of what may be achieved in practice, but it should be noted that rather rich mixes are required for higher strength values in case of the light weight fines to achieve these higher strengths. The tensile and shear strengths of light weight aggregate concrete are less than that for natural aggregate concrete of the same compressive strengths. The reduction in the case of tensile strength may be as much as 30%. The modulus of elasticity of light weight concrete is about 0.5 to 0.75 times the value of natural aggregate concrete of the same compressive strength varying from 7 to 21 kN/mm^2. Values of elastic deformation, shrinkage and creep are greater for light weight concrete. Extra reinforcement is also necessary.

Clinker and Breeze: clinker and breeze aggregates have been in use for many years in the production of blocks and slabs for internal partitions and other interior walls. These aggregates are cheap and plentiful, and provide a very useful product after they have been crushed and graded. In general clinker is regarded as a well burnt fused or sintered mass containing little combustible material; whereas breeze is a more lightly sintered and less well burnt residue and therefore contains more combustible matter. Increasing quantities of combustible content is determined approximately be igniting a small sample of the clinker as specified temperatures and finding the percentage loss in weight.

Pumice Concrete (Natural aggregate): pumice is most widely used natural light weight aggregate in common use. Provided it is free from fine volcanic dust and materials not of volcanic origin such as clay, pumice produces a satisfactory light weight concrete with a density of between 720 kg/m^3 to 1440 kg/m^3. Pumice provides better thermal insulation than other type of light weight concrete.

Foamed Slag: Foamed slag is made by rapidly quenching blast furnace slag produced in the manufacture of pig iron. Its texture and strength are dependent on the chemical composition and the method of treatment but in general the structure is similar to natural pumice.

Expanded Minerals: Naturally occurring clays, shales and slates may be used to produce light weight porous materials of a cellular texture by suitable treatment and heating up to temperature of about 1000°C to 1200°C. Materials with similar characteristics may also be obtained from pulverized fuel ash or fly ash. After crushing and screening to the desired size, these processed materials form good light weight aggregates.

Aerated cement mortars (often referred to simply as aerated concrete) to produce light weight porous materials of a cellular texture by suitable treatment and he are made by introducing air, or specially foamed gas, into a cement slurry so that, after setting, a hardened mortar with a cellular structure is formed. The slurry usually consists of a mixture of cement and siliceous material such as sand or pulverized fuel ash.

Coarse natural or light weight aggregate can also be used in conjunction with aerated cement mortars. Natural aggregates increase the density and to some extent reduce the moisture movements. Light weight aggregates do not cause the same increase in density,

but the moisture movements are more nearly those of aerated mortars.

No-Fines concrete is composed of cement and coarse aggregate only, the fine aggregate being omitted in order to leave uniformly distributed voids throughout the mass. The aggregates may be gravel or crushed stone, blast furnace slag, crushed brick or one of the light weight aggregates. No fines concrete presents some difficulty in the fixing of various fittings and it is necessary to embed nailing blocks of timber, saw dust cement or foamed slag. No fines concrete has little resistance to the penetration of water, but there is also very little capillary action. Thus, there is no tendency for the water to be drawn into the wall; the provision of a rendering, with a care in arranging and fixing flashing at various openings, is sufficient to waterproof the structure satisfactorily.

Palm Islands Dubai Construction, Design Facts and Technical Details

By: Aashish Malik, Assistant Professor (ADGITM)

Palm Islands Dubai

5 Km into the Persian Gulf, lie the Palm Islands, Dubai. Palm Jumeirah can even be seen from space. It is the biggest man-made island in the world. Dubai is one of the richest places in the world, having size twice that of London. By 2016 oil is believed to be finished in Dubai, hence thrashing its economy to ground. Dubai must find a new source of income. The Crown Prince Sheikh Muhammad bin Rasheed Al Maktoum devised a $ 2 billion plan to save his country. His vision was to turn Dubai into a #1 luxury and holiday resort. He has the history of getting done what he wants. Besides creating golf courses, world's tallest structures, he also has built the world's tallest hotel - The Burj Al Arab. His idea is mass tourism.

Why Palm Tree Islands were built?

Dubai is a perfect place for the idea, having sunny days throughout the year. It has numerous beaches with hotels and resorts and a number of shopping malls. 5 million tourists visited Dubai each year, which the Sheikh wanted to triple to 15 million. But the problem was that the coastline of Dubai is just 72 Km, not enough for 15 million tourists that were to come. There is always a solution to a problem, build a massive island, shaped Palm Tree, up to the year 2006. The island was supposed to be 5.5 Km in diameter, thus increasing the coastline by 56 Km.

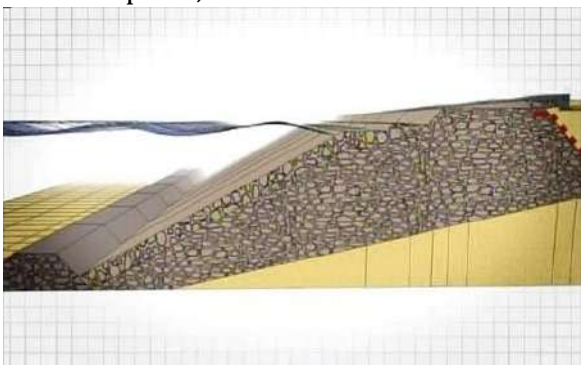
The extra ordinary plan was to build a city in that island. Shopping-malls, restaurants, hotels, apartments and homes. The island was to host 22 luxurious hotels. Island could also be built from concrete, but to blend it with the surroundings, it was to be made from sand and gravels. 94 million cubic meters of sand was required for its construction. To protect from sea, breakwater was to be built of 5.5 million cubic meters of rock. Together they constitute to be able to build a 2.5 m high wall encircling the entire world.

Start of Palm Jumeirah Island Construction

World's best engineers were needed for the project. Search for experienced professional leaded to Dutch, who have increased Holland's land by 35%. they were booked and were to prove first of all that it was possible to build a megastructure island, out at the sea. Strength of storms in the sea was to be calculated and also the rise in water level due to global warming was taken into account. Strong tides were the dangerous thing. They destroy nearly everything in their path. But this area proved to be a lucky one. Research team worked out that Arabian gulf is only 160 Km wide and only 30 meters deep, hence too short and too shallow for

catastrophic waves to built up. To keep this fragile island safe, breakwater was to be constructed having height up to 3 meters and 11.5 Km long. In August 2001 the construction of break water started.

Due to sept 11, 2001 attacks the tourism

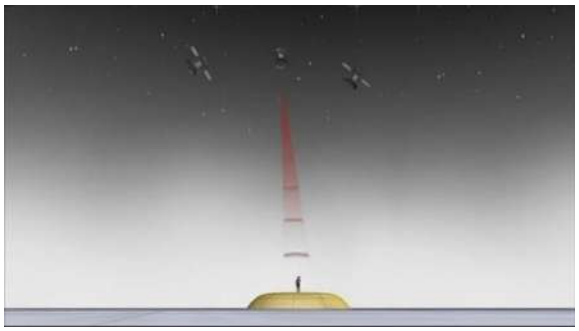


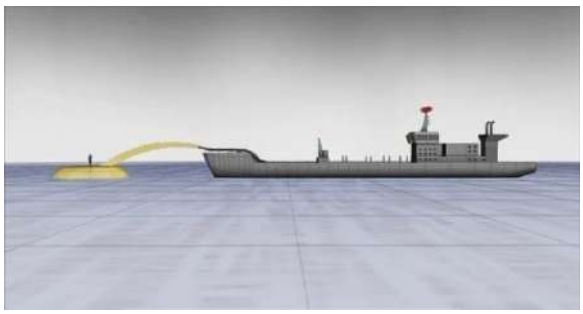
to middle-east stopped but the project kept on moving. 1200 foreign engineers were put to work. These engineers had previously experience of Hong Kong's International Airport, Singapore's Industrial center, Holland's North Road and other renowned megastructures. But no one had reclaimed a structure this size or shape before. By Nov, 2001 9 barges, 15 dumpers, 4 dredgers, 30 heavy land base machines and 10 cranes beside other construction machinery, were put to work.

Ist challenge was to put sand into the sea bed. Dredgers would collect sand from the sea and dump it where break water was to be constructed. All this was done when sea was at its calmest. Finding the right sand was an enormous job in itself. Dubai has a lot of sand, as there are vast areas there. But desert sand was too fine and sand at sea was coarser and more resistant to waves. To keep that sand in place, bare loaded rubble was dropped on to it. This was to rise breakwater to a height of 4 m above sea level. This was beginning of the sea defense, without which island couldn't exist.

The sloping layers take out the force of the waves as they hit it. But sand and rubble is at the base. What really protects them both is another layer of rock. Each piece of rock weighed up to 6 tons. Sourcing huge number of rocks forced builders to excavate rocks from 16 quarries across UAE. 11.5 Km breakwater needed 5.5 million cubic meters of rocks, enough to build two Egyptian Pyramids. Now, when breakwater had been built for half of its length, construction for the island began. Sand dredgers collected sand from the Persian Gulf and dumped it to form the extreme island. The 8000 tons dredgers filled only in one hour and dumped at 10m/s, enough to fill Olympic swimming pool in just 4 minutes.

How the land was curved - How Palm Island was curved

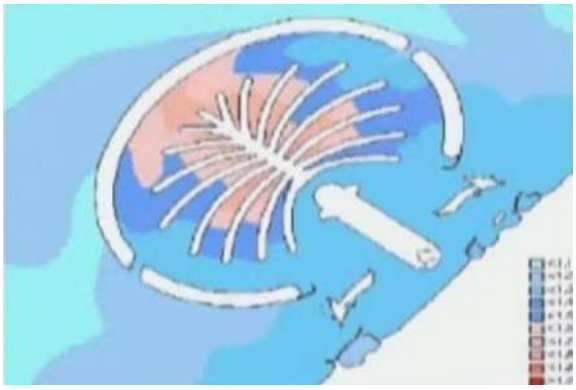




To insure that the island is in it's required place and shape, 676 Km up in the space a Private satellite was used. The shape of island is nearly curved everywhere and it required pin point accuracy to shape it as a palm tree, hence, GPS (Global Positioning System)

was used while pouring sand into the sea.

Mobile receivers were used as a grid reference for the island and the satellite gave coordinates of the point where sand was to be put. The dredgers would then fill the area of sea which they were commanded by the satellite.



As the construction of the Megastructure Island had started before the research was finished, now engineers realized that fresh water was not circulating properly inside the island branches of the palm shaped area. Tides were not flushing the system properly. Water was in danger of becoming stagnant. Engineers of the Palm Island in Dubai, came up with the solution that to cut the outer ring of island at two places, so that water enters and flushes the system. By August 2003 breakwater construction for the fragile island was completed. After two month from that, the island was also completed in the given time span.

Accommodation in Palm Islands Dubai

Now 4500 houses were to be built along with 22 hotels, shopping malls, resorts, and road network. This sand island was to support a full city but sand was not easy to build upon because sand was sprayed while pouring it in, so it was loose and Un-compacted. Liquefaction due to earthquake could also disappear the island into the sea. When earthquake occurs, it causes the sand particles to move closer due to vibration and compacts, thus pushing the water in between upwards, making the ground liquefy. It means if proper measure were not taken for the compaction of the island, it would sink back into the sea. So the construction team need to compact the sand layers themselves up to 12m depth. But it was not to be done by normal and usually used rollers. Vibro-compaction phenomena was used. 15 machines were employed for this purpose. After 8 months' time, the island was stabilized for 120, 000 people, who were to work there. Each day 850 buses would carry 40, 000 workers who were building a full city out in the sea.

These workers were to install gas pipes, water pipes, electric and telephone cables and build roads etc. they worked in 2, 12 hours shift in grueling temperatures i.e., at 40 ºC. 57 contractors were hired to construct houses, roads, hotels and shopping centers. The island was to house 60, 000 people at first but the people loved the idea so much that the capacity was doubled and all the houses sold out in just 3 days. So, the capacity was doubled and now the island homes accommodate about 0.12 million people. The beaches were to be checked regularly as sea water was eroding it continuously.

Impact of Palm Islands on ecology

At first the environmentalists were confirmed that the project would ruin the local marine life but when study was carried out, it showed that marine life was not disturbed and that the breakwater had turned into largest artificial reef for the marine life out there. Thus, the environmentalist had no objection to the project. Even before finishing this island, the prince was inspired by the success and wanted to build two more islands, each bigger than the previous one. Whole of the Project was completed in 2006.

Use of Plastic Waste for the enhancement of Bituminous Pavement

By: Himanshu Bhardwaja, Assistant Professor (ADGITM)

Plastic is the most widely used material in the present times. It is light in weight, moisture resistant, flexible and very inexpensive. Today plastic is used in every vital sector of the economy, ranging from agriculture to automobile, electronics, construction, etc. It has revolutionized all spheres of life. But this plastic ultimately becomes a waste. It is a common site both in urban and rural areas to see plastic wastes littering the roads. It forms the major portion of the total municipal solid wastes (MSW). Tons of plastic wastes
which include polyethenes, cups, bags, etc. are discarded every year, polluting land, rivers, seas, oceans, etc. Plastic is a non-biodegradable material and it has been found that it can remain on earth for about 4500 years without showing any signs of degradation. Its improper disposal can cause serious health hazards in humans. Based on the present usage scenario of plastics, its complete ban will not be justified; hence we have to find the alternatives to reuse the plastics.

Studies have shown that plastic waste after proper process can be used in the construction of bituminous pavements. Such pavements show enhanced properties and increased life spans, thus making the road construction economical and solving the environmental problem at the same time.

Plastic Aggregate & Bitumen Interaction Model

The plastic waste in the shredded form is sprayed and spread over hot aggregates in such a way that these aggregates get coated with a thin layer of molten plastic. The coated plastic remains in softened state for a temperature range of 140°C to 160°C. The hot bitumen (160°C) is added and spread over these aggregates. At this temperature both the coated aggregates and bitumen remains in liquid state and are capable of diffusing easily at the interface. This process is further helped by the increase in the contact area. Plastic is basically the polymer having long chain hydrocarbons and bitumen is a complex mixture of asphaltenes and maltenes which are also long chain hydrocarbon. The plastic layer has already bonded with aggregates. When bitumen was mixed with plastic coated aggregate a portion of bitumen diffuses through the plastic layer and binds with aggregate thus forming the internal three-dimensional linked network between plastic (polymer molecules) and bitumen making the bond strong. Hence, the pavement so constructed can withstand extreme weather condition, has extra strength, high cohesiveness and resistance to fatigue, stripping and deformation, thus increasing its lifespan.

Process & Test Results

The plastic waste such as carry bags, cups, disposables, etc. are shredded in the shredding machine and then sprayed in different percentages over the hot aggregates. The following tests were carried out on the coated aggregates:

1. Impact test
2. Los Angeles abrasion test

The results of these tests are shown in the following charts:

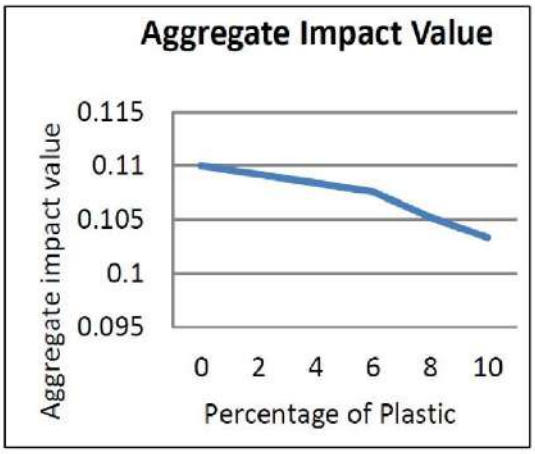


Fig 1. Variation of aggregate impact value with increase in percentage of plastic.

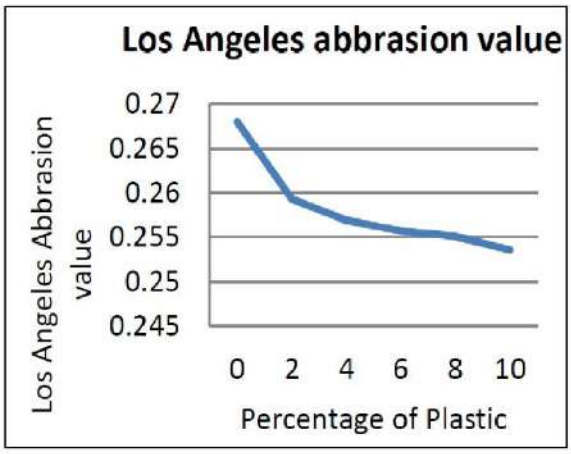


Fig 2. Variation in Los Angeles abrasion value with increase in percentage of plastic.

The following tests were conducted on the polymer modified bitumen:
1. Softening point test
2. Penetration test
3. Ductility test

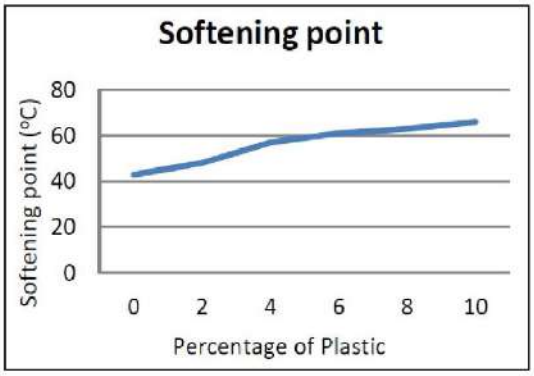


Fig 3. Variation of softening point of bitumen with increase in percentage of plastic

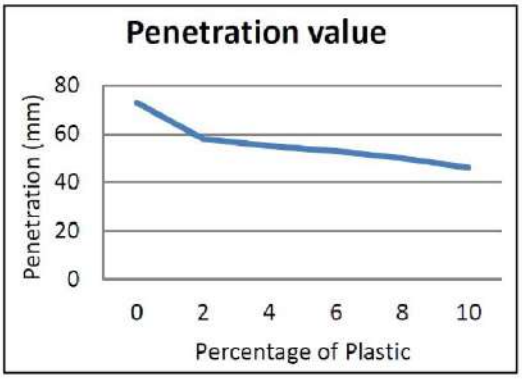


Fig 4. Variation of penetration value of bitumen with the increase in percentage of plastic.

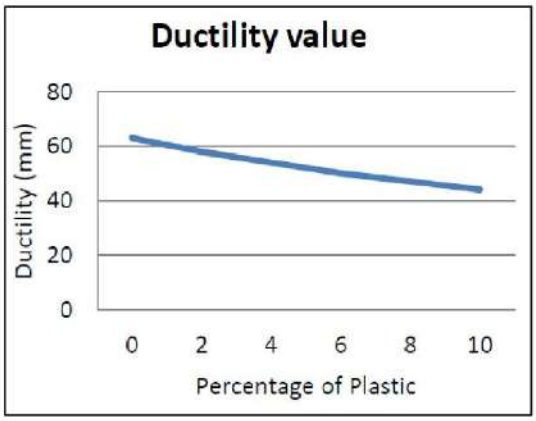


Fig 5. Variation of ductility of bitumen with the increase in percentage of plastic.

It is evident from the above graphs that the aggregates coated with plastics give lower values of impact and abrasion which is good for the aggregates to be used in the road construction as they are subjected to wear and tear from the traffic plying on the roads. Similarly, the qualities of bitumen, i.e. softening point, ductility and penetration is also improved considerably by replacing the bitumen with the plastic wastes, thereby making plastic waste an easy and economic replacement of bitumen in the construction of bituminous pavement.

Conclusion

The generation of waste plastics is increasing day by day. The plastics show adhesion property in their molten state. Plastics will increase the melting point of the bitumen. Hence, the use of waste plastics for pavement is one of the best methods for easy disposal of waste plastics. Moreover, plastic is not recyclable and using them in road construction will help in the disposal of these plastic wastes in an eco-friendly manner.

The use of the innovative technology will not only strengthen the road construction but also make it economical as well as increase the life span of roads. Plastic roads will be most feasible for a country like India, where temperature is around 50°C and the heavy monsoons too create havoc, leaving the roads with potholes and ruts. It is hoped that in near future we will have strong, durable and eco-friendly roads that will relieve the earth from all type of plastic waste.

Sustainable Construction

By: Lalit Singh, Assistant Professor (ADGITM)

The construction industry is one of the most prior consumers of natural resources and minerals by its very nature. The need and significance of sustainability in construction have become a debated topic due to the growing concerns over global warming and the finite nature of resources. This conventional truth caused increased pressure on construction firms to reduce their environmental impact.

Sustainability aims to meet present day needs for housing, working environments, and infrastructure without compromising the ability of future generations to meet their own needs for shelter, spaces for work, and service provision. In meeting these needs now and over time, sustainable construction, in other words, can become more socially supportive in the long run by reducing its overall ecological footprint, while also being innovatively responsive to the ever-increasing demand for built space.

In view of its environmental impact, sustainable construction involves the design and management of built structures, whether at the scale of buildings, infrastructure, or urban agglomerations; the performance of materials across all scales and throughout their whole use-cycles; and the use of renewable energy resources as well as their attendant technologies in building, operation, and maintenance to reduce global greenhouse gas emissions.

In view of its economic impact, sustainable construction involves the transition from a linear to a circular economy of renewable energy generation, material and waste recycling, water harvesting and preservation, transferable technologies, and the adaptability of structures to changes in use; innovative financing models premised on an economy of means that yields more with less; and the reinvestment of returns back into the common domain for collective benefit. *In view of its social impact*, sustainable construction involves adherence to the highest ethical standards in business and industry practices throughout all project phases; the promotion of socially-viable living and working environments, including occupational health and safety standards for labor forces and users; and the democratization of all processes pertaining to the production and use of the built environment as a wealth.

While fulfilling these concurrent objectives, sustainable construction involves as well concerns for the aesthetic quality of the built environment, its architecture, its infrastructure, and its urban organization, all attuned to the specificities of local culture as well as global commonalities.

“Target issues” for sustainable construction. Sustainable Construction is committed to the underlying principles of sustainability, which assert that long-term development of the built environment requires a mutually-reinforcing interplay of responsible economic, ecological, social, and aesthetic objectives. Additionally, and in accordance with the Paris Climate Agreement under the UN Framework Convention on Climate Change (adopted in 2015 and ratified in 2016), the Foundation places a premium on the reduction of global greenhouse gas

Sustainable and Green Building Construction Materials

By: Dr. Manvendra Verma, Assistant Professor (ADGITM)

We are traditionally used to using earth bricks, concrete, and wood in construction. They have been, and continue to be used in everyday construction, meaning the continued destruction of trees for timber, and the mining of resources to produce cement for binding sand, gravel, and bricks. For a better world, there are new processes, and sustainable as well as green building material alternatives that can be used in construction today. Here are the top 15 sustainable and green building materials in construction.

1. Bamboo

Bamboo is considered one of the best eco-friendly building materials. It has an incredibly high self-generation rate, with some being reported to have grown up to three feet within 24 hours. It continues spreading and growing without having to be replanted after harvest. Bamboo is a perennial grass and not wood and grows on every continent, except Europe and Antarctica. It also has a high strength-to-weight ratio, even greater comprehensive strength than concrete and brick, and lasts incredibly long. It is, therefore, the best choice for flooring and cabinetry. Unfortunately, bamboo requires treatment to resist insects and rot. If left untreated, bamboo contains a starch that greatly invites insects, and it could swell and crack after absorbing water.

2. Pre-Cast Slabs

The slabs are formed at a manufacturer's site and are shipped in whole sections to construction sites. Some are made entirely of concrete but have large hollow air spaces, like concrete blocks. Precast concrete slabs are used for walls and building facades as they hold up well to all sorts of weather, while others can be used for floor and flat roofs.

Concrete is an excellent way of controlling heat within a building and is affordable as a building material. The sustainability of precast concrete slabs is higher than many traditional concrete options as the slabs often take much less energy to produce and assemble. Precasting concrete also allows the material to properly cure in a controlled environment, rather than exposing it to a variety of unfavourable weather conditions while curing at a construction site. As such, precast concrete slabs avoid cracks and structural faults within the concrete and eventual demolitions.

3. Cork

It also excellently absorbs noise, making it perfect for insulation sheets, and due to its excellent shock absorption qualities, it perfect for sub-flooring. It can also be a good thermal insulator as it is fire resistant, especially if untreated, and does not release toxic gases when it burns. Cork, in being nearly impermeable, does not absorb water or rot.

Unfortunately, it can only be sourced from the Mediterranean, making shipping it a bit costly. Fortunately, it is extremely light and only requires less energy and emissions to ship.

4. Straw Bales

It is another green building material that can be used as a framing material. They have good insulation properties and can act as soundproof material. It

can also be used as fill material in between columns and in beams framework/ as they cannot allow air through, they can have some fire resistance properties.

Straw can be harvested and re-planted easily with minimal environmental impacts. Making straw into bales also has very low influence. They can also be placed in walls, attics and ceilings, to contribute to cooler the house in the summer and warmer temperatures in the winter.

5. Recycled Plastics

Rather than sourcing, mining and milling new components for construction, manufacturers are using recycled plastic and other ground-up trash to produce concrete. The practice is reducing greenhouse gas emissions and is giving plastic waste new use, rather than clogging landfills and contributing to plastic pollution.

A blend of recycled and virgin plastic is also used to make polymeric timbers, for use in making fences, picnic tables and other structures, at the same time, saving trees. Plastic from two-liter bottles can be spun into fiber for the production of carpets. Reused plastic can also design products such as cable pipes, roofs, floors, PVC manholes, and PVC windows.

6. Reclaimed Wood

Using reclaimed wood is one of the most environmentally responsible ways to save trees and reduce the amount of lumber in landfills. Reclaimed wood can be found in retired barns, excavation companies, home remodelling contractors and companies, salvage yards, and shipping crates and pallets.

Reclaimed wood is good for structural framing, cabinetry, and flooring. It is lightweight but has less strength and each piece's integrity should be assessed and chosen for an appropriate project. Also, most wood is susceptible to insects and degradation, meaning it needs reinforcement and additional treatment.

7. Reclaimed or Recycled steel

Steel can be used for the framing process, in place of wood, increasing the durability of a structure against earthquakes and high winds. A 2,000-square foot house requires about 50 trees to build, but a frame made from recycled steel requires the steel equivalent of just six scrapped cars.

Steel is 100% recyclable and significantly reduces the ecological impact of new construction. Mining, heating and shaping products made from aluminium and steel requires a lot of energy, but properly and efficiently reusing or recycling them into new products, lowers the energy used, and makes the material more sustainable, the recycled metal is long-lasting and does not require frequent replacements.

8. Plant-based Polyurethane Rigid Foam

Rigid foam has for long been used as insulation material in building. It was first used after a top manufacturer of surfboard material, was fined by the EPA, and subsequently put out of business, for using a toxic material. The new surfboard material was made from plant-based polyurethane rigid foam, which came from bamboo, kelp and hemp, rejuvenating the surfboard industry.

It is now in use in the manufacturing process including that of turbine blades and furniture. The material is rigid and relatively immovable, meaning it can be used for insulation. Additionally, it offers protection against mould and pests. It is also heat resistant, protects against mould and pests, and can be perfect as sound insulation.

9. Sheep's Wool

Sheep's wool is a great alternative to chemical-laden insulation. It insulates the home just as well as conventional insulation and requires less energy to manufacture. Sheep's wool can increase energy efficiency and soundproof your structure. It does not degrade nearly as quickly as other insulation materials like straw and compared to some natural insulators such as cotton, sheep's wool is more prevalent, can be harvested more easily and regenerates quickly.

Unfortunately, it is not the most affordable insulator. It also has to be treated to ward off insects and prevent the growth of fungi. Such treatment might make sheep's wool less eco-friendly, depending on the chemicals used.

10. Rammed Earth

It is a technology that has been used throughout human civilization for thousands of years and lasts a very long time. It is a popular and affordable solution to creating steadfast foundations, floors and walls, through natural materials such as chalk, earth, gravel or lime, and then compacting them.

When pressed tightly in wooden forms, it creates walls that have a similar feel to concrete. Buildings made from rammed earth are made safer or fortified by the use of rebar or bamboo. Mechanical tamper can greatly reduce the amount of labour required to create sturdy walls. Rammed earth walls and floors can be used as thermal storage, allowing the sun to warm them in the day and slowly release the warmth in the cooler evenings.

11. Hemp-Crete

It is a concrete-like material created from the woody inner fibres of the hemp plant. The fibres are bound with lime to create concrete-like shapes that are strong and light. Hemp concrete blocks are lightweight, dramatically reducing the energy used to transport the blocks. Hempcrete is sturdy, has good thermal and acoustic insulation qualities and is fire resistant. Additionally, its biggest sustainable property is that it is CO_2 negative, meaning it absorbs more CO_2 than it emits. Hemp itself is a fast-growing and renewable resource.

12. Mycelium

It is a building material that is actually natural. Mycelium is a natural unicellular organism that comprises the root structure of fungi and mushrooms. It could be encouraged to grow around a composite of other natural materials, such as ground-up straw, in moulds or forms. It is then air-dried to create lightweight and strong bricks or other shapes.

Combined with pasteurized sawdust, mycelium could be formed into almost any shape, and be used as a surprisingly sturdy building material. There is the potential for creating bricks and uniquely-shaped building segments that are both strong and lightweight. The mushroom-based building material can withstand extreme temperatures, making it an organic and compostable alternative to home insulation, Styrofoam and even concrete.

13. Ferrock

It is a relatively new material and it uses recycled materials such as steel dust from the steel industry, or ferrous rock leftover from industrial processes, usually sent to the landfill. It creates a concrete-like building material, stronger than the concrete itself. It traps and absorbs carbon dioxide as part of its drying and hardening process.

This makes ferrock carbon neutral and a lot less CO2 intensive as compared to

traditional concrete. It is a viable alternative to cement and can be mixed and poured to form driveways, staircases, pathways, and more structures. Some researchers believe ferrock is more resilient to weather than concrete.

14. Timber Crete

This is an interesting building material and is made from a mix of sawdust and concrete. It is lighter than concrete and reduces transportation emissions. The sawdust also reuses a waste product and replaces some of the energy-intensive components of traditional concrete. Timber concrete could also be formed into traditional shapes like pavers, bricks and blocks.

15. Terrazzo

This is a mosaic style of flooring where small pieces of marble or granite are set in polished concrete or epoxy resin. When well maintained, terrazzo floors can last up to 40 years without losing their brilliance. The original terrazzo was set in cement and was modelled after 20th-century Italian work.

Today, 90% of terrazzo floors are made with an epoxy resin. A company like Terrazzo & Marble Supply company manufactures 'forever floors' from their own epoxy, which incorporates materials like brass, aluminum and zinc, along with recycled glass, beer bottles, marbles and porcelain.

A terrazzo floor might be more expensive than carpets, but you will have to replace carpets. Terrazzo floor, on the other hand, can last for over four decades, making it a sustainable building material. Additionally, before pouring terrazzo into place, you can use the colours of your choice and make the floor of your choosing. It makes for easy-to-clean floors, which can also be installed in high-traffic areas like schools, airports, and stadiums.

Events organized by the Department of Civil Engineering

Webinar on Career Opportunities after B.E/ B.Tech

*The Department of Civil Engineering, ADGITM, conducted a Webinar on the topic "Career Opportunities after B. Tech" on **31st July' 2021** through Zoom Platform. The guest speaker, Mr. Anand Kumar, Sr. Faculty, ACE Engineering Academy, New Delhi shared his insight on the topic. The session witnessed participation of faculty members and third and final year students from Department. The session opened with basic discussion on Engineering. Further, the discussion continued topics such as competitive exams, their marking scheme, syllabus, books for reference and strategies to prepare. Mr. Anand Kumar also talked about various posts as an Engineer and several Government Departments associated with the respective field. Sir, shared his knowledge and experience in the field with students and encouraged young engineers to work hard in this direction.*

Faculty Members and students of Department of Civil Engineering, ADGITM during the session

Webinar on "Profile Building for Higher Education and Placements"

*The Department of Civil Engineering, ADGITM, conducted a Webinar on Profile building for Higher Education and Placements on **07th August' 2021.** The guest speakers, Ms. Sowmya Prabha, Career Expert and a Learning Architect and Mr. Abhishek Gupta, Founding Member, Career labs shared their insights on the topic and briefed students on basic profile building for career choices and advanced Profile building for higher education.*

The session witnessed participation of faculty members, final year and third year students of all Departments of Engineering, BBA and MBA. A total of 211 participants attended the session. The session

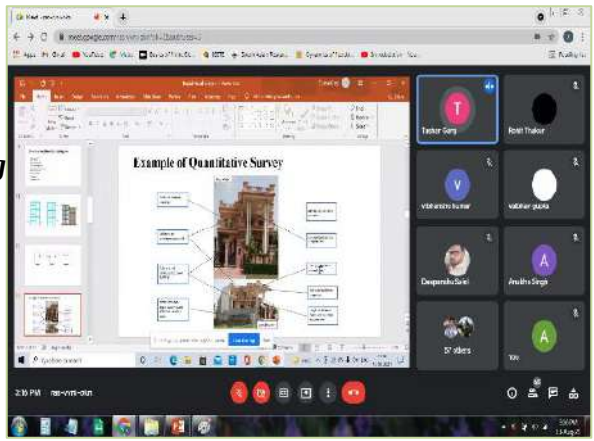
was concluded with an interaction between participants and the guest speakers. The session opened with Ms. Sowmya Prabha sharing her experience. Further, the discussion continued on Engineering, scope of placements and how to secure high paying jobs, breaking myths regarding higher education abroad, moving towards business development strategies. Further Mr. Abhishek Gupta continued the session by enthusiastically motivating students. He explained the process of profile building and discussed how it can be built for higher education, scholarships and placements. Sir shared his experience and knowledge and encouraged the students to work hard.

Faculties and students, during the session

Guest Lecture on "Visual Analysis of Structure against Earthquake"

The Department of Civil Engineering, ADGITM, conducted a Guest lecture on Visual Analysis of Structure against Earthquake on ***13th August' 2021*** *with Alumni, Mr. Tushar Gupta (Batch 2013-2017) IES, AIR – 9.Various topics such as Scoring, vulnerability assessment, soft storey, floating columns, stability analysis and ranking the buildings according to their probable damage were covered. Mr. Tushar Garg, IRSE, shared his insights on the importance and utility of visual analysis and further encouraged young engineers to pursue research in this field and motivated them to work hard.*

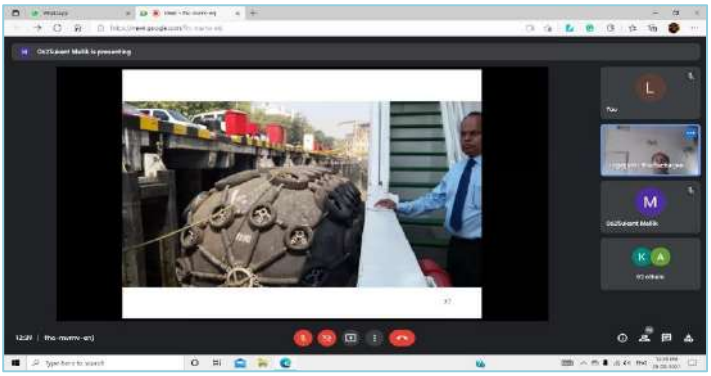
Participants during the session by Mr. Tushar Garg



Guest Lecture on "Repair, Rehabilitation and Retrofitting of Concrete Structures"

The Department of Civil Engineering, ADGITM, conducted a webinar on the topic "Repair, Rehabilitation & Retrofitting of Concrete Structures" on ***25th September 2021****. The guest speaker, Dr J.Bhattacharjee, with an experience of over 50 years in Civil -Engineering shared his insight on the topic.*

The session opened with basic terminology related to Repair, Rehabilitation & Retrofitting followed by Scope of rehabilitation of Concrete Structures. Various topics such as retrofit strategies, condition assessment of concrete structures, repair techniques, material advancement were highlighted.



Dr. Bhattacharjee, with several years of experience in teaching and consultancy shared his knowledge and experience in structural engineering and encouraged young engineers to pursue further research in this field.

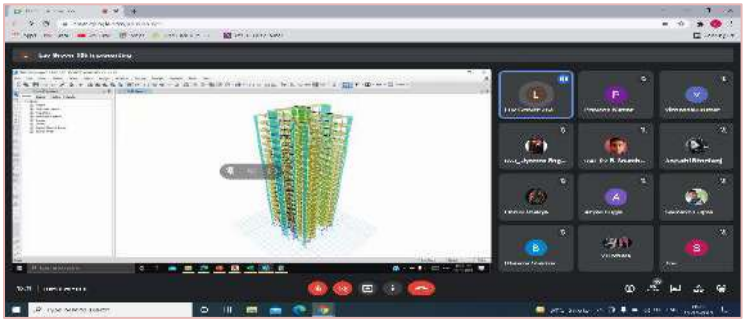
2 – Days Workshop on "Building Information & Modelling using Revit and E-Tabs"

The Department of Civil Engineering, ADGITM, conducted two-day workshop on the topic "Building Information & Modeling uses Revit & E-Tabs" on ***12th – 13th November 2021.*** *The heads of NEEV – Official Civil Engineering society of ADGITM, delivered a hands-on lecture a hands-on lecture on the topic.*

Day 1: *Brief introduction to BIM and Revit. Various topics such as importing a CAD drawing, addition of walls, slabs, foundations, columns and beams in Revit* ***along with their reinforcements were covered.***

Day 2: *Basic introduction of the E-Tabs software. Various topics such as modelling of G+22 structure, load*

assignment as per IS 875 1987 part-2, IS 1893 2016 part-1, Response Spectrum Analysis, etc. were covered.



Students of Department of Civil Engineering, ADGITM during the workshop on Day - 2

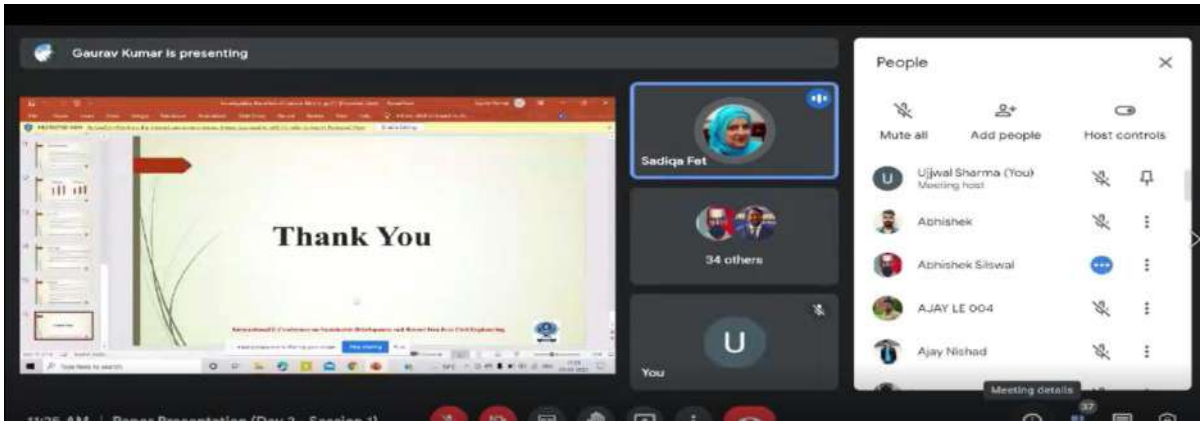
International e-Conference on "Sustainable Development and Recent Trends" in Civil Engineering (ICSDRT2022)

The Department of Civil Engineering, ADGITM, conducted international e-Conference on "Sustainable Development and Recent Trends" on ***4th –5th January 2022.*** *Our chief guest and keynote speaker Dr. Said Easa has completed his PhD from University of California, Masters in Engineering from McMaster University and Bachelor in Sciences from Cairo University.*

Our guest of honour and keynote speaker Prof. Dr. Mohammed Jameel did his PhD from IIT Delhi in 2008. He worked with University of Malaya, Malaysia for 8 years. Before joining University of Malaya, he used to do structural analysis of Aircrafts for B/E Aerospace, a US based MNC. During his career he received award of excellence in teaching.

The conference was divided into two days, on day 1, 4th January 2022, two sessions were there which was lead by session chairpersons. First session was lead by Session Chairperson, Dr. Athar Hussain sir, (PhD IIT Roorkee), Professor and Head Civil Engineering Department, Netaji Subhash University of Technology, NSUT West Campus. Second session of day 1 was lead by Dr. Meenakshi Singh, Assistant Professor

ADGITM.



International Keynote speakers, Faculty Members, Participants and Students,Department of Civil Engineering, ADGITM during the inaugural program & Sessions of conference

Orientation Program

*Orientation program was held on **20th January,2022.** The purpose of orientation program is to bring together new batch of students and faculties, which helps students to know about the institute, its rules and regulations. To understand the curriculum described by exam cell. Also, main aim is to bridge the gap between the professors and the students, ensuring a smooth communication between the two. Students and faculties from Civil Engineering Department. The orientation program was started with the message of honourable CEO Sir, respected Director Sir, and Head of Departments of CSE, ECE and Civil. They highlighted key note aspects of department to make students acquainted with the department.*

Faculty Members and Students, Department of Civil Engineering, ADGITM during the Orientation Programme

DR. AKHILESH DAS GUPTA INSTITUTE OF TECHNOLOGY & MANAGEMENT

About the Institution

"ADGITM is chartering new frontiers in knowledge, excellence, efficiency and blazing new trails in innovation, creativity and development. It is developing a sustainable, competitive edge through profession insight."

Dr. Akhilesh Das Gupta Institute of Technology & Management (ADGITM), formerly known as Northern India Engineering College (NIEC), New Delhi was established by BBDES, LUCKNOW in year 2003. ADGITM has an aesthetically designed campus spread over approximately 9 acres of the lush green environment at Shastri Park. The Campus comprises of five interconnected blocks covering a built-up area of approx. 3.0 Lac sq. ft. ADGITM offers Under Graduate and Post Graduate level full-time Professional programs approved by AICTE in affiliation with Guru Gobind Singh Indraprastha University (GGSIPU), New Delhi.

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