SKYSCRAP

TECHNICAL MAGAZINE

DEPARTMENT OF CIVIL ENGINEERING

Meghnad Saha Institute of Technology

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VISION OF THE DEPARTMENT

To be a center of excellence in Civil Engineering keeping pace with rapidly changing technologies and global needs.

MISSION OF THE DEPARTMENT

M1: To provide quality education in Civil Engineering through effective teaching learning process in a congenial academic environment.

M2: To serve the nation by providing professional Civil Engineering expertise.

M3: To promote research capability and innovative ideas in budding Engineers to address different emerging issues in Civil Engineering.

M4: To impart soft skills, leadership qualities and professional ethics amongst the young Engineers to handle real life projects with holistic concern for the society.

HOD'S MESSAGE

An intellect that intentionally empties itself of ideas and actively rejects rationality is a sterile and unproductive mental state. However, the release of the fifth edition of SKYSCRAP, the magazine of the Civil Engineering Department, is a commendable step towards stimulating the development and dissemination of new concepts. The publication aims to be a transformative and inclusive endeavor, and I hope it succeeds in achieving these goals. I extend my gratitude to the SKYSCRAP team and coordinators for their impressive work and wish the readers a pleasant experience.

EDITORIAL COMMITTEE

DEBJYOTI BAIRAGI (B.Tech 3RD YEAR)

SHREYA RAHA (B.Tech 3RD YEAR)

EDITORIAL

The rapid pace of technological progress is leading to the emergence of novel innovations that are redefining conventional practices. As a result, technical and creative competencies are undergoing significant changes. Therefore, it is crucial to distill meaningful insights from the abundance of ideas being disseminated. The sixth edition of SKYSCRAP contributes to this pursuit by providing a platform for fresh perspectives to enter the discourse. I extend my best wishes to our Department of Meghnad Saha Institute of Technology for their all efforts in this endeavor.

Contents


CONSTRUCTION IS MATTER OF OPTIMISM; ITS A MATTER OF FACING THE FUTURE WITH CONFIDENCE.
Cesar Pelli

GIS AND CIVIL ENGINEERING: BENEFITS, APPLICATIONS AND OPPORTUNITIES TO IMPROVE YOUR CONSTRUCTION PROJECT

An advanced information system such as GIS plays a crucial role in supporting all phases of the infrastructure life cycle. In fact, the benefits of integrating GIS and civil engineering are many.

Let’s take a look at how GIS can be used in civil engineering, what are the benefits of this integration and its main applications.

What does GIS stand for in construction?

GIS stands for Geographic Information System and is a system designed to acquire, store, manipulate, analyze, manage and communicate all types of geographic data. These data are associated with thematic maps and form a database of digital information that can cover a variety of multidisciplinary domains.

A typical GIS interface, for example, is a digital map of an area containing multiple layers of spatial data that allows users to examine and analyze patterns and its graphical and no graphical data with a level of accuracy and clarity that would be difficult to achieve in any other format.

In short, GIS in construction is a way to view and analyze data relating to a particular place.

Literally any information that can be associated with a map, in the form of address or geographic coordinates, can constitute a GIS interface. GIS thematic maps are socioeconomic information about a particular neighborhood, ecosystems in an area, for instance, before a new highway project begins, a traffic study, weather events, seismic data, etc.

All this information flows into a single digital container which is safe, accessible by everyone and anytime.

How is GIS used in construction?

In the construction industry, the definition of a new project typically starts with the survey of the area of intervention.

Current surveying tools (total station, drone, laser scanner, etc.) have facilitated the processing of extremely accurate data and increasing integration with digital modeling software: CAD, BIM (Building Information Modelling), GIS.

In the construction industry, in fact, GIS is increasingly connected to the BIM method, and such integration represents a major evolutionary leap in the civil engineering sector as well, especially for the design and management of infrastructure works.

As the use of BIM increases, so does the exchange of digital information between BIM and GIS tools. For example, BIM can use GIS data acquired from initial site surveys for design and construction purposes. Similarly, an as-built digital survey of the completed building accurately geolocates geometric information, material types, project phases, costs, building energy consumption, number of users, etc.

Basically, both systems store spatial information and, with proper integration, can avoid duplication of data.

In fact, by combining the power of location intelligence with BIM processes, it is possible to obtain a more comprehensive view that is useful for the management of both public and private works.

GIS aids civil engineering development in the following ways:

planning; data collection; analysis; construction.

What are the application of GIS in civil engineering?

Civil engineering is a discipline that covers many areas of interest and encompasses a wide range of expertise, including those pertaining to infrastructure development and maintenance. A large amount of data from a wide variety of sources is worked with, and systems for managing and analyzing the information collected are indispensable.

GIS supports civil engineering because it provides the tools for the creation, management, analysis, and visualization of data associated with infrastructure development and management. In practice, it allows data to be managed, making it easy to understand, analyze, and share them with other stakeholders in the construction industry.

The applications of GIS in civil engineering cover several areas, including:

- Structural-civil engineers can use GIS to include a multitude of analytical and historical area data in their projects. Structural analysis is one of the most widely used GIS applications. Compared with tabular data, GIS mapping has a number of advantages, such as the ability to identify problems early in the design phase using interactive overlays and 3D models;;

- Environmental – GIS provides environmental information on terrain, water sources and other natural features, creating all the layers of map overlays needed to help engineers conduct environmental impact analyses and assessments. In the analysis maps, all data are brought into system and less impactful solutions can be chosen and natural disasters predicted;

- Transportation – GIS in transportation engineering allows the overlay of a huge amount of data also characterized by strong dynamicity;

- Wastewater/rainwater – Hydraulic and hydrological modeling data can be integrated with GIS programs to examine and predict water demand and requirements. GIS combines surveyed data with historical data that can be visualized using 3D mapping, which includes graphical and numerical data layers that can be accessed with a single click;

- Site analysis – GIS analyzes and integrates a variety of images and data quickly by creating an overlay of relevant data on economic activity, transportation flow and population expansion, etc., so as to quickly return a clear and complete picture of the site of interest;;

- Topographic surveying – GIS proves to be an essential tool in topographic surveying because precise measurements are needed to create accurate mapping systems. Data are saved and remain conveniently accessible for use in projects;

- BIM integration – integration between BIM and GIS generates workflows that can exchange data from one system to another without loss of information, querying data within a single database. A data-centric approach generates a more in-depth view of the work and the relevant urban and natural context, enabling informed decision making, greater stakeholder involvement, and faster and more efficient processes. Through this new type of approach, GIS data enriches the BIM model with information, and BIM in turn feeds data into GIS information systems. Systematically applying the digital twin criterion for infrastructure as well makes it possible to collect in a single container the geometric model of the work, the technical data sheets, but also GIS data related to the territory where the infrastructure is located (weather information, seismic data, etc.).

What are the advantages of GIS in civil engineering?

Benefits of using a geographic information system in civil engineering include:

- improved decision making: making decisions becomes an easier and more informed process because specific and detailed information is presented;

- optimization of resources: cost reduction and increased efficiency are a direct result of a well-planned, analyzed and shared process;

- better communication: organizing information so that it can be easily viewed makes the whole process understandable and facilitates communication and interoperability among professionals (technicians, contractors, public administration, etc.);

- accessible database-all authorized users can easily access data on a database from anywhere and at any time.

Aveek Ray

Assistant Professor

INTERLINKING OF RIVERS

Brief Background

The idea of interlinking rivers was first mooted by the Chief Engineer of the Madras Presidency in 1919, Sir Arthur Cotton.

This idea was revisited in 1960 by the then Minister of State for Energy and Irrigation, KL Rao, who proposed to link rivers Ganga and Cauvery.

The National Water Development Agency was established by former Prime Minister Indira Gandhi in 1982.

In 2002, the Supreme Court asked the government to finalize a plan for interlinking rivers by 2003 and execute it by 2016.

A task force was formed by the government for the same in 2003.

In 2012, the SC again asked the government to start the project.

In 2014, the Ken-Betwa River Linking Project got Cabinet approval. However, the project is yet to take off because of the opposition faced by the government chiefly from environmentalists.

What is Inter-linking of Rivers (ILR)?

The idea behind the interlinking of rivers is that many parts of the country face problems of drought while many others face the problem of flooding every year.

The Indo-Gangetic rivers are perennial since they are fed by rains as well as the glaciers from the Himalayas.

The peninsular rivers in India are, however, not seasonal because they are rain-fed mainly from the south-west Monsoons.

Due to this, the Indo-Gangetic plains suffer from floods and the peninsular states suffer from droughts.

If this excess water can be diverted from the Plains to the Peninsula, the problem of floods and droughts can be solved to a large extent.

Hence, the interlinking of rivers will bring about an equitable distribution of river waters in India.

National River Linking Project (NRLP)

This project envisages the transfer of water from the water-excess basin to the water-deficient basin by interlinking 37 rivers of India by a network of almost 3000 storage dams. This will form a gigantic South Asian water grid.

There are two components to this project:

Himalayan Component

Peninsular Component

Himalayan Component of NRLP

Under the Himalayan component of the NRLP, there are 14 projects in the pipeline.

Storage dams will be constructed on the rivers Ganga and Brahmaputra, and also their tributaries.

The linking of the Ganga and the Yamuna is also proposed.

Apart from controlling flooding in the Ganga – Brahmaputra river system, it will also benefit the drought-prone areas of Rajasthan, Haryana and Gujarat.

This component has two sub-components:

Connecting the Ganga and Brahmaputra basins to the Mahanadi basin.

Connecting the Eastern tributaries of the Ganga with the Sabarmati and Chambal river systems.

Peninsular Component of NRLP

This component of the NRLP envisages the linking of the 16 rivers of southern India.Surplus water from the Mahanadi and the Godavari will be transferred to the Krishna, Cauvery, Pennar, and the Vaigai rivers.

Under this component, there are four sub-component linkages:

Linking Mahanadi and Godavari river basins to Cauvery, Krishna, and Vaigai river systems.

Ken to Betwa river, and Parbati & Kalisindh rivers to Chambal river.

West-flowing rivers to the south of Tapi to the north of Bombay.

Linking some west-flowing rivers to east-flowing rivers.

Benefits of River Interlinking

There are many benefits that the proposed interlinking projects will bring about. They are discussed below:

Interlinking rivers is a way to transfer excess water from the regions which receive a lot of rainfall to the areas that are drought-prone. This way, it can control both floods and droughts.

This will also help solve the water crisis in many parts of the country.

The project will also help in hydropower generation. This project envisages the building of many dams and reservoirs. This can generate about 34000 MW of electricity if the whole project is executed.

The project will help in dry weather flow augmentation. That is when there is a dry season, surplus water stored in the reservoirs can be released. This will enable a minimum amount of water flow in the rivers. This will greatly help in the control of pollution, in navigation, forests, fisheries, wildlife protection, etc.

Indian agriculture is primarily monsoon-dependent. This leads to problems in agricultural output when the monsoons behave unexpectedly. This can be solved when irrigation facilities improve. The project will provide irrigation facilities in water-deficient places.

The project will also help commercially because of the betterment of the inland waterways transport system. Moreover, the rural areas will have an alternate source of income in the form of fish farming, etc.

The project will also augment the defence and security of the country through the additional waterline defence.

Challenges in River Interlinking

Despite the many benefits that are associated with the river interlinking project, the project is yet to take off because of the many hurdles it is facing. Some of the challenges in this regard are as follows:

Project feasibility: The project is estimated to cost around Rs.5.6 lakh crores. Additionally, there is also the requirement of huge structures. All this requires a great engineering capacity. So, the cost and manpower requirement is immense.

Environmental impact: The huge project will alter entire ecosystems. The wildlife, flora and fauna of the river systems will suffer because of such displacements and modifications. Many national parks and sanctuaries fall within the river systems. All these considerations will have to be taken care of while implementing the project. The project can reduce the flow of fresh water into the sea, thus affecting marine aquatic life.

Impact on society: Building dams and reservoirs will cause the displacement of a lot of people. This will cause a lot of agony for a lot of people. They will have to be rehabilitated and adequately compensated.

Controlling floods: Some people express doubts as to the capability of this project to control floods. Although theoretically, it is possible, India's experience has been different. There have been instances where big dams like Hirakud Dam, Damodar Dam, etc. have brought flooding to Odisha, West Bengal, etc.

Inter-state disputes: Many states like Kerala, Sikkim, Andhra Pradesh, etc. have opposed the river interlinking project.

International disputes: In the Himalayan component of the project, the effect of building dams and interlinking rivers will have an effect on the neighboring countries. This will have to be factored in while implementing the project. Bangladesh has opposed the transfer of water from the Brahmaputra to the Ganga.

Way Forward with Interlinking of Rivers

Local solutions (like better irrigation practice) and watershed management, should be focused on.

The government should alternatively consider the National Waterways Project (NWP) which "eliminates" friction between states over the sharing of river waters since it uses only the excess flood water that goes into the sea unexploited.

The necessity and feasibility of river-interlinking should be seen on case to case basis, with adequate emphasis on easing out federal issues.

Dr. Susmita Bakshi

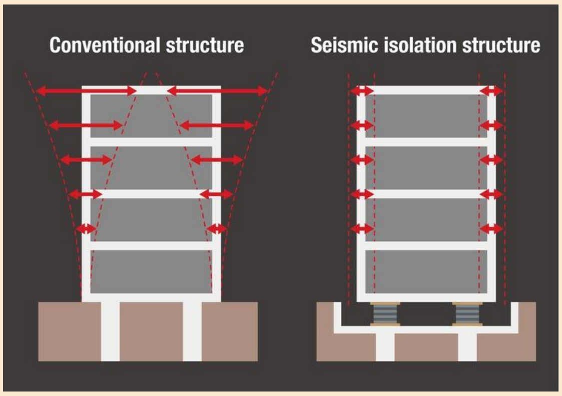
Assistant Professor

BASE ISOLATION

Earthquakes are one of the most destructive natural disasters that can occur, causing significant damage to buildings and infrastructure. One way to reduce the impact of earthquakes on buildings is through the use of base isolation. Base isolation is a technique used in the construction of buildings to reduce the amount of seismic energy that is transmitted to the building's structure.

The basic principle of base isolation is to separate the building's structure from the ground, using flexible bearings that are placed between the building's foundation and the ground. These bearings, also known as seismic isolation bearings, are designed to move or "float" with the ground during an earthquake, thus reducing the amount of seismic energy that is transmitted to the building's structure.

There are several different types of seismic isolation bearings, including elastomeric



bearings, sliding bearings, and roller bearings. Elastomeric bearings are made of rubber and steel and are designed to compress and shear during an earthquake, absorbing seismic energy. Sliding bearings are designed to slide horizontally during an earthquake, while roller bearings are designed to rotate and reduce the amount of seismic energy transmitted to the building.

One of the advantages of base isolation is that it can significantly reduce the amount of seismic energy transmitted to a building's structure, thus reducing the likelihood of structural damage and collapse. Additionally, base isolation can also reduce the amount of non-structural damage, such as broken windows and cracked walls.

Another advantage of base isolation is that it can be retrofitted to existing buildings. This means that older buildings that were not designed to withstand earthquakes can be made safer through the use of base isolation techniques. This can be a cost-effective solution for making older buildings safer, as it does not require the complete reconstruction of the building.

In conclusion, base isolation is a technique used in the construction of buildings to reduce the amount of seismic energy that is transmitted to the building's structure during an earthquake. The technique involves separating the building's structure from the ground using seismic isolation bearings, which are designed to move or "float" with the ground during an earthquake. Base isolation can significantly reduce the amount of seismic energy transmitted to a building's structure, thus reducing the likelihood of structural damage and collapse. Additionally, base isolation can be retrofitted to existing buildings, making older buildings safer in a cost-effective way.

Atanu Debnath

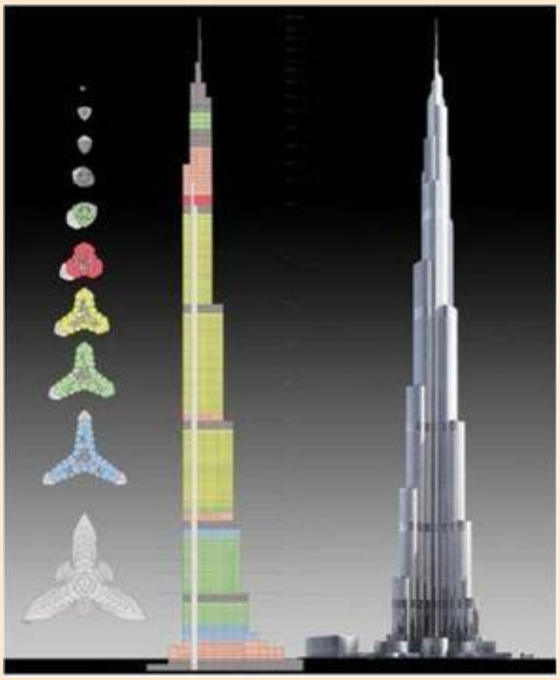
Assistant Professor

SHAPE OF BURJ KHALIFA

The Burj Khalifa, located in Dubai, United Arab Emirates, is the tallest man-made structure in the world, standing at 828 meters (2,722 feet). The shape and structure of the building is unique and innovative, with its Y-shaped floor plan playing a significant role in its design.

The Y-shape floor plan of the Burj Khalifa is not just an aesthetic choice, but a strategic one. The shape helps to maximize the number of corner offices, which are typically more desirable than interior offices due to their natural light and views of the surrounding area. Additionally, the Y shape helps to provide stability for the building, allowing it to resist the wind forces it experiences at its height. The building's design also helps to reduce the amount of shade on the building's terraces and to provide more space for outdoor areas.

The Burj Khalifa's structure is composed of a central concrete core and steel perimeter columns. The core provides stability to the building while the steel perimeter columns support the building's weight and provide lateral stability. The building's foundation is made up of a large concrete mat that is anchored deep into the ground, providing a solid base for the building to stand on.



Furthermore, the building's design also includes a number of other features to help it withstand the forces of nature. For example, the building's shape tapers as it gets taller, which helps to reduce wind loads. Additionally, the building's cladding system includes a series of vertical fins that help to deflect wind around the building and reduce the amount of wind that hits the building directly.

The shape and structure of the Burj Khalifa is a testament to the capabilities of modern engineering and architecture. The building's unique design not only makes it a visually striking structure, but also allows it to function efficiently and safely. The Y-shaped floor plan and the use of core and steel perimeter columns, along with other features, makes the Burj Khalifa a towering achievement in engineering and architectural design.

In conclusion, the Burj Khalifa's Y-shaped floor plan and its innovative structure are essential elements in the building's design. The unique shape of the building maximizes the number of corner offices and provides stability, while the structure's core and steel perimeter columns support the building's weight and provide lateral stability. The building's design also includes a number of other features to help it withstand the forces of nature. The Burj Khalifa is a true marvel of engineering and architectural design, and it continues to be an iconic symbol of Dubai and the United Arab Emirates.

Prassenjit Sanyal

Assistant Professor

BLENDING OF PHOTOGRAPHY AND ARTIFICIAL INTELLIGENCE (AI) IN CIVIL ENGINEERING

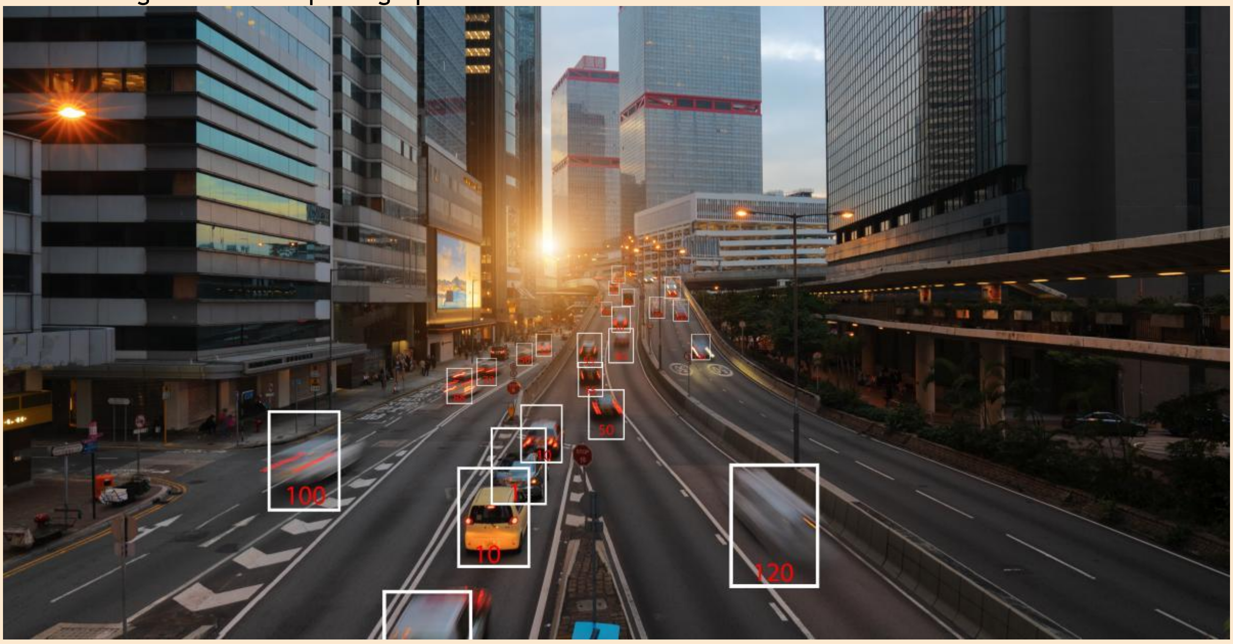
These are three distinct fields have a strong relationship with each other. They are used together in various ways to improve the design, construction, and maintenance of civil engineering projects.

One way that photography and civil engineering are used together is through the use of aerial photography. Aerial photography is used to create detailed maps and 3D models of the land. These maps and models are used by civil engineers to design and plan infrastructure projects, such as bridges, roads, and buildings. The aerial photographs are also used to monitor the progress of the construction projects and identify any potential issues.

Another way that photography and civil engineering are used together is through the use of digital cameras and software to create detailed visual inspections of structures and infrastructure. This is particularly useful for monitoring and maintaining existing structures, such as bridges and buildings. The digital images captured by the cameras can be analyzed by engineers to identify any potential issues and plan repairs and maintenance work.

Artificial intelligence (AI) is also increasingly being used in civil engineering to improve the design, construction, and maintenance of civil engineering projects. One way that AI is used in civil engineering is through the use of machine learning algorithms to analyze data from aerial photography and digital images. These algorithms can be used to identify patterns and trends in the data that would be difficult for a human to detect. This can help engineers to identify potential issues and plan repairs and maintenance work more efficiently.

AI is also being used in civil engineering to improve the design process by using simulations and computer models to test different design options. This allows engineers to optimize the design of a project and make



sure that it is safe, efficient, and cost-effective.

In conclusion, photography, Artificial Intelligence (AI), and civil engineering are three distinct fields that have a strong relationship with each other. They are used together in various ways to improve the design, construction, and maintenance of civil engineering projects. Photography is used to create detailed maps and 3D models of the land, and AI is used to analyze data from aerial photography and digital images. This helps civil engineers to identify potential issues and plan repairs and maintenance work more efficiently. Additionally, AI is also being used in civil engineering to improve the design process by using simulations and computer models to test different design options.

Saurav Pal

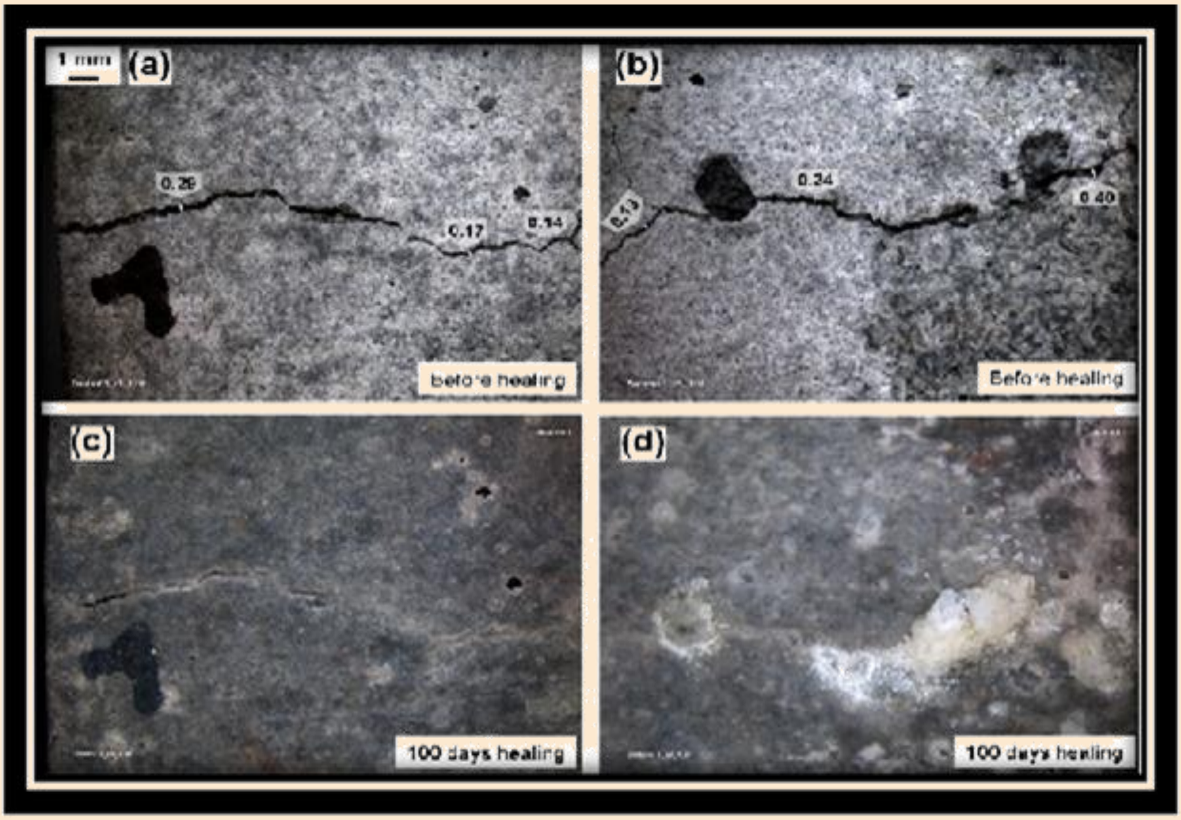
Assistant Professor

SELF-HEALING BACTERIAL CONCRETE

It is a type of concrete that contains bacteria that are capable of repairing cracks and other damage that occurs in the concrete over time. This innovative technology has the potential to revolutionize the construction industry by significantly extending the lifespan of concrete structures and reducing maintenance costs.

The concept of self-healing bacterial concrete is based on the ability of certain bacteria to produce calcium carbonate, which is the main component of concrete. These bacteria are embedded in the concrete mixture and remain dormant until a crack or damage occurs in the concrete. When this happens, the bacteria are activated and begin to produce calcium carbonate, which fills the crack and repairs the damage.

One of the key advantages of self-healing bacterial concrete is that it can repair cracks and damage in the concrete without any human intervention. This is an important feature, as traditional concrete repair methods can be costly and time-consuming.



Additionally, self-healing bacterial concrete is also more sustainable and environmentally friendly than traditional concrete. The bacteria used in the concrete are non-toxic and do not produce any harmful by-products. Furthermore, the self-healing process consumes CO2 from the air, which reduces the carbon footprint of the concrete.

The concept of self-healing bacterial concrete is still in the early stages of development, and more research is needed to fully understand its potential and limitations. However, initial results have been promising, and it is expected that self-healing bacterial concrete will become more widely used in the future as the technology continues to evolve.

In conclusion, self-healing bacterial concrete is a type of concrete that contains bacteria that are capable of repairing cracks and other damage that occurs in the concrete over time. This innovative technology has the potential to revolutionize the construction industry by significantly extending the lifespan of concrete structures and reducing maintenance costs. Additionally, self-healing bacterial concrete is also more sustainable and environmentally friendly than traditional concrete. The concept of self-healing bacterial concrete is still in the early stages of development, but it is expected that it will become more widely used in the future as the technology continues to evolve.

Aveek Ray

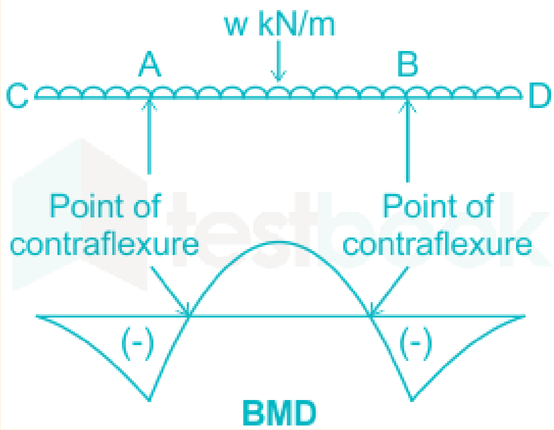
Assistant Professor

POINT OF CONTRAFLEXURE IN DOUBLE CANTILEVER BRIDGE -

The point of contraflexure is a critical point in the design of a bridge, particularly in the case of a double cantilever bridge. It is the point at which the bending moment in the structure changes from tension to compression or vice versa. The location of the point of contraflexure is determined by the distribution of loads on the bridge and the stiffness of the materials used in the construction.

In a double cantilever bridge, the point of contraflexure is typically located in the middle of the main span, where the two cantilever arms meet. This is because the loads on the bridge are distributed evenly across the main span, and the stiffness of the materials used in the construction is also the same throughout the span.

The point of contraflexure is an important consideration in the design of a double cantilever bridge because it determines the amount of bending that will occur in the structure. If the point of contraflexure is not located in the correct position, the structure may experience excessive bending and may not be able to withstand the loads that it is



subjected to.

To ensure that the point of contraflexure is located in the correct position, engineers use a variety of techniques to analyze the loads on the bridge and the stiffness of the materials used in the construction. These techniques include finite element analysis, which is a computer-based method of modeling the behavior of the structure under different loads, and load testing, which involves applying actual loads to a prototype of the structure to measure its behavior.

Once the point of contraflexure has been determined, the engineers can design the structure to accommodate the bending that will occur at this point. This typically involves using materials with high stiffness, such as steel or reinforced concrete, and designing the structure with a sufficient factor of safety to ensure that it can withstand the loads that it is subjected to.

In conclusion, the point of contraflexure is a critical point in the design of a double cantilever bridge. It is the point at which the bending moment in the structure changes from tension to compression or vice versa. The location of the point of contraflexure is determined by the distribution of loads on the bridge and the stiffness of the materials used in the construction. Engineers use a variety of techniques to analyze the loads on the bridge and the stiffness of the materials used in the construction to ensure that the point of contraflexure is located in the correct position. Once the point of contraflexure has been determined, the engineers can design the structure to accommodate the bending that will occur at this point.

Debjyoti Bairagi

(3rd year, B.Tech Student)

WHY TRUSS STRUCTURES ARE COMMONLY USED IN BRIDGES? -

Truss structures are a popular choice for bridges due to their strength, stability, and efficient use of materials. Truss bridges are characterized by their triangular shapes and are made up of a series of interconnected triangles that form a rigid structure. The use of truss structures in bridge construction offers several benefits, including:

Strength and stability: Truss bridges are known for their ability to withstand heavy loads and strong winds. The triangular shape of the truss provides a strong and stable structure that can withstand large amounts of weight and stress.

Efficient use of materials: Truss bridges use materials efficiently, which makes them an economical choice for bridge construction. The triangles in a truss structure are able to distribute loads evenly across the structure, which reduces the amount of material required to support the bridge.

Easy to construct: Truss bridges are relatively easy to construct, which makes them a popular choice for bridge construction. The components of a truss structure can be prefabricated and then assembled on site, which reduces the amount of time and labor required for construction.

Versatility: Truss bridges are versatile and can be used in a variety of settings. They can be used to span large distances, such as rivers or valleys, and can also be used in smaller applications, such as pedestrian bridges or railroad bridges.

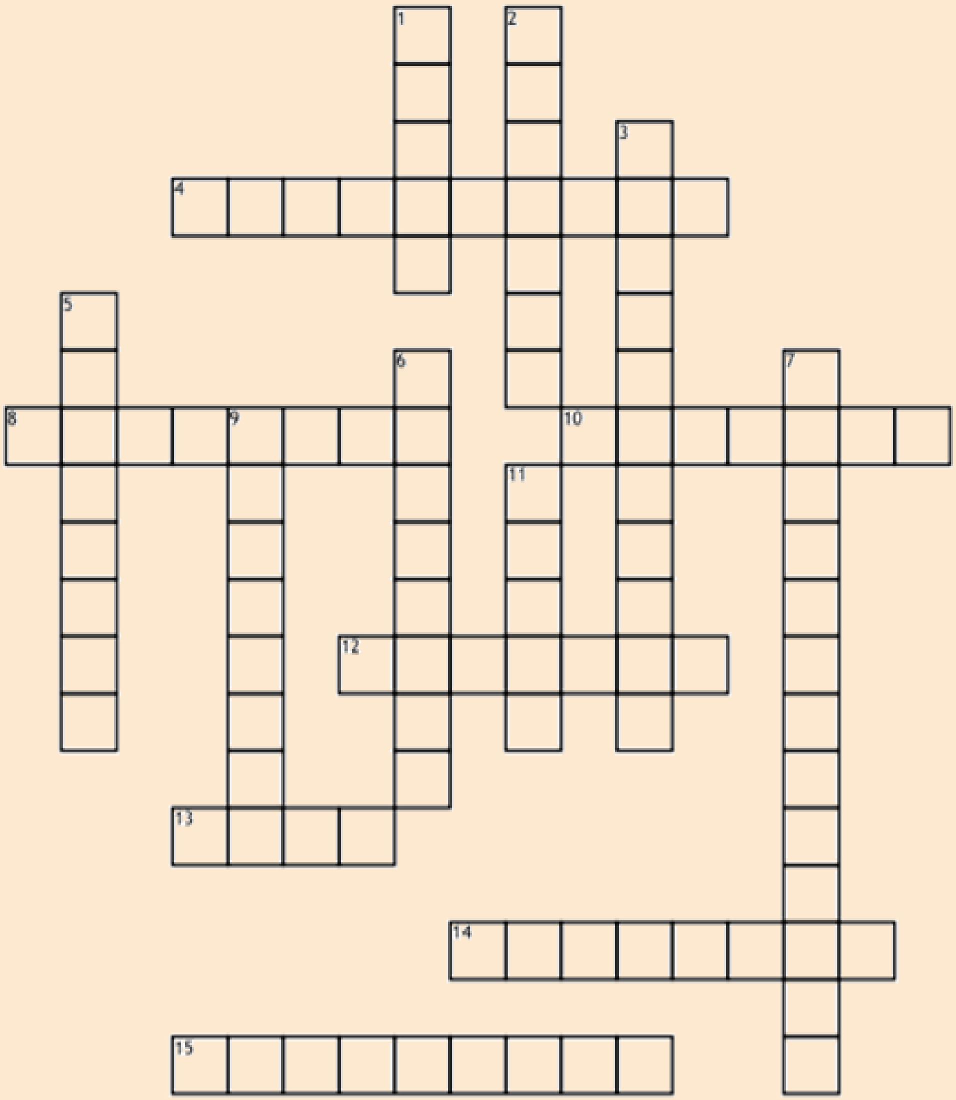
Durability: Truss bridges are known for their durability and long service life. They are able to withstand the elements and are not easily affected by weathering or corrosion.

In conclusion, truss structures are a popular choice for bridge construction due to their strength, stability, and efficient use of materials. The triangular shape of the truss provides a strong and stable structure that can withstand heavy loads and strong winds. The use of truss structures in bridge construction is also cost-effective, easy to construct, versatile, and durable, making it an excellent choice for many different types of bridges. Truss structures have been used for centuries and have proven to be reliable and efficient structures that can withstand the test of time.

Sneha Naskar

(3rd year, B.Tech Student)

CROSSWORD



Across

4. Which type of bridge can span the longest distances?

8. An arch bridge's shape is held together with a _______________

10. A force that is a mixture of tension and compression

12. An action that twists a material

13. Which bridge is the most susceptible to the bending force?

14. The weight of items on a structure

15. To strengthen an arch bridge, what is used?

Down

1. Cable bridges are made mostly of what material?

2. A force that stretches material apart

3. A force that squeezes a material

5. A force that makes materials slide past one another

6. The weight of the structure itself

7. To strengthen a rectangle, what is used?

9. The strongest and most rigid shape

11. Which bridge uses a triangular design to improve strength?

Sudoku

		7	4	9	1	6		5
2				6		3		9
					7		1	
	5	8	6					4
		3					9	
		6	2			1	8	7
9		4		7				2
6	7		8	3				
8	1			4	5			

Puzzle

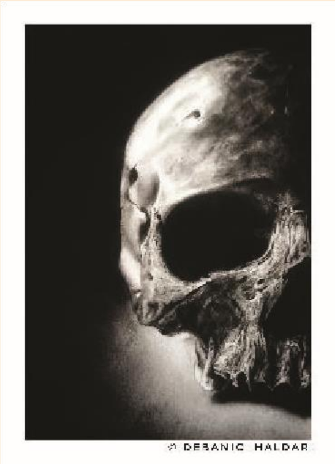
Find Civil Engineering Words – Solve this Civil Engg. Puzzle

S	O	O	L	T	I	A	B	H	T	C	D	G	O
T	N	M	I	E	C	A	Q	O	C	T	E	Y	P
A	I	R	P	O	R	T	R	U	X	U	R	U	P
D	B	P	A	N	H	T	H	S	Z	N	Y	V	O
I	H	L	S	V	Y	O	H	E	E	N	N	M	W
U	G	K	C	W	R	E	S	F	T	E	I	B	E
M	R	A	H	Q	E	F	G	P	O	L	K	R	R
T	E	Y	O	U	A	E	T	U	I	O	I	E	S
U	T	N	O	E	E	O	R	I	T	T	X	T	T
E	P	E	L	E	E	U	A	O	R	Q	A	U	A
R	U	R	E	G	R	F	G	E	A	E	T	L	T
K	O	W	D	A	L	H	E	R	E	D	Z	W	I
A	I	I	U	G	Y	R	Q	U	R	A	W	A	O
R	R	T	R	A	I	N	S	T	A	T	I	O	N
B	Y	T	Y	T	K	Y	P	Y	U	P	Q	U	E

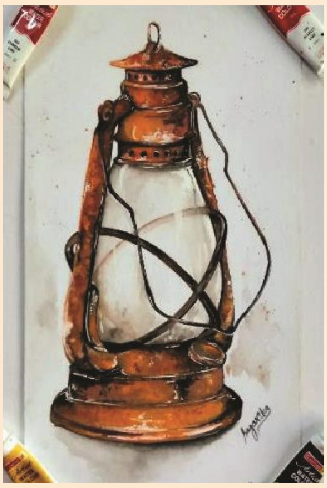
Sudoku Solution

3	8	7	4	9	1	6	2	5
2	4	1	5	6	8	3	7	9
5	6	9	3	2	7	4	1	8
7	5	8	6	1	9	2	3	4
1	2	3	7	8	4	5	9	6
4	9	6	2	5	3	1	8	7
9	3	4	1	7	6	8	5	2
6	7	5	8	3	2	9	4	1
8	1	2	9	4	5	7	6	3

CANVAS

Debanic Halder
(B.Tech 2nd Year)




Sagarika Mallik
(M.Tech 1st Year)

Some of the important IS Codes for Reference :

- IS 383 : 2016 – COARSE and FINE AGGREGATE for CONCRETE - SPECIFICATION
- IS 456 : 2000 -- PLAIN and REINFORCED CONCRETE - CODE of PRACTICE
- IS 800 : 2007 -- GENERAL CONSTRUCTION in STEEL - CODE of PRACTICE
- IS 875 (Part 1 - 5) – CODE of PRACTICE for DESIGN LOADS (OTHER THAN EARTHQUAKE) for BUILDINGS and STRUCTURES
- IS 1201 – 1220 : 1978 -- METHODS for TESTING TAR and BITUMINOUS MATERIALS
- IS 1343 : 2012 -- CODE of PRACTICE for PRESTRESSED CONCRETE
- IS 1622 : 1981 -- METHODS of SAMPLING and MICROBIOLOGICAL EXAMINATION of WATER
- IS 1893 (Part 1) : 2016 -- CRITERIA for EARTHQUAKE RESISTANT DESIGN of STRUCTURES -- GENERAL PROVISIONS and BUILDINGS
- IS 2386 (Part 1, 4 & 16) -- METHODS of TEST for AGGREGATES for CONCRETE
- IS 2502 : 1963 -- CODE of PRACTICE for BENDING and FIXING of BARS for CONCRETE REINFORCEMENT
- IS 2720 -- METHODS of TEST for SOILS
- IS 2911 – (Part 1 - 4) -- DESIGN and CONSTRUCTION of PILE FOUNDATIONS — CODE of PRACTICE
- IS 3025 -- METHODS of SAMPLING and TEST (PHYSICAL and CHEMICAL) for WATER and WASTEWATER
- IS 4986 : 2002 -- INSTALLATION of RAINGAUGE (NON-RECORDING TYPE) and MEASUREMENT of RAIN -- CODE of PRACTICE
- IS 4987 : 1994 -- RECOMMENDATIONS for ESTABLISHING NETWORK of RAINGAUGE STATIONS
- IS 5225 : 1992 -- METEOROLOGY - RAINGAUGE, NON-RECORDING - SPECIFICATION
- IS 6403 : 1981 -- CODE of PRACTICE for DETERMINATION of BREAKING CAPACITY of SHALLOW FOUNDATIONS
- IS 6512 : 1984 -- CRITERIA for DESIGN of SOLID GRAVITY DAMS
- IS 8009 – (Part 1 - 2) -- CODE of PRACTICE for CALCULATION of SETTLEMENTS of FOUNDATIONS
- IS 10262 : 2019 – RECOMMENDED GUIDELINES for CONCRETE MIX DESIGN
- IS 10500 : 2012 – DRINKING WATER — SPECIFICATION
- IS 13920 : 2016 -- DUCTILE DETAILING of REINFORCED CONCRETE STRUCTURES SUBJECTED to SEISMIC FORCES - CODE of PRACTICE