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Cover Story

Meet the Line Saudi

*Arabia's Future 106-mile
One building city*

We are pleased to present the September 2022 edition of Benchmark. In this edition, you will find an article on 'THE LINE' Saudi Arabia and the contribution by Students and Faculty members of the Department of Civil Engineering highlighted in the month of August. News updates and departmental activities are part of Canvas.

Inside

Pages:

*Activities of
Department
Such as-*

- Guest Lecture
- Industrial Visit
- Engineers' Day

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To excel in every area of Mechanical Engineering, inculcate research oriented study to explore hidden talent.

Providing Opportunity to display creativity, out of the box thinking & innovativeness, aimed at providing cutting edge technology for sustainable development.

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Providing qualified, motivated faculties to deliver the content using updated teaching methodology, inviting industry experts from various areas to disseminate subject knowledge in Mechanical Engineering.

Motivating students to undertake the Research Oriented studies, participate in competitions at all levels, grasping new techniques and methods which can be improved on further.

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To create quality professionals capable of planning, designing and analytical skills for better infrastructural development in the field of Mechanical Engineering.





Meet The Line, Saudi Arabia's Future

106-mile, One-building City

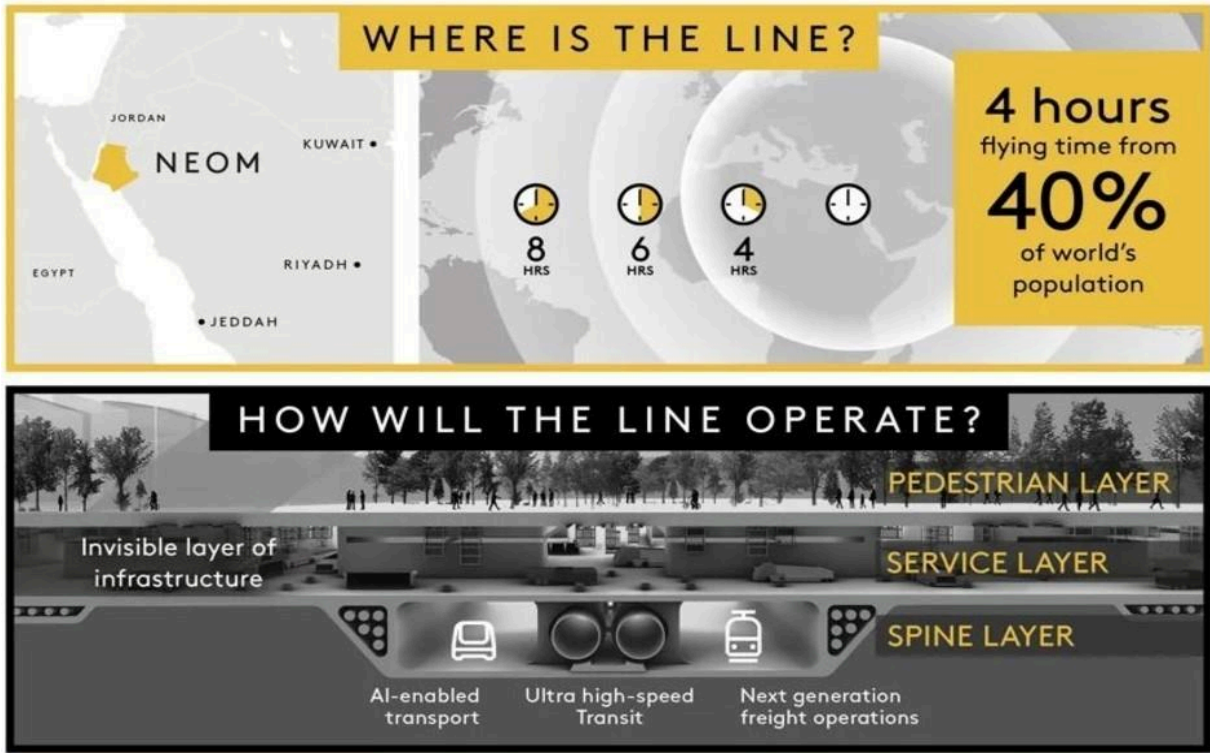
Saudi Arabia is home to some of the world's most interesting and ambitious architecture, but the country's newest urban project may just top them all. The government of Saudi Arabia unveiled plans in 2021 for the city of Neom, including a megastructure called **The Line**, a massive scheme still years from completion. **The Line** is designed to be an entire city composed of two parallel, 656-foot-wide (200-meter-wide) skyscrapers, each 106 miles (170 kilometers) long and 1,640 feet (500 meters) high (higher than most of the world's tallest skyscrapers), stretching across the northwest part of Saudi Arabia near the Red Sea.

If you think this sounds like the setting for a futuristic, dystopian novel, you're not wrong. **The Line** is characterized as a One-Building vertical metropolis with external mirrors that can accommodate 9 million people and has everything they may possibly need, such as parks and waterfalls, flying taxis, and robot maids. Even the inclusion of a fake moon for locals to enjoy is planned.

With its proposed width of only 656 feet, **The Line** will rely primarily on its height to encompass its residents and a host of modern trappings, such as a high-speed rail to connect sections of the 106-mile city. Saudi Arabian officials claim **The Line** will be otherwise devoid of roads, cars or emissions and will be powered strictly by clean energy. Here are a few of most notable proposed features of The Line:

- vertically layered homes, offices, public parks and public schools.

- year-round climate control of all indoor and outdoor spaces.
- high-speed rail that will transport residents from end-to-end in 20 minutes.
- 5-minute walk to all amenities.
- accessibility to parks and natural elements within a 2-minute walk.



Although a timeline was not part of **The Line's** announcement, initial earthwork began in October 2021, and it is expected that residents will begin moving in by the year 2030. This deadline was shared as part of a larger countrywide improvement plan dubbed Vision 2030 that is intended to draw 100 million annual visitors and keep Saudi Arabia in the running against travel hot spots like its Gulf neighbors of Dubai and Abu Dhabi. The Line is just one part of the \$500 billion Neom Project, an initiative announced in 2017, nested in the Vision 2030 plan and focused on the Northwest part of Saudi Arabia.

Along with **The Line**, there are plans to build a network of airports as well as the world's largest green energy plant. The area is intended to become so self-sufficient that it is being referred to as a "country within a country" where residents will be called "**Neomians**" rather than "Saudis."

"All people from all corners of the globe will be able to leave their creative and original imprint on the planet at NEOM. NEOM remains to be one of Saudi Vision 2030's most crucially important projects, and we are steadfastly committed to completing The Line on behalf of the country " in a press release on July 25, 2022, Saudi Crown Prince Mohammed bin Salman made the assertion.



*To know more
about The Line,
Scan the QR Code*

Geofoam Construction & Application to Industry

During the last few years, geotechnical engineering professionals and academics have become increasingly aware and familiar with the application of geofoam materials. The generic name "geofoam" was proposed by Horvath (1992) to describe all rigid plastic foam that's used in geotechnical applications. Later, the definition of geofoam was broadened to include any cellular material or product created by an expansion process. These synthetic materials are now recognized as a category of geosynthetics, as proposed by Horvath.

Although several materials have been used as geofoams, the majority of applications, involve the use of EPS. EPS is manufactured by first heating expandable polystyrene solid beads to produce a bulk of cellular spheres containing numerous closed cells and having a diameter of three to four times the diameter of the initial solid beads. The analysis and design of geotechnical application, using the functions of geofoam mentioned above, require the knowledge of the mechanical properties of geofoam in both the static and dynamic loading range. Although a considerable amount of data pertaining to the mechanical behaviour of EPS under static loading conditions have been reported in the geotechnical literature in the last few years

The manufacture of rigid plastic foams dates back to the 1950s, with adaptation for geotechnical use occurring in the early 1960s. In 1992, the category of "Geofoam" was proposed as an addition to the variety of geosynthetics already in existence. The most commonly used Geofoam material is a polymeric form called expanded polystyrene (EPS), also known as expanded polystyrene

outside of the United States. Such widespread use can be attributed to global availability, significantly lower cost than other materials, and the absence of postproduction long-term release of gases such as formaldehyde or CFC, a behaviour observed with other polymeric forms. The most common method of producing EPS Geofoam is block moulding, in which a mould is used to create a prismatic rectangular block. Depending upon the application, other mould shapes can be used, however it is more common to shape the blocks post-production. The raw material used to create Geofoam is referred to as expandable polystyrene, or often resin, and is composed of small beads with diameters similar to medium to coarse sand (0.2 to 3 mm). The bead size chosen will not ultimately affect the engineering properties of the completed block. The beads are composed of polystyrene and a dissolved petroleum hydrocarbon, usually pentane or rarely butane, which acts as the blowing agent. The beads may also contain other additives to affect certain properties of the completed block (flammability, etc.), however this is dependent upon the application in a similar fashion to the addition of admixtures in concrete. The density of EPS Geofoam is controlled primarily through regulation of the manufacturing. It has been found that even with a well-controlled manufacturing process, there will still be variability in density between blocks from the same production run, as well as a density gradient within each block. This can affect the geotechnical properties of the material, as density has been found to be a controlling factor in the performance of the Geofoam.

The actual range of densities that EPS blocks can be manufactured is between approximately 10 kg/m³ (0.6 lb/ft³) and 100 kg/m³ (6 lb/ft³). The low density of EPS Geofoam results in the development of uplift forces when submerged in water, and therefore for many design situations an anchor system or adequate surcharge load (e.g., soil cover) is required. The dimensions of Geofoam blocks affect only cost and construction layout, and not the engineering properties of the blocks. There are no standard sizes for EPS block molds and given the numerous applications of Geofoam blocks and a b u n d a n t manufacturers (over 100 in the United States), there is much variability in dimensions of raw Geofoam blocks. Typically, designers attempt to use full-sized blocks and when necessary, blocks can be cut to shapes in-situ with a hot wire or, less effectively, a chainsaw. An alternative to in situ shaping of the blocks is custom manufacture of the block mass, in which the EPS producer uses the construction plans to develop an efficient layout for the block mass, however this is usually reserved for complex projects due to the associated increases in cost. EPS Geofoam has proven to be quite durable when exposed to common natural elements. Polystyrene is non-biodegradable, and is inert in both soil and water. Exposure to ultraviolet (UV) radiation from sunlight causes only cosmetic discolorations, and only after an extended period of time, allowing for a window of exposure time during the construction period. Exposure to water may result in a small amount of absorption, the magnitude of which is inversely proportional to the density of the geofoam and is dependent upon numerous factors such as Geofoam block thickness, surrounding hydraulic



gradients, and the phase of the water. Water absorption does not affect the volume of the EPS, and there is no effect on mechanical properties. Exposure to certain substances and conditions can result in damage to the polystyrene. The use of polystyrene in transportation projects risks the material coming into contact with common fuels, which polystyrene will readily dissolve in, or road salts, however this risk is usually eliminated through the proper installation of a barrier such as an impermeable membrane. Polystyrene can be flammable when exposed to an ignition source, as is the blowing agent used in production. An additive, usually consisting of a bromine-based chemical, added to the expandable polystyrene causes the material to become flame retardant. The issue of ignition of the flammable blowing agent is resolved by allowing adequate seasoning time of the EPS block in order to allow out gassing to occur. Flame retardant EPS can still melt when exposed to extreme temperatures between approximately 150 and 260°C, however maximum exposure temperatures for design conditions are usually considerably lower. The thermal conductivity of dry EPS Geofoam is affected by the density of the material, which can be controlled during the manufacturing stage,

and the ambient temperature. Generally, the thermal conductivity of dry EPS Geofoam is approximately 30 to 40 times less than that of soil, making it a very efficient insulator. The effect of absorbed water upon thermal conductivity is more difficult to quantify, given the numerous factors affecting the volume of water uptake (Stark et. al. 2004). As water has a higher thermal conductivity than dry EPS Geofoam, moisture absorption is expected to result in an increase in thermal conductivity. Even under extreme cases of moisture absorption, EPS Geofoam serves as a better insulator than soil.

❖ Advantages:

- Low density/high strength: Geofoam is 1% to 2% The density of soil with equal strength.

- Inert: Geofoam will not break down, so it will not spread into surrounding soils. This means that geofoam will not pollute the surrounding soil.

❖ Disadvantages:

- Fire hazards: Untreated geofoam is a fire hazard.
- Vulnerable to petroleum solvents: If geofoam comes in contact with a petroleum solvent, it will immediately turn into a glue-type substance, making it unable to support any load.
- Buoyancy: Forces developed because of buoyancy can result in a dangerous uplift force.

Industrial Visits of Students & Staff

Industrial visit organized to Aissms ITI Bori-Bhadak Students observed their several machines and machine

tools like Lathe machine, Milling Machine and students and staff observed and understand the manufacturing

process



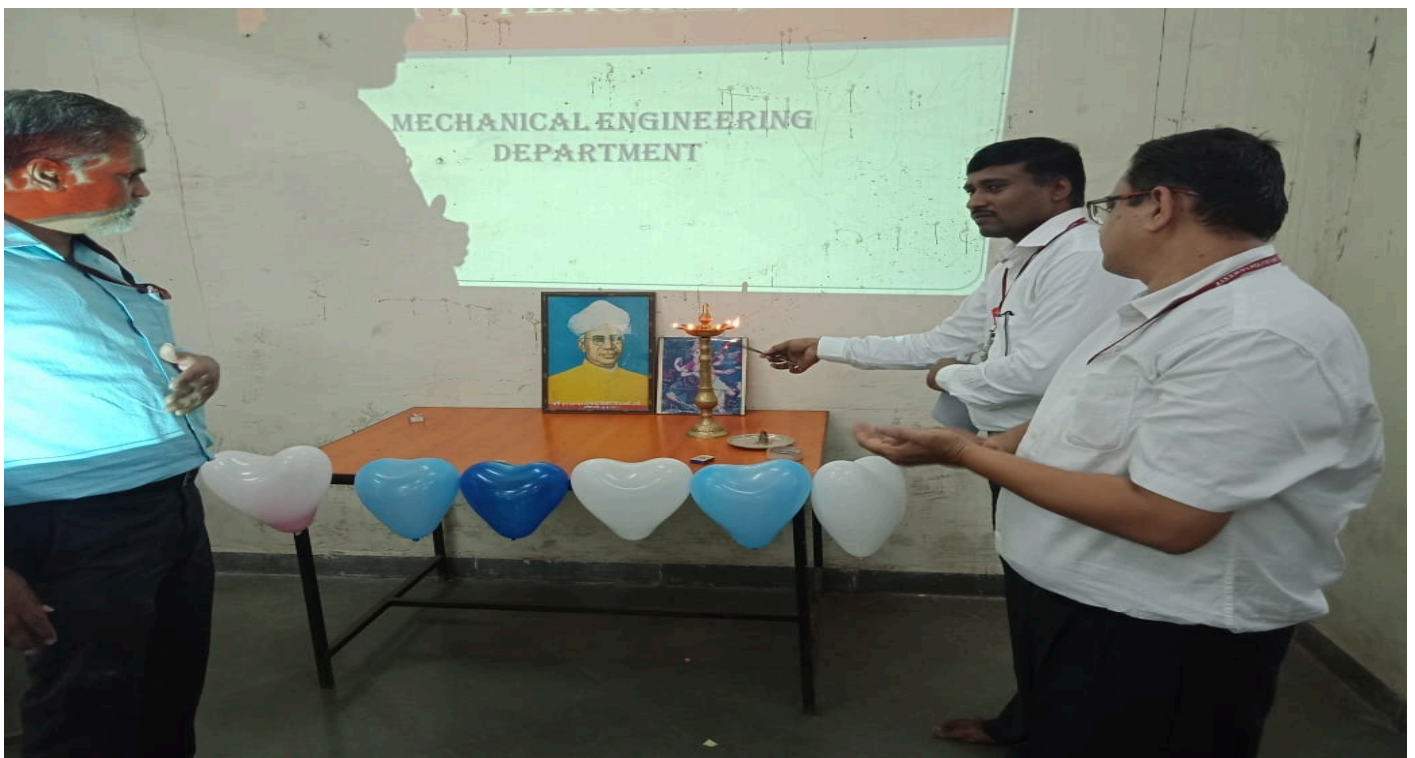
Activities

CELEBRATING ENGINEERS DAY BY STUDENTS

On occasion of Engineers Day on **September 15**, Our Staff members and students celebrating it and organized various game and fun activities. Thus our department gave tribute to the Indian engineer and Bharat Ratna Sir Mokshagundam Viswesvaraya.

In India, **Engineers Day** is celebrated on 15th September every year to pay tribute to Sir Mokshagundam Viswesvaraya (also known as Sir MV). Sir MV is one of India's first civil engineers, who was also awarded a Bharat Ratna in 1955. National Engineers Day is a day to honor the work of Sir MV and acknowledge other engineers as well.

Engineers Day is an occasion to spread awareness about the importance of civil engineering and to remember the contribution of countless civil engineers in nation-building. We have shared more details about this day, its history, significance, and theme below.



Engineers Day is celebrated every year to honor the efforts of all engineers. This day is celebrated around a unique theme each year. The Engineers Day 2023 theme has not been announced yet. The previous year's theme has been discussed below in detail.

7

Engineers Day 2022 theme was "Engineering for A Healthy Planet – Celebrating the UNESCO Engineering Report." Engineering plays a huge role in designing and innovating machines, devices, structures, and digital systems that everybody uses today. This theme recognizes the effort of the field to contribute to society.

The nation observes Engineers Day each year on 15th September. This day is celebrated to commemorate the achievements of Sir Mokshagundam Visvesvaraya (Sir MV) on his birth anniversary. Sir MV was a civil engineer, statesman, and administrator. He was made the Diwan of Mysore from 1912 to 1918. National Engineers day is also celebrated to acknowledge and appreciate the many contributions of all the engineers in the country. Other countries like Tanzania and South Africa also celebrate Engineers Day on 15th September.



NEWS BULLETIN



A Gujarat-based civil engineer, [Nikunj Trivedi](#), provides [free education](#) to children whose parents cannot afford tuition fees, on [Vadodara](#)'s footpath.

Nikunj teaches underprivileged students of private and government schools on the pavement in Vadodara to spread awareness about the importance of education among children.

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Noida Supertech twin towers razed to ground:
Watch the demolition from multiple angles

India on Sunday joined the club of countries that have razed buildings taller than 100 metres with the safe and successful demolition of the [Noida Supertech twin towers](#), said Joe [Brinkman](#) of South African firm Jet Demolitions.

The illegal twin towers in Noida's Sector 93A were grounded by waterfall

implosion technique within 15 seconds on Sunday.



IIT Gandhinagar

The researchers have used damage-cum-wind speed data of [cyclone Fani](#) in [Odisha](#) to develop a fragility model for towers to assess the functionality of the network and the influence of strategic interventions, according to a release issued by the IIT.



