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WELCOME SPEECH FROM THE CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

بسم الله الرحمن الرحيم السلام

عليكم ورحمة الله وبركاته

Greetings to all,

It is with great pleasure that I welcome you to the 17th RISM International Surveying Conference for Undergraduates (ISCU 2025), themed *"Embracing Construction Revolution 4.0: Transforming Malaysia's Built Environment."* On behalf of the Royal Institution of Surveyors Malaysia (RISM), I also wish to express our sincere appreciation to Universiti Teknologi MARA (UiTM), Perak Campus, for graciously hosting this significant event.

As we navigate the era of the Fourth Industrial Revolution (IR4.0)—or in our context, Construction Revolution 4.0 (CR4.0)—we are witnessing transformative advancements across the global construction sector. Technologies such as Building Information Modelling (BIM), the Internet of Things (IoT), artificial intelligence (AI), robotics, big data analytics, and cloud computing are redefining the way we build, manage, and interact with our built environment. For Malaysia, embracing CR4.0 is a strategic imperative to achieve our socio-economic and environmental goals.

This conference serves as a vital platform to unite surveying undergraduates from various disciplines, fostering critical dialogue on industry challenges, enhancing professional networking, and preparing a new generation of talent for the rapidly evolving construction landscape. It is also an opportunity for employers to engage with and inspire our future professionals.

I would like to extend my heartfelt thanks to all industry speakers, paper presenters, judges, and participants for their time, contributions, and support in making ISCU 2025 a success. I also commend the organising committee for curating a meaningful and dynamic conference experience.

May the knowledge gained, connections formed, and ideas exchanged during this event inspire all participants to lead and innovate in their future endeavours.

Wishing everyone a productive and memorable conference.

Prof. Ts Sr Dr. Adi Irfan Bin Che Ani'
Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM CO-CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

Bismillahirrahmanirrahim.

السلام عليكم ورحمة الله وبركاته and greetings to all.

It is my great pleasure to welcome everyone to the 17th International Surveyor Conference for Undergraduates (ISCU 2025), proudly hosted by Universiti Teknologi MARA (UiTM) Perak Branch in collaboration with the Royal Institution of Surveyors Malaysia (RISM). This event is a meaningful platform for students in the built environment to share ideas, showcase innovations, and build professional networks. We are honoured by your presence and enthusiastic participation, with 135 accepted papers and 78 poster presentations this year.

UiTM Perak, home to the College of Built Environment, has long been a hub for academic excellence in architecture, planning, and surveying. Our commitment remains strong in nurturing competent graduates who meet industry demands and contribute to nation-building.

While you're here, we invite you to experience the heritage and culture of Perak Tengah from the architectural richness of Rumah Kutai to the historical towns of Pasir Salak, Bota, and Kampung Gajah.

To all presenters and winners, congratulations on your achievements. Let your work today be a catalyst for future success and academic growth. We hope this conference will inspire you to explore new ideas, foster collaboration, and make lasting memories.

My deepest thanks to the Royal Institution of Surveyors Malaysia (RISM) and the organising committee for making this event a success.

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

Associates Professor Dr. Nur Hisham Ibrahim, *PMP*
Co-Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM THE PROJECT DIRECTOR

RISM 17th International Surveying Conference for Undergraduates 2025

Alhamdulillah, all praise to Allah S.W.T. for His guidance and blessings in making the RISM 17th International Surveying Conference for Undergraduates (ISCU) 2025 a reality.

It is with great honour and gratitude that I welcome all participants, guests, academicians, and industry professionals to this prestigious event, proudly organized under the Royal Institution of Surveyors Malaysia (RISM). This 17th edition of ISCU stands as a proud testament to our collective dedication toward academic excellence, professional collaboration, and youth empowerment in the field of surveying.

I extend my heartfelt appreciation to RISM for its unwavering support, to the hardworking ISCU 2025 Organising Committee, and to all 16 partnering universities across Malaysia for their commitment and contributions. Your efforts have shaped this conference into a dynamic platform for knowledge exchange, innovation, and professional growth.

To the academicians and practitioners present, your insights are invaluable in bridging the gap between academic theory and real-world practice. To our undergraduate participants, your passion, curiosity, and commitment are the very foundation of our future. May this conference not only deepen your academic journey but also ignite a spirit of leadership, integrity, and sustainable thinking.

Let this gathering serve as more than an academic milestone. May it foster lifelong networks, inspire transformative ideas, and chart new directions in our shared professional journey.

Wishing everyone a rewarding and inspiring conference experience.

Sr Dr. Nurul Fadzila Zahari
Project Director
RISM 17th ISCU 2025

IMPLEMENTATION OF QUALITY MATERIALS IN CONSTRUCTION TO PREVENT CONCRETE CRACKS.

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ABSTRACT

The study aims to identify the main causes of this type of crack. Next, the study will assess whether the following elements can reduce or overcome this cracking problem. The elements are the selection of quality materials, optimized aggregates, durable cement composition and advanced additives. From the findings of this study, the solution will be revealed and recommended preventive measures to enhance the concrete performance. Data for this research will be collected through a combination of qualitative and quantitative methods, the data will be analysed using qualitative analysis methods to identify key themes and patterns regarding material use, and quantitative analysis will be used to assess the impact of material quality on crack prevention.

Keywords: Quality materials, Concrete cracks, Non-structural cracks, Construction, Concrete strength, Poor material quality.

I. INTRODUCTION

Concrete is one of the most widely used construction materials due to its versatility, cost-effectiveness, and strength. It can be moulded into various shapes and adapted to meet performance requirements in different environmental conditions. However, despite its popularity, concrete is susceptible to cracking especially at early ages which can compromise its durability, appearance, and long-term performance.

These cracks often emerge due to poor-quality materials, improper construction techniques, and environmental exposure. For instance, incorrect placement of reinforcement, poor compaction, and inadequate curing processes can all contribute to early deterioration. Even minor, non-structural cracks can allow water and chemicals to infiltrate the concrete, accelerating corrosion of reinforcement and leading to further damage. In current construction practice, particularly in developing regions, material quality is a growing concern. Issues such as inconsistent mix proportions, lack of skilled supervision, and cost-driven compromises often result in concrete of substandard quality. According to (Czajkowska,2015), inadequate material management significantly affects construction performance and cost efficiency.

These issues underscore the importance of using high-quality materials such as well-graded aggregates, durable cement, and appropriate admixtures to minimize cracking and ensure long-term integrity. Therefore, understanding the root causes of concrete cracks and evaluating how good-quality materials can prevent them is essential. This research explores the relationship between material quality and the occurrence of non-structural cracks, focusing on preventive strategies through better material selection and construction practices.

Background of Study:

Improper material management on construction sites can negatively impact project performance. Construction projects rely heavily on material resources. Inadequate material management in building projects can lead to significant cost variations. Taking remedial steps to address cost variances can effectively limit project costs. (Czajkowska, 2015). Good-quality reinforced cement concrete is formed of cement, sand, aggregate, water, and reinforcement, as is low-quality concrete. Concrete quality is primarily determined by processes such as mixing, transporting, forming, compacting, and curing. It is critical that the component elements stay properly dispersed inside the concrete mass during the various phases of handling, and that full compaction is achieved followed by adequate curing.

Research Problem

Cracking in concrete structures continues to be a significant challenge in the construction industry, particularly non-structural cracks that develop during the early stages of a building's life. These cracks may not immediately

compromise the structural stability, but they do affect the appearance, durability, and long-term performance of concrete (Safiuddin, 2018). Such cracks often result from poor material quality, improper mix proportions, insufficient curing, and low construction supervision. The study aims to explore how using high-quality concrete materials can help prevent these cracks and improve the overall performance and longevity of concrete structures.

Theoretical Foundation:

This research is grounded in two key theoretical perspectives: materials science theory and quality control principles in construction. Both play a vital role in understanding how concrete behaves and how its performance can be improved through better material selection and construction practices.

From a materials science perspective, concrete is a composite material whose properties depend on the interaction between its components—cement, water, aggregates, and admixtures. According to (Safiuddin 2018), the durability and crack resistance of concrete are significantly influenced by the chemical and physical characteristics of these materials. For instance, improperly graded aggregates or high water-cement ratios can lead to shrinkage and early-age cracking. The selection of high-quality materials, such as low-permeability cement, well-graded aggregates, and advanced admixtures, can reduce cracking and enhance long-term durability (Kusuma, 2015).

In parallel, quality control theory emphasizes that the construction process itself—mixing, placing, compacting, and curing—must be managed under strict standards to ensure the desired concrete performance. (Alam, 2024) highlight that inadequate supervision, incorrect batching, and poor curing are leading causes of defects such as non-structural cracks. The principles of quality control stress the importance of trained personnel, standardized procedures, and regular inspections to ensure consistency and minimize errors on-site.

By integrating these two perspectives, this research assumes that preventing non-structural cracks in concrete depends not only on material quality but also on the systematic application of quality control during construction. Together, these theories provide the foundation for analysing how good-quality materials and proper construction methods can prevent early damage and extend the service life of concrete structure

Main Argument:

The main argument of the research is that using high-quality materials in construction is essential to prevent non-structural cracks in concrete. The study argues that poor construction practices, such as improper material selection, inadequate mix proportions, and insufficient quality control, lead to these cracks. These cracks, while not directly compromising the structural integrity, can negatively impact the durability, safety, and aesthetics of concrete structures. Therefore, by improving the quality of concrete materials and implementing effective construction methods, it is possible to reduce or eliminate these cracks, leading to longer-lasting, more durable buildings.

II. LITERATURE REVIEW

Concrete is a widely used material in construction due to its strength, affordability, and availability. However, despite its durability, concrete remains vulnerable to cracking, particularly during early ages. Many studies have examined the causes and characteristics of concrete cracks and the factors that influence their development. The literature also emphasizes the importance of quality materials and construction practices in minimizing defects and extending the life of concrete structures.

This review summarizes key findings from past research related to concrete composition, cracking mechanisms, material quality, and quality control. The review also highlights several challenges such as inconsistent mix proportions, poor curing techniques, and the absence of standard testing methods for admixtures. These studies collectively inform the understanding of concrete performance but also reveal research gaps, particularly regarding the long-term impact of material variability, the lack of cost-effective crack prevention methods, and the limited adoption of standardized quality control measures in typical construction environments. The table 1 below organizes existing research and identifies the gaps that this study seeks to address.

The table specifically highlights key findings from various studies on concrete, focusing on factors that lead to cracking and how to prevent it. It emphasizes the importance of high-quality materials, proper mix design, and effective quality control to ensure concrete durability. Challenges identified include material variability, inconsistent curing methods, and limited site supervision, which contribute to both structural and non-structural cracks.

Table 1. Key findings from past research related to concrete composition, cracking mechanisms, material quality, and quality control.

Study	Authors	Focus	Key Findings	Challenges Identified	Research Gaps
1. Concrete Composition and Behaviour	(Tantawi, 2024)	Role of concrete mix and curing	Concrete is versatile and performs well under proper conditions.	Variability in mix quality affects consistency.	Limited studies on how mix variability impacts long-term durability.
2. Concrete Cracking	(Safiuddin, 2018)	Early-age cracking mechanisms	Cracks develop due to mix design, curing, and environment	Hard to control early-age cracks under weather variation	Need for crack prevention methods adaptable to real-site conditions.
3. Factors Affecting Concrete Quality	(Kusuma, 2015)	Effect of materials on concrete durability	High-quality cement and admixtures improve resistance to cracks.	Inconsistent material quality leads to defects.	Lack of standard testing and evaluation for admixtures.
4. Quality Control in Concrete	(Alam, 2024)	Quality assurance during production	Good supervision reduces cracks and improves quality.	Skilled labour and tools not always available.	Insufficient research on affordable quality control for typical sites
5. Structural Integrity and Cracks	(Golewski, 2023)	Types and impact of cracks	Non-structural cracks reduce durability.	Hard to distinguish crack types early.	Limited tools for early detection and monitoring.
6. Construction Practices and Cracking	(Askar, 2023)	Poor practices leading to defects	Proper mix design and curing lower crack risk.	Site supervision and workmanship often lacking.	Few studies on how modern practices.

1. Introduction Of Concrete

Concrete is one of the most used materials in the construction industry due to its strength, durability, and versatility. It can be moulded into various forms and is suitable for a wide range of structural and architectural applications. According to (Tantawi 2024), concrete is valued for its ability to withstand harsh environmental conditions and its relatively low maintenance requirements over its service life.

Its composition—typically a mixture of cement, water, fine and coarse aggregates, and sometimes admixtures—allows for flexibility in design while maintaining adequate performance in terms of compressive strength, thermal resistance, and fire protection. As stated in (Concrete Work ,2022), concrete is widely used in infrastructure projects such as bridges, pavements, culverts, and retaining walls due to its long-lasting performance and cost-effectiveness.

Furthermore, concrete's non-combustible nature, resistance to rot and pests, and compatibility with reinforcement make it an ideal material for load-bearing elements in buildings. These characteristics have made it the material of choice for modern infrastructure development across various regions.

2. Components of a Structural Concrete Building

Structural concrete is widely used in construction to support the weight of a building, from its foundation to the top. It includes components like substructures, which are below-ground elements like walls, piers, and columns that transmit loads to the ground (Van Wyk 2024). Slabs are flat, two-dimensional elements that act as floors, roofs, or walls, transferring stress through bending (Chandradhara, 2024). Beams carry loads from various parts of the structure, using concrete for compression and steel reinforcement for tension. Columns are vertical supports that transmit bending forces, either partially or fully, depending on their connection to the structure (The Structural Engineer, 2013). Finally, walls serve to enclose spaces, provide privacy and security, and support floors and roofs, all while offering durability, fire resistance, and insulation.

3. Concrete Cracking

Cracking is a common issue in concrete structures, with crack-free concrete being rare in real-world conditions. Early-age cracking can occur due to factors like mix composition, environment, hydration rate, and curing conditions (Safiuddin, 2018). Researchers classify cracks into two types: transient cracks, which close after cooling, and permanent cracks**,** which do not (Safiuddin, 2018). Cracks can also be categorized by their causes,

such as drying shrinkage, or by characteristics like random, map, transverse, and longitudinal cracks. These cracks can appear from 3 to 56 days after placement and may persist in hardened concrete over time (Safiuddin, 2018). A crack is a structural discontinuity in the material that occurs when atomic binding forces fail, allowing the surfaces to separate under load.

4. Factors That Contribute to Concrete Cracking

Concrete cracking is primarily caused by several factors related to materials, the environment, and construction practices. One of the main causes is poor material quality. When low-grade cement, ungraded aggregates, or dirty water are used in the concrete mix, it weakens the concrete, making it more prone to cracking, especially as it dries and shrinks (Kusuma, 2015). Inadequate curing is another significant issue. If concrete dries too quickly or doesn't stay moist long enough, it won't achieve its full strength. This can cause cracks to form early, particularly due to drying or temperature changes (Safiuddin, 2018). Environmental conditions at the construction site also contribute. Extreme heat, strong winds, and low humidity can cause the concrete surface to dry too rapidly, leading to cracks. Sudden temperature fluctuations can also stress the concrete and result in cracking (Askar, 2023).

5. Types of Concrete Crack

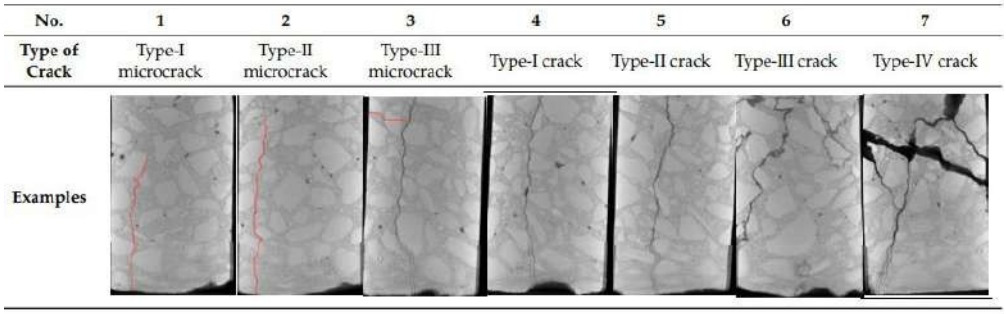

Figure 1. Type of cracks

Table 2. Characteristic According to Types of Cracks

TYPES OF CRACKS	CHARACTERISTIC
Type – I microcrack	Cracks occurred along the coarse particles' outline.
Type – II microcrack	Cracks formed along coarse aggregates, but bangs cut through their corners. The coarse aggregates
Type – III microcrack	Cracks appeared at the edges of course aggregates but occasionally cut through the middle.
Type – I crack	The fractures developed along the coarse aggregate outline and were quite thin.
Type – II crack	The fractures developed following the coarse aggregates' contour, but some cut through the corners and were quite narrow.
Type – III crack	The fissures did not fully align with the coarse particles. The fissures pierced into the core of the coarse aggregate and were thicker.
Type – IV crack	Cracks developed along the coarse aggregate contour, resulting in fragmentation of fine aggregates. The fragmentation was primarily strip- or block-shaped.

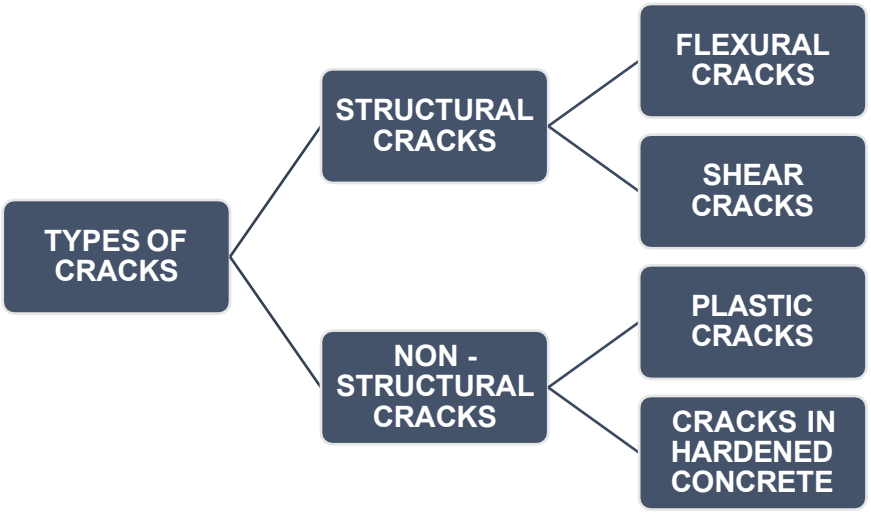

Figure 2. Types of cracks

6. Classify Cracks Based on Crack Width

Crack width is often determined during the design phase of a project and varies based on the building type. A crack is visible when it is at least 0.2 mm wide. A towering architectural structure requires fractures less than 0.2 mm, but a regular building may allow for cracks up to 0.3 mm. Cracks in tunnels should be controlled to avoid water intrusion.(Askar, 2023)

Table 3. Cracks Classifications

CRACKS CLASSIFICATION	CRACK WIDTH
Thin	Less Than 1 Mm
Medium	1 To 2mm
Wide	More Than 2mm

7. Importance of Material Quality in Concrete Performance

The quality of materials used in concrete significantly impacts its performance, durability, and sustainability. Concrete mixture optimization involves adjusting resources like cement, aggregates, and admixtures to meet engineering, construction, and economic needs (Kusuma et al., 2015). High-quality cement ensures proper hydration and strength development, while poor-quality cement can lead to weak bonds and cracking. Properly graded aggregates reduce voids, preventing shrinkage cracks and enhancing load-bearing capacity. The use of high-quality admixtures, such as superplasticizers and silica fume, improves workability, crack resistance, and durability by reducing permeability. Consistency in material quality ensures predictable performance, while superior materials increase resistance to environmental factors like freeze-thaw cycles and chemical attacks, ensuring longer-lasting and low-maintenance concrete structures (Kusuma et al., 2015).

8. Findings

The findings confirm that concrete is a versatile and durable material, widely used due to its low cost and ability to withstand harsh environmental conditions, as emphasized by Tantawi & Tantawi (n.d.). However, the performance of concrete is significantly influenced by its composition, including the mix of cement, aggregates, and water, along with the curing process and external environmental factors (Chandradhara, n.d.). The findings also confirm that cracking is a common issue in concrete structures, often occurring during early stages due to factors such as mix composition, hydration rates, and curing conditions (Safiuddin et al., 2018). Cracks are classified into transient cracks**,** which close after cooling due to compression, and permanent cracks, which persist over time, with the classification further extended to structural elements based on causes like drying shrinkage, settlement, or environmental conditions (Safiuddin et al., 2018). Moreover, the findings confirm that the quality of materials, including cement, aggregates, and admixtures, directly impacts concrete's durability, with high-

quality materials reducing the risk of cracking (Kusuma et al., 2015). The research also confirms that proper construction practices, such as correct mix designs, curing techniques, and effective supervision, are essential to minimizing defects and ensuring the long-term stability of concrete structures (Alam, 2016). However, the findings highlight gaps in research, particularly regarding the long-term effects of various materials and environmental conditions on concrete cracking, as well as the need for advanced methods to detect structural cracks early and standardized approaches for evaluating concrete mixes and additives (Safiuddin et al., 2018).

CONCLUSION

This research aimed to identify the primary causes of non-structural cracks in concrete, define the characteristics of high-quality concrete materials that prevent cracks, and analyze the effectiveness of using these materials in preventing cracks. The findings confirm that concrete's performance is heavily influenced by its composition, including the mix of cement, aggregates, and water, as well as external factors such as curing conditions and environmental influences.

One of the main causes of cracking is improper mix proportions, hydration rates, and curing techniques, particularly during the early stages of concrete placement. The research also reveals that high-quality materials, including cement, aggregates, and admixtures, significantly reduce the risk of cracking and improve the durability and overall performance of concrete.

Moreover, effective construction practices, such as proper mix design, correct curing techniques, and thorough supervision, are crucial to ensuring long-term stability and preventing defects in concrete structures. The findings further emphasize the need for advanced methods to detect cracks early and the establishment of standardized approaches for evaluating concrete mixes and additives. While this study provides essential insights into the relationship between material quality and concrete cracking, it also highlights gaps in research regarding the long-term effects of environmental factors and the full potential of high-quality materials in preventing cracking. Overall, the research offers practical recommendations for improving concrete performance and ensuring the durability and integrity of concrete structures.

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I would like to extend my heartfelt thanks to the Department of Building Surveying at UiTM Perak Branch, I also would like to express my sincere gratitude to Sr. Dr. Norazura binti Mizal Azzmi for her invaluable advice, support, and encouragement throughout this journey. Her expertise and commitment have greatly enhanced my understanding and development, and her constructive feedback has motivated me to strive for excellence. I also want to thank my friends for their unwavering support, cooperation, and companionship. Your encouragement and shared experiences have made this journey not only achievable but also meaningful. Finally, I am grateful to the authors and researchers whose work, including the journals, has been a key resource in shaping this research. Their contributions have significantly enriched my study.
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