ASCE
SRI LANKA SECTION

# VISION BIG

ISSUE IV | MAY 2025

## ASCE-SLS SINHALA & TAMIL NEW YEAR CELEBRATIONS [*BAK MAHA ULELA*]

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# PRESIDENT'S MESSAGE

As the President of the American Society of Civil Engineers – Sri Lanka Section (ASCE-SLS) for the year 2024/2025, I am pleased to present the second issue of our newsletter, "Vision Big," for this term.
I would like to extend my sincere appreciation to our Editor, Eng. Mrs. Dilini Gamage, and her dedicated team for their hard work and commitment in bringing this publication to life.

It brings me great pride and joy to share that we have successfully organized several impactful activities, including social events, CPD programs, charity initiatives, and field visits. These were made possible through the dedication and collaborative efforts of our subcommittee members. Notably, in April, we celebrated the Sinhala and Tamil New Year and conducted our second CPD event. In the month of May, we marked the Vesak season by making a charitable donation to Lady Ridgway Hospital.
These events are primarily aimed at supporting the younger generation undergraduate students and recently graduated members by helping them engage with the Society, familiarize themselves with the industry, and build strong relationships with senior professionals. As such, I warmly encourage their continued participation and support for all upcoming events.
I am also pleased to announce that we have recently established a Student Chapter at NSBM Green University. Our next step is to expand this initiative to the Sir John Kothalawala Defence University, as we continue to strengthen our outreach to future civil engineers.

I believe that our newsletter, "Vision Big," serves as a valuable platform for sharing knowledge and practical experiences across all sectors of civil engineering. Once again, I sincerely thank the editorial team for their exceptional effort in elevating the quality and impact of this publication.

I am confident that with the continued support of our members, we will achieve even greater success in the months ahead. I wish you all the very best for the year 2025, may it be filled with success, growth, and fulfillment.

Thank You

(ENG.) DR. DENZIL R. LOKULIYANA

Ph.D, MSc., BSc. (Eng.) Hons., MBA
C.Eng.MIE(SL),MRICS(UK),MPMI(USA),CPEng.,MASCE(USA),MJSCE(Japan),FICPM(SL)

*President - ASCE - Sri Lanka Section*

# SECRETARY'S MESSAGE

As we wrap up the first quarter of 2025, I am happy to share with you the vibrant progress and meaningful engagements our Section has undertaken during the past few months.
We began the year with great momentum, embracing both our professional responsibilities and cultural spirit. One of the most joyful highlights was the "Bakmaha Ulela 2025", our traditional Sinhala and Tamil New Year celebration. It was heartwarming to witness our members, families, and students come together in the spirit of unity, fun, and fellowship. Events like this remind us of the strong community we continue to build beyond our professional lives.

On the academic and professional development front, we successfully conducted our first CPD Session for 2025, focusing on emerging trends in sustainable construction practices. The session received active participation and positive feedback from our members and industry colleagues, reinforcing our commitment to lifelong learning and technical excellence.

Looking ahead, we are excited to announce the upcoming Annual ASCE-SLS Musical Evening, a night that blends the elegance of music with the camaraderie of our engineering community. We warmly invite all members and well-wishers to join us for this special celebration.

A significant development this quarter is our focused drive to establish ASCE student chapters at all major universities across Sri Lanka. This expansion aims to empower the next generation of civil engineers by giving them early exposure to the values, network, and opportunities that ASCE offers.

As the Secretary of ASCE-SLS, I remain grateful for the continued support and enthusiasm of our membership. Let us carry this positive spirit forward as we continue to lead, serve, and inspire.

Warm Regards,

DESHAMANYA. ENG. (DR.) PRAGEETH WIJESEKARA
*Secretary - ASCE - Sri Lanka Section*

# THE EDITORIAL

Warm greetings from the ASCE Sri Lanka Section!

As we reflect on the first quarter of 2025, we are proud to share the highlights of what has been a vibrant and engaging start to the year. This newsletter captures the spirit of our members and student community coming together with purpose, passion, and professionalism.

In April, we celebrated the Sinhala and Tamil New Year festival with our student members–a joyful gathering that strengthened connections and brought festive cheer to our engineering family.
In the spirit of giving back, we carried out a CSR project by donating essential items to Lady Ridgeway Hospital, supporting the healthcare needs of children and showing how engineers can contribute to society beyond technical work.

We also hosted a well-received CPD event, titled “My Journey through Computational Mechanics”, where an experienced speaker shared their professional insights and lessons learned in applying computational tools to real-world civil engineering challenges.

In this issue, you’ll find engaging contributions on topics such as enhancing earthquake resistance through modern design tools and insights into ancient construction techniques. These articles highlight the blend of tradition and innovation that defines our field today.

Publishing this newsletter every four months is a milestone we’re proud of, and it’s made possible by the continued support of our members and contributors. We sincerely thank everyone who has submitted articles and updates.

We encourage more of you–both professionals and students–to share your experiences, insights, and research. Your stories help strengthen our engineering community and inspire others along the way.

Happy reading!
ENG. (MRS.) DILINI GAMAGE
*Editor- ASCE - Sri Lanka Section*

# BRINGING TRADITIONS TO LIFE: SINHALA AND TAMIL NEW YEAR CELEBRATIONS

The Social Events Committee of the American Society of Civil Engineers – Sri Lanka Section (ASCE SLS) successfully organized a vibrant Sinhala and Tamil New Year celebration on 5th April 2025 at Wasana Nature Resort, Kandana. The event was a wonderful blend of tradition, fun, and fellowship, bringing together a diverse gathering of participants under one cultural umbrella.

The celebration saw the enthusiastic participation of ASCE SLS Board Members, student chapter members from several universities across the island, distinguished invitees from the Sri Lanka Association of Institution Certified Engineers (SLAICE), and family members. The scenic setting of the Wasana Resort created the perfect backdrop for this cultural event, allowing participants to reconnect with traditions and each other.

The day was packed with energy as attendees took part in a wide range of traditional New Year games, including "Wasana Muttiya Bidima" (Breaking the Pot), "Aliyata Ehe Thebima" (Feeding the Elephant), "Kotta Pora" (Pillow Fight), "Banis Kema" (Bun Eating Contest), "Henda Matha Dehigediya Thaba Diwima" (Balancing a Lime on a Spoon), Water Balloon Pass, Passing the Thread Through a Needle and Running, Hat Pass, Counting Seeds in a Papaya, and "Segawunu Amuththa Sevima" (Finding the Hidden Guest). Laughter, teamwork, and friendly competition filled the air as participants cheered each other on in the true spirit of the season.

Adding a delicious touch to the celebrations, attendees also enjoyed a delightful spread of traditional Avurudu sweets, which brought back nostalgic memories and introduced the rich culinary heritage to newer generations.

The event concluded with a prize-giving ceremony recognizing winners of the games, followed by a delicious dinner and fellowship session that further strengthened the bonds among ASCE members, students, and guests. The camaraderie and joy shared throughout the day were truly heartwarming and reflective of ASCE SLS's dedication to fostering unity and cultural appreciation.

Special appreciation goes to the staff of Wasana Nature Resort, whose support played a vital role in ensuring the smooth organization and success of the event.
The Sinhala and Tamil New Year celebration was not just a fun gathering–it was an experience of teamwork, cultural unity, and shared joy, reinforcing the spirit of togetherness that defines the ASCE SLS community.


Wasana
Nature Resort


# HIGHLIGHTS


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Resort - Kandana

# ENHANCING EARTHQUAKE-RESISTANT HIGH-RISE RESIDENTIAL DESIGN THROUGH BIM: A FOCUS ON REVIT AND TEKLA IN SRI LANKA

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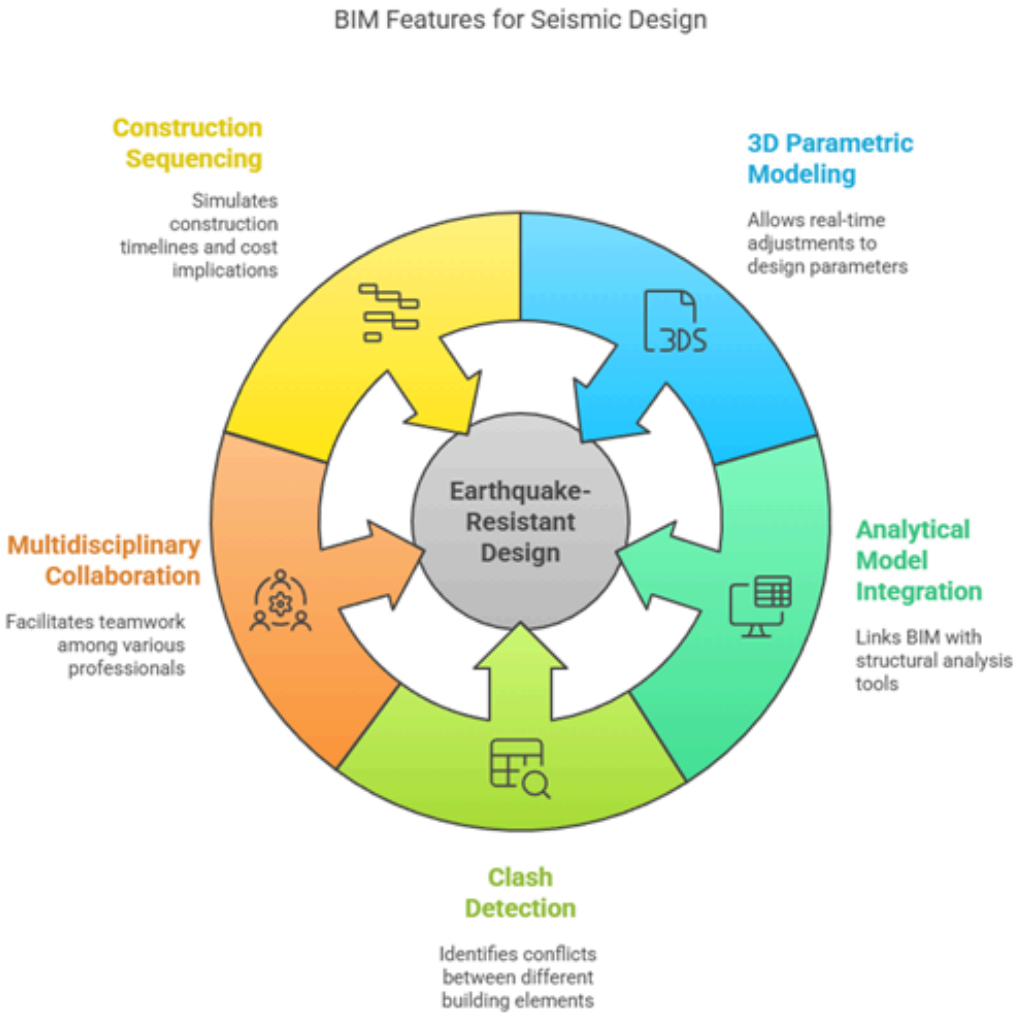
**Abstract**
Building Information Modeling (BIM) offers a transformative approach to designing earthquake-resistant high-rise residential buildings. This paper explores how BIM–specifically through platforms like Autodesk Revit and Trimble Tekla Structures–enhances structural analysis, design coordination, and construction resilience. Although Sri Lanka is not classified as a high seismic zone, integrating seismic resilience into building design is a prudent, future-focused strategy that aligns with global standards. BIM enables early simulation of structural behavior, multidisciplinary collaboration, and accurate documentation, all of which contribute to safer and more sustainable construction practices.

**Introduction**
In the context of increasing urbanization and the rising demand for high-rise residential buildings, structural safety and resilience are critical. Earthquake-resistant design is a core requirement in many regions globally, even in areas with low to moderate seismic activity. High-rise buildings, due to their height and mass, are particularly vulnerable to seismic forces. While Sri Lanka has not experienced major seismic events in recent history, tremors from neighboring regions and global trends in disaster resilience emphasize the importance of proactive design. Building Information Modeling (BIM) offers a robust framework for integrating seismic considerations into the entire building lifecycle–from conceptual design through to construction and facility management.

**BIM Features for Seismic Design**
BIM tools provide a centralized platform for creating intelligent 3D models embedded with data relevant to all phases of the building process. Key BIM features beneficial for earthquake-resistant design include:

- **3D Parametric Modeling:**

BIM enables real-time adjustments to design parameters. Engineers can modify dimensions, materials, or structural systems, and all related components update automatically across the model. This flexibility allows quick design iterations to test different seismic strategies.




- **Analytical Model Integration:**

BIM models can be directly linked with structural analysis tools to simulate seismic performance. Revit supports integration with Autodesk Robot and CSI ETABS, while Tekla integrates seamlessly with Tekla Structural Designer. Engineers can run load simulations, assess deformation, and refine the structure accordingly.

- **Clash Detection and Coordination:**

BIM detects conflicts between structural, architectural, and MEP elements early in the design phase. For seismic design, this ensures that vital elements like shear walls or braces are not compromised by service penetrations or spatial conflicts.

- **Multidisciplinary Collaboration:**

Architects, structural engineers, and contractors can work simultaneously within or alongside the BIM model. This reduces communication delays and helps resolve seismic design conflicts collaboratively.

- **Construction Sequencing and Cost Analysis:**

4D and 5D BIM allow simulation of the construction timeline and cost implications. These dimensions are crucial in ensuring that the construction phase maintains the structural stability required in earthquake zones, particularly when temporary supports or phased construction are needed.

**Revit for Seismic Design Autodesk**

Revit is widely used for architectural and structural design coordination. It offers strong capabilities for early-stage seismic design:

- **Integrated Modeling:** Architects and structural engineers can work within the same environment or in linked models, facilitating seamless communication and updates.
- **Structural Components:** Revit allows modeling of reinforced concrete shear walls, bracing systems, and moment-resisting frames using intelligent parametric families. Engineers can specify dimensions, materials, and reinforcement details.
- **Analytical Model Export:** The analytical model within Revit can be exported to structural analysis software. Load cases, boundary conditions, and support definitions are retained, enabling accurate simulation of earthquake scenarios.
- **Reinforcement Detailing:** Revit supports the modeling of 3D rebar within structural elements. This is essential for verifying compliance with seismic detailing requirements like tie spacing, lap lengths, and boundary confinement.

**Tekla Structures for Seismic Detailing**

Trimble Tekla Structures excels in detailed structural modeling, particularly for steel and reinforced concrete components. Its relevance for seismic design includes:

- **High Level of Detail (LOD 400-500):** Tekla enables modeling down to the level of individual bolts, welds, and reinforcement bars. This precision is vital for accurate fabrication and construction in seismic zones.
- **Seismic Load Generation and Analysis:** Tekla Structural Designer automates seismic load application per international codes such as ASCE 7, Eurocode 8, and IS 1893. It generates seismic load cases, response spectra, and performs dynamic analysis within the same environment.
- **Steel Connection Design:** Tekla includes libraries of seismic-rated connections and allows engineers to design and validate gusset plates, moment connections, and braced frames.
- **Reinforcement Modeling:** For concrete members like columns and shear walls, Tekla supports full detailing of rebar cages, stirrups, hooks, and anchorage. This ensures that all seismic detailing rules are implemented precisely.
- **Constructability Checks:** Tekla highlights clashes and rebar congestion that may affect buildability. These insights are particularly useful in dense seismic detailing zones like beam-column joints.

**Combining Revit and Tekla**

Using Revit and Tekla together provides a comprehensive BIM workflow:

- Revit is ideal during design development, for architectural coordination and early structural design.
- Tekla is used for detailed engineering, construction planning, and fabrication-level documentation.
- Models can be exchanged using IFC or direct plugins, ensuring that information flows from concept to construction without duplication or loss.

This integrated workflow ensures that seismic elements such as base isolators, dampers, and bracing systems are consistently coordinated, documented, and fabricated to meet design intent and code requirements.

**Application in Sri Lanka Although**

Sri Lanka is not seismically active, several factors support the integration of seismic resilience in construction:

- **Proximity to Subduction Zones:** Regional earthquakes from Indonesia and the Indian Ocean can impact Sri Lanka indirectly.
- **Code References:** In the absence of a national seismic design code, engineers often refer to Indian standards (IS 1893) or Eurocode 8. BIM tools like Tekla support these standards natively.

- **Wind Load Considerations:** High-rise buildings in Sri Lanka are often designed for cyclone resistance. BIM allows synergy between wind and seismic design strategies, ensuring that structural systems serve dual purposes.
- **Future-Proofing:** With changing climate conditions and urban densification, building codes may evolve to include seismic provisions. BIM facilitates adaptation by enabling rapid updates and re-analysis of existing models.
- **Risk Mitigation:** BIM helps in visualizing emergency exit strategies, evaluating non-structural elements (which can cause injury in earthquakes), and planning retrofitting if needed.

**Case Examples**

Notable international projects demonstrate the value of BIM in seismic design:

- **Marina Bay Sands, Singapore:** Used BIM-integrated structural analysis to evaluate seismic responses despite low seismic risk.
- **Taipei 101, Taiwan:** Features a massive tuned mass damper. BIM would allow full integration of this element for coordination and simulation.
- **Empire State Building Retrofit:** Seismic upgrades were planned using BIM models to identify reinforcement zones and minimize disruption.

These case studies serve as references for implementing similar practices in Sri Lanka, promoting a resilient built environment.

**Conclusion**

BIM provides an efficient, collaborative, and data-rich platform for earthquake-resistant design, even in regions with low seismic activity. Tools like Revit and Tekla offer complementary features–from conceptual modeling to fabrication-ready detailing–empowering engineers to design safer high-rise buildings. In Sri Lanka, adopting BIM for seismic resilience aligns with global best practices and supports long-term safety and sustainability.

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# SEEKING THE SECRETS OF THE ANCIENT CONCRETE RECIPE OF THE ROMANS

**ASHEN SHAMINDA**
Student Member of ASCE

Concrete is the second most used substance in the world after water. Even though technology is growing very rapidly, concrete cannot be able to replace hundred percent yet. As civil engineers, what we can do is develop the properties of concrete according to our desires unless concrete cannot be replaced completely. The history of concrete technology goes back to the ancient Roman era because the Romans were the first engineers who developed a material to erect very strong buildings. In this article, the chemistry of the Roman concrete matrix, how Romans managed tensile forces in concrete without having reinforcement, and the suitability of Roman concrete to modern era applications will be negotiated.

When someone goes to southern France, the 3-tier aqueduct, mighty Pantheon (Largest dome structure ever in the world), and other monuments were still standing after 2000 years. But today, mind-blowing landmarks and infrastructure will last only a couple of decades. There are several reasons why Roman concrete outlasted for 2000 years.

*Figure 2 - Pantheon Dome structure*

*Figure 3 - 3 tier aqueduct*

**How Romans managed tensile forces in their concrete**

When the steel of reinforced concrete is exposed to the environment. It's rust, and finally, it affects the strength of steel to bear the loads [1]. Usually, the rust consists of iron oxide, which leads to additional internal stress under the concrete, and finally concrete starts to appear cracks. However, the Roman engineers came up with a very tricky solution, which was that they didn't use any steel in their concrete. Simple enough, right?

In day-to-day life, when you travel by train from Colombo to the central hills, you might see "nine arch bridge". The reason to use that shape is that arch-shaped elements only have compression forces throughout their elements. It efficiently transfers the load to the ground. The Romans also followed the same theory to get rid of the tensile forces in concrete. The simplest way to make concrete in compression is to put some heavy stuff on concrete columns. That is why, on top of the column, large amounts of concrete were placed when we observed Roman temples. In addition to that, these tremendous concrete columns were very close, there is no big span between adjacent columns.

A large concrete block is supported by two columns we can idealize as simply supported beam. In a simply supported beam, the maximum bending moment occurs at midspan of the beam. According to the simple bending formula, when the bending moment is increased, automatically, the bending stress also increases. It means that we need a lot of reinforcement to protect the concrete beam from tensile forces; that is why the Romans decided to place the columns very short distance to each other. According to all evidence and observations, we can state that Romans always tried to resist compression and never tension.

**Roman concrete recipe**

Preventing reinforcement is not the only reason for the supremacy of Roman concrete. The chemistry of Roman concrete is our next intention to discuss. Sometimes, they had better concrete recipes to cook concrete. However, this great technology vanished over time.

There is a couple of research that have been done about Roman concrete by now, and it reveals that volcanic ash, seawater, and some rock minerals were used to strengthen the concrete more durable. Historians tell that the magic was in the volcanic ash because it contained silica and alumina, which, together in the mix, created chemical reactions that strengthened the concrete [2]. Not only that, when seawater gets into the Roman concrete matrix, the minerals are going to toughen the concrete over time and not weaken it. That is why Roman structures are still sitting in seawater after 2000 years.

*Figure 4 - Pantheon front view*

**Water-cement ratio of Roman concrete**

What if we add some water to a concrete mixture? The result is that when water is added to concrete, the water-cement ratio increases, and the strength of the concrete goes down. The Roman concrete experts knew that phenomena, they tried to add water as little water as possible. Therefore, the concrete mixture was very dry. Next, they pounded the mixture into place using tamping tools. In the modern era, Roller compacted concrete has some similarity to Roman concrete. The roller compacted concrete uses similar ingredients to the conventional concrete but with much less water. Creating a very dry mix. Another similarity was, we added fly ash to the roller compacted concrete like roman c**oncrete.**

**Can we use Roman concrete today?**

After all studies, evidence, and theories, we have to ask one question. Can Roman concrete replace modern concrete?. The answer is very sophisticated. Again, we all talked about Roman concretes are unreinforced concrete that relies on geometry, weight, and its chemistry. But some construction marvels cannot be erected without experience of tensile stress. Modern structures like highway overpasses and skyscrapers would be a dream forever without reinforced concrete. Most infrastructure is paid for by people's money, and erecting a building according to Roman standards is rarely impossible because it costs a lot of money.

Even though Roman concrete emits far less carbon dioxide, these days, there is environmentally friendly concrete in use. However, there are some applications where we can use Roman concrete, such as roads, dome structures, and so on. However, concrete technology will find a way to extend the Roman concrete recipe to enhance the modern infrastructure soon.

*Figure 5 - ancient Roman Temple*

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[1] N. J. Delatte, "Lessons from Roman Cement and Concrete," Civil and Environmental Engineering Faculty Publications, vol. 7, p. 8, 2001.

[2] C.J. BRANDON, R.L.HOHLFELDER, M.D. JACKSON,J.P.OLESON, "BUILDING FOR ETERNITY, The History And Technology of Roman Concrete Engineering In the Sea.," in Roman Maritime Concrete Technology in its Mediterranean Context, OWBOW Books, 2014, p. 15.

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# EVENTS FROM LAST QUARTER

## CSR PROJECT

# " BEYOND STRUCTURES: ASCE SLS SUPPORTS YOUNG LIVES AT LADY RIDGEWAY HOSPITAL"

On May 24, 2025, the American Society of Civil Engineers – Sri Lanka Section (ASCE SLS) proudly carried out a Corporate Social Responsibility (CSR) initiative through a donation to Ward 10 of Lady Ridgeway Hospital for Children, Colombo 08. This effort was aimed at supporting the hospital's continued care for children in need and bringing a bit of comfort to young patients and their families. As civil engineers, our responsibility extends beyond infrastructure – it includes compassion and service to the communities we live in. We thank all those who contributed to making this initiative possible. Together, we continue to build not just structures, but a more caring society.

## CPD SESSION ON
# "MY JOURNEY THROUGH COMPUTATIONAL MECHANICS"

On Thursday, April 24, 2025, the Sri Lanka Section of the American Society of Civil Engineers (ASCE-SLS) successfully hosted CPD Session-01/2025 under the leadership of Eng. (Dr.) Denzil Lokuliyana. The event was held at the IESL Wimalasurendra Auditorium in Colombo 07 and attracted a wide audience of professionals and students alike.

The session featured a thought-provoking presentation titled "My Journey through Computational Mechanics" by Eng. K.M. Vignarajah, a well-respected figure in the field of civil engineering. In his talk, Eng. Vignarajah shared valuable insights from his extensive career, emphasizing the evolution of computational techniques in structural engineering and their growing relevance in modern-day practice.

The session not only offered deep technical content but also highlighted the importance of continuous learning and adaptability in engineering careers. The event concluded with an engaging Q&A session and networking over refreshments, fostering professional dialogue and knowledge sharing among attendees.

ASCE-SLS continues to deliver enriching CPD programs aimed at strengthening the professional capacity of Sri Lanka's civil engineering community.

Send us your articles, news and information that worth sharing with fellow Civil Engineers!
We value your constructive feed back too!

Reach us

secretaryasceslig@gmail.com

THANK YOU!
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