INSIGHT

Technical Magazine 2021-22

CIVIL ENGINEERING STUDENTS ASSOCIATION

SREE RAMA GOVERNMENT
POLYTECHNIC COLLEGE TRIPRAYAR

VISION OF INSTITUTION

• Moulding technically competent and socially responsible professionals

MISSION OF INSTITUTION

• To create an excellent academic ambience with the state-of-the-art infrastructure in harmony with sustainable development

• To equip the students with technical and social skills and inculcate the habit of life long learning

VISION OF DEPARTMENT

• To be a center of excellence in Civil Engineering that moulds eminent professionals with due care of societal responsibilities and sense of ethics

MISSION OF DEPARTMENT

• To provide a compatible learning environment with ample resources and Infrastructure in tune with sustainable development

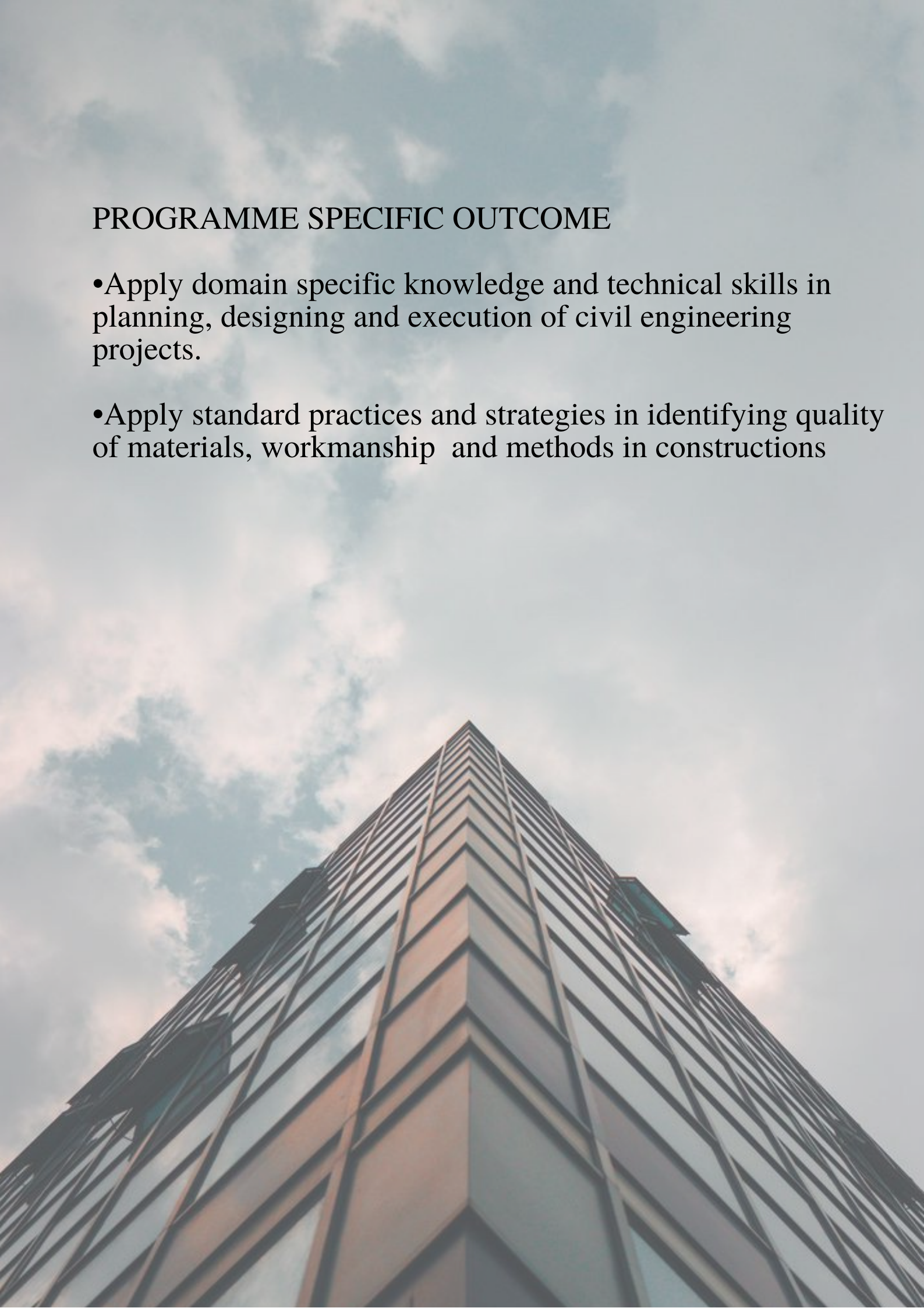
• To encourage life long learning by empowering students with domain specific knowledge, technical skills, industrial exposure and social consciousness

PROGRAMME EDUCATIONAL OBJECTIVES

• Build professionally competent Civil Engineers capable of solving the broad-based problems in the field of Civil Engineering.

• Acquire effective communication skills and exhibit high levels of professionalism with ethical attitude while working in diverse team.

• Foster life long learning with the spirit of acquiring new knowledge and skills to remain contemporary in civil engineering practices



PROGRAMME SPECIFIC OUTCOME

•Apply domain specific knowledge and technical skills in planning, designing and execution of civil engineering projects.

•Apply standard practices and strategies in identifying quality of materials, workmanship and methods in constructions

Abdul Nasser A A
(Principal
SRGPTC,Triprayar)

PRINCIPAL'S MESSAGE

It gives me immense pleasure to know that the department of civil engineering is publishing there technical magazine for the year 2021-22. A magazine is instrumental for the students to depicit their creativity and imagination. It offers vast opportunity for young writers to express themselves and share their knowledge to fellow students. I earnestly wish that the entire student community of the college especially student of civil engineering department may take the benefits and fruit of this tech magazine, I congratulate the editors and content writers of this souvenir for their enthusiasm, congratulations to team Civil.

Jayanthi M U
(HOD Civil Engineering)

HOD'S MESSAGE

It's a great pleasure and i feel proud to be a part of the tech magazine of our civil engineering department.This magazine intends to bring out the creativity and flamboyance of the minds of the students. Civil engineering is one of the most important, old field of engineering.

The subjects are not merely based on bookish knowledge but require lots of practical and creative approach and we as a department plan to teach our students looking at industry point of view.

I heartily congratulate all the editorial members and faculty members for helping and working together to publish this magazine. Thank you all for your precious time and noteworthy efforts.

STUDENTS OUR PRIDE!

OUR TOPPERS

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Technical Articles

AUTOMATED SIMULATION OF THE ERECTION ACTIVITIES IN VIRTUAL CONSTRUCTION

By
HARINANDA V S

INTRODUCTION

This paper summarizes the on-going research aimed at developing knowledge, methods and tools required to implement automated robotic crane erection processes for the construction industry. Construction cranes are treated as multi-degree-of-freedom robots and modelled in a virtual environment. Virtual cranes are provided with motion-planning algorithms that enable them to find collision-free and time efficient paths for each piece that needs to be erected. Inverse kinematics is then used to determine the crane motions required to move elements in previously computed paths. By using an effective method to coordinate the tasks and motions of multiple cranes, the system is also extended to construction projects that require simultaneous use of closely-spaced cranes. The virtual crane model provides realistic visualizations of erection processes and detailed erection schedules.

Cranes are one of the most important and heavily used resources in a construction site. Cranes have a central role on the control and pace of construction operations .In the case of medium and high rise buildings, cranes are the most important equipment resources at a site as most of the material to be placed in the buildings is transported using cranes. Hence, an inefficient use of this resource will have a direct effect on the erection schedule and on the overall construction schedule. In the automated simulation of erection activities, cranes are treated as robots with predefined degrees of freedom and crane-specific motion planning techniques are developed to generate time-optimized and collision-free paths for each piece to be erected in the project. Using inverse kinematics and structural dynamics simulation, the computer system then computes the crane motions and velocities necessary to achieve the previously calculated paths.

BENEFITS

The main benefits are the accurate planning and scheduling of crane operations leading to optimization of crane usage and project schedules, as well as improving overall crane safety in the project. This aims at the development of systems that will allow computer-assisted erection of civil infrastructure and ultimately to achieve fully-automated erection processes using robotic cranes. Recent advances in computer graphic technology is used to provide realistic visualizations that will enable crane operators, construction managers and subcontractors to visualize erection operations in the computer before they take place. It also Results in increased productivity of erection processes by optimizing the time required to transport each piece in the project and in the case of multiple cranes by minimizing crane waiting times.

CURRENT TOWER CRANE ERECTION ACTIIVITY

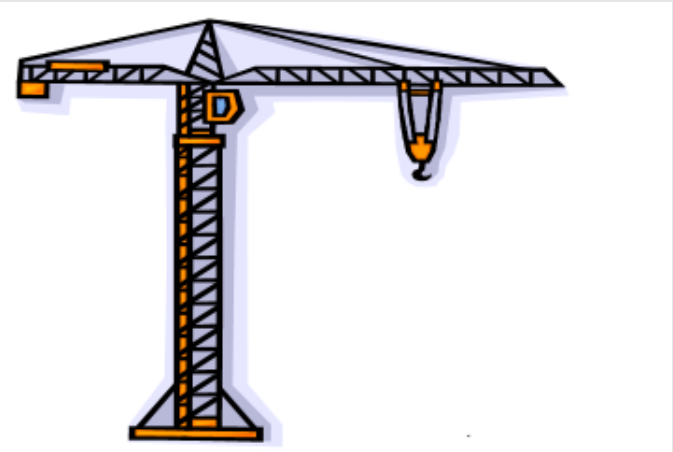


Fig 1. Horizontal tower crane model

Despite the importance of crane lifting operations in estimating

of erection, in current practice, crane planning and erection schedules is primarily done using very rough estimates of production rates such as average number of tons erected per day or average number of pieces erected per day. While these production rates provide some rough estimates of the speed of erection processes, they are prone to large errors due to project specific variations. For example, the type and weight of pieces being erected can change significantly from one project to another, from one type of element being lifted to another, or can even have large variations for the same type of element as it changes from one location of the project to another. While erection schedules based on number of pieces are, in general, better than those based on weight, they also are prone to significant variations. On one hand in current practice, seldom there is an actual count of the number of pieces to be erected on a project. On the other, the hoisting times of particular pieces can have very large variations with respect to the average hoisting times that are used in the rough erection schedules

ADVANTAGES OF AUTOMATED ERECTION ACTIVITIES

Planning of the optimal path for each piece that needs to be erected can be a very complicated and very time consuming process if done manually.

However, computers can greatly assist in the execution of many paths. Given an origin, destiny and special constraints such as the state of construction of the structure being erected, position of cranes, power lines, etc. the system will design a collision-free path that minimizes the time required to move the piece. Using inverse kinematics the system will then compute the motions required by each degree of freedom of the crane in order to follow the trajectory. Once an algorithm is developed to select the optimal and safe path for each piece, the computer can repeat the process for each piece to be erected in the project. By providing detailed piece-by-piece planning, the system will provide more accurate erection schedules that will allow a better coordination of erection construction operations with other construction activities at a site. Furthermore, the research will increase safety of crane operations by providing the design of crane motions that lead to collision free paths and by minimizing vibrations of elements being erected that could hit construction personnel.

APPLICATION

Here the tower crane is treated as a robot and uses methods employed in robotics to represent the motions of construction equipment. A robot configuration is a specification of the positions of all robot points relative to a fixed coordinate system. Usually a configuration is expressed as a vector of position or orientation parameters.

Configure space (C-space) of a robot is a space of all its possible configurations, which are able to describe the attitude of a robot in Cartesian space, i.e. real world space.

A robot essentially is a set of rigid bodies connected in a chain by joints. In robotics the rigid bodies are called links. As shown in figure 8 there is a joint between a neighbouring pair of links (Craig 1989). The Denavit-Hartenberg notation is a commonly used method to describe a robot kinematically. The method defines each link by four parameters: two for representing the link itself and the other two for describing the connection to neighbouring links. In each link, only one of the four parameters is a variable and the other three are constants parameters. Motions in each link of the robot can be achieved by constructing a transformation matrix T for each link (each degree of freedom) in the robot.

The transformation function is used to obtain the motion of the hook from the different motions of the crane. The transformation is a function a n joint variables, which is given by;

$$ {}^{0}_{N}T = {}^{0}_{1}T\,{}^{1}_{2}T\,{}^{2}_{3}T \ldots . {}^{N-1}_{N}T $$

This process is called direct kinematics of manipulators. On the contrary, obtaining (solving) the crane's motions from the position and motion of the hook is called inverse kinematics of manipulators.

CONCLUSION

A new method to automate and simulate erection activities is revealed. Unlike currently erection schedules, mainly prepared by very rough estimates such as average number of tons erected per day of number of pieces erected per days, the system will provide detailed and accurate erection schedules by generating actual trajectories and crane motions. These erection schedules will be visualized in a 4D environment in which project managers will be able to visualize the state of the erection on any day, hour, or even tiny time increment of the schedule.

A computer system is developed to generate and visualize erection activities by given building and tower crane models. The system develops a new crane-specific sampling technique for planning erection paths. An efficient and simple collision detecting method is developed and work well for planning paths. An algorithm of converting engineer model to construction model is developed as well. The computer system allows engineers to import an engineer model and obtain the animation of erection activities. The early simulation will help avoid potential construction problems in design phase, and result in more efficient and better-quality projects.

CIGARETTE BUTT BRICKS

By
SREELAKSHMI P S

INTRODUCTION

Cigarette butts (CBs) are the most commonly littered waste material in the world. It is estimated that over 5.7 trillion cigarett es are consumed worldwide each year, resulting in millions of tons of highly toxic waste contaminating the environment. CBs are composed of cellulose acetate filters a polymer with poor biodegradability conditionand which, depending upon the environmental s, can take many years to decompose. RMIT has come up with a solution to offset the waste and use it efficiently in the manufacturing of bricks. About 1% of the butts must be used in the production that would result in more sustainable, lighter and energy efficient building material. In this paper, it is aimed to research about CBs to explore the concept. The result is an even fair product which increases the insulation properties of the material and solving the problems of the future.

Worldwide, cigarette butts are among the most common type of litter. Most cigarette filters are made of cellulose acetate which is slow to biodegrade and can take up to 18 months or more to break down under normal conditions. CB filters release a range of toxic chemicals as they deteriorate. Toxic chemicals trapped in the CB fil ters can be leached and cause serious damage to the environment. There are up to 4000 chemical components in cigarette smoke, of which 3000 are in the gas phase and 1000 in the tar phase. Landfilling and incineration of CB waste are neither universally sus tainable nor economically feasible disposal methods. Recycling CBs is difficult because there are no easy mechanisms or procedures to assure efficient and economical separation of the butts and appropriate treatment of the entrapped chemicals. An alternati ve investigated herein is to incorporate CBs in a building material such as fired bricks.

CIGARETTE BUTT BRICKS

Fired clay bricks were manufactured with 1% CBs by weight and tested against control bricks with 0% CBs. The energy required during the firing process was calculated with a saving of up to 10.20%, for bricks incorporating 1% CBs. The calculated thermal conductivity of the samples showed a reduction of 17% from 1.078 to 0.898 W m1 K1 with the addition of 1% CBs. This means that the heat energy transferred through a brick wall reduces by about 17%. The results showed that the compressive strength of 1% CB bricks by weight tested was 30.8 MPa, while the compressive strength of the co ntrol bricks was 48.6 MPa. In addition, the manufactured bricks were tested for water absorption, efflorescence, initial rate of absorption (IRA), microstructural analysis, density, and shrinkage.

MANUFACTURING OF CIGARETTE BUTT BRICKS

• Clay The main raw material for bricks is clay other than clayey soils or soft 3slate or shale, which is usually obtained from open pits with the attendant disruption of drainage, vegetation and wildlife habitat. Clays for brick making vary broadly in composition and depend on the locality from which the soil originates . Different proportions of clays are composed mainly of silica (grains of sand), alumina, lime, iron, manganese, sulphur and phosphates.

• Cigarette butts The common name for the remains of a cigarette after smoking is a cigarette butt. The butt is typically about 30% of the cigarette's original length. It consists of a tissue tube which holds a filter and some remains of tobacco mixed with ash. The normal life span of a discarded filter is thought to be up to 15 years. The CBs of di fferent brands and sizes are used. The butts has been collected in dry receptacles (cardboard boxes) and stored in sealed plastic bags. Necessary precautions and safety steps were adhered to during the storing, handling and disposal of wastes. The wearing of masks and gloves was done .

• Water Water is an important ingredient of bricks as it actually used for manufacturing of bricks. Since it helps to bind all the raw materials for giving proper m

PROCEDURE

• Required proportions of raw materials are taken separately.

• CBs, clay and water are mixed thoroughly.

• The freshly prepared mix is pressed into the mould.

• As most of the local manufacturers are producing brick of dimensions 210mm×110mm×70mm. The same dimension is adopted here for production of bricks.

• All the brick samples are kept for drying for 5 days followed by 10 days sun firing.

• Compressive strength test and water absorption test are to be conducted to find the effective proportion of the raw material.

PHYSICAL PROPERTIES

• cigarette butt content: Density of cigarette butt Bricks is less than that of conventional bricks without cigarette butts.

• Compressive strength of cigarette butt bricks is less than the conventional bricks by more than 8 5%. Water absorption increases almost linearly with the increase of cigarette butt content. Cigarette butt bricks have low porosity and shrinkage.

• Bricks are light and have good insulation capability. The percentage of cigarette butt addition is sp ecified based on the type of project or works in which cigarette butt bricks are used. This is because different amount of cigarette butt in bricks modify brick properties.

• Tests have been conducted on different replacement percentages like 1.5, 2.5, 7.5, and 10 percent. Each replacement quantity results in different physical properties. As the quantity of cigarette butts is increased, its detrimental effects on the bricks would be more obvious.

ADVANTAGES

• It gets that waste out of the environment. • It makes bricks cheaper.

• Less energy-intensive bricks can be produced.

• The energy needed to fire bricks can be cut by up to 58%.

• Lighter and better insulator bricks are produced; meaning they could help cut household cooling and heating demands.

• When the cigarette butts are fired in the bricks, the heavy metals and other pollutants are trapped and immobilized in the solid block so they cannot leach.

• Bricks shrinkage, porosity, and thermal properties are improved.

• Cigarette butts can be placed in bricks without any fear of leaching or contamination.

• Cigarette butt bricks are an alternative to conventional bricks.

CONCLUSION

The results found in this study are very promising. It is concluded that cigarette butts can be regarded as a potential addition to the raw materials of new types of light for nonloadbearing as well as load-- weight fired bricks, bearing applications, providing the mix is appropria tely designed and prepared for the required properties. Considering the number of bricks produced around the world every year, recycling CBs into bricks could contribute significantly to a sustainable solution of one of the serious environmental pollution problems on our planet.

INVESTIGATION ON THE FERROCK AS AN ALTERNATIVE CEMENT CONCRETE

By
MEENU.P.G

Concrete is the most utilized structural ingredient in all Places. Roughly 1 ton of cement is created every year from Each person on the planet. In view of the broad use, it is Critical to assess the effects of this material in the Environment precisely. These days, a material's ecological Effect is assessed with its individual impact on ozone Harming gas discharges and environmental change. From This perspective, the Green concrete ide was evolved. Globally, cement production is in charge of 5 to 7 percent of carbon dioxide generated. David Stone is the author of Another concreting innovation called Ferrock, in view of Iron carbonate and utilizing to a great extent reused Materials to deliver around 95%. It's giving promising Suggestions as a choice to concrete and a far greener Construction material. Being environment friendly, Ferrock uses all the materials from scratch viz., waste Metal powder, Limestone, Metakaolin and Flyash. This Concreting technology is far greener, stronger and durable Compared to its predecessor.

Ferrock is a carbon negative and thus an eco-friendlier product. It acts as a waste management tool, where in the waste is being best utilized. The raw materials of ferrock are iron powder, fly ash, These raw materials are varying in proportions to get the best use of it in terms of strengths. The major proportion in the ferrock is of the iron powder. Other components of ferrock are considered based on the comparison with that of cement as this product is a replacement to cement, and also keeping in view the compatibility with other materials for construction. The strength gaining mechanism of ferrock is by consumption of carbon dioxide which react with the iron and forms the iron carbonate that adheres strongly to the substrate.

HISTORY OF FERROCK

Ferrock was invented by Dr. David Stone, founder and owner of Iron Shell Media Technologies, and former University of Arizona Ph.D. student in the Department of Soil, Water, and Environmental Science Department. Stone accidentally made Ferrock while he was working on a project back in 2002. At the time, he was researching ways to prevent iron from rusting and hardening Stone accidentally made Ferrock while he was working on a project back in 2002. At the time, he was researching ways to prevent iron from rusting and hardening.

At first, he didn't think much of the material he created and abandoned the test. However, he soon changed his mind and decided to focus on finding a material with the same physical capabilities of concrete, but in an eco-friendly version.To test his new idea, he worked with the Tohono O'odham Nation Reservation in Southern Arizona to source the silica he needed to do his tests.He also received $200,000 in grants by the Environmental Protection Agency (EPA), which allowed him to create demonstrative projects, along with assistance from the tribe.Once Stone had the Ferrock manufacturing process figured out, he entered his eco-friendly alternative to concrete in a competition, which he won.

In 2013, the US Patent and Trademark Office issued a patent for the invention. Although Stone is the one who invented Ferrock, the copyright belongs to the University of Arizona, since he was working for them at the time of his discovery.A year later, in 2014, Stone worked out a contract to hold a license that allowed him to commercialize his invention. This license was done in collaboration with Tech Launch Arizona (TLA).

MATERIALS

Ferrock is a binding material which was mainly introduced as the cement replacement. Thus, in order to obtain the binding property for the product, materials similar to cement were used and trails were done in order to obtain the same. Thus, considering the minor ingredients such as metakaolin, fly ash, limestone, oxalic acid was used along with the major ingredient iron powder, ferrock was manufactured.

IRON POWDER

Major constituent of ferrock is the iron powder which is obtained from the wastes of steel industries and mines Which in-turn does a waste management and it doesn't sum up on to the carbon dioxide content in the atmosphere.During its manufacturing process. The iron powder being used is ferrock is taken from the heaps of bag house dust Waste of the shot blasting operations of steel and also electric arc furnace manufacturing process of steel. This Component is not economically viable to recycle and get the iron content from it thus it has been a landfill at great costs In the world.

Other Ingredients

The other ingredients of ferrock include fly ash as a source of silica for formation of iron silicate, limestone powder providing nucleation sites and metakaolin for the cohesiveness in the paste.And the other material used in ferrock in addition to that of Iron powder is the fly ash of class F as silica source in iron silicate formation where its spherical shape enhances the Workability, fine limestone powder of 0.7 microns size confirming to ASTM C 568 that is added for creating the Nucleation sites and metakaolin confirming to ASTM C 618 is to provide cohesiveness in its mixture's fresh paste.

MIX PROPORTION OF RAW MATERIALS

The raw materials are mixed together in proportions to get the maximum
usage of it, and to gain considerable strength and desired properties. Thus, tests were conducted with varied proportions of the raw materials.And carried out work on varied proportions of iron powder, fly ash, metakaolin and limestone. Focusing on the important raw material used for binding.The ratio of ferrock mortar used Was 1:3 with water solids ratio 0.3. The proportion are displayed in table 2.1

Table 2.1 Mix Proportions of Ferrock

Mix	Ferrock (Kg/m^3)	Fine aggregate (Kg/m^3)	Oxalic Acid (catalyst)	
			Moles	Kg/m^3
M1	390	1170	4	42.12
M2	390	1170	6	63.18
M3	390	1170	8	84.24
M4	390	1170	10	105.3
M5	390	1170	12	126.3

MANUFACTURING PROCESS OF FERROCK

Ferrock also uses clay and limestone as part of its composition, but the ratio of clay and limestone used is much smaller compared to OPC, eight and ten percent respectively. The majority of the mixture, totaling 80%, is composed of low-value waste products. The main ingredient is metallic iron powder, which is a by-Product of shot blasting, a finishing technique for steel manufacturing. During the shot blasting process the iron Powder is ground to a micro-particle scale which becomes a considerable nuisance to the blasting Facility because of its ineffectual applicability and the inherent respiratory hazard associated with working with such A fine material. These ingredients are combined as a dry-mix with a source of silica, such as fly ash or recycled glass . Oxalic acid is also added to facilitate the chemical process and then blended to create a uniform mixture. It is necessary to point out that the Oxalic Acid, It is in fact a well-known Chemical promoter commonly used in the iron industry due to its characteristics as an iron dissolvent, which Prevents oxidization and has the capacity to absorb CO_2 While reacting with the Ferrock Mixture.

POTENTIAL APPLICATIONS

In a large-scale application, the plausibility for sizable industrial transformation begins to take form. By Constructing buildings, homes, roadways, walkways and various forms of infrastructure out of this material Prospective urban-dwellings will become consumers of carbon dioxide compared to the exponential producers of Present-day. While architects may quarrel with the ascetic limitations of a rustic pigment covering the majority of Urban landscapes, the consequent environmental restoration associated with such an effort may entice designers to Find new applications for a variety of red-Ferrock structures.The characteristics of ferrock make it an extremely versatile compound. Its applications can vary based on The coarse size of the aggregates added

Using a coarse-grit aggregate it may be used slabs, blocks, other pre-cast Forms and general applications. By using fine aggregates the material becomes very malleable and can be spread on Like stucco, plaster or mortar. Adding additional reinforcement, like rebar, allows for the construction of large full-Sized structures . Like concrete, the applications of this material is limited only by its form. When cast in place, Ferrock's shorter cure time allows for compressed project construction schedules, conserving capital resources. While most contemporary building materials must be specially treated to withstand environmental Degradation, Ferrock is resistant to rust, oxidation, UV radiation, rotting and corrosion. Therefore, Ferrock can be Used for marine applications like breakwater, seawalls, piers, structural pilings, foundations and other structures Exposed to seawater. .

Its environmental durability also makes its application in the manufacture of pipes that are Typically used for water transmission and wastewater removal. Ferrock is not affected by the constituents of sewage Water like hydrogen sulfide and sulfuric acid, which corrodes regular cement pipes. Further, since Ferrock is less Brittle compared to concrete, it enables better pipe-to-pipe connection and consequently there is less damage while Aligning and installing sections

AN EXPERIMENTAL STUDY OF BASALT CHOPPED REINFORCED CONCRETE ON COMPRESSIVE, TENSILE AND FLEXURAL BEHAVIOUR

By
KEERTHANA BIJU

Concrete has the advantage of high compressive strength, superior corrosion resistance and relatively lower cost; therefore it is still the most widely used building material in the world. However as one type of artificial brittle materials, concrete is relatively insufficient in terms of tensile strength bending resistance and toughness. As the service time increases the defect of concretes become increasingly prominent, which leads to many problems in engineering applications. At present it is internationally recognized that fibers are added to concrete to overcome the defects of the concrete. The concern with the interior fracture the toughness of concrete are alleviated to large extend by reinforced it with fibers of various materials. The resulting material with a random distribution of short discontinuous fiber is referred as fiber reinforced concrete (FRC).

It is now established that one of the important properties of Fiber Reinforced Concrete (FRC) is its superior resistance to cracking and crack propagation. Fiber- reinforced concrete (FRC) is concrete containing fibrous material which increases its structural integrity. The vast improvements achieved by the addition of fibers to concrete; there are several applications where fibers Reinforced Concrete (FRC) can be intelligently and beneficially used. These fibers have already been used in many large projects involving the construction of industrial floors, pavements, highway overlays, etc. in India. These fibers are also used in the production of continuous fibers and are used as a replacement to reinforcing steel.

ADVANTAGES

The impact strength of basalt reinforced concrete increases in about 20 times. Basalt fiber provide a 3 dimensional concrete reinforcement comparing to usual rebar that provides two dimensional reinforcement Construction time reduces due to needless to install wire mesh. The fiber can be easily mixed Reduces the width of cracks. The thickness of concrete can be reduced to half The total cost of construction reduces. The fatigue strength of basalt fiber reinforced concrete increases The cost of repairs and maintenance gradually reduces.

APPLICATIONS

Basalt based materials including, including basalt roving chopped basalt fiber strands and basalt composite rebar can be used for enhancing radioactive waste isolation during the storage and disposal phases and maintaining it during a significant portion of the post closure phase. Concrete reinforced with chopped basalt fiber strands has high durability, high abrasion resistance, high Shock resistance, high frost resistance, high corrosion resistance, and high water resistance. Another key advantage of basalt fiber is its low cost and its use does not significantly affect the construction cost of nuclear power facilities. Basalt has high chemical and thermal stability, good thermal, electrical and sound insulating properties. Hence it is used in fire protection.

COMPRESSIVE STRENGTH TEST

The Compressive strength is the capacity of a material or structure to withstand compressive load without failure. It can be measured by plotting applied force against deformation noted from the universal testing machine. Some materials fracture at their compressive strength limit, others deform irreversibly, so a given amount of deformation may be considered as the limit for Compressive load. Compressive strength is the key value for design of concrete structures. Compressive strength of the concrete is obtained by testing the cubes of size 150 mm x 150 mm x150 mm at 28th day. The concrete cubes designed for M20 grade were cast and cured for 28 days. After 28 days of continuous curing the specimens were taken out and they were exposed to atmosphere for few hours. Surface water and grit shall be wiped off and any projecting fins are removed. In the case of cubes, the specimen is placed in the machine in such a manner that the load is applied to opposite sides of the cubes. A spherically seated block is brought to bear on the Specimen; the movable portion is rotated gently by hand so that uniform seating may be obtained. The load is applied without shock and increased continuously until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The compressive test on hardened control & basalt concrete were performed on a 2000kN capacity hydraulic testing. Machine in accordance to the relevant Indian Standards. Three concrete cubes were tested for every compressive strength test.

FLEXURAL STRENGTH

Concrete as we know is relatively strong in compression and weak in tension. In reinforced concrete members, little dependence is placed on the tensile strength of concrete since steel reinforcing bars are provided to resist all tensile forces. The Flexural strength of the concrete is obtained by testing the Prism specimens of size 100 mm x 100 mm x 500 mm at 28th day. The concrete Prism specimens designed forM20gradewere cast and cured for 28 days. After 28 days of continuous curing the specimens were taken out and they were exposed to atmosphere for few hours. The bearing surfaces of the supporting and loading rollers are wiped clean, and any loose sand or other material removed from the surface of the specimen where they are to make contact with the rollers specimen where they are to make contact with the rollers. The specimen is then placed in the machine in such a manner that the load is applied to the uppermost surface as cast in the mould, along two lines spaced 13.3 cm apart. The axis of the specimen is carefully aligned with the axis of the loading device. No Packing is used between the bearing surfaces of the specimen and the rollers. The load is applied without shock and increasing continuously at a rate such that the extreme fiber stress increases approximately 0.7 kg/sq cm/min that is, at a rate of loading of 180kg/min. The load is being increased until the specimen fails, and the maximum load applied to the specimen during the test is recorded. The appearance of the fractured faces of concrete and any unusual features in the type of failure is noted.

CONCLUSION

The compressive strength at 1.5 percentages was 34.31 N/mm2. The increase percentage of strength At 1.5 percentage basalt chopped fiber was 9.65 % Over controlled concrete cube strength 31.29 N/mm2, which was an optimum percentage of Basalt chopped fiber content (1.5 %) for 7 days Curing period. The compressive strength at 1.5 percentages was 46.27 N/mm2. The increase percentage of strength At 1.5 percentage basalt chopped fiber was 11.20 % Over controlled concrete cube strength 41.61 N/mm2, which was an optimum percentage of Basalt chopped fiber content (1.5 %) for 28 days Curing period. The split tensile strength at 1.5 percentages was3.1N/mm2. The increase percentage of strength at 1.5 percentage basalt chopped fiber was 12.32 % Over controlled concrete cylinder strength 2.76 N/mm2, which was an optimum percentage of Basalt chopped fiber content (1.5 %) for 28 days Curing period. The flexural strength at 2.0 percentages was 7.9N/mm2. The increase percentage of strength at 2.0 Percentage basalt chopped fiber was 48.21 over controlled concrete prism strength 5.33 N/mm2, which was an optimum percentage of basalt Chopped fiber content (2.0 %) for 28 days curing Period. These strength values were increased in Percentage of basalt chopped fiber up to 1.5 % for Cubes and cylinders, 2 % for prisms. There was Optimum percentage basalt chopped fiber content in concrete to increase in strength. The achievable strength can be obtained by adding Basalt chopped fibers from 0.5 to 1.5 % further Increase in basalt chopped fibers in concrete Decrease in strength. The desired percentage of Fiber content in concrete would be 0.5 to 1.5%.

AUTOCLAVED AERATED CONCRETE BLOCK

By SREEKANTH P S

The traditional bricks are the main building materials that are used extensively in the construction and building industry. Autoclaved Aerated Concrete blocks are recently one of the newly adopted building materials . The Autoclaved aerated concrete (AAC) is a product of fly ash which is mixed with lime, cement, and water and an aerating agent. The AAC is mainly produced as cubo id blocks and prefabricated panels.

The Autoclaved aerated concrete is a type of concrete that is manufactured to contain lots of closed air voids. The AAC blocks are energy efficient, durable, less dense, and lightweight. It is manufactured by adding a fo aming additive to concrete in different sizes of molds as per requirement, then wirecutting these blocks or panels from the resulting ‘cake lump’ and ‘heating them with steam.

This process is called as Autoclaving. It has been observed that this material is an ecofriendly building material that is being manufactured from industrial waste and is composed of nontoxic ingredients. In this paper, an overview of AAC blocks with reference to its potential and sustainability as a novel building material has bee n presented. The paper also presents a comparative cost analysis of AAC Blocks with the Red clay bricks and its suitability and potential use in the construction in the building industry

The traditional bricks are the main building materials that are used extensively in the construction and building industries in India. In recent years, with expanding urbanization and increasing demand for construction materials, brick kilns have to grow to meet the demand. It has direc tly or indirectly caused a series of environmental and health problems. environmental pollution from brickmaking operations is injurious to human health, animals and plant life. At a global level, environmental pollution from brickcontr making operations ibutes to the phenomena of global warming and climate change.

Autoclaved Aerated Concrete (AAC) is one of the eco and c ertified green building materials. AAC is porous, non-– friendly toxic, reusable, renewable and recyclable. Autoclaved Aerated Concrete, also known as aircrete, is a lightweight, loadbearing, high insulating, durable building product, which is produced in a wide ran ge of sizes and strengths. AAC offers incredible opportunities to increase building quality and at the same time reduce costs at the construction site. The Autoclaved Aerated Concrete material was invented by a Sweden Architect, Johan Axel Eriksson in 1924 . AAC is manufactured with a mix of quartz sand or pulverized fly ash, lime, cement, gypsum/anhydrite, water and aluminium and is hardened by steamcuring in autoclaves. fly ash. Due its excellent properties, AAC is used in primary raw material for AAC is many building constructions. AAC replaces clay bricks which are environmentally unsustainable. Being aerated, it contains 50 60 % of air, leading to light weight and low thermal conductivity. The characteristic of AAC is helpful in green housings and sav es fertile lands and a solution for fly ash disposal.

WHY AAC BLOCKS?

AAC blocks reduce the dead weight ,which leading to reduce steel consumption in the construction of the building due to its lightweight as well as its reduced the consumption of cement and mortar. It produce at least 30% less solid waste than traditional concrete. there is a decrease of 50% of greenhouse gas emissions due to its non-polluting manufacturing process. It is 3-4 times lighter than traditional bricks, therefore, easier and cheaper to transport. It is made with non-allergenic material. In addition to this It reducing the vulnerability of disastrous damage to the structure/building, during the natural hazards. The size of block is bigger than the size of the traditional brick so it is easy to work with it. The use of AAC block will reduce the operating cost by 30% to 40%. AAC Blocks can be easily cut, drilled, nailed, milled and grooved to fit individual requirements .one of the most important being its lower environmental impact . It improved thermal efficiency will reduce the heating and cooling load in building.

DISADVANTAGE OF AAC BLOCKS

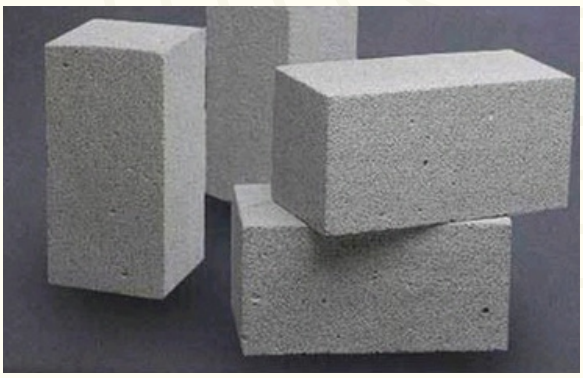
• Cost Cost of production higher than the ordinary concrete block or brick

• Crack in walls We need to take precautions to eliminate drying shrinkage crack And stress concentration crack

• Nailing v/s Drilling If you need to fix furniture in AAC blocks wall, you need to use a drill bit and a raw plug. you can't just put a nail.

• Brittle nature They need to be handled more carefully than clay brick to avoid breakage

• Attachments Its brittle nature requires long thin screw for wall hanging and cabinets and requires a drill bit or hammering in. we have to use a large diameter wall plug, which has higher cost than standard plug



CONCLUSION

Compressive strength of AAC blocks is comparatively more than traditional clay brick. These are suitable for walls in RCC framed building. Utilization of fly ash leads to the reduction in the cement consumption in the product which results in reduction of green house gases. Density of AAC block is 1/3 that of traditional clay brick and there is no more change in wet condition. It helps in reducing dead load of structure. Cost of construction reduces by maximum up to 20 % as reduction of dead load of wall on beam makes comparatively lighter members. As both side face of AAC block wall are plane, thickness of plaster is very less, and so there is substantial reduction up to 50% in requirement of cement and sand for plaster work. AAC is manufactured from common and abundant natural raw materials, therefore it is extremely resourceefficient and eco friendly. The energy consumed in the production process emits no pollutants and creates no byproducts or toxic waste products. The work ability of AAC helps to elim inate waste on the jobsite .

BENDABLE CONCRETE

By KRISHNENDU KM

The correct decision of building materials assumes a pivotal part once arranging a structure to fall among the meanings sustainable development.one in everything about premier normally utilised development materials is concrete. Concrete is the most utilised material inside world with solid applications and expanding requests. Regardless of critical progression in concrete and cementations materials, similar to dams, roads, bridges, tunnels and buildings

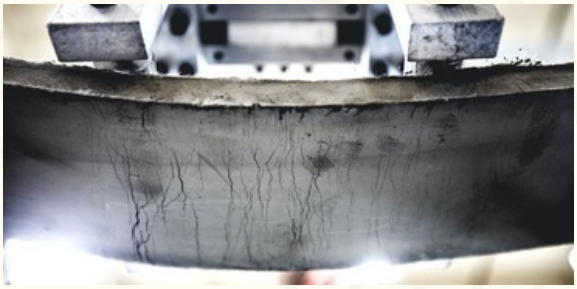
Need intensive repair and maintenance throughout its life because the brittleness of concrete rises with the increase in strength. The strain capability of typical concrete is 0.1 % creating it unbendable and brittle. The brittle nature of concrete may be a major explanation for failure beneath strain. Cement primarily based strain hardening ductile building material composite term is designed cementations composite or flexible concrete.

Advantages: The flexible concrete has the ability to bend like a metal It is more Stronger, more durable, and lasts longer than conventional concrete It has a self-healing property that is it can heal itself by using carbon dioxide and rainwater It is not brittle like a glass It is more resistant to cracking It does not emit that amount of harmful gases as compared to conventional concrete.

The flexible concrete is approx. 20-40 percent lighter The use of steel reinforcement is reduces and can be eliminated It reduces the cost of the project It can be used as precast concrete.

Disadvantages : It has a high initial cost as compared to conventional concrete.

It requires skilled labor for its construction. It needs some special type of materials which can be difficult to find in some areas. Its quality depend upon the material used and the condition under which it is made. Its compressive strength can be lesser than the conventional concrete.



BENEFITS OF USING BENDABLE CONCRETE

This particular concrete is advantageous because it emits low levels of harmful gases, unlike traditional concrete. Bendable concrete is more crack-resistant, which reduces repair costs—as a result, saving you money in the long run. Although this type of concrete is more expensive upfront when compared to its traditional counterpart, it is highly resistant to wear and tear. The other advantage of this bendable concrete is that it has a higher strain level than any conventional concrete, hence making it more flexible. This particular concrete also has a high flexibility rate nearly 500 times that of your traditional concrete.

Flexible concrete needs less steel reinforcement hence allowing engineers to diversify their design. The other good thing about flexible concrete is its self-healing ability which uses carbon dioxide and rainwater. When it comes to weight, flexible concrete is by far lighter than traditional concrete making it great for the construction of sky scrappers. Lastly, flexible concrete is not as fragile as traditional concrete making it the better option.

SEISMIC PERFORMANCE

Nowadays, most of the new buildings are designed according to current seismic codes. It's fairly good, but the building prevents the collapse, which has not been identified by the current seismic codes. Researchers have focused on the development of high-performance elements for structural applications based on a new materials technology that was Bendable concrete. It exhibits excellent ductile properties and strain capacity of 1.5% to 7%. The compressive strength of PVA bendable concrete was 50.5 Mpa though that of concrete was 34.9 Mpa. Cyclic loading was performed under control of maximum deflection angles are 0.5, 1.0, 2.0, 3.0, 4.0 and 5.0% rations (Kim et al.2013). In RC beam flexural crack and shear diagonal crack initiated firstly at 14.8kN and 58.2kN and yield of stirrup were in 72.5kN. Bendable concrete flexural crack and shear crack initiated at 19.6kN and 54.2kN and yield of stirrup occurred at 123kN. The test results initiate that the brittle failures and bond splitting failure in the RC beam can be prevented by using PVA-ECC in place of the concrete Zang et al. (2007).

FATIGUE PERFORMANCE

Bridge rehabilitation is becoming a major problem for transportation authorities and expansion joints are also a major source for bridge deterioration (Au et al. 2013). The elimination of mechanical expansion joint to improve the durability performance of the bridge structure. In the fatigue test, ECC link slab and SCC link slabs are used with 20% fatigue loading. ECC slab shows better structural performance, subjected to high fatigue stress levels (60 & 75%) compared to the SCC fatigue stress level (45%) Zia et al.1995. As a result, ECC is a cost-effective, sustainable joint–free bridge decks with good structural performance (K.M.A Hossain & M. S. Anwar 2017).

CONCLUSION

Bendable concrete provides a flexible and lighter system that is essential for structural applications. It provides a smooth and dependable construction method when construction costs are high. In a managed setting, which guarantees structural consistency. The background to the current analysis is that nowadays, quite five-hundredths of the world's population live in urban areas and this share is anticipated to extend to virtually seventieth by 2050. Individuals are migrating to the 'concrete jungle'. Concrete is an unreadable part of people's lives in urban areas. It's virtually all over – on the bridges, pavements, and buildings, in our homes, schools, and workplaces. However, despite common belief, concrete isn't a robust artefact in several instances. Once subjected to worry, concrete cracks simply. Because of concrete's brittle nature, it takes solely a minor movement of cracks to seem. Once it involves smaller structures, this isn't sometimes a heavy issue. In these cases, cracks are also simply mended with the employment of recent concrete. This new concrete will get broken within the future and be patched up once more this method is somewhat dearly-won over the semi-permanent however usually safe.

EFFECTS OF THERMAL BRIDGING IN BUILDING ENVELOPE

By
NISHANA K S

A thermal bridge, also called a cold bridge, heat bridge, or thermal bypass, it is the thermal insulation of envelopes occur in all forms of building construction and should be minimised to reduce local heat losses. Where two parts of the building meet at junctions, e.g., window reveals, eaves, flat roof/gable wall junctions etc. heat flow can be increased due to structural components penetrating insulation, poor detailing by designers and poor installation by trades. Climate change is one of the most critical challenges facing humanity today. The process of climate change unleashed by the rapid rise of atmospheric greenhouse gas emissions, historically and today, has the capacity to completely change our everyday life. To minimize the adverse impacts of climate change we can start with our homes by building them so well, that they consume no or just a little energy like it is in lowenergy houses. Energy production is a major cause of atmospheric greenhouse gas emissions, howeverenergy is simply lost through the building envelope as heat. Insulating walls represents one of the simplest solutions for decreasing the building's heat losses.

IDENTIFYING THERMAL BRIDGES

Thermal bridges can be identified with Infrared thermal imaging, Surveying buildings for thermal bridges is performed using passive infrared thermography (IRT) according to the International Organization for Standardization (ISO). Infrared Thermography of buildings can allow thermal signatures that indicate heat leaks. IRT detects thermal abnormalities that are linked to the movement of fluids through building elements, highlighting the variations in the thermal properties of the materials that correspondingly cause a major change in temperature. Automated analysis approaches, such as Laser scanning technologies can provide thermal imaging on 3 dimensional CAD model surfaces and metric information to thermographic analyses. Surface temperature data in 3D models can identify and measure thermal irregularities of thermal bridges and insulation leaks. Thermal imaging can also be acquired through the use of unmanned aerial vehicles (UAV), fusing thermal data from multiple cameras and platforms. The UAV uses an infrared camera to generate a thermal field image of recorded temperature values, where every pixel represents radiative energy emitted by the surface of the building.

MAGNITUDE OF IMPACT

It depends on a no. of factors; The type of structural material (wood, steel, concrete, masonry), The details used to interface or interconnect assemblies or make component attachments to the structure. The location of insulation materials on or within the assembly the thermal characteristics of elements penetrating insulation layers and the continuity of the heat flow path. Thermal bridging can result in increased energy required to heat or cool a conditioned space due to winter heat loss and summer heat gain. At interior locations near thermal bridges, occupants may experience thermal discomfort due to the difference in temperature. Additionally, when the temperature difference between indoorand outdoorspace is large and there is warm and humid air indoors, such as the conditions experienced in the winter, there is a risk of condensation in the building envelope due to the cooler temperature on the interior surface at thermal bridge locations.

IMPACT OF THERMAL BRIDGING

The effect is most significant in cold climates during the winter when the indoor- outdoor temperature difference is greatest. Condensation can ultimately result in mold growth with consequent poor indoor air quality and insulation degradation. In addition to heat transfer, if the indoor environment is not adequately vented, thermal bridging may cause the brick material to absorb rainwater and humidity into the wall, which can result in mold growth and deterioration of building envelope material.to reduce thermal bridge, a continuous thermal insulation layer in the thermal envelope, such as withy rigid foam board insulation, by installing window with thermally broken frames made of low conductivity material.

EFFECTS OF THERMAL BRIDGING

Increased heat transfer through thermal bridges The consequence of heat loss through normal thermal bridge should be expressly quantified both in terms of energy and money. Also, it is important to explain the calculation of heat loss and fact that thermal bridge value increases with increase in insulation, thickness of the material surrounding the thermal bridge

Low surface temperatures. This can lead to local condensation or eventually local blackening or insides surface another consequence reduced thermal comfort such as cold floors or cold dendroid.

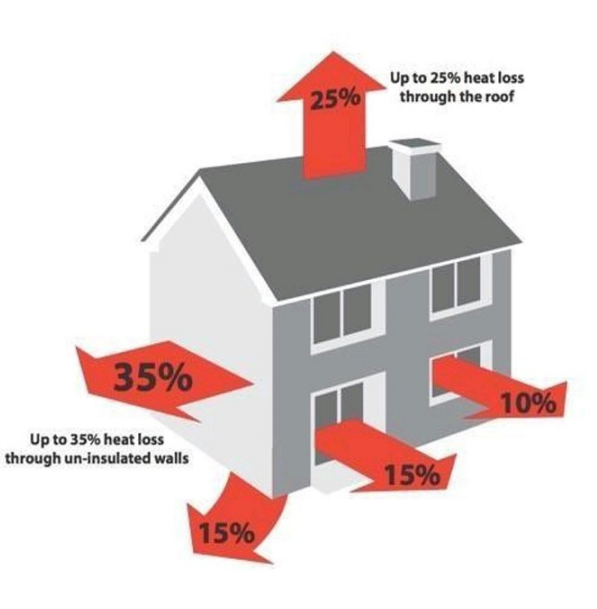
Low temperature inside the construction. This may lead to material stresses due to temperature variations and possibility also industrial condensation with resulting moisture damage. This can lead to local condensation or eventually local blackening or insides surface another consequence reduced thermal comfort such as cold floors or cold dendroid.

Low temperature inside the construction. This may lead to material stresses due to temperature variations and possibility also industrial condensation with resulting moisture damage. 8

Fig 4.1. Impact of condensation and mold growth

CONCLUSION

Energy loss through sidewalls of a home accounts for nearly 35% of total energy loss, more than window (10%), doors (15%),the foundation (15%),and even the roof (25%). The thermal bridge created by the wood studs in the home needs to be broken with continuous insulation to help reduce this energy loss.one of the most affordable times to add a continuous blanket of insulation to an existing home is when new siding is installed ,whether that be with flat, rigid sheets of insulation, or insulated vinyl siding.



BOX PUSHING TECHNIQUE FOR UNDERPASS BRIDGE

By
THRISHA ASHOKAN

Present day intensity of traffic both rail and road is very high due to the fast development of industries and other infrastructures. So it cannot be disturbed for the construction of under bridges or canal crossings, drainage etc by conventional i.e. Open cut system. In open cut system cutting out the entire project site to do the excavation is called open excavation and start consruction.So if the construction is done by this method then you have to suppose divert roads and railways. It will take long ti me so it is inconvenient. So that we have to look for some advanced or specialised techniques such as box pushing technology. To address this issue box pushing technology can be implemented. Since the work has to be done without interruption to traffic, bo x pushing is largely favored compared to conventional methods. To address this sort of issue in our country, the Noida authorities have come up with implementing a method called cut and cover method .This method is implemented with the help of Box pushing technique. Even in Delhi that is Delhi Metro Rail Corporation (DMRC) While constructing metro structures adapted the same technique.

By which they have avoided the large scale digging process at their project sites. DMRC used reinforced cement concrete box es with the help of hydraulic jacks to create a subway tunnel. The main purpose of box pushing technique is to make a horizontal opening inside the ground through the embankment by providing a sort of Precast box units in underground without disturbing ove rhead amenities like traffic and various structures.Advantades of this technique is no disruption in traffic movements ,Whether it be railways or roadways. The method of box pushing broadly consist of construction of thrust bed construction of precast RC C box Segments over thrust bed ,Front cutting shield ,Intermediate jacking station and pushing operation of precast box units the boxes are designed and constructed at the site itself. The problems with level crossing can also be avoided by this method.

BOX PUSHING TECHNOLOGY

We can use Box pushing technique as an alternative of conventional method such as Cut and Fig cover method , RH girder etc. The method of box pushing broadly consists of construction of thrust bed, construction of precast RCC box Segments over thrust bed, front cutting shied, Intermediate jacking station and pushing operation of precast box unit

MATERIALS USED

It consists of one vent(opening) of 7.50×5.65m in side size and wall thickness of 0.750m(outer size 9.00m×7.15m.).Each segment weighs 1100 metric tons and uses 60t of steel and 440 cum of concrete. The box is crossing 5 existing running lines and 5 future non running lines. Length of vent is 69.36m long (43.00m length pre cast by pushin g technique and 26.36 m length by cast in situ. Require a RCC box with M Grade concrete. A thrust bed of size 11.250×10.200m with M30 25 grade concrete provided with 67 pin packets for pushing. Front cutting shield with 25 mm thick plate all round. Drag s heets are provided in 3 layers with 0.60 mm thick each. Pushing of segment is done with hydraulic jacks of 183t capacity .

ADVANTAGES

• No disruption in traffic movement. • Better quality control.
• Economical.
• Time for completion is less.
• There is no cranes and machinery.
•Saving in man power.
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DISADVANTAGES

• Needs trained staff and skilled supervision.
• No scope of night working.
• Once the vertical and lateral alignment of box disturbed it becomes almost impossible to rectify.
• It is difficult to construct in hard data

NOIDA ADOPTS BOXPUSHING TECHNIQUE FOR UNDER PASS BRIDGES

Noida authority has started implementing cut and cover method with the help of box pushing techniques.Similarly,Delhi Metro Rail Corporation (DMRC) while constructing metro structures adopted the same technique whereby it avoided large scale digging DMRC used reinforced cement concrete boxes pushed with the help of Hydraulic jacks, to create a s ubway tunnel. Under this technique RCC boxes are cast outside in segments pushed through heavy road embankments by jacking the required thrust bed. The line and level of Precast boxes are also controlled. Noida adopting box pushing technique in metro structures.

CONCLUSION

The entire system is purely technical, dependent on Hydraulic system & safest method of crossing underground /embankment without disturbing Overhead traffic /structures for R.U.B, Canal siphon and other drainage crossings. With the box pushing technique t here is no interruption to the traffic moving around .Better quality control due to the provision of Precast boxes . Quantities will be less compared to the conventional method of construction. The cost of construction is less compared with the conventiona l depending upon the site requirements which in turn helps in saving reinforcement ,time, labour and expenditure. We can save man power and machinery and also importantly there is no involvement of cranes and machineries So it is an effective solution we can eliminate the problems with traffic and level crossings.