EDIFICE

The Biannual Newsletter of the Department of Civil Engineering

Volume 3 **January 2019** **Issue 2**

EDIFICE

THE BIANNUAL NEWSLETTER OF THE DEPARTMENT OF CIVIL ENGINEERING

JANUARY 2019
Volume 3 Issue 2

DEPARTMENT OF CIVIL ENGINEERING,
SSN COLLEGE OF ENGINEERING,
KALAVAKKAM, CHENNAI
www.ssn.edu.in

Cover Photo: Museum of the Future, Dubai, UAE

Inside This Issue

FROM THE HOD'S DESK

Warm Greetings and New Year wishes to all,

It gives me great pleasure to release the third volume of EDIFICE with good support from faculty and students of Civil fraternity. Like previous years the faculty have published good number of papers in indexed journals and I wish to congratulate all of them for their continued research efforts with dedication. The department has been awarded with an internal funding of 8.18 lakhs for carrying out 12 numbers of student research projects and one faculty research project. My best wishes for successful completion of the projects which will bring laurels to the department. The last semester was full of various activities including Guest lecture, Workshop, Symposium, FDTP organized by the department with the support of faculty and students. My compliments to the office bearers of the Association of Civil Engineers for conducting various events successfully during the symposium INVENTE 2018. I am extremely pleased that over 25 students have been placed so far and I wish all the very best for the graduating class of 2019 for a successful career in academia and industry.

I appreciate and thank the editorial team for their sincere effort in bringing the current edition of the newsletter.

Dr. S. Ramana Gopal

1. **Ramanagopal, S.,** (2018), "Properties of SCC with Nano Silica and Cu Slag as partial replacement for cement and fine Aggregate", Research Journal of Pharmaceutical, Biological and Chemical Sciences, Vol. 9, No. 9, pp. 967-977.

2. **James, J.,** Pandian, P. K., (2018), "Bagasse Ash as an Auxiliary Additive to Lime Stabilization of an Expansive Soil: Strength and Microstructural Investigation," Advances in Civil Engineering, Vol. 2018, Article ID 9658639, 16 pages.

3. **Vijayalakshmi, R.,** (2018), "Effective Utilization of Agricultural waste-RHA as Pozzolanic admixture in cement", Research Journal of Pharmaceutical, Biological and Chemical Sciences, Vol. 9, No. 4, pp. 337-344.

4. **Sangeetha, P.,** Shanmugapriya, M., Shrinidhi, A., Vaishnavi, K., (2018), "Analytical Study on the bond behaviour between steel and concrete using Comsol", Research Journal of Pharmaceutical, Biological and Chemical Sciences, Vol. 9, No. 4, pp. 1522-1529.

5. **Sivapriya, S. V., Sangeetha, P.,** Balasubramanian P., Dharanedharan, K. S., Srinivasan, V., (2018), "Effective reuse of Marble dust powder in cement mortar", Research Journal of Pharmaceutical, Biological and Chemical Sciences, Vol. 9, No. 5, pp. 584-592.

6. **Sangeetha, P.,** Muthuraman R. M. A., (2018) "Performance of Steel Concrete Steel Sandwich Beam with Varying Shear connectors", Indian Journal of Science and Technology, Vol. 11, No. 34, pp 01-07.

7. **James, J.,** Pandian, P.K., (2018), "Chemical, Mineral And Microstructural Characterization Of Solid Wastes For Use As Auxiliary Additives In Soil Stabilization", Journal of Solid Waste Technology and Management, Vol. 44, No. 3, pp. 270-280.

8. **Vijayalakshmi, R., Sangeetha, P.,** Kamaal, M., Gokul, V., (2018), "Effective utilization of Rice Husk Ash and Copper Slag as partial replacement for cement and fine aggregate in SCC", Research Journal of Pharmaceutical, Biological and Chemical Sciences", Vol.9, No. 5, pp. 1956-1967.

9. **Sangeetha, P.,** Muthuraman, R. M. A., Dachina, G., Dhiya, M., Janani, S., Madhumathi, S., (2018) "Behaviour of Concrete filled Steel Tubes", Journal of Informatics and Mathematical Sciences, Vol. 10, No. 1 & 2, pp. 297-304.

10. Shanmugapriya, M., **Sangeetha, P.,** (2018) "Entropy Generation Analysis of Cu-water nano fluid flow over a moving wedge", Desalination and Water Treatment, Vol.121, pp.14-21.

11. **James, J.,** David, E. P. B. G., Nagarathinam, M., Thaniyarasu, M. K., Madhu, J., (2018), "Pozzolanic benefit of fly ash and steel slag blends in the development of uniaxial compressive strength of lime stabilized soil", Revista Facultad de Ingenieria Vol. 27, No. 49, pp. 7-21.

12. **Sivapriya, S. V.,** Muttharam, M., (2018), "Behaviour of Cyclic Laterally Loaded Pile Group in soft Clay", Indian Geotechnical Journal.

13. **Sivapriya, S. V.,** Ridhuvaran, S., Karthick, V., Gopikrishna, R., (2018), "Flexural and Compressional behaviour of Steel Fiber Reinforced Concrete", Research Journal of Pharmaceutical, Biological and Chemical Sciences, Vol.9, No. 6, pp. 405-412.

14. **Sivapriya, S.V.,** (2018), "Stress-strain and penetration characteristics of clay modified with crumb rubber", Revista Facultad De Ingeniería, Vol. 27 no. 49, pp. 65-75.

1. **Sangeetha, P.,** Senthil, R., and Kumar, P.N., (2019*), "Influence of Design Parameters on Composite and Noncomposite Space Truss Structure Analysed Using ANSYS", In: K. S. Vijay Sekar et al. (Eds.), Advances in Manufacturing Processes, Lecture Notes in Mechanical Engineering, Springer Singapore, pp. 111-121.

2. Manoharan, R., **Rajkumar, R.,** Krishnan, B.G., and Aravindh, R., (2019*), "Retrofitting of RC Beams Using Polymer Ferrocement Laminates – Laboratory Model Study and Finite Element Analysis", In: K. S. Vijay Sekar et al. (Eds.), Advances in Manufacturing Processes, Lecture Notes in Mechanical Engineering, Springer Singapore, pp. 631-646.

3. **Rajagopalan, S., Sreehari, P., Mahalingam, B.,** Haneefa, K. M., (2019*), "On Mechanical and Thermal Properties of Concretes with Rubber as Partial Replacement to Well-Graded Conventional Aggregates", A. K. Lakshminarayan et al. (Eds.), Advances in Materials and Metallurgy, Lecture Notes in Mechanical Engineering, Springer Singapore, pp. 57-65.

4. **Sivapriya, S.V.,** and Charumathy, N., (2019*), "Effect of Crumb Rubber on Inorganic and High Compressible Clay', A. K. Lakshminarayan et al. (Eds.), Advances in Materials and Metallurgy, Lecture Notes in Mechanical Engineering, Springer Singapore, pp. 67-73.

*First online in September 2018

CONFERENCE PUBLICATIONS

1. **Sangeetha, P.,** Shanmughapriya, M., (2018), "Numerical study on the behaviour of FRP wrapped concrete columns under uniaxial compression", In Procs. of the International Conference on Mathematical Methods, Modelling and Simulation in Chemical Sciences (ICMMSC 2018), 6th to 8th December 2018, SSN College of Engineering, Chennai, India.

2. **Sangeetha, P.,** Shanmughapriya, M., Deveshwar, K., Jagadeesh, A., (2018), "Numerical and Experimental evaluation on the behaviour of cold formed steel box struts and prediction of experimental using artificial neural networks", In Procs. of the International Conference on Mathematical Methods, Modelling and Simulation in Chemical Sciences (ICMMSC 2018), 6th to 8th December 2018, SSN College of Engineering, Chennai, India.

3. **Sivapriya, S. V., James, J.,** (2018), "Numerical Study on Static Behaviour of a Stone Column Under Uniformly Distributed Load", In Procs. of the International Conference on Mathematical Methods, Modelling and Simulation in Chemical Sciences (ICMMSC 2018), 6th to 8th December 2018, SSN College of Engineering, Chennai, India.

EVENTS ATTENDED

1. **Dr. P. Sreehari** attended a Two-day workshop on "Advances in Hydrology and Water Resources" on 26th & 27th November, 2018 at Anna University, Chennai, India.

2. **Dr. S. V. Sivapriya** attended a workshop on "Soil-structure Interaction and Retaining Walls" as a part of Indian Geotechnical Conference 2018 on 12th December 2018 at IISc Bangalore, Bengaluru, India.

Bogibeel Bridge: India's Longest, Asia's Second Longest, Fully Welded Dual Deck Rail-cum-Road Bridge

Location : Across Brahmaputra
Length : 4.9 km
Cost : ₹ 5900 Crores
Time : 16 Years

1. **Dr. Srinath Rajagopalan** delivered an Invited Technical Talk in the Faculty Development Programme on 'Recent Developments in Pollution Abatement' on 30th November 2018 in the Department of Chemical Engineering, SSN College of Engineering, Chennai, India.

2. **Dr. S. V. Sivapriya** reviewed a manuscript for KSCE Journal of Civil Engineering published by Springer Nature.

3. **Dr. Jijo James** reviewed a manuscript for International Journal of Pavement Research and Technology published by Elsevier B.V.

4. **Dr. Jijo James** obtained membership of the professional body 'Indian Society of Systems for Science and Engineering' – Membership No. 06465

WELCOME

We are elated to welcome **Dr. Sivakumar Naganathan**, who has joined SSN as Professor in Civil Engineering on 3rd December 2018. He has more than 30 years of experience in Teaching & Research. He received his Bachelor's degree and Master's Degree from Regional Engineering College, Trichy (Now, National Institute of Technology Tiruchirapalli) and his Ph.D., (Concrete Technology) in 2010 from University of Malaya. Prior to joining SSN, he was working with the Universiti Tenaga Nasional, Malaysia as Associate Professor, Sunway Universiti College Malaysia, SEGi College Malaysia, Shanmugha polytechnic, Tirumalaisamudram, and Trafalgar House Construction India Pvt Ltd.

He was teaching for University of Queensland, University of Tasmania, Western Michigan University true twinning programme, Universiti Putra Malaysia and Universiti Tenaga Nasional programmes covering a span of 18 years. He is the recipient of outstanding teaching award (top 5) and popular and memorable lecturer award (top 10) in college of engineering, Universiti Tenaga Nasional Malaysia (UNITEN). He has also received the Certificate of excellence for highest number of scopus indexed journal publication and most outstanding paper award (published in high impact journal) at UNITEN- Malaysia. His name is included in the 31st Edition of Marquis Who's Who in the World 2014, USA.

He has over 77 publications including 8 books and conferences with 392 citations with h-index of 12 and one patent to his credit. Prior to joining SSN, he was working with the Universiti Tenaga Nasional, Malaysia as Associate Professor.

Yamuna Expressway: 6 Lane, 165 Km long, access controlled Expressway connecting Greater Noida with Agra built at a cost of ₹ 128.39 Billion

ASSOCIATION INAUGURATION

The inaugural function of the Association of Civil Engineers was held on the 6th August 2018 with Mr. T. R. Subash, Joint General Manager, Engineering Design & Research Centre, Larsen & Toubro Limited, Chennai presiding as the chief guest. The association was formally inaugurated for the academic year by the chief guest, head of the department and the association in-charge.

Following this, the office bearers for the academic year were introduced. Mr. T. R. Subash delivered a guest lecture on “Civil Engineer and The Industry”. The lecture presented the current scenario prevalent in the Civil Engineering Industry and the requirements that a freshly graduated Civil Engineer must possess as expected by the Industry. He also gave an overview of the Tunnelling work done and the construction of underground stations for the Chennai Metro Rail Project along with the challenges faced. Finally, he wound up his lecture with a motivational video on the Civil Engineering Marvels constructed around the world.

Inauguration of the Association of Civil Engineers by Mr. T. R. Subash

The Chief Guest interacting with one of the students

A One day workshop on “Seismic Risk Assessment and Retrofitting” was organized by the Department of Civil Engineering on the 27th of September 2018. The event was convened by Dr. S. Ramanagopal, Professor and Head, Civil Engineering and coordinated by Dr. P. Sangeetha and Dr. R. Vijayalakshmi, Associate Professors, Civil Engineering. The objective of the workshop was to provide an opportunity for students and faculty to familiarize with seismic resistance and retrofitting of structures. More than 70 participants from the various engineering colleges across Tamil Nadu had registered and attended the workshop. Dr. M. Sekar, Professor of Eminence, Structural Engineering Division, Anna University, Chennai gave the inaugural address and delivered the first lecture of the workshop. He talked about the Seismic vulnerability and risk assessment. The second session was handled by Dr. Amlan K Sengupta, Professor, Structural Engineering Division of IIT Madras, Chennai. He enlightened the participants about the guidelines available for seismic construction and retrofitting of structures. The post lunch session was handled by Dr. C. Umarani, Professor, Structural Engineering Division, Anna University, Chennai. The Workshop concluded with a vote of thanks and distribution of certificates to the participants from various institutions across Tamil Nadu.

Dr. M. Sekar delivering the lecture in session I of the workshop

Dr. Amlan K. Sengupta delivering the lecture in session II of the workshop

Dr. C. Umarani delivering the lecture in session III of the workshop

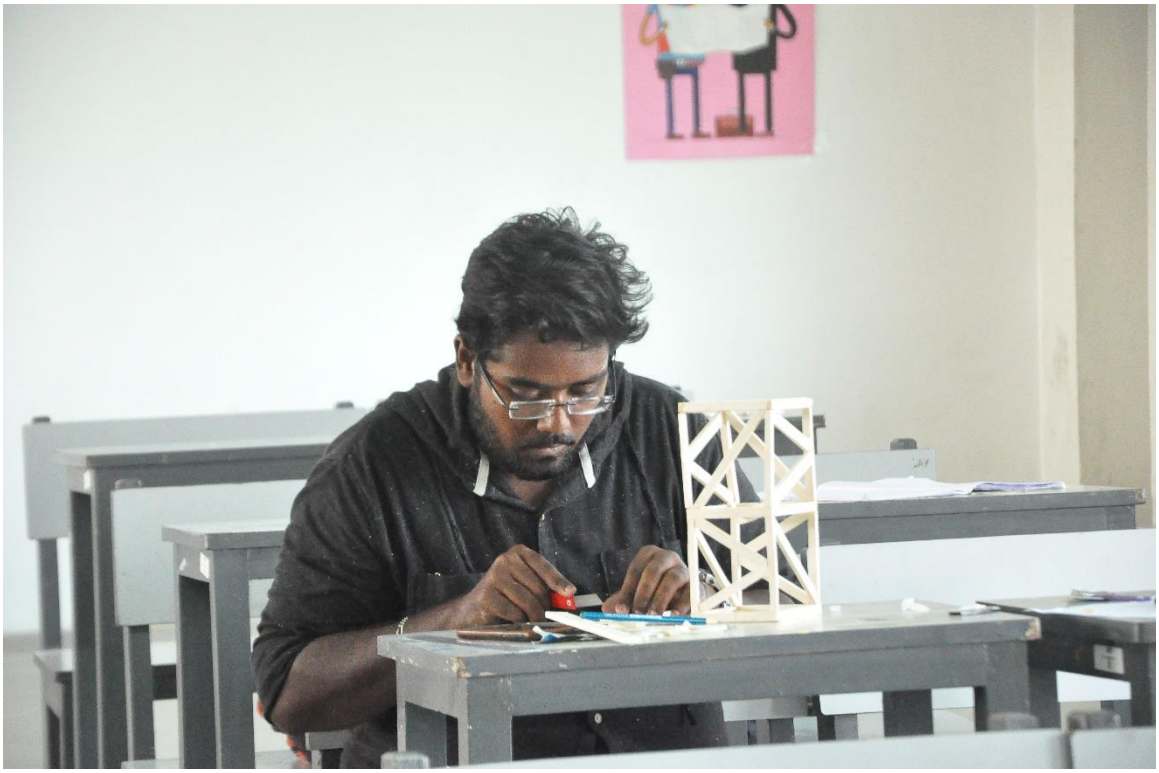
Participants at the Workshop (Top and Bottom)

Invente 3.0, the third version of SSN College of Engineering's multidisciplinary technical fest was held on 21st and 22nd of September, 2018. Drawing crowds of thousands of students across both days, Invente was a roaring success, and achieved its primary goals of honing the students' technical abilities through workshops conducted by renowned professionals across various fields while also testing and rewarding proficient performers in various technical and non-technical events.

The Civil Department of SSN College of Engineering conducted a total of eight technical events encompassing the multiple branches of engineering falling under the broad aegis of the Civil Engineering discipline, along with workshops on day 1 and day 2. The Technical Events included the following: Paper Presentation, InQUIZitive, Concrete Challenge, Technical Debate, Battle of Design, Build It, Green Turbo ,Quote or Quit. The workshop was entitled 'Workshop on Advanced Surveying Instruments' held by Mr. Jayashanker from Indus Industries. This line up of events was received well by the students from more than 15 different colleges in the state – and overall participation exceeded over 100 across both days, making Invente 3.0 a successful event.

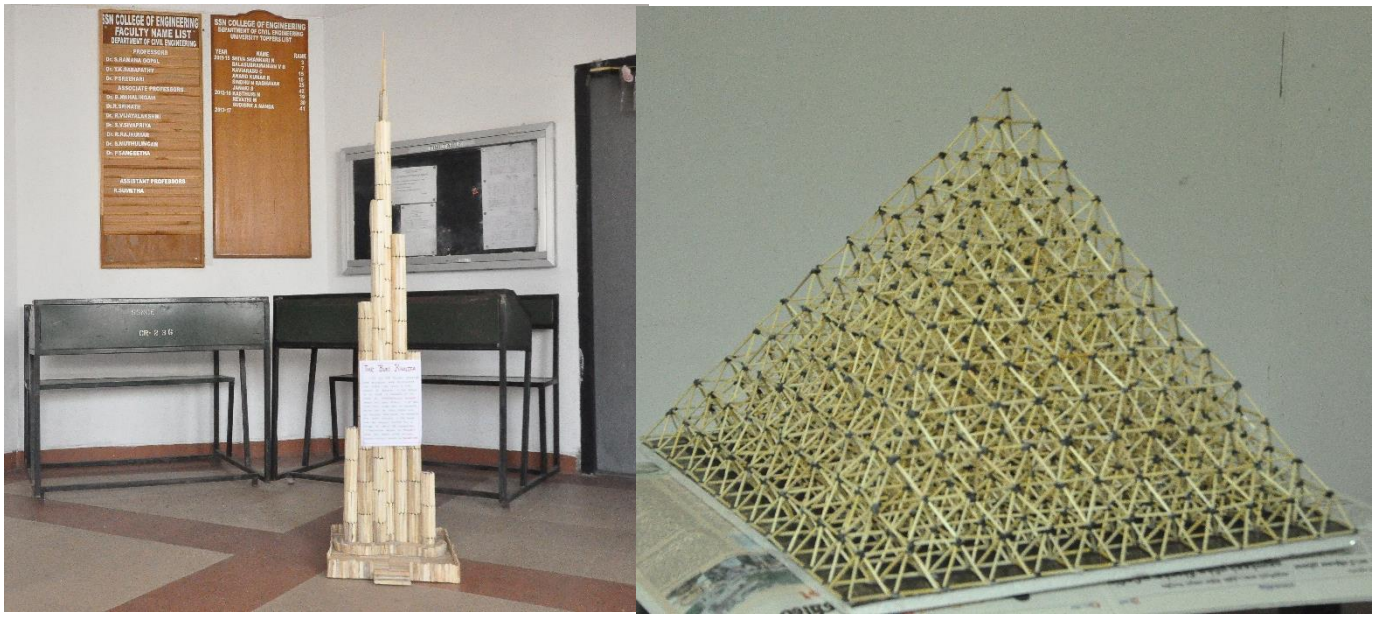
Inauguration of Invente 3.0

Participants waiting for Green Turbo Event at Invente 3.0



A Participant in action in the Bridge It Event

Participants at the Workshop on Total Station held as a Part of Invente 3.0



Models exhibited as a part of Invente 3.0

FACULTY DEVELOPMENT PROGRAMME

The Department of Civil Engineering organized a seven days FDTP on CE6603- Design of Steel Structures approved by Anna University from 3rd to 7th December 2018. The programme was coordinated by Dr. R. Rajkumar and Dr. Y.K. Sabapathy. Fourteen external faculty members from various engineering colleges from all over Tamil Nadu participated in the programme. The following were the resource persons who delivered lectures in the training programme.

External Speakers	**Internal Speakers**
Dr. K. Muthumani Professor, VIT & Former Chief Scientist, SERC	Dr. Y. K. Sabapathy Professor, Civil Engg.
Dr. S. Thirugnanasambandam Associate Professor, Annamalai University	Dr. B. Mahalingam Associate Professor, Civil Engg.
Dr. S. Seetharaman, Former Chief Scientist, SERC	Dr. R. Raj Kumar Associate Professor, Civil Engg.
Dr. P. Revathy, Assistant Professor, Pondicherry Engineering College	Dr. P. Sangeetha Associate Professor, Civil Engg.

Valedictory Function of the Faculty Development and Training Programme

SSN SCHOLARSHIP DAY

The 20th Annual SSN Scholarship Day was conducted on the 19th of December 2018 in the Justice Pratap Singh Auditorium where scholarships worth ₹6 crores have been distributed till now. Nine students of the Department of Civil Engineering were awarded scholarships for their meritorious performance. Three of them were awarded scholarships in the exemplary category and six of them were awarded the scholarship in outstanding category.

S.No.	Reg. No.	Name	Year	GPA	Scholarship Status
1	312217103020	Harika Madiredyy	II	9.06	Exemplary
2	312217103061	Vinothini S N	II	8.90	Outstanding
3	312217103004	A Anne Sherin	II	8.84	Outstanding
4	312216103032	Manjula R	III	9.39	Exemplary
5	312216103013	Deveshwar K	III	9.12	Outstanding
6	312216103019	Hema Naga Sri Pushpa Swetha T	III	9.06	Outstanding
7	312215103029	K Vaishnavi	IV	9.06	Exemplary
8	312215103030	Manimanickam RM	IV	8.79	Outstanding
9	312215103040	K P Priyadharshini	IV	8.79	Outstanding

Inauguration of 20th Scholarship Day Event

FACULTY SEMINAR

A faculty research seminar was conducted on the 18th of December 2018. Dr. Jijo James, Associate Professor in Civil Engineering, gave a lecture on "Strength, Mineralogy and Microstructure of a Lime Stabilized Expansive Soil Amended with Waste Materials". He explained about the expansive soils and the problems faced due to them by a geotechnical engineer followed by stabilization of such soils using lime. He then talked about the various industrial wastes generated in India and their reuse in various Civil Engineering applications like concrete engineering and soil stabilization. He followed it up with the methodology developed for evaluating the performance of solid wastes as auxiliary additives to lime in soil stabilization based on the existing investigative literature done in both India and Abroad. He then described the results of using five specific solid wastes viz. Phosphogypsum, Ceramic Dust, Press Mud, Bagasse Ash and Coconut Shell Powder as auxiliary additives to lime in stabilization of an expansive soil. He also described the mineralogical and microstructural changes taking place in the soil based on the results of X-ray diffraction and Scanning electron microscopy results and concluded that Bagasse Ash and Phosphogypsum had excellent potential to be used as auxiliary additives followed by Ceramic Dust, Press Mud and Coconut Shell Powder in that order.

Dr. Jijo James at the start of his research seminar

EIKSUND TUNNEL

World's Deepest Undersea Rock Tunnel, excavated using 1300 tonnes of explosives to remove 660,000 m^3 of rock.

Location : Norway
Length : 7.765 km
Deepest Pt. : -287m
Cost : 800 Million Kr
Opened : 2008

2016-2020 batch students studying III year visited the **Nemmeli Desalination Plant** on 09-08-2018 and 10-08-2018 with the faculty coordinators Dr. B. Mahalingam & Dr. P. Sangeetha and Dr. R. Srinath & Dr. R. Vijayalakshmi respectively. The Nemmeli Desalination Plant is a water desalination plant at Nemmeli, Chennai, on the coast of the Bay of Bengal that supplies water to the city of Chennai. It is located about 35 km south of the city centre, along the East Coast Road. Built at a cost of ₹ 5,333.8 million, the plant is the second desalination plant in the city after the 100-MLD (million litres per day) plant at Minjur and itself has a capacity to treat 100 million litres of seawater a day. The plant, owned by Chennai Metrowater, was constructed by VA Tech Wabag, in consortium with IDE Technologies in Israel, and Larsen and Toubro (L&T) Limited laid the 65-km-long pipeline from the plant to various parts of the city and built underground sumps en route. The process technology involves marine sea water intake system and pre-treatment system consisting of disc filters followed by ultra-filtration (UF). A 1,050-metre-long pipeline with a diameter of 1,600 mm (HDPE) has been sunk at a depth of about 14.1 m in the sea side and 5.5 m in the shore side, capable of drawing nearly 265 MLD of seawater by means of gravity. Another 750-metre-long pipeline with a diameter of 1,200 mm discharges waste water from the plant. The production cost of treated water at the plant has been calculated as ₹ 30 per kilolitre of water.

Students at Nemmeli Desalination Plant

INDUSTRIAL VISIT

2016-2020 batch students studying III year visited Council of Scientific and Industrial Research **Structural Engineering Research Centre** (CSIR-SERC), Taramani, Chennai on 26-09- 2018 with the faculty coordinators Dr. B. Mahalingam and Dr. S. V. Sivapriya. It is one of India's premier national laboratories involved in analysis, design and testing of structures and structural components. The students were able to visit the various structural test facilities when they visited the centre.

Students at Structural Engineering Research Centre

INPLANT TRAINING AND INTERNSHIP

Company	Name of the Students
Airports Authority of India, Chennai	S. Rohit
	R. S. Saravanakumar
	P. Sathish Kumar
	A. S. Gobinaath
	A. R. Gobinathan
	R. Hanish Kumar
	D. Madhan Kumar
Larsen & Toubro Constructions	S. Sabarish
Gulf Spic General Trading & Contracting Company W.L.L, Kuwait	K. Sooraj
IIT Madras, Chennai	R. Chitra Lekha

HIGHER STUDIES

Name of the Student	Name of the Course	Name of the University	Year of Admission
Skanda Vishnu S	M.S., Civil, Environmental and Sustainable Engineering	Arizona State University, USA	2018
Rahul Raj Ravi	Masters in Management and Real Estate Development	IE Business School, Spain	2018
Aarthy Reddy R	M. Tech., Construction Engineering and Management	SRM Institute of Science and Technology, Chennai	2018
Hareesh C M	M.E., Structural Engineering	SRM Valliammai Engineering College, Chennai	2018

Company	Name of the Students
Dow Chemicals	Shobana P
Zoom Rx	Vishnu Aravind G
	Kannan Meena C
	Rahul Goenka A
Freshworks	Kannan Meena C
	Rahul Goenka A
Meckinsey	Kannan Meena C
Latentview	Roshni C
	Vaishnavi K
Tata Consultancy Services	Alex Kirubakaraan J
	Duraimurugan A
	Poonguzhali A
	Sadhana S
Cognizant Technology Solutions	Annal A S
	Mukul Anand B
	Dinesh Kumar P
	Duraimurugan A
	Jai Vigneshwar A
	Mohammed Kamal J
	Karthikeyan T
	Karthik Raja R
	Prathiba Devi N
	Saranya S
	Yogesh Kumar K
	Srilekha V
Infosys	Annal A S
	Inakota Sai Sahith
	Karthik Raja R
	Sadhana S
	Srilekha V

STUDENTS INTERNALLY FUNDED PROJECTS

S.No.	Students	Project Supervisor	Project Title	Duration
1	Prithika Saishree S Vikram P.G Yuvalatha P Yuvarani	Dr. S. Ramana Gopal	Behaviour of GFRP–perforated-steel tube-encased Clay Aggregate concrete column under axial compression	10 Months/ ₹ 25,000
2	Charumathi .V Niveditha K.S Rakshitha S Sheena Grace. D	Dr. R. Vijayalakshmi	Properties of pervious concretes containing expanded clay aggregate and blast furnace slag as coarse aggregate	10 Months/ ₹ 24,000
3	Jyothir Adithya R M Ragesh Raj M Sidharath K Shah Vishwa R	Dr. R. Vijayalakshmi	Compression behaviour of back-to-back gapped built-up Cold-Formed steel Hollow flange Channel sections	10 Months/ ₹ 25,000
4	Devarasetty Yaswitha Gobinathan A R Madan Kumar D Munieswar Reddy A	Dr. S. Ramana Gopal	Behaviour of the composite slab for varying thickness of the profile decking sheet under two point loading condition	10 Months/ ₹ 25,000
5	Sushritha G Yuvaraj K	Dr. Sivapriya S V	Stabilisation of highly compressible clay mixed with egg shell ash and bagasse ash - A laboratory study	12 Months/ ₹ 20,000
6	Hariraj M J Harish Kumar M Shalini Devi M Gokul V	Dr. R. Vijayalakshmi	Compression behaviour of Fiber reinforced light weight concrete stack bonded masonry prism	9 Months/ ₹ 23,000
7	Ashwin S Janani J Yokesh R B	Dr. P. Sangeetha	Experimental and analytical behaviour of the space truss components	10 Months/ ₹ 25,000

S.No.	Students	Project Supervisor	Project Title	Duration
8	Sajid Ali Basudev Singh	Dr. Jijo James Dr. Sivapriya S V	Potential of Nano-TiO_2 as a stabilizer and auxiliary additive in stabilization of an Expansive soil	12 Months/ ₹ 20,000
9	Kavya L Kamaleswari T Vishvaa R S	Dr. R. Rajkumar	Experimental study on the behaviour of Ferrocement encased brick masonry columns	8 Months/ ₹ 22,000
10	Arulselvan S M Vinothni S N	Dr. R. Rajkumar	Experimental study on the behaviour of Ferrocement encased brick masonry columns	8 Months/ ₹ 22,000
11	Modhapriyan A Vaishanvi M Rajarajan T	Dr. P. Sangeetha	Study on the behaviour of the cold - formed steel built up columns with intermediate batten plate	10 Months/ ₹ 24,000
12	Ashok Kumar A N Dhinagaran M Hanish Kumar R Rohit S	Dr. R. Srinath	Thermal effects on Concrete	10 Months/ ₹ 20,000
13	David Arunraj B Madhan Kumar D Sathish Kumar P Selvam K	Dr. B. Mahalingam	Durability study on self-compacting concrete	10 Months/ ₹ 22,000
14	Achuchtha Varman S Priyadharshni Varma UM	Dr. P. Sreehari Dr. B. Mahalingam	Study on durability of Roman Mortar	10 Months/ ₹ 25,000
15	Aparna P Vijay R. Manjula K. Sooraj	Dr. M. Shanmugapriya Dr. P. Sangeetha	Numerical and experimental study on the behaviour of the cold-formed steel built up columns	10 Months/ ₹ 25,000

The idea of entrepreneurship is one that's slowly begun to concretize in the minds of several engineering students these days much more than a mere career option. Several reasons attribute to this conspicuous trend in the market- an outburst of unemployed or dissatisfied youth, the willingness to risk chances and be part of a change, or an innovative brainstorm for incubation, much before the student's very graduation too. The idea of self-sustenance and the privilege to adopt a work culture as per their interests are other main reasons that influence this start-up ecosystem.

Entrepreneurship, which banks on the ability to sell your idea as a proper business proposition, seeds on the sheer commitment and perseverance in every stage of its incubation and operation. Facing the financial risks in the hope of a foreseeable profit, prudent decisions and proper knowledge of what to execute when, is what that takes the firm to go where every entrepreneur dreams of it to go. 'Leader's curse' is an interesting theory in management that can be discussed here- the takeaway of this concept highlighting anther important quality necessary for an entrepreneur to pursue his business. The theory mainly throws light on how the inability of the leader to put forth his/her firm's mission, be it on the goals that they wish to achieve or in the manner of its performance, to all employees there can become a self-defeating element over time. In other words, all the workers engaged in the company must be aware of the meaning of the system that prevails in the workplace. Even if they are not aware of the exact meaning, they must be convinced that leader knows it all and all they have to do is just contribute to the manager's vision. Lining up such an enterprise and micro-managing every single value-transaction is sometimes impossible for an entrepreneur- but there's no way that he/she can come up with this as an excuse.

One of the roads relatively less-ventured in entrepreneurship, which however is progressively getting recognized these days, happen to be Social Entrepreneurship. While the common misconception is that it is more or less related to NGOs and charity, social entrepreneurship is definitely much beyond that. In fact, the only main difference between a mainstream enterprise and this is in the way the founder manages to incorporate a social mission into his/her for-profit model of business enterprise, one that is referred to as a hybrid model.

By doing so, one only earns money for oneself but also devotes part of the resources or hard-work in order to create a social impact, for the intended beneficiary. For example, Mirakle Couriers is a national award-winning courier agencies that employ low-income deaf adults to deliver mails. Jayashree Industries, the start-up company that provides low-cost sanitary napkins to the marginalized women sections in India, is now a worldwide recognized business model. By doing so, the entrepreneur manages to earn the goodwill of the customers and investors, and that does help him/her upscale the business too.

Setting up a business venture only after attaining a formal degree in economics or management is a practice now part of the old times. On the contrary, the technical knowledge acquired in the various realms of engineering enhance the capabilities of the interested entrepreneur- not just because of the background one is exposed to, but also from the skills associated with completion of each of the tasks assigned. In this context, an engineer who is trained to take up vital responsibilities and also manage human resource efficiently turn out to exhibit inherent proficiency in networking- a skill that is essential to survive in the industry. All that it takes to stay healthy in business is to keep learning whatever it takes to emerge triumphant, be it economics or consumer theory. To quote Warren Buffet, 'the more you learn, the more you earn'.

Entrepreneurship is however, not a child's play or a loser's reason to claim that he/she is motivated in life. Many of the social entrepreneurs I have gotten a chance to interact with, believe that the risk taken as early as in the initial ideation will keep firing at you in every stage of your career- not just because it can turn into a failure any moment, but also because success is still not out there. This never-ending journey therefore, requires utmost diligence to keep sowing the seeds and patience, to wait for its rewards. Moreover, choosing entrepreneurship just because you can stay in the limelight forever is a hoax- even highly regarded entrepreneurs are immediately forgotten once they hit their lows (unless they have bad loans to pay or choose to flee). In short, entrepreneurship sounds cool in the market only because it is marketed that way- it's dirty business out there, and you must be willing to go all-in, to achieve your very mission. Interestingly, entrepreneurship is also a medium to keep telling yourself why your passion means so much to you, and surprise yourself as to how far you can go to achieve that dream.

J. Gokul Krishna
III Year Civil

The next industrial revolution is dawning – powered not by steam but Artificial Intelligence and big data. Artificial intelligence is a branch of computer science, involved in the research, design and application of intelligent computer. Artificial intelligence, a comprehensive discipline, was developed based on the interaction of several kinds of disciplines, such as computer science, cybernetics, information theory, psychology, linguistics, and neurophysiology. The goal of this field is to explore how to imitate and execute some of the intelligent function of human brain, so that people can develop technology products and establish relevant theories. Artificial intelligence is a science on the research and application of the law of the activities of human intelligence. It has been a far-reaching cross-frontier subject, after the 50 years of advancement.

In the field of civil engineering, many problems, especially in engineering design, construction management, and program decision-making, were influenced by many uncertainties which could be solved not only in need of mathematics, physics, and mechanics calculations but also depend on the experience of practitioners. Self-diagnosis, multi-objective shape control, and reinforcement-learning processes were some of the advancements of AI in civil engineering. Among artificial intelligence-based computational techniques,

- modeling nonlinear, complex, and ambiguous behavior of cement-based materials undergoing single, dual, or multiple damage factors of different forms in civil engineering
- back-propagation to neural networks to assess the slope failure
- generating and evaluating optimal/near-optimal construction scheduling plans that minimize both project time and cost
- predicting the length of pavement transverse cracking
- estimating the value of the friction coefficient was used in Manning Equation to predict the open channel flows
- identifying the damage pattern changes in frequency response functions (FRFs) and artificial neural networks (ANNs) to identify defects

- predicting the compressive strength based on the concrete mix-design, size and shape of specimen, curing technique and period, environmental conditions, and so forth
- estimating the service life of reinforced concrete bridge by utilizing four fuzzy interfaces to quantify the exposure condition, required cover thickness, corrosion current density, and pitting corrosion ratio

are some of the latest developments pertaining to the field of civil engineering.

The general trend of development of AI in the field of civil engineering is the process of combining the Artificial Intelligence technology ,practical engineering, hybrid engineering technologies, object-oriented systems, civil expert research systems, and the Internet. To deepen the understanding of the problems of uncertainty and to seek appropriate reasoning mechanism is the primary task. To develop practical artificial intelligence technology, only to be developed in the field of artificial intelligence technology, and the knowledge to have a thorough ' grasp'. To make artificial intelligence technology to revolutionize and commercialize is also a major challenge in the future.

Artificial intelligence technology will change with each passing day, as the computer is applied more and more popularly, and in civil engineering field will have a broad prospect. The industry is taking a long time because it is one of the few in which many of its practices have remained the same for more than a century. This second machine age is seeing machines that can think rather than just do. As expert systems replace human thinking and process improvement steps up several gears, we also will need to reconsider the ethics that underlie our profession, as we code computers to replace much of what we now call engineering judgement exercised by humans.

Vinothini S N

II Year Civil

Engineering Cementitious Composite or popularly known as **Bendable Concrete** is an ultra-ductile mortar based composite reinforced with specially selected short random fibers, usually polymer fibres. ECC has a strain capacity in the range of 3–7%, compared to 0.1% for ordinary portland cement concrete. They can be used to give seismic resistance to buildings. It was developed by Prof. Victor Li of University of Michigan, USA.

ENGINEERING BEHIND HOOVER DAM

Hoover dam was an engineering feat during the days of Great Depression. It is an arch-gravity dam in the Black Canyon of the Colorado river in America. The main objective for construction were for irrigation and power generation. It employed some 10,000 to 20,000 people and the construction costs hundreds of life. The dam was constructed by 'Six Companies'. Before laying down any concrete, more groundwork has to be done. The coffer dams (temporary enclosures so that the water can be pumped out resulting in a dry land for work) was first constructed. About 1,500,000 cubic yards of material was removed till the bedrock was reached. The sidewalls of the canyon was also excavated till the virgin rock is reached to resist the force of the impounded lake. The underlying rock foundation is then reinforced with grout curtain. It was done to stabilize the rock and to discourage seepage of water under the dam by filling with grout which erodes the cavities in the rock. Since concrete heats and contracts as it cures, the potential for uneven cooling and contraction of the concrete posed a serious problem. Engineers calculated that if the dam were to be built in a single continuous pour, the concrete would take 125 years to cool, and the resulting stresses would cause the dam to crack and fail.

ENGINEERING BEHIND HOOVER DAM

Instead, the ground where the dam would rise was marked with rectangles, and concrete blocks in columns were poured, some as large as 50 square feet and 5 feet high. Each five-foot form contained a series of 1-inch steel pipes. Cool river water would be poured through the pipes, followed by ice-cold water from a refrigeration plant. When an individual block had cured and had stopped contracting, the pipes were filled with grout. Grout was also used to fill the hairline spaces between columns, which were grooved to increase the strength of the joints. Hoover Dam's concrete has continued to slowly gain strength and the dam is composed of a durable concrete having a compressive strength exceeding the range found in normal mass concrete. Hoover Dam concrete is not subject to alkali-silica reaction (ASR), also known as concrete cancer, as the Hoover Dam happened to use non-reactive aggregate. The reaction takes place between alkaline cement paste and silica in aggregate reacts to form a soluble and viscous sodium silicate gel which is hygroscopic in nature and expand due to absorption of water. This leads to cracking and ultimately to failure. The Hoover Dam stands as a living example of humans ability to control the nature for our needs.

Panaromic View of Hoover Dam from Arizona Side

Yogesh Kumar V

II Year Civil

The “nano” prefix is derived from the Greek noun nanos, meaning dwarf. A nanometre (nm) is one billionth (1×10^{-9}) of a metre: the length of about ten atoms placed side-by-side, or 1/80,000th of the thickness of a human hair. The term nanotechnology covers a family of technologies, including nanosciences and nanotechnologies. Nanoscience is the study of phenomena and manipulation of materials at atomic, molecular and macromolecular scales, where properties differ significantly from those at a larger scale. Nanotechnologies are the design, characterization, production and application of structures, devices and systems by controlling shape and size at nanometric scale. The term nanotechnology is an umbrella term that encompasses a vast range of technologies across a number of disciplines involving the manipulation and application of matter, based on its properties at the atomic scale. The areas of application of nanotechnology are Medicine, Chemistry and Environment, Energy, Agriculture, Information and Communication, Heavy Industries and Consumer Goods. At the commercial level, the main areas of application are materials and manufacturing (coatings and composites for products like automobiles and buildings), electronics (displays and batteries) and health care and life sciences (pharmaceutical applications). Nanomaterials as a field can be defined as the study of materials with morphological features on the nanoscale, especially those that have special properties stemming from their nanoscale dimensions. Nanomaterials can be defined as those physical substances with at least one dimension between 1 to 100 nm. The nanomaterials properties can be very different from the properties of the same materials at micro (10^{-6} m) or macro scale (10^{-6} to 10^{-3} m).

Nanomaterials are broadly classified into Fullerenes and Nanoparticles. The fullerenes are a class of allotropes of carbon which conceptually are graphene sheets rolled into tubes or spheres. Liquids or solids of materials with particle sizes between 1 and 100 nm, are known as nanoparticles. Nanomaterials in Civil Engineering include Carbon Nanotubes, Titanium Dioxide Nanoparticles, Silicon Dioxide Nanoparticles, Zinc Oxide Nanoparticles, Silver Nanoparticles, Aluminium Oxide Nanoparticles, Zirconium Oxide Nanoparticles, Wolfram Oxide (Tungsten Trioxide) Nanoparticles and Iron Nanoparticles to name a few.

Carbon Nanotubes

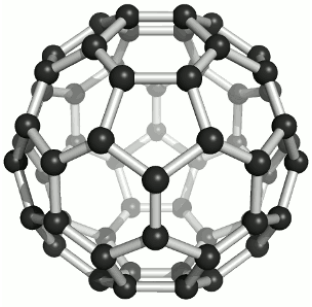
Carbon nanotubes are a form of carbon having a cylindrical shape, the name coming from their nanometre diameter. They can be several millimetres in length and can have one "layer" or wall (single walled nanotube) or more than one wall (multi walled nanotube). Nanotubes are members of the fullerene structural family and exhibit extraordinary strength and unique electrical properties, being efficient thermal conductors. They have five times the Young's modulus and eight times (theoretically 100 times) the strength of steel, whilst being 1/6th the density. Expected benefits of carbon nanotubes are: mechanical durability and crack prevention in concrete, enhanced mechanical and thermal properties in ceramics and real-time structural health monitoring capacity.

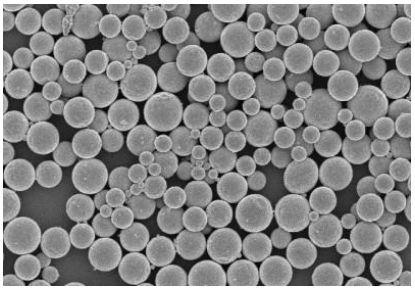
Titanium Dioxide Nanoparticles

Titanium Dioxide nanoparticles is a white pigment that can be used as an additive to cement, paint, concrete, glass windows due to its sterilizing properties. Titanium dioxide breaks down organic pollutants, volatile organic compounds and bacterial membranes through powerful photocatalytic reactions, reducing air pollutants when it is applied to outdoor surfaces. Being hydrophilic, it gives self-cleaning properties to surfaces to which it is applied, because rain water is attracted to the surface and forms sheets which collect the pollutants and dirt particles previously broken down and washes them off. The resulting concrete surface has a white colour that retains its whiteness very effectively.

Silicon Dioxide Nanoparticles

Nano-Silica can significantly increase the compressive strength of concretes containing large fly ash volume at early age, by filling the pores between large fly ash and cement particles. Nano-silica decreases the setting time of mortar when compared with silica fume (microsilica) and reduces bleeding water and segregation by the improvement of the cohesiveness.





Fullerene (Left)
Nanoparticles (Right)

Zinc Oxide Nanoparticles

Zinc oxide is a unique material that exhibits dual semiconducting and piezoelectric properties. It is added into various materials and products, including plastics, ceramics, glass, cement, rubber, paints, adhesive, sealants, pigments and fire retardants. When used for concrete manufacturing, ZnO improves the processing time and the resistance of concrete against water.

Silver Nanoparticles

Nanosilver will affect, when in contact with bacteria, viruses and fungi, the cellular metabolism and inhibits cell growth. Nanosilver inhibits multiplication and growth of bacteria and fungi, which causes infection, odour, itchiness and sores. When the nanoparticles are coated on the surface of any material, the surface area increases several million times than the normal silver foil.

Aluminium Oxide Nanoparticles

Alumina (Al_2O_3) component reacts with calcium hydroxide produced from the hydration of calcium silicates. The rate of the pozzolanic reaction is proportional to the amount of surface area available for reaction. The addition of nano-Al_2O_3 of high purity improves the characteristics of concretes, in terms of higher split tensile and flexural strength. The cement could be advantageously replaced in the concrete mixture with nano-Al_2O_3 particles up to maximum limit of 2.0% with average particle sizes of 15 nm, the optimal level of nano-Al_2O_3 particles content being achieved with 1.0% replacement.

Zirconium Oxide Nanoparticles

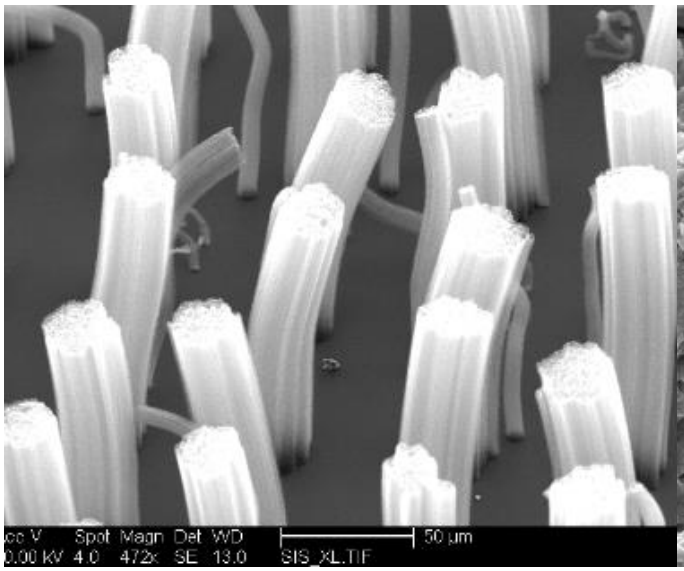
Zirconium oxide (or Zirconia) nanopowder or nanoparticles are white high surface area particles with typical dimensions of 5 to 100 nanometers and specific surface area in the range of 25 to 50 m^2/g. Nano zirconium shows good aesthetics (translucency), superior physical resistance (hardness, flexibility, durability), chemical resistance (practically inert) and is a very good insulator.

Tungsten Trioxide Nanoparticles

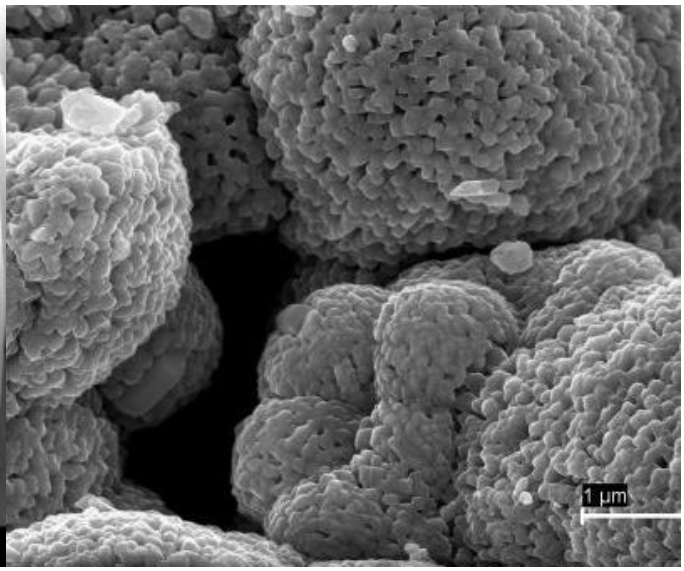
In recent years, tungsten trioxide has been employed in the production of electrochromic windows, or smart windows. These windows are electrically switchable glass that change light transmission properties with an applied voltage. This allows the user to tint their windows, changing the amount of heat or light passing through.

Iron Nanoparticles

Zero Valent Iron (ZVI) nanoparticles can be used for environmental remediation of contaminants. They can be used for degradation of various organic contaminants such as chlorinated organic solvents, organochlorine pesticides, polychlorinated biphenyls (PCBs), and organic dyes. ZVI has the potential to transform metal ions such as Cd, Ni, Zn, As, Cr, Ag, and Pb, as well as notorious inorganic anions like perchlorate and nitrate.



Scanning Electron Microscopy Image of Carbon Nanotubes



Scanning Electron Microscopy Image of TiO_2 Nanoparticles

(This article was extracted from the presentation given by Dr. Jijo James in the Engineer's Training Programme at the C.P.W.D. Regional Training Centre in Chennai. All Images are credited to Internet Sources from where they were sourced.)

Edifice Editorial Team