



EVENT GUIDE BOOK

# 5<sup>th</sup> ICRMCE

International Conference on Rehabilitation  
and Maintenance in Civil Engineering

Solo  
July, 8-10 2021

**Conference Secretariat of 5<sup>th</sup> ICRMCE**  
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**International Conference on Rehabilitation  
and Maintenance in Civil Engineering**

Solo, Indonesia, July 8-10 2021

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## Welcome Speech (Rector of Sebelas Maret University)



Good Morning Ladies and Gentlemen.

As Rector of Sebelas Maret University, I am pleased to welcome you all to the 5<sup>th</sup> International Conference on Rehabilitation and Maintenance in Civil Engineering (5<sup>th</sup> ICRMCE) organized by the Civil Engineering Departments of Sebelas Maret University (UNS), Mataram University and other partner universities.

First, I would like to congratulate the organizing committee for successfully holding this international conference despite the restraints and challenges posed by the Covid-19 pandemic. This conference was initially planned to hold in Lombok, thereafter plans changed to conduct a blended system conference. However, due to the pandemic developments in Indonesia, we concluded that this year's ICRMCE will be held fully online. The dedication shown by the organizing committee has taught us that *"if there is a will, there is a way"*. Many thanks to the university partners that get involved in this event. They are University Mataram (as co-organizer), Diponegoro University, Muhammadiyah University of Yogyakarta, Jenderal Soedirman University, University of Jember, and UPN Veteran East Java. Some institution partners, among others, Himpunan Ahli Konstruksi Indonesia (HAKI), Himpunan Ahli Teknik Tanah Indonesia (HATTI), and National Center for Research on Earthquake Engineering (NCREE) Taiwan, have also given great support to this conference.

Over the years, ICRMCE has been conducted once in three years (triennially) and today marks the 5<sup>th</sup> occasion of this grand event. ICRMCE has continued to show our university's commitment towards supporting the global sustainable development goal of building resilient infrastructure and fostering innovation by enhanced scientific research and upgraded technological capabilities. This year's ICRMCE adopts the theme **"Advanced Research and Technology for Rehabilitation and Maintenance in Civil Engineering"**, and we hope that this conference serves as a forum for researchers, academicians, government agencies, consultants, and contractors to exchange experiences, technological advancement, and innovation related to rehabilitation and maintenance in civil engineering.

Furthermore, we hope this event strengthens the cooperation between Sebelas Maret University and other partners university locally and internationally. Moreover, supporting the implementation of "Kampus Merdeka" and world-class university initiatives. The Indonesian government initiative "Kampus Merdeka" which means "Independent Campus" emphasizes the need for collaboration between universities, as well as building stronger relationships between universities and industries.

As a legal entity state university, UNS is expected to carry out institutional strengthening leading to the achievement of Key Performance Indicators (KPIs). The activities carried out by departments, faculties and the university must contribute to the achievement of the KPIs. One of the KPIs is that departments collaborate with world-class partners in research and other activities fostering knowledge sharing.

I am certain that this conference is in line with national and global goals, and I am assuring you that we are open to facilitating more events like this in the future. Once again, I would like to welcome you all to this virtual conference while expressing my heartfelt appreciation to the organizing committee, partner universities, sponsors, and our esteem keynote and invited speakers.

I wish you all good health.

Thank you for your attention.

**Jamal Wiwoho**

Rector of Sebelas Maret University

## Welcome Speech (Rector of Mataram University)



**Assalamualaikum wr wb.**

**Rector of the University of Sebelas Maret (UNS), Rectors of partner universities, distinguished guests, speakers, participants, ladies and gentlemen**

I would like to express my warmest welcome to the 5<sup>th</sup> International Conference on Rehabilitation and Maintenance in Civil Engineering (ICRMCE 5). This international conference has been initiated by the University of Sebelas Maret (UNS) which enthusiastically invited the University of Mataram and several partner universities to join in. Therefore, allow me to express my deepest gratitude to the Rektor of UNS and also to the Rectors of partner universities involved in organizing this very exciting international conference.

**Rector of UNS, Rectors of partner universities, distinguished guests, speakers, participants, ladies and gentlemen**

I am very proud to be here with experts, researchers and academia from many countries and it is a truly an honor to be able to deliver my welcoming speech in this international conference. This conference will provide an excellent opportunity for sharing knowledge in the field of Smart and Innovative Technology for Rehabilitation and Maintenance of Infrastructure in Industrial Era 4.0.

Smart and innovative technology is of particularly important, especially because we are currently experiencing what is known as the Covid-19 pandemic. Conventional ways of repairing and maintaining infrastructure require new breakthroughs. It should also be considered that Indonesia is a country that is very vulnerable to disasters because it is located in the Ring of Fire. Therefore, the planning of disaster-resistant infrastructures, repairing techniques and maintenance of existing structures should be an important concern. In the process of searching what we called a New Normal, adequate effort of anticipation to natural hazards should also be in our priority. In this situation, the development and the application of smart and innovative technology are of particularly necessary.

I notice that the aim of the conference is to provide an environment for researchers to discuss the development of smart and innovative technology particularly in the rehabilitation and maintenance

of infrastructure. The presence of keynote speakers and invited speakers from various countries really enrich this conference. It can be expected that there will be an interesting exchange of information, especially in terms of scientific developments and other technological innovations in the field of rehabilitation and maintenance of infrastructure.

**Rector of UNS, Rectors of Partner universities, distinguished guests, speakers, participants, ladies and gentlemen**

The Industrial Revolution 4.0 marked by continuous automation of traditional manufacturing and industrial practices using modern smart technology requires experts in its implementation. Therefore, intense interest from participants who will be presenting papers on smart and innovative technology for rehabilitation and maintenance of infrastructure are clear signal that there will be a positive impact from this conference. It is also expected that the conference will create partnerships between universities and industries in finding new technologies to finally configure the innovation at a larger scale.

We have to take this exciting conference forward to make it beneficial in the development of smart and innovative technology for rehabilitation and maintenance of infrastructure. I do believe this event will generate discussion which can be transferred into real works as in this modern era there is a strong emphasis on putting theory into practice.

I would like to express my sincere thanks and appreciation to the Rector of the University of Sebelas Maret (UNS), Rectors of partner universities, organizers of the conference, keynote speakers, invited speakers and also to the sponsors who contribute to this event. To all participants who have joined from different countries, I would like to extend my very warm welcome to this conference. I wish you all have a productive and fruitful discussion.

Thank you.

**Wassalamualaikum wr wb.**

**Yusron Saadi**

Vice Rector for Planning, Collaboration and Information System  
University of Mataram

## Welcome Speech (Chairman of The 5<sup>th</sup> ICRMCE)



Rehabilitation and maintenance are equally as critical as planning and design in civil engineering. Infrastructure defects are caused by excessive load, natural hazards, poor implementation of construction procedures, and material degradation. Rehabilitation and maintenance help extend the useful life of buildings and infrastructure. Rehabilitation is defined as efforts to restore buildings and infrastructure functions due to defect or structural deterioration. This encompasses a wide range of activities such as repairing, strengthening, revitalization, renovation, and restoration. While maintenance is the process of ensuring that the building and infrastructure continue to operate as planned. International Conference on Rehabilitation and Maintenance in Civil Engineering (ICRMCE) is a triennial conference that aims to provide a forum for researchers, academicians (professors, lecturers, and students), government agencies, consultants, and contractors to exchange experiences, technological advancement, and innovation in the field of civil engineering rehabilitation and maintenance. The previous four ICRMCE conferences took place successfully in the years 2009, 2012, 2015, and 2018. Hundreds of researchers worldwide attended these events to present their scientific papers in various areas of civil engineering such as; material engineering, structural engineering, geotechnical engineering, transportation engineering, and construction management.

The Civil Engineering Department of Sebelas Maret University, in collaboration with the Department of Civil Engineering of Mataram University, organized the 5<sup>th</sup> International Conference on Rehabilitation and Maintenance in Civil Engineering (5<sup>th</sup> ICRMCE). The conference was initially scheduled to hold offline in Mataram, Indonesia. However, due to the escalating Coronavirus disease (COVID-19) outbreak and the need for social distancing, we decided to shift the conference online. Some reputable universities and institutions participated in the present ICRMCE as partners. Among others are Nihon University, University of Stuttgart, National Taiwan University, TU Delft, Hiroshima University, Diponegoro University, Muhammadiyah University of Yogyakarta, Jenderal Soedirman University, University of Jember, UPN Veteran East Java, National Center for Research on Earthquake Engineering (NCREE) Taiwan, Himpunan Ahli Konstruksi Indonesia (HAKI), and Himpunan Ahli Teknik Tanah Indonesia (HATTI).

After a rigorous peer-review process, more than 100 papers were accepted for presentation at the 5th ICRMCE. All articles will be published by Springer Nature in the series of Lecture Notes in Civil Engineering indexed by Scopus and El Compendex databases. Presenters who joined this conference are from Japan, Singapore, Malaysia, China, Taiwan, England, Kuwait, and Indonesia. Furthermore, several outstanding keynote and invited speakers will present state-of-the-art findings in the field of civil engineering. Our esteemed speakers are Prof. Shyh-Jiann Hwang

(National Taiwan University), Prof. Buntara Sthenly Gan (Nihon University), Dr. Edgar Bohner (VTT Technical Research Centre of Finland), Prof. Mohamed Shahin (Curtin University), Dr. Budi Yulianto (Sebelas Maret University), Dr. Yusron Saadi (Mataram University), Prof. Agus Setyo Muntohar (Muhammadiyah University of Yogyakarta), Prof. Suharyanto (Diponegoro University), Dr. Ho Si Lanh (Hiroshima University), Dr. Entin Hidayah (University of Jember), Prof. Yining Ding (Dalian University of Technology), Dr. I Nyoman Dita P. Putra (UPN Veteran East Java), Dr. Probo Hardini (Jenderal Soedirman University), Dr. Erwin Lim (Institut Teknologi Bandung), and Dr. Alfredo Satyanaga (Nazarbayev University). The conference concludes with a short course on "Seismic Evaluation and Retrofit of Buildings" presented by eminent speakers from NCREE Taiwan, Nanyang Technological University, King Mongkut's University of Technology, and Sebelas Maret University.

In the process of organizing this conference, we received invaluable motivation, advice, and support from several individuals and institutions. I intended to express my gratitude and appreciation to all of them. First, my most profound appreciation goes to all organizing committee members who worked day and night preparing for this conference. Holding this conference would have been impossible without the help, support, and advice from the Head of Civil Engineering Department, Dean of Engineering Faculty, and Rector of Sebelas Maret University. Special thanks to the conference sponsors (PT Hutama Karya, PT Adhi Karya, PT Waskita Karya, PT Wijaya Karya, and PT WIKA Rekayasa Konstruksi) and media partner (Sipil Pedia) for their generous support. We express our gratitude to Prof. S.A. Kristiawan (Sebelas Maret University), Dr. Ing. Akanshu Sharma (University of Stuttgart), and Prof. Buntara Sthenly Gan (Nihon University) for their willingness to serve as editors of the 5th ICRMCE proceeding. I also want to express my heartfelt appreciation to Dr. Windu Partono (Diponegoro University), Dr. Agus Maryoto (Jenderal Soedirman University), Prof. Buan Anshori (Mataram University), Dr. Jauhar Fajrin (Mataram University), Dr. Seplika Yadi (Muhammadiyah University of Yogyakarta), Dr. Retno Utami (University of Jember), Dr. Minarni (UPN Veteran East Java), and Dr. Erwin Lim (Institut Teknologi Bandung) for their assistance and dedication in collectively organizing this conference.

Finally, on behalf of the organizing committee, we apologize for any shortcomings that might have occurred during the entire event. We wish all attendees of the 5<sup>th</sup> ICRMCE an awesome virtual experience!

Stay healthy and we look forward to seeing you at the next ICRMCE.

Surakarta, July 8, 2021

**Halwan Alfisa Saifullah**

The 5<sup>th</sup> ICRMCE Chairman

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*International Conference on Rehabilitation and Maintenance in Civil Engineering*

**July 8-10, 2021**

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| Paper ID : 124 (Experimental Investigation on the Shear Behavior of Patched RC Beams without Web Reinforcements: Efficacy of Patching Position with Respect to the Shear Span) .....                 | 90 |
| Paper ID : 126 (Compressive and Flexural Strength Behavior of Banana Tree Fiber Hybrid Concrete) .....   | 91 |
| Paper ID : 127 (Relationship Model Between Conceptual Cost Estimation Process of Flyover Development in the Provincial Government of DKI Jakarta with The Accuracy Level) .....                      | 91 |
| Paper ID : 128 (Development of Preventive Maintenance Guidelines for Simple-Classification Government Buildings based on Work Breakdown Structure within the DKI Jakarta Provincial Government)..... | 92 |
| Paper ID : 130 (Seismic Performance of Tall and Slender Minaret Structure with Hexagonal RC Wall Section by Means Fragility Curve Development).....  | 93 |

|   |    |
|---|----|
| Paper ID : 131 (Potentials of Internet of Things (IoT) and Intelligent Building System for Building Management).....        | 93 |
| Paper ID : 132 (Cost Structure of Construction Safety on High Residential Buildings in Indonesia).....                      | 94 |
| Paper ID : 134 (Role of Diagonal Bars in Reinforced Concrete Deep Beams Tested under Static Load).....                      | 95 |
| Paper ID : 135 (Design of Typical Rainwater Harvesting Storage Tanks Based on Housing Type (Case Study in Indonesia)) ..... | 95 |



## 5<sup>th</sup> ICRMCE Rundown

### Day 1 - Thursday, July 8, 2021

| Item                   | Time                                |                 | Duration    | Activities  | Annotations                              | Venue           |                 |
|------------------------|-------------------------------------|-----------------|-------------|---|--|-----------------|-----------------|
|                        | UTC+07:00 (Western Indonesian Time) |                 |             |   |  | Offline         | Online          |
|                        | Start                               | Over            |             |   |  |                 |                 |
| <b>PLENARY SESSION</b> |                                     |                 |             |   |  |                 |                 |
| <b>1</b>               | <b>8:00 AM</b>                      | <b>8:30 AM</b>  | <b>0:30</b> | <b>Registration (Join to Virtual Conference Platform)</b> |  |                 |                 |
|                        | 8:00 AM                             | 8:25 AM         | 0:25        | Registration for Plenary Session Participants             | (Sponshorsip Exhibition)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 8:25 AM                             | 8:30 AM         | 0:05        | Announcement to Join The Opening Ceremony                 | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |
| <b>2</b>               | <b>8:30 AM</b>                      | <b>9:00 AM</b>  | <b>0:30</b> | <b>Opening</b>  |  |                 |                 |
|                        | 8:30 AM                             | 8:35 AM         | 0:05        | Greetings and Event Agenda Explanation                    | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 8:35 AM                             | 8:40 AM         | 0:05        | National Anthem of Indonesia                              | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 8:40 AM                             | 8:45 AM         | 0:05        | Welcome Speech by Chairman of 5th ICRMCE                  | <b>Dr.Eng. Halwan Alfisa Saifullah</b>   | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 8:45 AM                             | 8:50 AM         | 0:05        | Welcome Speech by Rector of Universitas Mataram           | <b>Prof. Dr. Lalu Husni, SH., M.Hum.</b> | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 8:50 AM                             | 9:00 AM         | 0:10        | Welcome Speech by Rector of Universitas Sebelas Maret     | <b>Prof. Dr. Jamal Wiwoho</b>            | R. Sidang Utama | bit.ly/icrmce05 |
| <b>3</b>               | <b>9:00 AM</b>                      | <b>9:50 AM</b>  | <b>0:50</b> | <b>Keynote Speech 1</b>                                   |  |                 |                 |
|                        | 9:00 AM                             | 9:05 AM         | 0:05        | Read CV of Keynote Speaker and Moderator                  | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 9:05 AM                             | 9:35 AM         | 0:30        | Keynote Speaker Session                                   | <b>Prof. Shyh-Jiann Hwang</b>            | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 9:35 AM                             | 9:50 AM         | 0:15        | Moderator's Wrap-Up, QnA Session                          | <b>Moderator (Prof. Buan Anshari)</b>    | R. Sidang Utama | bit.ly/icrmce05 |
| <b>4</b>               | <b>9:50 AM</b>                      | <b>10:05 AM</b> | <b>0:15</b> | <b>Coffee Break</b>                                       |  |                 |                 |
|                        | 9:50 AM                             | 10:00 AM        | 0:10        | Coffee Break  | (Sponshorsip Exhibition)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 10:00 AM                            | 10:05 AM        | 0:05        | Announcement to Rejoin The Keynote Speech Session         | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |
| <b>5</b>               | <b>10:05 AM</b>                     | <b>10:55 AM</b> | <b>0:50</b> | <b>Keynote Speech 2</b>                                   |  |                 |                 |
|                        | 10:05 AM                            | 10:10 AM        | 0:05        | Read CV of Keynote Speaker and Moderator                  | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 10:10 AM                            | 10:40 AM        | 0:30        | Keynote Speaker Session                                   | <b>Prof. Buntara S. Gan</b>              | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 10:40 AM                            | 10:55 AM        | 0:15        | Moderator's Wrap-Up, QnA Session                          | <b>Moderator (Prof S.A. Kristiawan)</b>  | R. Sidang Utama | bit.ly/icrmce05 |
| <b>6</b>               | <b>10:55 AM</b>                     | <b>11:45 AM</b> | <b>0:50</b> | <b>Keynote Speech 3</b>                                   |  |                 |                 |
|                        | 10:55 AM                            | 11:00 AM        | 0:05        | Read CV of Keynote Speaker and Moderator                  | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 11:00 AM                            | 11:30 AM        | 0:30        | Keynote Speaker Session                                   | <b>Prof. Edgar Bohner</b>                | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 11:30 AM                            | 11:45 AM        | 0:15        | Moderator's Wrap-Up, QnA Session                          | <b>Moderator (Dr. Suryawan Murtiadi)</b> | R. Sidang Utama | bit.ly/icrmce05 |
| <b>7</b>               | <b>11:45 AM</b>                     | <b>12:30 PM</b> | <b>0:45</b> | <b>Pray and Lunch Break</b>                               |  |                 |                 |
|                        | 11:45 AM                            | 12:20 PM        | 0:35        | Lunch Break   | (Sponshorsip Exhibition)                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 12:20 PM                            | 12:30 PM        | 0:10        | Announcement to Join The Parallel Session                 | MC (Mr. Yusuf Kurniawan)                 | R. Sidang Utama | bit.ly/icrmce05 |

| PARALLEL SESSION (5 VIRTUAL CLASS) |          |          |      |                                       |  |                                   |  |                         |                       |  |  |
|------------------------------------|----------|----------|------|---------------------------------------|--|-----------------------------------|--|-------------------------|-----------------------|--|--|
| PARALLEL CLASS A                   |          |          |      |                                       |  |                                   |  |                         |                       |  |  |
| 8                                  | 12:30 PM | 3:00 PM  | 2:30 | Paper ID                              | Paper Title (1st Round)  | Speakers                          | Moderator (Main)                         | Moderator (Backup)      | Virtual Room          |  |  |
|                                    | 12:30 PM | 12:35 PM | 0:05 | Opening 1st Round Parallel Session    |  |                                   |  |                         |                       |  |  |
|                                    | 12:35 PM | 12:55 PM | 0:20 | 133                                   | Self-monitoring and localization of crack of concrete beam with fibers and carbon black subjected to bending   | Dr. Yining Ding (Invited Speaker) | Dr. Ing Bobby Rio Indriyantho, S.T. M.T. | Dr. Suryawan Murtiadi   | bit.ly/icrmce05-room1 |  |  |
|                                    | 12:55 PM | 1:07 PM  | 0:12 | 006                                   | The Setting Time of Portland Composite Cement Mixed with Calcium Stearate  | Agus Maryoto                      |  |                         |                       |  |  |
|                                    | 1:07 PM  | 1:19 PM  | 0:12 | 011                                   | Evaluation of Silt Content Within Sand Building Material for Disaster Mitigation: A Case Study in Lombok, Indonesia  | Jauhar Fajrin                     |  |                         |                       |  |  |
|                                    | 1:19 PM  | 1:31 PM  | 0:12 | 029                                   | A Review on Application of Machine Learning in Building Performance Prediction   | Rizka Wulan Triadji               |  |                         |                       |  |  |
|                                    | 1:31 PM  | 1:43 PM  | 0:12 | 037                                   | Seismic Performance Analysis of Multi-story Buildings with Addition of Bracing Based on SNI 1726: 2019 (Case Study: Airlangga University Parking Building) | Krisnamurti Krisnamurti           |  |                         |                       |  |  |
|                                    | 1:43 PM  | 1:55 PM  | 0:12 | 061                                   | Analysis of Reinforced Concrete Capacity for Irregular Cross-Sections Using Numerical Methods  | Nuroji Nuroji                     |  |                         |                       |  |  |
|                                    | 1:55 PM  | 2:07 PM  | 0:12 | 114                                   | Effect of Regulatory Change in Earthquake Load Analysis on Structures with Irregular Shapes  | Hendramawat Aski Safarizki        |  |                         |                       |  |  |
|                                    | 2:07 PM  | 2:19 PM  | 0:12 | 115                                   | Residual Stress Evaluation on Cold-Formed Steel C-Section by X-Ray Diffraction   | Tri Widya Swastika                |  |                         |                       |  |  |
|                                    | 2:19 PM  | 2:31 PM  | 0:12 | 130                                   | Seismic Performance of Tall and Slender Minaret Structure with Hexagonal RC Wall Section by Means Fragility Curve Development                              | Erik Wahyu Pradana                |  |                         |                       |  |  |
|                                    | 2:31 PM  | 2:43 PM  | 0:12 |                                       |  |                                   |  |                         |                       |  |  |
|                                    | 2:43 PM  | 2:55 PM  | 0:12 |                                       |  |                                   |  |                         |                       |  |  |
|                                    | 2:55 PM  | 3:00 PM  | 0:05 | Closing 1st Round Parallel Session    |  |                                   |  |                         |                       |  |  |
| 9                                  | 3:00 PM  | 3:15 PM  | 0:15 | Coffee Break                          |  |                                   |  |                         |                       |  |  |
| 10                                 | 3:15 PM  | 4:55 PM  | 1:40 | Paper ID                              | Paper Title (2nd Round)  | Speakers                          | Moderator (Main)                         | Moderator (Backup)      | Virtual Room          |  |  |
|                                    | 3:15 PM  | 3:19 PM  | 0:04 | Opening of 2nd Round Parallel Session |  |                                   |  |                         |                       |  |  |
|                                    | 3:19 PM  | 3:31 PM  | 0:12 | 012                                   | Investigation of Polypropylene Fiber Reinforced Concrete after Elevated Temperature Using Color Quantification and Alkalinity Method                       | Ni Nyoman Kencanawati             | Dr.Eng Pinta Astuti, ST., M.Eng          | Dr. Ir. Krisnamurti, MT | bit.ly/icrmce05-room1 |  |  |
|                                    | 3:31 PM  | 3:43 PM  | 0:12 | 019                                   | State-of-the-art of Artificial Intelligence Methods in Structural Health Monitoring  | I Gede Eka Agastya Putra          |  |                         |                       |  |  |
|                                    | 3:43 PM  | 3:55 PM  | 0:12 | 073                                   | Cable Force Prediction Technique Using Subspace and Effective Vibration Length Method  | Muhammad Ibnu Syamsi              |  |                         |                       |  |  |
|                                    | 3:55 PM  | 4:07 PM  | 0:12 | 097                                   | Crack and Corrosion Inspections for Coastal and Marine Concrete Infrastructure: A Review   | Sabrina Harahap                   |  |                         |                       |  |  |
|                                    | 4:07 PM  | 4:19 PM  | 0:12 | 117                                   | Secondary AE analysis of Pre-Corroded Concrete Beam  | Ahmad Zaki                        |  |                         |                       |  |  |
|                                    | 4:19 PM  | 4:31 PM  | 0:12 |                                       |  |                                   |  |                         |                       |  |  |
|                                    | 4:31 PM  | 4:43 PM  | 0:12 |                                       |  |                                   |  |                         |                       |  |  |
|                                    | 4:43 PM  | 4:55 PM  | 0:12 |                                       |  |                                   |  |                         |                       |  |  |
| 11                                 | 4:55 PM  | 5:00 PM  | 0:05 | Parallel Session Closing              |  |                                   |  |                         |                       |  |  |

| PARALLEL SESSION (5 VIRTUAL CLASS) |          |          |      |                                       |  |                                  |                                     |                                      |                       |  |  |
|------------------------------------|----------|----------|------|---------------------------------------|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------|--|--|
| PARALLEL CLASS B                   |          |          |      |                                       |  |                                  |                                     |                                      |                       |  |  |
| 8                                  | 12:30 PM | 3:00 PM  | 2:30 | Paper ID                              | Paper Title (1st Round)  | Speakers                         | Moderator (Main)                    | Moderator (Backup)                   | Virtual Room          |  |  |
|                                    | 12:30 PM | 12:35 PM | 0:05 | Opening 1st Round Parallel Session    |  |                                  |                                     |                                      |                       |  |  |
|                                    | 12:35 PM | 12:55 PM | 0:20 | 138                                   | Mechanical properties of fine-grained concrete using fine-red sand and fly ash for road construction: A case study in Vietnam  | Dr. Lanh Si Ho (Invited Speaker) | Dr. Seplika Yadi, ST, MT            | Setiono, S.T., M.Sc.                 | bit.ly/icrmce05-room2 |  |  |
|                                    | 12:55 PM | 1:07 PM  | 0:12 | 085                                   | The stability of the Napun Gete Dam in Flores Island constructed on jointed and porous rocks   | Ria Restu Marlanintyas           |                                     |                                      |                       |  |  |
|                                    | 1:07 PM  | 1:19 PM  | 0:12 | 077                                   | Application of the Update PSHA on the Stability Analysis of the Meninting Diversion Tunnel in Lombok Island-Indonesia  | Didi S Agustawijaya              |                                     |                                      |                       |  |  |
|                                    | 1:19 PM  | 1:31 PM  | 0:12 | 028                                   | SLOPE STABILITY IN SOFT SOIL USING HARDENING SOIL MODELING   | Yerry Kahaditu Firmansyah        |                                     |                                      |                       |  |  |
|                                    | 1:31 PM  | 1:43 PM  | 0:12 | 069                                   | Implementation of Microbially Induce Calcite Precipitation by Bacillus Subtilis and Adding Sand in Repairing Shear Strength of Organic Soil (Peat) from Siak Regency Riau Province Indonesia | Dian Setiawan M                  |                                     |                                      |                       |  |  |
|                                    | 1:43 PM  | 1:55 PM  | 0:12 | 008                                   | Software Performance of Risk Targeted Maximum Considered Earthquake (MCER) Calculation   | Windu Partono                    |                                     |                                      |                       |  |  |
|                                    | 1:55 PM  | 2:07 PM  | 0:12 | 015                                   | The performance of horizontal drain as a state-of-the-art landslide mitigation strategy: A case study analysis   | Putu Tantri kumala sari          |                                     |                                      |                       |  |  |
|                                    | 2:07 PM  | 2:19 PM  | 0:12 | 026                                   | Shear strain evaluation on analysis of additional clay liner layer modeling in Ngipik landfill, Gresik   | Siti Nurlita Fitri               |                                     |                                      |                       |  |  |
|                                    | 2:19 PM  | 2:31 PM  | 0:12 | 023                                   | Landslide Analysis Subject to Geological Uncertainty Using Monte Carlo Simulation (A Study Case in Taiwan)   | Joni Fitra                       |                                     |                                      |                       |  |  |
|                                    | 2:31 PM  | 2:43 PM  | 0:12 |                                       |  |                                  |                                     |                                      |                       |  |  |
|                                    | 2:43 PM  | 2:55 PM  | 0:12 |                                       |  |                                  |                                     |                                      |                       |  |  |
|                                    | 2:55 PM  | 3:00 PM  | 0:05 | Closing 1st Round Parallel Session    |  |                                  |                                     |                                      |                       |  |  |
| 9                                  | 3:00 PM  | 3:15 PM  | 0:15 | Coffee Break                          |  |                                  |                                     |                                      |                       |  |  |
| 10                                 | 3:15 PM  | 4:55 PM  | 1:40 | Paper ID                              | Paper Title (2nd Round)  | Speakers                         | Moderator (Main)                    | Moderator (Backup)                   | Virtual Room          |  |  |
|                                    | 3:15 PM  | 3:19 PM  | 0:04 | Opening of 2nd Round Parallel Session |  |                                  |                                     |                                      |                       |  |  |
|                                    | 3:19 PM  | 3:31 PM  | 0:12 | 016                                   | Seismic Microzonation of Yogyakarta Province Based on 2019 Risk-targeted Maximum Considered Earthquake   | Windu Partono                    | Jauhar Fajrin, ST., MSc(Eng)., Ph.D | Dr. I Nyoman D. Pahang Putra.,ST, MT | bit.ly/icrmce05-room2 |  |  |
|                                    | 3:31 PM  | 3:43 PM  | 0:12 | 045                                   | Analysis Impact and Mitigation of Landslides using Analytical Hierarchy Process (AHP) Method   | Andriani Andriani                |                                     |                                      |                       |  |  |
|                                    | 3:43 PM  | 3:55 PM  | 0:12 | 063                                   | Influence of The Number and The Height Steps of Ter-raced Model on Slope Stability Analysis.   | Niken Silmi Surjandari           |                                     |                                      |                       |  |  |
|                                    | 3:55 PM  | 4:07 PM  | 0:12 | 079                                   | Fault Structure Interpretation On The Western Part of East Java Using Second Vertical Derivative   | Wien Lestari                     |                                     |                                      |                       |  |  |
|                                    | 4:07 PM  | 4:19 PM  | 0:12 | 096                                   | Seepage and Piping Control of Earth Fill Dam (Case study of Pidekso Dam Indonesia)   | Muhammad Zainal Arifin           |                                     |                                      |                       |  |  |
|                                    | 4:19 PM  | 4:31 PM  | 0:12 |                                       |  |                                  |                                     |                                      |                       |  |  |
|                                    | 4:31 PM  | 4:43 PM  | 0:12 |                                       |  |                                  |                                     |                                      |                       |  |  |
|                                    | 4:43 PM  | 4:55 PM  | 0:12 |                                       |  |                                  |                                     |                                      |                       |  |  |
| 11                                 | 4:55 PM  | 5:00 PM  | 0:05 | Parallel Session Closing              |  |                                  |                                     |                                      |                       |  |  |

| PARALLEL SESSION (5 VIRTUAL CLASS) |          |          |      |                                       |   |  |                                |                                  |                       |  |  |
|------------------------------------|----------|----------|------|---------------------------------------|---|--|--------------------------------|----------------------------------|-----------------------|--|--|
| PARALLEL CLASS C                   |          |          |      |                                       |   |  |                                |                                  |                       |  |  |
| 8                                  | 12:30 PM | 3:00 PM  | 2:30 | Paper ID                              | Paper Title (1st Round)   | Speakers                                       | Moderator (Main)               | Moderator (Backup)               | Virtual Room          |  |  |
|                                    | 12:30 PM | 12:35 PM | 0:05 | Opening 1st Round Parallel Session    |   |  |                                |                                  |                       |  |  |
|                                    | 12:35 PM | 12:55 PM | 0:20 |                                       | Application for Periodization of Building Maintenance in Construction Work  | Dr. I Nyoman D. Pahang Putra (Invited Speaker) | Ferry Hermawan, ST., MT., PhD. | Dr. Eng Pinta Astuti, ST., M.Eng | bit.ly/icrmce05-room3 |  |  |
|                                    | 12:55 PM | 1:07 PM  | 0:12 | 004                                   | Risk Assessment of Construction Project Scheduling  | Zetta Rasullia Kamandang                       |                                |                                  |                       |  |  |
|                                    | 1:07 PM  | 1:19 PM  | 0:12 | 035                                   | Identification Risk Potential Hazard of Railway Project Based on The Work Breakdown Structure to Improve Safety Performance                                       | Dicky V Aryanto                                |                                |                                  |                       |  |  |
|                                    | 1:19 PM  | 1:31 PM  | 0:12 | 036                                   | Investigating Construction Project Delay Using Fault Tree Analysis Based on Its Dominant Risk on Private Project  | Jojok Widodo Soetjipto                         |                                |                                  |                       |  |  |
|                                    | 1:31 PM  | 1:43 PM  | 0:12 | 074                                   | Risk Allocation Implementation Analysis of Public Private Partnership for Infrastructure Project (Case Study of Solo-Yogyakarta-NYIA Kulon Progo Highway Project) | Aloysia P. H Purnomo                           |                                |                                  |                       |  |  |
|                                    | 1:43 PM  | 1:55 PM  | 0:12 | 099                                   | Development of Preventive Maintenance Guidelines for Electrical Components on Government Building Based on Work Breakdown Structure                               | Azhara Yudha Pradipta                          |                                |                                  |                       |  |  |
|                                    | 1:55 PM  | 2:07 PM  | 0:12 | 067                                   | Evaluation of the Implementation of Fire Safety Management Based on Work Breakdown Structure Affecting the Insurance Premium Costs of High-Rise Lecture Buildings | Ero Prahara Mahardika                          |                                |                                  |                       |  |  |
|                                    | 2:07 PM  | 2:19 PM  | 0:12 | 013                                   | Risk Analysis of Shared Marine Space in The View of Traditional Fishermen Perceptions in The National Tourism Strategy Area of Lombok, Indonesia                  | Ida Ayu Oka Suwati Sideman                     |                                |                                  |                       |  |  |
|                                    | 2:19 PM  | 2:31 PM  | 0:12 |                                       |   |  |                                |                                  |                       |  |  |
|                                    | 2:31 PM  | 2:43 PM  | 0:12 |                                       |   |  |                                |                                  |                       |  |  |
|                                    | 2:43 PM  | 2:55 PM  | 0:12 |                                       |   |  |                                |                                  |                       |  |  |
|                                    | 2:55 PM  | 3:00 PM  | 0:05 | Closing 1st Round Parallel Session    |   |  |                                |                                  |                       |  |  |
| 9                                  | 3:00 PM  | 3:15 PM  | 0:15 | Coffee Break                          |   |  |                                |                                  |                       |  |  |
| 10                                 | 3:15 PM  | 4:55 PM  | 1:40 | Paper ID                              | Paper Title (2nd Round)   | Speakers                                       | Moderator (Main)               | Moderator (Backup)               | Virtual Room          |  |  |
|                                    | 3:15 PM  | 3:19 PM  | 0:04 | Opening of 2nd Round Parallel Session |   |  |                                |                                  |                       |  |  |
|                                    | 3:19 PM  | 3:31 PM  | 0:12 | 030                                   | Implementing a Relational Database in Processing Construction Project Documents   | Mik Wanul Khosiin                              | Zetta Rasullia Kamandang, M.Sc | Dr. Gito Sugiyanto, S.T., M.T    | bit.ly/icrmce05-room3 |  |  |
|                                    | 3:31 PM  | 3:43 PM  | 0:12 | 031                                   | Reducing the release of greenhouse gases in the rigid pavement material transport process unit  | Fajar Sri Handayani                            |                                |                                  |                       |  |  |
|                                    | 3:43 PM  | 3:55 PM  | 0:12 | 032                                   | Life Cycle Analysis of Permeable Pavement in The Urban Area Using Mechanistic-Empirical Performance   | Hery Awan Susanto                              |                                |                                  |                       |  |  |
|                                    | 3:55 PM  | 4:07 PM  | 0:12 | 062                                   | Key performance indicator for analytical hierarchy process used for determining the effect of reverse supply chain toward green building projects                 | Hermawan Hermawan                              |                                |                                  |                       |  |  |
|                                    | 4:07 PM  | 4:19 PM  | 0:12 | 080                                   | Development of Blockchain and Machine Learning System in The Process of Construction Planning Method of The Smart Building Building to Save Cost and Time         | Christianto Tedjo                              |                                |                                  |                       |  |  |
|                                    | 4:19 PM  | 4:31 PM  | 0:12 | 089                                   | The sustainability aspect of the consulting firm in terms of its competitiveness in Indonesia   | Mairizal M Zainuddin                           |                                |                                  |                       |  |  |
|                                    | 4:31 PM  | 4:43 PM  | 0:12 |                                       |   |  |                                |                                  |                       |  |  |
|                                    | 4:43 PM  | 4:55 PM  | 0:12 |                                       |   |  |                                |                                  |                       |  |  |
| 11                                 | 4:55 PM  | 5:00 PM  | 0:05 | Parallel Session Closing              |   |  |                                |                                  |                       |  |  |

| PARALLEL SESSION (5 VIRTUAL CLASS) |          |          |      |                                       |  |                                    |   |                               |                       |  |
|------------------------------------|----------|----------|------|---------------------------------------|--|------------------------------------|---|-------------------------------|-----------------------|--|
| PARALLEL CLASS D                   |          |          |      |                                       |  |                                    |   |                               |                       |  |
| 8                                  | 12:30 PM | 3:00 PM  | 2:30 | Paper ID                              | Paper Title (1st Round)  | Speakers                           | Moderator (Main)                              | Moderator (Backup)            | Virtual Room          |  |
|                                    | 12:30 PM | 12:35 PM | 0:05 | Opening 1st Round Parallel Session    |  |                                    |   |                               |                       |  |
|                                    | 12:35 PM | 12:55 PM | 0:20 | 059                                   | Risk and stability evaluation of Klego Dam, Boyolali, Indonesia  | Prof. Suharyanto (Invited Speaker) | Dr.Eng. Purwanto Bekti Santoso, S.T., M.T     | Hery Awan Susanto, S.T., M.T. | bit.ly/icrmce05-room4 |  |
|                                    | 12:55 PM | 1:07 PM  | 0:12 | 033                                   | Water Quality Mapping On The Coast Of Bangkalan Madura Based On The Acidity Value From The Remote Sensing Algorithm          | Hendrata Wibisana                  |   |                               |                       |  |
|                                    | 1:19 PM  | 1:31 PM  | 0:12 | 106                                   | Multi-Attribute Analysis of Raw Water Treatment from Deep Wells at PDAM Tirta Mahottama, Klungkung Regency, Bali             | I Wayan Koko Suryawan              |   |                               |                       |  |
|                                    | 1:31 PM  | 1:43 PM  | 0:12 | 109                                   | Determination of Produced Wastewater Treatment Systems for Reclaim Water in Oil and Gas Industry                             | I Wayan Koko Suryawan              |   |                               |                       |  |
|                                    | 1:43 PM  | 1:55 PM  | 0:12 | 111                                   | Preference of Sludge Treatment Plan in IPA II Pejempongan Water Treatment Plant  | I Wayan Koko Suryawan              |   |                               |                       |  |
|                                    | 1:55 PM  | 2:07 PM  | 0:12 | 060                                   | Overview of Building Maintenance in Irrigation Areas of the Pacal Irrigation Network, Bojonegoro Regency, East Java          | Mahdika Putra Nanda                |   |                               |                       |  |
|                                    | 2:07 PM  | 2:19 PM  | 0:12 | 001                                   | Wind-Generated Waves Simulation Utilizing DELFT3D in Payangan Beach, Jember  | Retno Utami Agung Wiyono           |   |                               |                       |  |
|                                    | 2:19 PM  | 2:31 PM  | 0:12 | 039                                   | The Effectiveness of Infiltration Wells as an Alternative to Eco Drainage Systems to Control Flooding in Mangkubumen Village | Retnayu Molya                      |   |                               |                       |  |
|                                    | 2:31 PM  | 2:43 PM  | 0:12 |                                       |  |                                    |   |                               |                       |  |
|                                    | 2:43 PM  | 2:55 PM  | 0:12 |                                       |  |                                    |   |                               |                       |  |
|                                    | 2:55 PM  | 3:00 PM  | 0:05 | Closing 1st Round Parallel Session    |  |                                    |   |                               |                       |  |
| 9                                  | 3:00 PM  | 3:15 PM  | 0:15 | Coffee Break                          |  |                                    |   |                               |                       |  |
| 10                                 | 3:15 PM  | 4:55 PM  | 1:40 | Paper ID                              | Paper Title (2nd Round)  | Speakers                           | Moderator (Main)                              | Moderator (Backup)            | Virtual Room          |  |
|                                    | 3:15 PM  | 3:19 PM  | 0:04 | Opening of 2nd Round Parallel Session |  |                                    |   |                               |                       |  |
|                                    | 3:19 PM  | 3:31 PM  | 0:12 | 041                                   | Validation of TRMM Rainfall Data on Slope Stability in Karanganyar, Indonesia  | Rintis Hadiani                     | Retno Utami Agung Wiyono, S.T., M. Eng., Ph.D | Prof. Buan Anshari            | bit.ly/icrmce05-room4 |  |
|                                    | 3:31 PM  | 3:43 PM  | 0:12 | 104                                   | Hourly Rainfall Simulation based on Daily Data   | Suroso Suroso                      |   |                               |                       |  |
|                                    | 3:43 PM  | 3:55 PM  | 0:12 | 107                                   | Small Debris Flow Simulation Using MORPHO2DH   | Puji Harsanto                      |   |                               |                       |  |
|                                    | 3:55 PM  | 4:07 PM  | 0:12 | 108                                   | Tsunami Hazard in Cilacap City due to the Megathrust of West-Central Java Segment  | Wahyu Widiyanto                    |   |                               |                       |  |
|                                    | 4:07 PM  | 4:19 PM  | 0:12 | 113                                   | Comparison of suitable drought Indices for Over West Nusa Tenggara   | Humairo Saidah                     |   |                               |                       |  |
|                                    | 4:19 PM  | 4:31 PM  | 0:12 |                                       |  |                                    |   |                               |                       |  |
|                                    | 4:31 PM  | 4:43 PM  | 0:12 |                                       |  |                                    |   |                               |                       |  |
|                                    | 4:43 PM  | 4:55 PM  | 0:12 |                                       |  |                                    |   |                               |                       |  |
| 11                                 | 4:55 PM  | 5:00 PM  | 0:05 | Parallel Session Closing              |  |                                    |   |                               |                       |  |

| PARALLEL SESSION (5 VIRTUAL CLASS) |          |          |      |                                       |   |  |                                |                                       |                       |  |  |
|------------------------------------|----------|----------|------|---------------------------------------|---|--|--------------------------------|---------------------------------------|-----------------------|--|--|
| PARALLEL CLASS E                   |          |          |      |                                       |   |  |                                |                                       |                       |  |  |
| 8                                  | 12:30 PM | 3:00 PM  | 2:30 | Paper ID                              | Paper Title (1st Round)   | Speakers                               | Moderator (Main)               | Moderator (Backup)                    | Virtual Room          |  |  |
|                                    | 12:30 PM | 12:35 PM | 0:05 | Opening 1st Round Parallel Session    |   |  |                                |                                       |                       |  |  |
|                                    | 12:35 PM | 12:55 PM | 0:20 |                                       | Do City Development Policies Determine Sustainable Transportation?  | Probo Hardini, Ph.D. (Invited Speaker) | Ir. Ary Setyawan, M.Sc., Ph.D. | Ni Nyoman Kencanawati, ST., MT., Ph.D | bit.ly/icrmce05-room5 |  |  |
|                                    | 12:55 PM | 1:07 PM  | 0:12 | 020                                   | Evaluation of Logistics System Performance-based on Indonesian Government Policy  | Muhammad Rizky Prakoso                 |                                |                                       |                       |  |  |
|                                    | 1:07 PM  | 1:19 PM  | 0:12 | 070                                   | Identification Factors of Safety Climate, Awareness, and Behaviors to Improve Safety Performance in Telecommunication Tower Construction at PT X  | Barra Farras                           |                                |                                       |                       |  |  |
|                                    | 1:19 PM  | 1:31 PM  | 0:12 | 098                                   | Analysis of Train Derailment Factors (Case Study: Wijayakusuma Train)   | Nugroho Utomo                          |                                |                                       |                       |  |  |
|                                    | 1:31 PM  | 1:43 PM  | 0:12 | 038                                   | THE IMPLEMENTATION OF FUNCTIONAL ROAD ASSESSMENT ON PRAMUKA ROAD SECTION IN KLATEN DISTRICT   | Syahrul A. Wuryatmaja                  |                                |                                       |                       |  |  |
|                                    | 1:43 PM  | 1:55 PM  | 0:12 | 083                                   | RUBBERIZED ASPHALT PILOT ROAD TRIAL IN KUWAIT   | Hussain M H Albaghli                   |                                |                                       |                       |  |  |
|                                    | 1:55 PM  | 2:07 PM  | 0:12 | 014                                   | e-Peralatan System as a Disaster Mitigation Management on Indonesia National Roads  | Adityo b Utomo                         |                                |                                       |                       |  |  |
|                                    | 2:07 PM  | 2:19 PM  | 0:12 | 017                                   | Determining the Maximum Speed Limit in Residential Area   | Gito Sugiyanto                         |                                |                                       |                       |  |  |
|                                    | 2:19 PM  | 2:31 PM  | 0:12 | 018                                   | Investigating the Factors Influencing the Demand of School Bus  | Willy Kriswardhana                     |                                |                                       |                       |  |  |
|                                    | 2:31 PM  | 2:43 PM  | 0:12 | 024                                   | Mapping Literature of Reclaimed Asphalt Pavement Using Bibliometric Analysis by VOSviewer   | Mochammad Qomaruddin                   |                                |                                       |                       |  |  |
|                                    | 2:43 PM  | 2:55 PM  | 0:12 |                                       |   |  |                                |                                       |                       |  |  |
|                                    | 2:55 PM  | 3:00 PM  | 0:05 | Closing 1st Round Parallel Session    |   |  |                                |                                       |                       |  |  |
| 9                                  | 3:00 PM  | 3:15 PM  | 0:15 | Coffee Break                          |   |  |                                |                                       |                       |  |  |
| 10                                 | 3:15 PM  | 4:55 PM  | 1:40 | Paper ID                              | Paper Title (2nd Round)   | Speakers                               | Moderator (Main)               | Moderator (Backup)                    | Virtual Room          |  |  |
|                                    | 3:15 PM  | 3:19 PM  | 0:04 | Opening of 2nd Round Parallel Session |   |  |                                |                                       |                       |  |  |
|                                    | 3:19 PM  | 3:31 PM  | 0:12 | 025                                   | A Probabilistic Model of Container Port Demand in Java Concerning the Port Hinterland Connectivity  | Lydia Novitriana Nur Hidayati          | Willy Kriswardhana, ST, MT     | Setiono, S.T., M.Sc.                  | bit.ly/icrmce05-room5 |  |  |
|                                    | 3:31 PM  | 3:43 PM  | 0:12 | 027                                   | Characteristics of foreign motorcyclists in tourism areas in Bali   | Cokorda P Wirasutama                   |                                |                                       |                       |  |  |
|                                    | 3:43 PM  | 3:55 PM  | 0:12 | 044                                   | Marshall Characteristics of Asphalt Mixture with Water Hyacinth Ash as Filler   | Bagus Hario Setiadji                   |                                |                                       |                       |  |  |
|                                    | 3:55 PM  | 4:07 PM  | 0:12 | 050                                   | Literature Study: Alternative Material for Hot Rolled Sheet-Wearing Course (HRS-WC) Pavement  | Elsa Eka Putri                         |                                |                                       |                       |  |  |
|                                    | 4:07 PM  | 4:19 PM  | 0:12 | 064                                   | Identification of Traffic Accident Hazardous Location and Cost of Accidents in Developing Country (Case Study of Tabanan Regency, Bali-Indonesia) | Putu A Suthanaya                       |                                |                                       |                       |  |  |
|                                    | 4:19 PM  | 4:31 PM  | 0:12 | 076                                   | Analysis of Community Satisfaction Level on the Road Rehabilitation and Reconstruction Project (learn from Palu Disasters Area)                   | Andri Irfan                            |                                |                                       |                       |  |  |
|                                    | 4:31 PM  | 4:43 PM  | 0:12 |                                       |   |  |                                |                                       |                       |  |  |
|                                    | 4:43 PM  | 4:55 PM  | 0:12 |                                       |   |  |                                |                                       |                       |  |  |
| 11                                 | 4:55 PM  | 5:00 PM  | 0:05 | Parallel Session Closing              |   |  |                                |                                       |                       |  |  |

## Day 2 - Friday, July 9, 2021

| Item                   | Time                                |                 | Duration    | Activities  | Annotations                                | Venue           |                 |
|------------------------|-------------------------------------|-----------------|-------------|---|--|-----------------|-----------------|
|                        | UTC+07:00 (Western Indonesian Time) |                 |             |   |  | Offline         | Online          |
|                        | Start                               | Over            |             |   |  |                 |                 |
| <b>PLENARY SESSION</b> |                                     |                 |             |   |  |                 |                 |
| <b>1</b>               | <b>8:00 AM</b>                      | <b>8:30 AM</b>  | <b>0:30</b> | <b>Registration (Join to Virtual Conference Platform)</b> |  |                 |                 |
|                        | 8:00 AM                             | 8:25 AM         | 0:25        | Registration for Plenary Session Participants             | (Sponshorsip Exhibition)                   | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 8:25 AM                             | 8:30 AM         | 0:05        | Announcement to Join The Opening Ceremony                 | MC (Mr. Yusuf Kurniawan)                   | R. Sidang Utama | bit.ly/icrmce05 |
| <b>2</b>               | <b>8:30 AM</b>                      | <b>8:40 AM</b>  | <b>0:10</b> | <b>Opening</b>  |  |                 |                 |
|                        | 8:30 AM                             | 8:40 AM         | 0:10        | Greetings and Event Agenda Explanation                    | MC (Mr. Yusuf Kurniawan)                   | R. Sidang Utama | bit.ly/icrmce05 |
| <b>3</b>               | <b>8:40 AM</b>                      | <b>9:30 AM</b>  | <b>0:50</b> | <b>Keynote Speech 1</b>                                   |  |                 |                 |
|                        | 8:40 AM                             | 8:45 AM         | 0:05        | Read CV of Keynote Speakers and Moderator                 | MC (Mr. Yusuf Kurniawan)                   | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 8:45 AM                             | 9:15 AM         | 0:30        | Keynote Speaker Session                                   | <b>Prof. Mohammed Shahin</b>               | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 9:15 AM                             | 9:30 AM         | 0:15        | Moderator's Wrap-Up, QnA Session                          | <b>Moderator (Prof. Yusep Muslih P.)</b>   | R. Sidang Utama | bit.ly/icrmce05 |
| <b>4</b>               | <b>9:30 AM</b>                      | <b>10:20 AM</b> | <b>0:50</b> | <b>Keynote Speech 2</b>                                   |  |                 |                 |
|                        | 9:30 AM                             | 9:35 AM         | 0:05        | Read CV of Keynote Speakers and Moderator                 | MC (Mr. Yusuf Kurniawan)                   | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 9:35 AM                             | 10:05 AM        | 0:30        | Keynote Speaker Session                                   | <b>Budi Yulianto, Ph.D.</b>                | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 10:05 AM                            | 10:20 AM        | 0:15        | Moderator's Wrap-Up, QnA Session                          | <b>Moderator (Ary Setyawan, Ph.D.)</b>     | R. Sidang Utama | bit.ly/icrmce05 |
| <b>5</b>               | <b>10:20 AM</b>                     | <b>10:35 AM</b> | <b>0:15</b> | <b>Coffee Break</b>                                       |  |                 |                 |
|                        | 10:20 AM                            | 10:30 AM        | 0:10        | Coffee Break  | (Sponshorsip Exhibition)                   | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 10:30 AM                            | 10:35 AM        | 0:05        | Announcement for Rejoining The Keynote Speech Session     | Moderator                                  | R. Sidang Utama | bit.ly/icrmce05 |
| <b>6</b>               | <b>10:35 AM</b>                     | <b>11:25 AM</b> | <b>0:50</b> | <b>Keynote Speech 3</b>                                   |  |                 |                 |
|                        | 10:35 AM                            | 10:40 AM        | 0:05        | Read CV of Keynote Speakers and Moderator                 | MC (Mr. Yusuf Kurniawan)                   | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 10:40 AM                            | 11:10 AM        | 0:30        | Keynote Speaker Session                                   | <b>Yusron Saadi, Ph.D.</b>                 | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 11:10 AM                            | 11:25 AM        | 0:15        | Moderator's Wrap-Up, QnA Session                          | <b>Moderator (Retno Utami A.W., Ph.D.)</b> | R. Sidang Utama | bit.ly/icrmce05 |
| <b>7</b>               | <b>11:25 AM</b>                     | <b>1:00 PM</b>  | <b>1:35</b> | <b>Pray and Lunch Break</b>                               |  |                 |                 |
|                        | 11:25 AM                            | 12:55 PM        | 1:30        | Lunch Break   | (Sponshorsip Exhibition)                   | R. Sidang Utama | bit.ly/icrmce05 |
|                        | 12:55 PM                            | 1:00 PM         | 0:05        | Announcement to Join The Parallel Session                 | MC (Mr. Yusuf Kurniawan)                   | R. Sidang Utama | bit.ly/icrmce05 |

| PARALLEL SESSION (4 VIRTUAL CLASS) |         |         |      |                                    |  |   |                         |                                       |                       |                 |
|------------------------------------|---------|---------|------|------------------------------------|--|---|-------------------------|---------------------------------------|-----------------------|-----------------|
| PARALLEL CLASS A                   |         |         |      |                                    |  |   |                         |                                       |                       |                 |
| 8                                  | 1:00 PM | 3:25 PM | 2:25 | Paper ID                           | Paper Title (1st Round)  | Speakers                                | Moderator (Main)        | Moderator (Backup)                    | Virtual Room          |                 |
|                                    | 1:00 PM | 1:05 PM | 0:05 | Opening 1st Round Parallel Session |  |   |                         |                                       |                       |                 |
|                                    | 1:05 PM | 1:25 PM | 0:20 | 131                                | Potentials of Internet of Things (IoT) and Intelligent Building System for Building Management                                 | Dr. Alfredo Satyanaga (Invited Speaker) | Dr. Ir. Krisnamurti, MT | Ni Nyoman Kencanawati, ST., MT., Ph.D | bit.ly/icrmce05-room1 |                 |
|                                    | 1:25 PM | 1:37 PM | 0:12 | 042                                | The behavior of RC T-Beams Strengthened FRP Rods and Sheets Under Loading-Unloading  | Sukamta Sukamta                         |                         |                                       |                       |                 |
|                                    | 1:37 PM | 1:49 PM | 0:12 | 043                                | Confinement of FRP Anchorage to FRP Strengthened Over-Reinforced Concrete Beam   | Nuroji Nuroji                           |                         |                                       |                       |                 |
|                                    | 1:49 PM | 2:01 PM | 0:12 | 090                                | Strengthening of Non-Engineered Building Beam Column Joint to Increase Seismic Performance with Variation of Steel Plate Width | Edy Edy Purwanto                        |                         |                                       |                       |                 |
|                                    | 2:01 PM | 2:13 PM | 0:12 | 0116                               | Liquefaction Potential of Volcanic Deposits during the Lombok Earthquake in 2018   | Muhajirah Muhajirah                     |                         |                                       |                       |                 |
|                                    | 2:13 PM | 2:25 PM | 0:12 | 010                                | Additional Vertical Movement of The Single Pile Foundation With Combined Loads   | Sumiyati Gunawan                        |                         |                                       |                       |                 |
|                                    | 2:25 PM | 2:37 PM | 0:12 | 034                                | Numerical Simulation of Slope Stability for Soil Embankment Reinforced with Inclined Bamboo Piles                              | Ngudiyono Ngudiyono                     |                         |                                       |                       |                 |
|                                    | 2:37 PM | 2:49 PM | 0:12 | 092                                | DEVELOPMENT OF BLOCKCHAIN BASED KNOWLEDGE MANAGEMENT SYSTEM MODEL IN EPC PROJECTS (EPC-X Project Case Study)                   | Dimas Yossi Priyambodo                  |                         |                                       |                       |                 |
|                                    | 2:49 PM | 3:01 PM | 0:12 | 095                                | Evaluation of the Public Procurement Principles Implementation in Surabaya Construction Projects                               | Mohammad Arif Rohman                    |                         |                                       |                       |                 |
|                                    | 3:01 PM | 3:13 PM | 0:12 | 142                                | Analysis of CO2 Emissions Generated by Pickup Commercial Vehicles Using the IPCC Method and Direct Method                      | Florentina P Pramesti                   |                         |                                       |                       |                 |
|                                    | 3:13 PM | 3:25 PM | 0:12 |                                    |  |   |                         |                                       |                       |                 |
|                                    | 3:25 PM | 3:30 PM | 0:05 | Parallel Session Closing           |  |   |                         |                                       |                       |                 |
| 9                                  | 3:30 PM | 5:00 PM | 1:30 | Closing and Awarding Ceremony      |  |   |                         |                                       |                       | bit.ly/icrmce05 |

| PARALLEL SESSION (4 VIRTUAL CLASS) |         |         |      |                                    |   |                                 |                                      |                          |                       |                 |  |
|------------------------------------|---------|---------|------|------------------------------------|---|---------------------------------|--------------------------------------|--------------------------|-----------------------|-----------------|--|
| PARALLEL CLASS B                   |         |         |      |                                    |   |                                 |                                      |                          |                       |                 |  |
| 8                                  | 1:00 PM | 3:25 PM | 2:25 | Paper ID                           | Paper Title (1st Round)   | Speakers                        | Moderator (Main)                     | Moderator (Backup)       | Virtual Room          |                 |  |
|                                    | 1:00 PM | 1:05 PM | 0:05 | Opening 1st Round Parallel Session |   |                                 |                                      |                          |                       |                 |  |
|                                    | 1:05 PM | 1:25 PM | 0:20 | 134                                | Role of Diagonal Bars in Reinforced Concrete Deep Beams Tested under Static Load  | Dr. Erwin Lim (Invited Speaker) | Dr. I Nyoman D. Pahang Putra.,ST, MT | Dr. Seplika Yadi, ST, MT | bit.ly/icrmce05-room2 |                 |  |
|                                    | 1:25 PM | 1:37 PM | 0:12 | 124                                | Experimental Investigation on the Shear Behavior of Patched RC Beams without Web Reinforcements: Efficacy of Patching Position with Respect to the Shear Span     | Adji Putra Abrian               |                                      |                          |                       |                 |  |
|                                    | 1:37 PM | 1:49 PM | 0:12 | 112                                | A Critical Review of Bridge Management System in Indonesia  | Surya Dewi Puspitasari          |                                      |                          |                       |                 |  |
|                                    | 1:49 PM | 2:01 PM | 0:12 | 128                                | Development of Simple Building Maintenance System based on WBS, BIM and WEB to Improve Building Maintenance Performance In The Government of DKI Jakarta Province | Dyah Ayu Pangastuti             |                                      |                          |                       |                 |  |
|                                    | 2:01 PM | 2:13 PM | 0:12 | 078                                | The Effect of P-Delta and P-Delta Plus Large Displacements Modelling on Horizontal Displacement   | Jonie Tanijaya                  |                                      |                          |                       |                 |  |
|                                    | 2:13 PM | 2:25 PM | 0:12 | 122                                | Various Strut – Macro Modelings for Infilled Frame Analysis   | Isyana Ratna Hapsari            |                                      |                          |                       |                 |  |
|                                    | 2:25 PM | 2:37 PM | 0:12 | 126                                | Compressive and Flexural Strength Behavior of Banana Tree Fiber Hybrid Concrete   | Hakas Prayuda                   |                                      |                          |                       |                 |  |
|                                    | 2:37 PM | 2:49 PM | 0:12 | 081                                | Sensitivity analysis on the effect of reinforcement materials addition for soil stabilization   | Ida A Nomleni                   |                                      |                          |                       |                 |  |
|                                    | 2:49 PM | 3:01 PM | 0:12 | 087                                | Lesson Learned from Weathering Clay Shale Residual Interface Shear Strength Testing Method  | Fathiyah H Sagitaningrum        |                                      |                          |                       |                 |  |
|                                    | 3:01 PM | 3:13 PM | 0:12 | 143                                | ANALYSIS OF CO2 GAS EMISSIONS GENERATED BY LIGHTWEIGHT PASSENGER CARS USING IPCC METHOD AND DIRECT METHOD   | Florentina P Pramesti           |                                      |                          |                       |                 |  |
|                                    | 3:13 PM | 3:25 PM | 0:12 |                                    |   |                                 |                                      |                          |                       |                 |  |
|                                    | 3:25 PM | 3:30 PM | 0:05 | Parallel Session Closing           |   |                                 |                                      |                          |                       |                 |  |
| 9                                  | 3:30 PM | 5:00 PM | 1:30 | Closing and Awarding Ceremony      |   |                                 |                                      |                          |                       | bit.ly/icrmce05 |  |

| PARALLEL SESSION (4 VIRTUAL CLASS) |         |         |      |                                    |   |   |                               |                                     |                       |                 |
|------------------------------------|---------|---------|------|------------------------------------|---|---|-------------------------------|-------------------------------------|-----------------------|-----------------|
| PARALLEL CLASS C                   |         |         |      |                                    |   |   |                               |                                     |                       |                 |
| 8                                  | 1:00 PM | 3:25 PM | 2:25 | Paper ID                           | Paper Title (1st Round)   | Speakers                                    | Moderator (Main)              | Moderator (Backup)                  | Virtual Room          |                 |
|                                    | 1:00 PM | 1:05 PM | 0:05 | Opening 1st Round Parallel Session |   |   |                               |                                     |                       |                 |
|                                    | 1:05 PM | 1:25 PM | 0:20 |                                    | Electrokinetics Treatment of Expansive Clay: a Review and Laboratory Test   | Prof. Agus Setyo Muntohar (Invited Speaker) | Dr. Gito Sugiyanto, S.T., M.T | Jauhar Fajrin, ST., MSc(Eng)., Ph.D | bit.ly/icrmce05-room3 |                 |
|                                    | 1:25 PM | 1:37 PM | 0:12 | 100                                | Cost effectiveness analysis of greenhouse gas emissions reduction in the flexible pavement material transportation process unit   | Fajar Sri Handayani                         |                               |                                     |                       |                 |
|                                    | 1:37 PM | 1:49 PM | 0:12 | 102                                | Investigating Materials for Refurbishment Strategy in the Heritage Building: a Case Soesman Kantor Semarang   | Ferry Hermawan                              |                               |                                     |                       |                 |
|                                    | 1:49 PM | 2:01 PM | 0:12 | 127                                | Relationship Model Between Conceptual Cost Estimation Process of Flyover Development in the Provincial Government of DKI Jakarta with The Accuracy Level Using Structural Equation Modeling (SEM) | Putika Yussi                                |                               |                                     |                       |                 |
|                                    | 2:01 PM | 2:13 PM | 0:12 | 132                                | Cost Structure of Construction Safety on High Residential Buildings in Indonesia  | Rossy Army Machfudiyanto                    |                               |                                     |                       |                 |
|                                    | 2:13 PM | 2:25 PM | 0:12 | 119                                | Simulation of Debris Flow Using "SIMLAR" in the watershed of Gendol River, Indonesia  | Jazaul Ikhsan                               |                               |                                     |                       |                 |
|                                    | 2:25 PM | 2:37 PM | 0:12 | 121                                | How to fight flooding? An evaluation of water infrastructure condition for operation and maintenance, a case study of Pepe River  | Rian Mantasa Salve Prastica                 |                               |                                     |                       |                 |
|                                    | 2:37 PM | 2:49 PM | 0:12 | 082                                | Analysis of the Behaviour Model of Foreign Motorcyclists in Tourism Areas in Bali   | Cokorda P Wirasutama                        |                               |                                     |                       |                 |
|                                    | 2:49 PM | 3:01 PM | 0:12 | 088                                | Application of Fuzzy Inference System Mamdani at Pelican Crossing   | Salsabila Naura Putri                       |                               |                                     |                       |                 |
|                                    | 3:01 PM | 3:13 PM | 0:12 | 140                                | The Strength and Modulus of Elasticity of High Strength Self-Compacting Concrete (HSSCC) with 12.5% Metakaolin and Variations of Silica Fume  | Endah Safitri                               |                               |                                     |                       |                 |
|                                    | 3:13 PM | 3:25 PM | 0:12 |                                    |   |   |                               |                                     |                       |                 |
|                                    | 3:25 PM | 3:30 PM | 0:05 | Parallel Session Closing           |   |   |                               |                                     |                       |                 |
| 9                                  | 3:30 PM | 5:00 PM | 1:30 | Closing and Awarding Ceremony      |   |   |                               |                                     |                       | bit.ly/icrmce05 |

| PARALLEL SESSION (4 VIRTUAL CLASS) |         |         |      |                                    |   |                                     |                               |                       |                       |                 |
|------------------------------------|---------|---------|------|------------------------------------|---|-------------------------------------|-------------------------------|-----------------------|-----------------------|-----------------|
| PARALLEL CLASS D                   |         |         |      |                                    |   |                                     |                               |                       |                       |                 |
| 8                                  | 1:00 PM | 3:25 PM | 2:25 | Paper ID                           | Paper Title (1st Round)   | Speakers                            | Moderator (Main)              | Moderator (Backup)    | Virtual Room          |                 |
|                                    | 1:00 PM | 1:05 PM | 0:05 | Opening 1st Round Parallel Session |   |                                     |                               |                       |                       |                 |
|                                    | 1:05 PM | 1:25 PM | 0:20 | 065                                | Assessment of Flash Flood Susceptibility Potential Based on Frequency Ratio Approach in the Wonoboyo Watershed in East Java, Indonesia  | Dr. Entin Hidayah (Invited Speaker) | Hery Awan Susanto, S.T., M.T. | Dr. Suryawan Murtiadi | bit.ly/icrmce05-room4 |                 |
|                                    | 1:25 PM | 1:37 PM | 0:12 | 052                                | Analysis of Leb Irrigation Patterns of Pipe System in Sorgum Plants in Sand Dry Lands Akar Akar Village   | I Dewa Gede Jaya Negara             |                               |                       |                       |                 |
|                                    | 1:37 PM | 1:49 PM | 0:12 | 084                                | Impact of Climate Change on the Safety of Dam   | Heri Sulistiyono                    |                               |                       |                       |                 |
|                                    | 1:49 PM | 2:01 PM | 0:12 | 094                                | Sustainability Analysis of Minimization of Spills From a Reservoir  | Syamsul Hidayat                     |                               |                       |                       |                 |
|                                    | 2:01 PM | 2:13 PM | 0:12 | 135                                | Design of Typical Rainwater Harvesting Storage Tanks Based on Housing Type (Case Study in Indonesia)  | Lina Indawati                       |                               |                       |                       |                 |
|                                    | 2:13 PM | 2:25 PM | 0:12 | 091                                | Analysis of the Influence of Region Development Factors, Individual and Activity, Internal Operator and External Operator on the Demand for the Jakarta Bandung High-Speed Rail | samijan samijan                     |                               |                       |                       |                 |
|                                    | 2:25 PM | 2:37 PM | 0:12 | 101                                | A Systematic Review of Concrete Material for Noise Reduction of Transportation Sectors  | Ecky E Ferry                        |                               |                       |                       |                 |
|                                    | 2:37 PM | 2:49 PM | 0:12 | 103                                | Knowledge and Practice of Helmet Usage among Senior High School Students in Klaten Regency  | Dewi Handayani                      |                               |                       |                       |                 |
|                                    | 2:49 PM | 3:01 PM | 0:12 | 141                                | The Effect of 12.5% Metakaolin and Variations of Silica Fume on Split Tensile Strength and Modulus of Rupture of High Strength Self-Compacting Concrete (HSSCC)                 | Endah Safitri                       |                               |                       |                       |                 |
|                                    | 3:01 PM | 3:13 PM | 0:12 | 139                                | Assessment of retaining wall design in Harris Skyline tower's basement, Surabaya  | Siti Nurlita Fitri                  |                               |                       |                       |                 |
|                                    | 3:13 PM | 3:25 PM | 0:12 |                                    |   |                                     |                               |                       |                       |                 |
|                                    | 3:25 PM | 3:30 PM | 0:05 | Parallel Session Closing           |   |                                     |                               |                       |                       |                 |
| 9                                  | 3:30 PM | 5:00 PM | 1:30 | Closing and Awarding Ceremony      |   |                                     |                               |                       |                       | bit.ly/icrmce05 |

### Day 3 - Saturday, July 10, 2021

| Item                | Time                                     |                 | Duration    | Activities  | Annotations  | Venue           |                    |
|---------------------|--|-----------------|-------------|---|--|-----------------|--------------------|
|                     | UTC+07:00 (Western Indonesian Time, WIB) |                 |             |   |  | Offline         | Online             |
|                     | Start                                    | Over            |             |   |  |                 |                    |
| <b>SHORT COURSE</b> |  |                 |             |   |  |                 |                    |
| <b>1</b>            | <b>7:30 AM</b>                           | <b>7:50 AM</b>  | <b>0:20</b> | <b>Registration (Join to Virtual Conference Platform)</b>   |  |                 |                    |
|                     | 7:30 AM                                  | 7:45 AM         | 0:15        | Registration for Participants   | (Sponshorsip Exhibition)                                       | R. Sidang Utama | Announced by email |
|                     | 7:45 AM                                  | 7:50 AM         | 0:05        | Announcement to Join The Opening Ceremony   | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
| <b>2</b>            | <b>7:50 AM</b>                           | <b>8:00 AM</b>  | <b>0:10</b> | <b>Opening</b>  |  |                 |                    |
|                     | 7:50 AM                                  | 7:55 AM         | 0:05        | Welcome Speech by Dean Faculty of Engineering UNS   | <b>Dr.techn. Sholihin As'Ad</b>                                | R. Sidang Utama | Announced by email |
|                     | 7:55 AM                                  | 8:00 AM         | 0:05        | Welcome Speech by Director General of NCREE   | <b>Prof. Chung-Che Chou</b>                                    | R. Sidang Utama | Announced by email |
| <b>3</b>            | <b>8:00 AM</b>                           | <b>9:00 AM</b>  | <b>1:00</b> | <b>Short Course 1</b>   |  |                 |                    |
|                     | 8:00 AM                                  | 8:05 AM         | 0:05        | Read CV of Speakers and Moderator   | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
|                     | 8:05 AM                                  | 8:45 AM         | 0:40        | <i>Seismic Retrofitting Program of School Buildings in Taiwan</i>                                 | <b>Speaker 1 (Prof. Shyh-Jiann Hwang, NTU, Taiwan)</b>         | R. Sidang Utama | Announced by email |
|                     | 8:45 AM                                  | 9:00 AM         | 0:15        | Moderator Wrap-Up, QnA Session  | Moderator (Joseph Remir)                                       | R. Sidang Utama | Announced by email |
| <b>4</b>            | <b>9:00 AM</b>                           | <b>10:00 AM</b> | <b>1:00</b> | <b>Short Course 2</b>   |  |                 |                    |
|                     | 9:00 AM                                  | 9:05 AM         | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
|                     | 9:05 AM                                  | 9:45 AM         | 0:40        | <i>Selection of Buildings for FRP Retrofitting</i>  | <b>Speaker 2 (Prof. Bing Li, NTU, Singapore)</b>               | R. Sidang Utama | Announced by email |
|                     | 9:45 AM                                  | 10:00 AM        | 0:15        | Moderator Wrap-Up, QnA Session  | Moderator (Joseph Remir)                                       | R. Sidang Utama | Announced by email |
| <b>5</b>            | <b>10:00 AM</b>                          | <b>11:00 AM</b> | <b>1:00</b> | <b>Short Course 3</b>   |  |                 |                    |
|                     | 10:00 AM                                 | 10:05 AM        | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
|                     | 10:05 AM                                 | 10:45 AM        | 0:40        | <i>Evaluation of Seismic Vulnerability Screening Indices using Earthquake Reconnaissance Data</i> | <b>Speaker 3 (Prof. Aishwarya Y. Puranam, NTU, Taiwan)</b>     | R. Sidang Utama | Announced by email |
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| <b>6</b>            | <b>11:00 AM</b>                          | <b>12:00 PM</b> | <b>1:00</b> | <b>Short Course 4</b>   |  |                 |                    |
|                     | 11:00 AM                                 | 11:05 AM        | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
|                     | 11:05 AM                                 | 11:45 AM        | 0:40        | <i>Seismic Assessment methods and Experimental Verifications of Reinforced Concrete Buildings</i> | <b>Speaker 4 (Prof. Fu-Pei Hsiao, NCREE, Taiwan)</b>           | R. Sidang Utama | Announced by email |
|                     | 11:45 AM                                 | 12:00 PM        | 0:15        | Moderator Wrap-Up, QnA Session  | Moderator (Joseph Remir)                                       | R. Sidang Utama | Announced by email |
| <b>7</b>            | <b>12:00 PM</b>                          | <b>1:00 PM</b>  | <b>1:00</b> | <b>Pray and Lunch Break</b>   |  |                 |                    |
|                     | 12:00 PM                                 | 12:55 PM        | 0:55        | Lunch Break   | (Sponshorsip Exhibition)                                       | R. Sidang Utama | Announced by email |
|                     | 12:55 PM                                 | 1:00 PM         | 0:05        | Announcement for Joining The Parallel Session   | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
| <b>8</b>            | <b>1:00 PM</b>                           | <b>2:00 PM</b>  | <b>1:00</b> | <b>Short Course 5</b>   |  |                 |                    |
|                     | 1:00 PM                                  | 1:05 PM         | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
|                     | 1:05 PM                                  | 1:45 PM         | 0:40        | <i>Seismic Retrofitting of School Buildings: Thailand's Perspectives</i>                          | <b>Speaker 5 (Prof. Sutat Leelataviwat, KMUTT, Thailand)</b>   | R. Sidang Utama | Announced by email |
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| <b>9</b>            | <b>2:00 PM</b>                           | <b>3:00 PM</b>  | <b>1:00</b> | <b>Short Course 6</b>   |  |                 |                    |
|                     | 2:00 PM                                  | 2:05 PM         | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
|                     | 2:05 PM                                  | 2:45 PM         | 0:40        | <i>Fragility as a Tool for Seismic Performance and Retrofitting Evaluation</i>                    | <b>Speaker 6 (Assoc. Prof. Senot Sangadji, UNS, Indonesia)</b> | R. Sidang Utama | Announced by email |
|                     | 2:45 PM                                  | 3:00 PM         | 0:15        | Moderator Wrap-Up, QnA Session  | Moderator (Joseph Remir)                                       | R. Sidang Utama | Announced by email |
| <b>10</b>           | <b>3:00 PM</b>                           | <b>3:05 PM</b>  | <b>0:05</b> | <b>Short Course Closing</b>   | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |

## ABSTRACT

Paper ID : 001

### Wind-Generated Wave Simulation on Payangan Beach Utilizing DELFT3D

Enggar Setia Baresi<sup>1</sup>, Retno Utami Agung Wiyono<sup>1</sup> and Wiwik Yunarni Widiarti<sup>1</sup>

<sup>1</sup> Civil Engineering Department, Universitas Jember  
retnoutami@unej.ac.id

**Abstract.** The Southern Coastal area of Jember has been damaged almost yearly by coastal flooding and high waves, especially Payangan Beach. A study on high waves is urgently needed for disaster risk preparedness. This study is conducted to monitor the high waves and simulate the effect on the beach. Delft3D-Wave model is used to provide a spatiotemporal characteristic of the event. The focus of the study is to analyze the high waves on Payangan Beach generated by wind forces. The domain model is a curvilinear grid with a grid size ranging from 130 m until 900 m. National bathymetric data and CDS Copernicus wind data were utilized as data sources. The simulation outcomes have shown that waves are generated far from the coastline across the ocean inside the fetch area or even further to open seas of the Indian Ocean. The simulations show the significant wave height increase during the high waves event according to specific meteorological characteristics from 1.6 – 2.0 m on normal days and exceeding 3.2 m when the high waves hit.

**Keywords:** high waves, Delft3D, wind-generated waves.

Paper ID : 004

### Risk Assessment of Construction Project Scheduling

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**Abstract.** To perform a successful construction project, accuracy in managing project risks has to be fulfilled by project parties. Regarding time-related risk, failure to estimate project construction duration is one of the common problems that can affect the entire project performance during the execution. To avoid the impact of these risks, a scheduling method using probabilistic duration has been developed, namely Monte Carlo simulation. In this study, optimistic, most likely, and pessimistic duration of each task and task relationship information of a real case study were collected and were examined in several steps, (1) determining the number of iterations, (2) Monte Carlo simulation, (3) scheduling analysis, and (4) probabilistic of success analysis. Based on the calculation, the success probabilities of as-planned, optimistic, most likely, pessimistic, and simulated durations are 0.479%, 0.054%, 2.108%, 57.912%, and 52.575% respectively. By only have 0.479% of success probability, the as-planned duration is unsuited to be submitted as project completion duration in the contract. Furthermore, to avoid

### Day 3 - Saturday, July 10, 2021

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|---------------------|--|-----------------|-------------|---|--|-----------------|--------------------|
|                     | UTC+07:00 (Western Indonesian Time, WIB) |                 |             |   |  | Offline         | Online             |
|                     | Start                                    | Over            |             |   |  |                 |                    |
| <b>SHORT COURSE</b> |  |                 |             |   |  |                 |                    |
| <b>1</b>            | <b>7:30 AM</b>                           | <b>7:50 AM</b>  | <b>0:20</b> | <b>Registration (Join to Virtual Conference Platform)</b>   |  |                 |                    |
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|                     | 7:45 AM                                  | 7:50 AM         | 0:05        | Announcement to Join The Opening Ceremony   | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
| <b>2</b>            | <b>7:50 AM</b>                           | <b>8:00 AM</b>  | <b>0:10</b> | <b>Opening</b>  |  |                 |                    |
|                     | 7:50 AM                                  | 7:55 AM         | 0:05        | Welcome Speech by Dean Faculty of Engineering UNS   | <b>Dr.techn. Sholihin As'Ad</b>                                | R. Sidang Utama | Announced by email |
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| <b>3</b>            | <b>8:00 AM</b>                           | <b>9:00 AM</b>  | <b>1:00</b> | <b>Short Course 1</b>   |  |                 |                    |
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|                     | 8:05 AM                                  | 8:45 AM         | 0:40        | <i>Seismic Retrofitting Program of School Buildings in Taiwan</i>                                 | <b>Speaker 1 (Prof. Shyh-Jiann Hwang, NTU, Taiwan)</b>         | R. Sidang Utama | Announced by email |
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| <b>4</b>            | <b>9:00 AM</b>                           | <b>10:00 AM</b> | <b>1:00</b> | <b>Short Course 2</b>   |  |                 |                    |
|                     | 9:00 AM                                  | 9:05 AM         | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
|                     | 9:05 AM                                  | 9:45 AM         | 0:40        | <i>Selection of Buildings for FRP Retrofitting</i>  | <b>Speaker 2 (Prof. Bing Li, NTU, Singapore)</b>               | R. Sidang Utama | Announced by email |
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| <b>5</b>            | <b>10:00 AM</b>                          | <b>11:00 AM</b> | <b>1:00</b> | <b>Short Course 3</b>   |  |                 |                    |
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|                     | 10:05 AM                                 | 10:45 AM        | 0:40        | <i>Evaluation of Seismic Vulnerability Screening Indices using Earthquake Reconnaissance Data</i> | <b>Speaker 3 (Prof. Aishwarya Y. Puranam, NTU, Taiwan)</b>     | R. Sidang Utama | Announced by email |
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| <b>6</b>            | <b>11:00 AM</b>                          | <b>12:00 PM</b> | <b>1:00</b> | <b>Short Course 4</b>   |  |                 |                    |
|                     | 11:00 AM                                 | 11:05 AM        | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
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| <b>8</b>            | <b>1:00 PM</b>                           | <b>2:00 PM</b>  | <b>1:00</b> | <b>Short Course 5</b>   |  |                 |                    |
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| <b>9</b>            | <b>2:00 PM</b>                           | <b>3:00 PM</b>  | <b>1:00</b> | <b>Short Course 6</b>   |  |                 |                    |
|                     | 2:00 PM                                  | 2:05 PM         | 0:05        | Read CV of Speaker  | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |
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| <b>10</b>           | <b>3:00 PM</b>                           | <b>3:05 PM</b>  | <b>0:05</b> | <b>Short Course Closing</b>   | MC (Mr. Yusuf Kurniawan)                                       | R. Sidang Utama | Announced by email |

risk in scheduling, the simulation suggests the project parties to allocate at least 332 days of project duration which has a 100% of success probability.

**Keywords:** Project Scheduling, Monte Carlo Simulation, Success Probability

Paper ID : 006

## The Setting Time of Portland Composite Cement Mixed with Calcium Stearate

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**Abstract.** This study aims to determine the effect of calcium stearate in setting time of Portland Composite Cement setting time. Tests carried out include the consistency of normal PCC, initial setting time, final setting time, mortar compressive strength and phase hydration. The calcium stearate content is used as additive for PCC is 0, 1, 2 and 3% of the weight of cement. Used cement is PCC type without added fly ash and with additional 10% fly ash by cement weight. Mortar compressive strength specimens are cubes with size of 50 x 50 x 50 mm. Mortar compressive strength test was performed at 3, 7, 14 and 28 days. The phase of hydration test object is a powder which is drilled from a harden cement paste. This powder is tested for its compound content using an X-Ray Diffraction (XRD) tool. The test results found that the use of calcium stearate accelerated the initial and final setting time of PCC around 78 minutes. Mortar compressive strength decreases when the use of calcium stearate in the mortar mixture increases. This tendency is in line with the results of the XRD test that the amount of Crystalline formed at 28 days becomes smaller when the amount of calcium stearate added to PCC increased.

**Keywords:** Calcium Stearate, Fly Ash, Final Setting Time, Initial Setting Time; Portland Composite Cement.

Paper ID : 008

## Software Performance of Risk-targeted Maximum Considered Earthquake (MCE<sub>R</sub>) Calculation

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**Abstract.** Website software (WS) for Risk-targeted Maximum Considered Earthquake (MCE<sub>R</sub>) acceleration calculation was announced in 2019. Single user non website software (stand-alone software / SAS) was also released in June 2020. The MCE<sub>R</sub> acceleration is divided into three

different values  $MCE_G$  (peak ground acceleration),  $MCE_{R-S_s}$  (short period) and  $MCE_{R-S_1}$  (1-s period) spectral acceleration. The purpose of the SAS software development is to help civil engineers living in areas having no internet connection or internet connection problems. Both software packages should yield the same  $MCE_R$  result when the same building location or position or coordinate is entered as an input. This paper describes the evaluation of SAS in calculating the  $MCE_R$  compared to the result calculated using the WS. The evaluation was performed at three different islands in Indonesia; Sumatra, Java and Sulawesi islands and at 154, 115 and 81 coordinate positions on these islands, respectively. More than 10% difference in the data was observed when the  $MCE_R$  acceleration was calculated at the area having ( $MCE_G$  and  $MCE_{R-S_1}$ ) greater than 0.6 g (g is gravitational acceleration). The minimum 10% difference in data was also observed when the  $MCE_{R-S_s}$  was greater than 1.5 g. The largest difference was also observed when the coordinate positions were located close to seismic sources (fault source traces).

**Keywords:**  $MCE_R$ , Website Software, Stand-Alone Software.

Paper ID : 010

## Additional Vertical Movement of The Single Pile Foundation With Combined Loads

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<sup>1</sup> *Phd Student, Department of Civil Engineering, Sebelas Maret University*

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**Abstract.** Pile-foundation support the upper structure to the subgrade, it generally supports vertical loads, occasionally when the horizontal loads are found to be more dominant, it becomes an important consideration in the design. Pile foundations with combined loads are generally analyzed separately, however on the site, the two loads work simultaneously. In-Indonesia, particularly, loading tests do not performed once. Therefore, it does not account for the additional vertical displacement and lateral deflection.

This research will investigate the analysis and experimental laboratory, effect of vertical displacement on single pile foundation, as the effect of combined loads, and get a relationship that can be used as a reference for analyzing additional vertical displacement due to combined loads on single pile foundations. The process was in three stages with the first being the preliminary analysis through 2D Finite Element Method (2D-FEM) Plaxis2D8.6 while the second was an experimental test in the laboratory, and third, being the analysis through 3DFEM Plaxis3D1.1 for validation with soil data and loading test on several projects in the field.

The results obtained show that after adding vertical load ( $P_v$ ) about 5x lateral load ( $H_v$ ), that on ( $P_v/H_v > 5$ ), the vertical displacement stays, (as the result of the loading test) until it collapses, when ( $P_v/H_v \leq 5$ ), the lateral load will cause a significant increase in vertical movement due to the combination of the load.

**Keywords:** *Vertical-horizontal load, single pile, vertical displacement*

## Evaluation of Silt Content in Natural Sand Used as Building Materials: A Statistical Analysis Approach

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<sup>2</sup> Ministry of Public Works, West Nusa Tenggara Province, Indonesia  
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**Abstract.** The excessive amount of silt within natural sand may reduce the bonding between sand and other constituent materials when used as building materials. The maximum amount allowed varies from 4 to 10%, and the allowable amount according to the Indonesian Standard (SNI S-04-1998-F) should be less than 5%. This study aims to evaluate the amount of silt in natural sand from several sand quarries in Lombok, Indonesia. The natural sand samples were collected from eight sand quarries in Lombok and the silt content was determined based on weight measurement. The study was designed to assess the silt content of each sand quarry against the SNI and also compared the silt content among the quarries. Two appropriate statistical analysis methods were applied; one-sample t-test and analysis of variance (ANOVA). The main conclusion drawn was that most of the natural sand in Lombok contains high silt content. The one-sample t-test results showed that the P-value of seven out of eight quarries was greater than the significance level ( $\alpha$ ), except for the sample taken from Sukadana. This value indicates that the silt content pretty close to the maximum value allowed by the SNI, which is already critical to be used as a building material. Meanwhile, the ANOVA result shows that the silt content from all sand quarries does not have a significant difference, which is indicated by the P-value greater than 0.05. Nevertheless, the result of a further analysis using Fisher's test shows that the sand collected from Sukadana quarry has fairly low silt content and differs significantly from the others. It is strongly recommended to give a proper pre-treatment such cleaning process before using sand in this area as a building material.

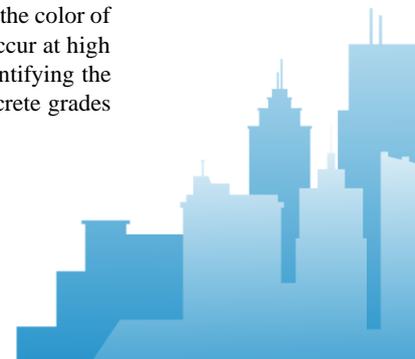
**Keywords:** Silt Content, Inferential Statistics, Material Assessment.

## Investigation of Polypropylene Fiber Reinforced Concrete after Elevated Temperature Using Color Quantification and Alkalinity Method

Ni Nyoman Kencanawati , Suryawan Murtiadi, and Zul Aida Nur

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**Abstract.** Concrete properties change when it is exposed to high temperature. Fire can reduce the strength and the stiffness of the concrete. Another visible thing is the change in the color of the concrete. Furthermore, a decrease in the alkaline degree of concrete can also occur at high temperatures. This study combines quantifying the value of the color change, quantifying the alkaline level, and evaluating the residual strength of post-fire concrete. Two concrete grades



were prepared: 25 MPa and 45 MPa and exposed to a high temperature of 300°C and 700°C. The amount of 1.8, 2, and 2.5 kg/m<sup>3</sup> of polypropylene fiber were added to the concrete. According to the temperature rise analysis, the farther the position from the concrete surface causes a decrease in temperature. The 2.5 kg/m<sup>3</sup> fiber content shows more excellent post-fire mechanical performance because it provides the pores needed by concrete when water vapor pressure occurs due to high temperature; therefore, cracks in the cement paste can be avoided. Visually, the color change between grade 25 MPa and 45 MPa are the same in each temperature; however, they have different coordinates as observed by the color test. Furthermore, the addition of 2.5 kg/m<sup>3</sup> fiber to the concrete contributes a superior effect to prevent the decrease of the alkaline level during the fire.

**Keywords:** Concrete Color Quantification, Concrete pH, Elevated Temperature, Polypropylene Fiber.

Paper ID : 013

## **Risk Analysis of Shared Marine Space in The View of Traditional Fishermen Perceptions in The National Tourism Strategic Area of Lombok, Indonesia**

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**Abstract.** This research is in Gili Air, North Lombok Regency. This island is one of the three islands which is the National Tourism Strategic Area. The dominant livelihoods of local residents are traditional fishermen, self-employment and tourism support activities. It is a natural thing, if the port in the region is designed as a tourist port. Likewise, when submitting a plan for operating a tourist port, various risks are reviewed, but they often do not involve the economic value of fishermen's failure to catch fish. This is a gap that is considered important in this study. This study is the result of preliminary research from the Doctor Program thesis, which the purpose of this study is a risk analysis that places fishermen in the common use of marine space as part of the risk forming components of a tourist port. The research method used "Cause and Effect Analysis"[11][12][30] which is a structured method to identify possible causes of a risk. This method classifies the causes of risk into categories to facilitate identification [35][36]. This study proves that the causes of risk formation from low income of fishermen are water traffic, equipment and catch marketing, respectively. The detailed analysis shows that the synergy of the organization, schedules and services of the wharf and anchor grooves are the sub-cause of the risk.

**Keywords:** Risk Analysis, Traditional Fisherman, Cause and Effect Analysis, Perceptions.

Paper ID : 014

## **e-Peralatan System as an Equipment Management for Disaster Mitigation on Indonesia National Roads**

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**Abstract.** The e-Peralatan is an information system developed to optimize the cycle time of heavy equipment owned by National Road Construction Agencies of Central Java and Special Region of Yogyakarta. Heavy equipment is used to support the process of construction, maintenance, and disaster mitigation that impact the national road in the work area. The type of heavy equipment contained in the e- Peralatan is known as DRU (Disaster Reacting Unit) that consists of excavators, motor graders, wheel loaders, vibrator rollers, dump trucks, and dozers. This paper aims to explore how to create e-Peralatan system as a equipment management for disaster mitigation. Preliminary data were gathered by inventorying equipment, identifying existing business processes, and collecting documents related to equipment utilization. Then, the preparation of utilization framework involving National Road Construction Agencies of Central Java and The Special Region of Yogyakarta, local government, and publics. We found that there is no digital equipment management system for disaster mitigation. At the end of the dissemination, all parties have the hope of digital equipment management that can be utilized together. Our findings indicate that e-Peralatan provides many changes in the business process compared to conventional methods. The changes are including less standby time, faster equipment rental ordering time, cost certainty, time certainty, document administration certainty, and process certainty.

**Keywords:** Disaster, Heavy Equipment, Digital System, e-Peralatan.

Paper ID : 015

## **The performance of horizontal drain as a landslide mitigation strategy**

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**Abstract.** Landslides often occur during or shortly after heavy rains in several locations. One of the preventive efforts proposed is the removal of groundwater levels from the subsurface. A method proven to be effective in achieving this is the application of horizontal drain to increase the safety factor on a slope against landslides, especially during the rainy season. This research was, therefore, conducted to summarize the results of previous studies both on a field scale and numerical analysis to determine the effectiveness of horizontal drain on landslides. The results showed the horizontal drain has the ability to effectively lower the groundwater level at different degrees depending on soil parameters, rain conditions, the topography of the area, and

the dimensions used. Moreover, the horizontal drain was also able to increase the slope safety factor by 1-4% for 1-meter groundwater level decrease and almost 20% for 9-meter groundwater level decrease.

**Keywords:** Landslide, Horizontal drain, Landslide due to rainfall.

Paper ID : 016

## Seismic Microzonation of Yogyakarta Province Based on 2019 Risk-targeted Maximum Considered Earthquake

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**Abstract.** Yogyakarta Province is located close to two active seismic sources, Opak Fault which crosses the province area and the South Java subduction source which is located at the south of Java island. The province is located at the southern part of Java island. Based on the Indonesian earthquake database, from 1984 to 2015 at least seven earthquakes struck this province. The 2006 earthquake with 6.2 Mw magnitude was the largest earthquake to hit this area, causing approximately 88,249 buildings to be totally destroyed and 98,343 buildings to collapse. Most of the destroyed and collapsed buildings were constructed based on the old version of the seismic design code. Improvements in earthquake research have already been conducted in this area and the latest research was conducted at 2016. According to the New Indonesian seismic code 2019, improvements in seismic acceleration for building design need to be adjusted in this area. This paper described the seismic microzonation of Yogyakarta Province based on the New Indonesian seismic maps and 2019 seismic code in terms of the Risk-targeted Maximum Considered Earthquake. The analysis was performed by conducting a combination of three seismic hazard analysis, namely probability, deterministic and Risk-targeted Ground Motion. Based on the Risk-targeted Maximum Considered Earthquake data calculated and its distribution in this area, an area with a maximum 10 km radius from the Opak Fault trace was detected as the largest acceleration area. This area can be used as an indicator of a dangerous area of the province when subject to earthquake ground motion.

**Keywords:** Probabilistic, Deterministic, Risk-targeted Maximum Considered Earthquake, Risk-targeted Ground Motion,.

Paper ID : 017

## Determining the Maximum Speed Limit in Residential Area

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**Abstract.** The residential area which is located on the right or left side of the arterial or collector road is one of the areas with high potential to traffic accidents. One of the efforts that can be done to reduce the number of traffic accidents is by limiting the maximum speed of the vehicle. This is done because most of the traffic accidents that occur are due to the factor speeding. The aim of this research was to determine the value of the maximum speed limit in residential areas using the 85<sup>th</sup> percentile and stopping sight distance (SSD). The study locations are in three collector roads in Purbalingga Regency namely Padamara Street, Letnan Yusuf Street, and Letkol Isdiman Street. Based on the analysis result, the maximum speed limit of vehicles based on the 85<sup>th</sup> percentile method varies between 42 up to 44 kph. The maximum speed limit based on the SSD method is 39.32 kph for Padamara Street, 38.10 kph for Letnan Yusuf Street, and 38.40 kph for Letkol Isdiman Street. The maximum speed limit of vehicles proposed for collector roads with residential area functions on the right or left side is 40 kph.

**Keywords:** Accident, 85<sup>th</sup> Percentile, Residential area, Speed limit, Stopping sight distance.

Paper ID : 018

## Investigating the Factors Influencing the Demand of School Bus

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**Abstract.** Mode choice to school is frequently influenced by both student and parent responses. However, the school bus is not a popular mode of school trip in Indonesia. Escalating the demand for the school bus is essential as reducing the use of the private motorised vehicle is a must. A stated preference survey and binary logistic regression method were performed to understand which factor influencing the willingness to ride the school bus. This study aims to investigate which characteristic of both children and parents significantly influence the school bus ridership. Factors that significantly influence students' willingness to ride school buses are gender, car ownership, and travel time to school. Furthermore, in terms of parents' permission, household factors, namely car ownership and income are significant. Direction for future study is presented.

**Keywords:** school bus, demand, influencing factors, stated preference.

Paper ID : 019

## State-of-the-art of Artificial Intelligence Methods in Structural Health Monitoring

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**Abstract.** Development of technology nowadays occur in every aspect of life, including in computational technology. Artificial Intelligence (AI) over the past years became trending topic in field related to computation as it is mimic the way human think. This is led into effective problem-solving execution for a complex problem. Solution based on AI method is proven to be time-efficient compare with traditional ways and require significantly less resource to conduct experiment. AI method is able to perform a decision making based on series of given data with relatively short time, less error and efficient in overall computation. The objective of this paper is to investigate what is the most popular AI method and with the intended use in Structural Health Monitoring (SHM) by referring to reliable publications over the past decade. This paper shows the Neural Network is the most popular AI method in terms of SHM with 38% from total research over the past decade which is used as a performance evaluation.

**Keywords:** Structural Health Monitoring, Artificial Intelligence, Machine Learning, Neural Network, Pattern Recognition.

Paper ID : 020

## Evaluation of Logistics System Performance-based on Indonesian Government Policy

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**Abstract.** The Logistics system plays an essential role in the flow of goods or services distributed throughout the country. The disparity in the price of products in one area with another area can significantly differ due to the poorly organized logistics system. Currently, Indonesia's logistics system has not been maximized, as evidenced by the high cost of logistics that account for about 23.5% of GDP nationally and still far from developed countries that are only 10% of GDP even less. This paper evaluates the performance of logistics systems in Indonesia based on government policy. The cost component that is a problem in Indonesia's logistics system will be mentioned in this paper based on journals, reports and related regulations. The data is taken by distributing questionnaires to the logistics delivery service providers. The result was that the logistics cost component that most affects the cost of logistics in Indonesia are the cost of sea and land transportation, due to too much tax and levy that needs to be spent and inadequate infrastructure.

**Keywords:** Logistics System, Government Policy, Logistics, Indonesia.

## Landslide Analysis Subject to Geological Uncertainty Using Monte Carlo Simulation (A Study Case in Taiwan)

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**Abstract.** Landslide is the primary driver of the denudational process and sediment source dominantly onsite. Landslides are one of the most disastrous effects in Taiwan; groundwater or flood erosion is highly attributed to the landslide. Water induced to the slope increases driving force and decrease resisting force causing a slope landslide. This condition is generally affecting slope stability. In this study, we attempt to consider the uncertainty of the dip angle in slope stability analysis. In this research, the Monte Carlo simulation was used to quantify the effect of the geological uncertainty. Various sources of dip angles (with mean and standard deviation) were employed to generate 100000 dip angle samples. All of the dip angles employed in this study were based on Highway no. 3 sliding events in Taiwan. Four different measurement sources, i.e., Central Geological Survey (CGS, Taiwan), Compass measurement before the sliding event, Surface measurement after the event, and LiDAR-derived data, were employed in this study.

Further, the measured dip angles were converted to the projected dip angle based on the plane's strike. Simulation results show LiDAR Measurement Source provides the lowest failure probability of 16.9%, and Central Geological Survey (CGS, Taiwan) Measurement provides the highest failure probability of 78%. Therefore, based on the engineering design concept, if the design performed using the CGS data, the engineering design must be very conservative compared to the design using the LiDAR data

**Keywords:** Landslide, Geological Uncertainty, Monte Carlo Simulation

## Mapping Literature of Reclaimed Asphalt Pavement Using Bibliometric Analysis by VOSviewer

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**Abstract.** The purpose of this paper is to map the research topics of reclaimed asphalt pavement and to find potential topics for further research. This method uses the Scopus meta data source with the bibliometric analysis technique with the VOSviewer tool. From this analysis, it can be seen that there are many relationships between RAP and the topic of aggregate, mixing, hot-mix asphalt and compressive strength. However, topics that have not been widely researched include extraction, micro structural properties, furnaces and interfacial transition zone in the RAP. Most authors write RAP such as Xiao F, Amirkhanian S N, Daniel J S, Canestrari F, Huang B, Zaumanis M and Arulrajah. And countries that have contributed greatly to RAP research are from many authors such as America, China, Italy and India.

**Keywords:** Reclaimed Asphalt Pavement, Bibliometric, VOSviewer.

Paper ID : 025

## **A Probabilistic Model of Container Port Demand in Java Concerning the Port Hinterland Connectivity**

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**Abstract.** The port demand could be modelled from the port choice of the ports' actors. From the actors' perspectives, factors influencing port choice do not solely depend on the port performance itself. As a port is an interchange location of land and sea transport, the port selection is closely associated with the inland mode choice. This study applies a multinomial logit (MNL) model to predict the probability of a joint port and inland mode choice in Java, Indonesia. Six factors classified into port performance and port hinterland connectivity are applied to estimate the probability of port demand. The model also allows us to estimate the port hinterland boundaries as a corollary of port choice made by the actors. Further from the simulation on several transport strategies, introducing Patimban port as a new container port in Java greatly affects the adjacent port demand. Reducing rail transport time and improving port performance also leads to substantial port and mode shifting for container transport in Java.

**Keywords:** MNL model, Port choice, Inland mode choice, Port hinterland connectivity.

Paper ID : 026

## **Shear strain evaluation on analysis of additional clay liner layer modeling in Ngipik landfill, Gresik**

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**Abstract.** The discovery of new faults in the East Java region has led to different perspectives of analyzing dynamic infrastructures including the landfills and one of the major factors in understanding the local site effect is the shear strain. The Ngipik landfill in Gresik, East Java has been using an open dumping method which involves direct disposal of wastes into the surface pit since 2002. There is, therefore, the need to implement strategies to avoid groundwater contamination and one of the appropriate methods is the addition of clay liner. Therefore, this research applied different forms of this method in four simulated modelings and four profiles to assess its efficiency in terms of the surface area dynamic properties using finite element analysis. The result showed the shear strain reduced by approximately 40% from the existing condition. This, therefore, shows the importance of adding a layer such as the clay liner in open dumping landfill.

**Keywords:** Clay liner, Shear strain, Dynamic

Paper ID : 027

## Characteristics of foreign motorcyclists in tourism areas in Bali

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**Abstract** Along with the development of tourism, the number of foreign motorcyclists also increases. Meanwhile, it is widely known and empirically found that foreign riders are prone to greater risks than domestic riders in most countries around the world. This is due to different traffic cultures. Therefore, safety measures of foreign riders are highly important. (Yoh, et al. 2016) This study examined the characteristics of foreign motorcyclists in tourism areas in Bali, as a preliminary study on the behaviour of foreign motorcyclists in tourism areas in Bali. This study was conducted through questionnaire survey on 30 foreign motorcyclists. The results obtained were analyzed using SPSS. Based on the survey results respondents' characteristics were categorized based on gender, age, education, marital status, and countries of origin, driver's license ownership, purpose of riding and the riding distance traveled.

**Keywords:** characteristics, motorcyclist, foreigner

Paper ID : 028

## The Stability of A Slope On Soft Soil Using The Hardening Soil Model

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**Abstract.** The development of reservoir construction does not always stand on with good carrying capacity soil, on the part of the existing soil layer with a soft to very soft constancy.

About 10% or more of the total area in various regions in Indonesia or more precisely about 20 million hectares are soft-land which is composed of soft soil and moss soil. If we look at the problem of soft clay soil, which is very influential in the construction of the construction and its success, soil repair must be done first therefore the construction is not dented already the predetermined and intentional age. There is a soil repair solution that is minimal in cost but very good and effective for maintaining the stability of the landfill, namely by using a soil repair system with a retaining wall. The Finite Element Model is a method of research to solve a problem in a study or field of mathematics and physics. This method presents several parameter estimates for an amount of distinct scheme nodal constructions not known. The Hardening Soil Model Standard or what can be abbreviated as (HS) is a continuation of the advanced soil behavior model. But the value or number of soil stiffness can be described, analyzed, and explained in more detail and accurately using stiffness. There is three dissimilar effort arduousness, called triaxial load stiffness ( $E_{50}$ ), triaxial loading stiffness ( $E_{ur}$ ), and one-way load stiffness ( $E_{oed}$ ). In a convincing case, the Hardening Soil Model or (HS) method is proven to be more truthful and closer to field conditions. It can be seen and has been proven from numerous previous studies that show the Hardening Soil Model (HS) method is very distinctive and accurate by the outcomes of field testing. The charge of the safety factor or (SF) obtained after the investigation of slope constancy on soft soil using hardening soil modeling analysis is 1.59.

**Keywords:** Reservoir construction, Soil improvement, Hardening Soil Model

Paper ID : 029

## **A Review on Application of Machine Learning in Building Performance Prediction**

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**Abstract.** Designers usually use Building Performance Simulation (BPS) to support decision making in facing design requirements and expected building performance. However, the fact is that BPS still experiences several limitations, such as BPS requires high computation time in assessing various design options. Machine learning is considered capable of solving the problem that the existing BPS has. Research on this problem has been conducted to provide solutions and prove the reliability of machine learning in predicting building performance. Therefore, this paper aims to discuss the research and overview of how machine learning has been used in predicting building performance. The results show that, performance prediction using machine learning has been developed on energy and environmental performance. Also, machine learning can significantly reduce the prediction time without reducing its accuracy.

**Keywords:** machine learning, building performance, energy performance, environmental performance.

## Implementing a Relational Database in Processing Construction Project Documents

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**Abstract.** Construction project documents are very large and complex, and most of those are still carried out with traditional systems, consequently, it takes a lot of time to process, low accuracy, cannot be stored for long periods, and make it difficult for future engineers to access historical data project for the next project planning. The current researchers have responded to this situation by trying the implementation database management, however, it has not had a significant impact on the industrial field. Thus, the study of the application of relational databases through SQL with a different approach, namely integrating project tables such as resource tables, cost items, work items, and project drawings, which are currently being worked on separately. As the output, it would be demonstrated into a supply chain management table (table\_3), construction cash flow (table\_4), and the quantity take-off management table (table\_5). The total project price from the result of the SQL program shown in supply chain and project cash flow tables is IDR 1,42 billion with a project duration of 109 days. The SCM table describes the types of resources used in the project including the quantity and price values. Then, the table of CSF contains a list of cost items along with the volume and price of work for the budget plan and cash flow plan. Moreover, QTO table describes the association between cost items and project drawings intended to project surveyors for the quantity take-off management process. Project managers are always required to make decisions for project control appropriately such as cost estimation, resource planning, and project schedule effectively. Therefore, through those three tables, the authors hope they can help construction practitioners to improve their construction projects efficiently in the future.

**Keywords:** Relational Database, Construction, SQL.

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Paper ID : 031

## Reducing the Release of Greenhouse Gases in the Rigid Pavement Material Transportation Process Unit

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**Abstract.** Material transportation of the road construction project has had some negative impact on the environment, one of which is the release of greenhouse gas emissions. In an attempt of developing sustainable development strategy, there is a need to identify and quantitatively evaluate the GHG emission reduction opportunities that exist in material transportation of the rigid pavement life cycle. The aims of this study is to estimate and evaluate the reduction of greenhouse gas emissions in the rigid pavement material transportation process unit. The life cycle assessment was used to estimate the greenhouse gases emissions. The evaluation of greenhouse gas emission reductions is not only on the percentage of the reduction, but also on the cost effectiveness of the reduction. The cost effectiveness analysis (CEA) was used to calculate cost effectiveness. The result shows that a reduction in greenhouse gas emissions in the variation of the use of dump trucks in the rigid pavement material transportation process unit ranged from 2.89% to 6.24%. Each alternative to reducing emissions has the potential to reduce greenhouse gas emissions at a cost comparable to reduced emission.

**Keywords:** reducing, greenhouse gases, rigid pavement.

Paper ID : 032

## Life Cycle Analysis of Permeable Pavement In The Urban Area Using Mechanistic-Empirical Performance

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**Abstract.** In the second half of the twentieth century, climate science has observed significant climate change events. Climate change scenarios such as increased temperature and precipitation in the urban area have resulted in disaster such as urban heat island effect or flooding streets. In response to the these extreme climate scenario, engineering communicates have proposed the permeable pavement technology. Permeable pavement is a type of pavement that allows water to flow through existing cavities into the pavement. The benefits of permeable pavement include reducing storm water runoff, reducing heat island effect, improving water quality, and noise reduction. However, the concept of permeable pavement is opposite to traditional pavement engineering that the intrusion of water may resulting in moisture damage of pavement materials or degradation of structural capacity. In this study, mechanistic-empirical analysis was performed to model the performance of permeable pavement in the subtropical climate with two variation of base and soil materials under both low and high traffic scenario. The performance criteria of fatigue cracking and rutting were used to determine the service life of permeable pavements. Furthermore, the estimated pavement performance was used to

perform the life cycle analysis of the permeable pavements. All sustainability aspects including economic, environmental, and social during the construction, maintenance, and operation periods were modeled for 20 years analysis.

**Keywords:** Permeable pavement, mechanistic-empirical analysis, climate change, life cycle analysis, sustainability.

Paper ID : 033

## **Water Quality Mapping on The Coast of Bangkalan Madura Based on The Acidity Value from Aqua MODIS Satellite Imagery**

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**Abstract.** This study aims to present a map of the acidity values distribution along the Bangkalan, Madura coastline to illustrate the water quality based on its acidity value by implementing remote sensing technology that used the reflectance value at wavelengths of visible light which is correlated with acidity value (pH). This information could be essential to people who live on the coast, so they could be more aware of the water quality changing because most of them depending on their livelihood from fishery activities. Based on the calculation, the mathematical models that can represent the pH value are exponential and linear algorithms due to their number of  $R^2$  value compared to other models, with 0.779 and 0.773 values, respectively. Furthermore, the study result indicates that acidity in the Bangkalan coast is in the range of 6.4 to 6.98 which obtained by an exponential algorithm, and 6.57 to 6.98 which was obtained by a linear algorithm, respectively. This study concludes that the distribution of acidity in the Bangkalan coast is still within the safe pH range for aquatic ecosystems on the coast.

**Keywords:** Acidity Value, Aqua MODIS Satellite Imagery, Madura

Paper ID : 034

## **Numerical Simulation of Slope Stability for Soil Embankment Reinforced with Inclined Bamboo Piles**

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**Abstract.** Slope stability is an important parameter when designing for the embankment. Poor-quality and degradation properties of soil material became triggers slope failure. Bamboo culm (*Dendrocalamus asper*) provided a diameter of 6 cm to 15 cm and high tensile strength parallel to the grain, and it was suitable for slope stabilizing. Slope stabilization by bamboo pile is a passive technique in which soil displacements require to activate pile forces. In this manuscript, two-dimensional (2D) model slope reinforcement with bamboo pile with the shear strength reduction (SSR) finite element method (FEM) by using ABAQUS SE software has simulated.

The bamboo piles with 5 m length and 6 cm, 10 cm, 15 cm for diameter were placed two in the edge, one in the middle, and inserted perpendicular to slope plane embankment with the inclination of  $33.69^\circ$ . The model of the slope was analyzed, its influence on bamboo piles soil interaction by evaluating the safety factor (FOS). The result has shown that reinforced embankment slope with inclined bamboo piles had increased slope stability, the safety of factor (FOS) increase to 1.515. The shear strength reduction (SSR) finite element method (FEM) can be used as an alternative for slope stability analysis.

**Keywords:** Slope stability, SSR, FEM, Reinforcement, Bamboo Pile

Paper ID : 035

## **Identification Risk Potential Hazard of Railway Project Based on The Work Breakdown Structure to Improve Safety Performance**

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**Abstract.** Railway construction work is carried out in developing or developed countries around the world. The railway was built as a means of mass transportation to support connectivity between places. Railway construction work is one of the complex construction projects. Construction accidents can hamper many work activities. It is not uncommon for construction accidents to occur in construction that affects people, property, public safety, and the environment. For this reason, it is necessary to identify and analyze the risk of hazards from the beginning to prevent the occurrence of these construction accidents. This study aims to identify the potential hazards in each work package by reviewing work methods, work activities, and WBS-based resources for standardized railway construction using a qualitative approach. This re-search is expected to produce safety risk sources with the highest potential hazards in the railway construction works. The risk of construction accidents can be reduced or even zero risks of construction accidents (zero accident) during construction project activities.

**Keywords:** Railway, Work Breakdown Structure, Risk, Safety Performance.

Paper ID : 036

## **Investigating Construction Project Delay Using Fault Tree Analysis Based on Its Dominant Risk on Private Project**

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**Abstract.** The team project has already arranged the project planning and scheduling, but so many projects have deviations in the schedule. Simultaneously, the project is highly dependent on the existence of all project participants and their environment. The previous study has resulted in many variables that cause project delays but has no ability to predict them in the future. In this research, the author did the survey and interviewed to solve this problem by knowing the causative factors and predicting the probability of their occurrence. Therefore, this study uses the FTA model to predict project delay events based on their variables and mitigate them. Due to so many risk variables, this study used the Pareto diagram to filter them. This diagram can reduce 16 variables into seven variables with the highest risk. The simulation results state that the probability rate of construction project delay on all variables is 0.1000. Still, each variable's contribution, namely environment, worker variables, contractor performance, owner roles, and Construction Management (CM) consultant roles, is 0.0766 0.0138, 0.0074, and 0.0064, respectively. This model has been validated based on existing project data and produces relatively the same occurrence, i.e., the project has behind schedule. Finally, this research also provides mitigation to minimize the risk of project delays.

**Keywords:** Project Delay, FTA, Simulation.

Paper ID : 037

## **Seismic Performance Analysis of Multi-story Buildings with Addition of Bracing Based on SNI 1726: 2019 (Case Study: Airlangga University Parking Building)**

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**Abstract.** There are various alternatives to improve the performance of a structure in resisting lateral forces. One of them is the addition of types X, V, Z, and inverted V braces or stiffeners to the elements of the portal structure. The research aims to study the effect of X and V's bracing types on the behavior of special moment-resisting frame systems of building using the response spectrum analysis method. For analysis purposes, 3 models of the frame were used, namely without bracing, with type X braced frame, and type V braced frame. The three models can be used to fulfill the requirement of service limit performance, ultimate limit performance, and control of the P-delta effect. The biggest drift between floors occurs in modeling without bracing. Significant changes occur in modeling with bracing type X and type V with a drift reduction of 51.5% and 63.8%. The result shows that the use of bracing can increase the stiffness and strength of the structure. The optimal bracing performance in this study is bracing with type X.

**Keywords:** moment-resisting frame systems, bracing, response spectrum analysis.

## The Implementation of Functional Road Assessment On Pramuka Road Section In Klaten District

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**Abstract.** Roads as one of the important facilities in transportation have a role as a distributor of goods and services, as an economic driver, so it is necessary to improve the quality of the roads so as to improve driving safety. Based on the Minister of Public Works Regulation No. 11 / PRT / M / 2010 each regent / major must conduct an evaluation of functional road assessment on district / city roads. The district road that was reviewed for the implementation of the research was Pramuka Street with the function of being secondary local. The purpose of this study is to determine the functional assessment eligibility category of roads and to provide recommendations so that Pramuka Street can achieve eligible function. The difference with previous studies is a review of the location, types of roads based on their function, and an assessment of the administrative component. The data required is in the form of technical requirements and administrative requirements. Component assessment is carried out by means of direct measurement and assessment in the field and requires secondary data obtained from an agency. The analysis is done by calculating the deviation results for each component inspection. The results of this study concluded that the Pramuka Street was categorized as conditional function. The recommendations given still need improvements in geometric road techniques, pavement structure techniques, complementary building techniques, traffic engineering management techniques, and road equipment techniques. Road administration documents for those that do not yet exist are also immediately completed and the document procurement process also needs to be accelerated immediately. Recommendations are given so that roads can achieve an eligible function condition.

**Keywords:** Functional Road Assessment, Secondary Local, Functional Assessment Eligibility Category, Recommendations.

## The Effectiveness of Infiltration Wells as an Alternatife Eco Drainage System to Control Flooding in Mangkubumen Village

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**Abstract.** The city of Surakarta is a lowland area located in the slopes of Mount Lawu and Mount Merapi. Therefore, the city of Surakarta is prone to inundation and flooding. Mangkubumen Village is one of the areas that is quite dense and often inundation and flooding



occurs during the rainy season. This problem occurs because the conventional drainage system cannot accommodate runoff water. Urban drainage planning must take into account the environmental drainage function (Eco drainage). One of the eco drainage methods is to use infiltration wells. This research is descriptive quantitative. The main objective of this research is to determine the reduction of runoff by implementing infiltration wells in Mangkubumen Village so that the channel can accommodate water according to its normal capacity. Comparative analysis shows the return runoff discharge of 2, 5, 10, 20, 50, 100 years is 1,956 m<sup>3</sup> / second, 1,996 m<sup>3</sup> / second, 2,017 m<sup>3</sup> / second, 2,035 m<sup>3</sup> / second, 2,055 m<sup>3</sup> / second, and 2,069 m<sup>3</sup> / second. The existing drainage channel is 1,767 m<sup>3</sup> / second. After the application of infiltration wells, the capacity of the eco-drainage system is 2,121 m<sup>3</sup> / second. This shows that the drainage channel can accommodate runoff discharge up to a 100- year return period.

**Keywords:** Eco drainage, Infiltration well, Urban drainage, Conventional drainage.

Paper ID : 041

## **Validation of TRMM Rainfall Data on Slope Stability in Karanganyar, Indonesia**

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**Abstract.** The use of TRMM rain data is one source of solving the lack of rain data sources in Indonesia. TRMM satellite data has not been widely used, so the validation of the data needs attention. TRMM GMap\_NRT is one type of satellite data that can be used as a source of rain data. However, research on the validation of TRMM GMap\_NRT rain data has not been widely discussed. This study presents the validation of the GMap\_NRT TRMM satellite data against the rain gauge's regional rain data in the Karanganyar area, Central Java. The data validation was also carried out on soil stability at the site, considering that the research location is landslide-prone. This validation compares the safety factor (SF) value from calculating the two types of rain data (TRMM GMap\_NRT and rain gauge). Rain indicators for regional rain are Jatipuro, Tawangmangu, and Karangpandan. Rainfall processing used the Thiessen Polygon method. Infiltration processing used the SCS-CN method. The data validation used the r correlation equation approach and the calibration coefficient was obtained. The correlation coefficient and error values are 0.76 and 251.63 mm/month (20.97 mm/day). The TRMM rainfall data were then analyzed to find the value of slope stability by analyzing the annual maximum two-day rainfall. The results of this study are a map of the SF for 7 years (2014-2020). The conclusion of this study is the SF map for seven years does not show a significant difference. However, further research in this regard is highly recommended.

**Keywords:** TRMM Validation, TRMM GMap\_NRT, Rainfall, Landslide.

Paper ID : 042

## The Behavior of RC T-Beams Strengthened FRP Rods and Sheets Under Loading-Unloading

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**Abstract.** The latest regulation on earthquake loading on building structures has been issued by the Indonesian government (SNI 1726:2019). The regulation changed earthquake acceleration in several locations in Indonesia. The existing structure of the building on the location that increased the spectrum response needs to evaluate the structure of the building to ensure the structure is safe against the earthquake loading. The Previous research prove that strengthening the beam with Fiber Reinforced Polymer (FRP) can significantly increase the moment capacity. This research will develop previous work about strengthening reinforced concrete beams with FRP rods and sheets under loading-unloading. The beam will receive loading-unloading in the mid-span with a displacement control loading cycle each 1/10 of maximum displacement under monotonic loading with a static loading rate = 0.0015 mm/s. Analysis beam characteristics based on pattern behavior, load-displacement relations, moment-curvature relations, and ductility of the beam. This research is still ongoing and predicted that the strengthening with FRP Rods and Sheets on the reinforced concrete beam will increase the load carrying capacity, ductility, and capacity of dissipation energy. The load-carrying capacity of the beam under loading-unloading will be smaller compared to monotonic loading.

**Keywords:** Reinforced Concrete Beam, Fiber Reinforced Polymer, Loading-Unloading

Paper ID : 043

## A Proposed Method of FRP Anchorage for FRP Confined Over-Reinforced Concrete Beam

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**Abstract.** Fiber Reinforced Polymer (FRP) is a material for strengthening, retrofitting or confining concrete elements. Research on the FRP performance demonstrated that debonding was one of the major failure modes, reducing the ultimate capacity of the composite action between the FRP and concrete. Debonding between FRP and concrete is mostly characterized in the interfacial transition zone (ITZ). Increasing the bond performance in the ITZ is conducted by applying an anchorage system to prevent premature bond loss. The aim of this paper is to propose three concepts of FRP anchorage systems and evaluate their usefulness and theoretical effectiveness. For evaluation, an over-reinforced flexural member is externally strengthened using carbon fiber wraps, the compression area of this member is confined using a u-shape configuration. The three types of FRP anchorages introduced in this study are the spike, insertion, and stitch anchor. It is expected that the anchors will increase the bond performance between the concrete and the CFRP, preventing premature failure and increasing the concrete

strength and deformation behavior due to the confinement effect. At further stages, full size elements will be tested to prove this hypothesis, and to evaluate which type of the three anchors is the most effective.

**Keywords:** fiber-reinforced polymer, anchorage, confinement.

Paper ID : 044

## **Marshall Characteristics of Asphalt Mixture with Water Hyacinth Ash as Filler**

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**Abstract.** Road pavement is a quite important to support the mobilization of goods or services. Asphalt pavement is the main type of road pavement constructed in Indonesia. This kind of pavement consists of several materials, such as coarse aggregate, fine aggregate, asphalt as binder, and filler. Cement as filler is generally used in Indonesia, however, because of high cost, ones are more preferable to seek the substitute of cement. One type of material that could be used as cement substitute is water hyacinth, due to chemical properties it possesses. Water hyacinth contains chemical cellulose from organic polymers, and in the form of ash, it has a potential to increase the quality of asphalt. The purpose of this study was to evaluate the possibility of the use of water hyacinth ash (WHA) as a part of material of asphalt mixture. The method used was an empirical design method by conducting laboratory works to obtain primary data. The coarse and fine aggregates used came from Gringsing District, Batang Regency, Central Java Province, while the asphalt was the one with penetration grade 60/70. In this study, the content of WHA used as filler was 0%, 25%, 50%, 75% and 100% of the total weight of filler. The results showed that the increasing use of WHA will decrease the stability and durability. Therefore, it is recommended to limit the use of WHA to a maximum of 25% as filler of the asphalt mixture, as a part of the implementation of green technology in practice.

**Keywords:** Water hyacinth ash, Asphalt Mixture, Stability, Durability.

Paper ID : 045

## **The Analysis of Impact and Mitigation of Landslides using Analytical Hierarchy Process (AHP) Method**

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**Abstract.** Landslides disaster is the third biggest disaster in the last ten years in Indonesia. The impact of landslides has resulted in many materials and non-material losses, such as casualties,

physical impacts, environmental health, and socio-economy. Mitigation efforts are needed to reduce and even eliminate losses due to land-slides. In this study, the Analytical Hierarchy Process (AHP) method is used to assess the impact and mitigation of landslides so that the right decisions can be taken to deal with this problem. Questionnaires were conducted on 20 experts in the fields of disaster, geotechnical, geology and environment through direct distribution of questionnaires and google forms. The Likert scale is used as an additional method to obtain weights from the indicators contained in the last level of landslide mitigation. The results show that using the AHP method can identify the direct impacts felt by the community and the most dominant im-pacts occur due to landslides so that the most suitable mitigation efforts can be chosen based on the environmental conditions experiencing the disaster. Mitigation efforts before the disaster is one of the steps that must be taken to reduce the impact caused by landslides, structural and non-structural mitigation is carried out to mitigate the landslide hazard.

**Keywords:** Landslide, Mitigation, AHP.

Paper ID : 050

## **Literature Study: Alternative Material for Hot Rolled Sheet-Wearing Course (HRS-WC) Pavement**

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**Abstract.** HRS mixture is a concrete asphalt mixture using gaps that have a high bitumen content so that it has high flexibility and is resistant to deformation. Moreover, this pavement is suitable for application in Indonesia because Indonesia is a tropical country with high enough heat. HRS has two types of pavement layers, namely HRS-Base and HRS-WC. As a non-structural layer containing more fine aggregate and bitumen, the HRS-WC Mixture's structural strength is prone to plastic deformation with rutting on the asphalt surface. Therefore, the quality of HRS-WC needs to be improved through new specifications and the type of material used must have good physical and mechanical properties. Efforts have been made to improve the quality of the existing asphalt. Modifying the physical and chemical properties of asphalt with various added materials was to obtain cheap and good quality asphalt. This literature study aims to identify the alternative materials that can improve the HRS-WC Mixture performance based on previous studies in terms of the Marshall test results of related research. The collection and analysis of research data from books, documents, journals, and research results have obtained eight alternative materials to improve the HRS-WC Mixture's performance, namely used tire powder, concrete waste, tras, bagasse ash, rice husk ash, coconut shells, palm oil, natural rubber (latex) and coal ash. On the other hand, alternative use has advantages from economic and environmental aspects. They are replacing/reducing the use of new aggregates and reducing the amount of waste that pollutes the environment.

**Keywords:** HRS-WC, Alternative Materials, Marshall parameter, Waste

Paper ID : 052

## **Analysis of Leb Irrigation Patterns of Pipe System in Sorghum Plants in Sand Dry Lands Akar Akar Village**

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**Abstract.** To take advantage of the dry land potential in North Lombok district which reaches 38,000 ha, the government has facilitated groundwater irrigation networks (JIAT). The most visible use of groundwater irrigation networks so far has been in the community for maize farming with wasteful water use, and it is necessary to develop crops such as sorghum in order to obtain more feed availability that supports the provision of animal feed. To support this, it is necessary to support an adequate irrigation system so that it can provide economic improvement or reduce costs used. This study aims to examine the pattern of over-pipe irrigation water use in sorghum to harvest in dry sandy land on a land area of about 500m<sup>2</sup>. Leb irrigation network using 2 "pvc pipe on 6 blocks of sorghum crop land, with irrigation duration of 20 minutes and 30 minutes. The irrigation test is carried out on the uniformity, discharge, volume of irrigation water use and the pattern of irrigation for sorghum plants. Results The amount of irrigation water used by sorghum with irrigation pipe is 21.80 m<sup>3</sup>. The pattern of irrigation water distribution can be applied following the existing JIAT irrigation pattern in the field but with a shorter duration. The resulting diversity of 94% is very good so that suitable for irrigation on sorghum crops. Over-pipe irrigation systems with irrigation duration of 20 minutes and 30 minutes can provide soil moisture of about 35% - 40% so that it has the potential to be used in supporting sorghum crop irrigation.

**Key words:** . uniformity, pipe width, irrigation pattern

Paper ID : 059

## **Risk and stability evaluation of Klego Dam, Boyolali, Indonesia**

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**Abstract.** Klego Dam constructed in the 1990's and has been operated since 1993. Its main function is to supply Irrigation water of 1.353 Ha. It is located right at the boundary between Bengawan Solo Watershed and Jratunseluna Watershed. Previously, the dam was managed by BBWS Bengawan Solo. In the 2010's, the dam's management is relinquished to BBWS Pemali Juana. This management's change contributes to some discontinuity in the dam's operation and maintenance, which contributes further to the loss of some important historical data and

information of the dam. This unfavorable situation for proper operation and maintenance of the dam is further aggravated by the publication of new ground speed map for seismic design (Peta Gempa Indonesia). It is, therefore, urgent to evaluate the stability and safety of Klego Dam with the new seismic design reference even under limited available data and information. The paper presents the evaluation on the status of the dam's safety considering the seepage and slope stability. It uses Geostudio software to evaluate stability of the dam under various conditions. It also performed seepage analysis uses limited Piezometers' records. The analysis shows that the safety of Klego Dam is barely sufficient. However the dam needs some rehabilitation on its embankments, dam's crest, and its instrumentations as well as the proper implementation of Maintenance and Operation procedures. The availability on the SOP and its implementation will reduce the risk of dam's failure.

**Keywords:** Klego Dam, Stability Analysis, Seepage Analysis.

Paper ID : 060

## **The Evaluation of Irrigation Maintenance in Pacal Irrigation Area at Bojonegoro Regency, East Java**

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**Abstract.** Pacal Irrigation Area, located at Bojonegoro regency and sourced from Pacal dam, was supporting 16.624 Ha agricultural field in 5 districts including Kapas, Balen, Sumberrejo, Kepoh Baru, and Baureno. Due to its vital function as agricultural support service, Pacal irrigation network should be able to function optimally to assist high crop yields. The maintenance of irrigation then became an important concern. However, the previous survey showed poor maintenance toward irrigation infrastructure, leading to non-optimal function to crop yields. This research aimed to identify the physical condition of the irrigation network and its infrastructure in Pacal irrigation area. The evaluation is based on the Minister of Public Works and Public Housing Regulation No. 12/2005 about exploitation and irrigation maintenance system. This particular regulation determined the appropriate maintenance for efficient irrigation operation and performance, leading to optimal agricultural productivity. The result showed that the primary canal was damaged in 12,55 %, indicating a minor level of damage. Meanwhile, for the network and infrastructure surrounding the area, periodic maintenance was needed to ensure the irrigation performance running efficiently for supplying water.

**Keywords:** Irrigation, Maintenance, Evaluation, Performance.

Paper ID : 061

## **Analysis of Reinforced Concrete Capacity for Irregular Cross-Sections Using Numerical Methods**

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**Abstract.** Although reinforced concrete member usually forms the rectangular shape, for architectural reasons or an optimization purpose the section may be formed on the nonrectangular or irregular shape. Analysis of the sectional capacity in the case of non-square or irregular sections is very complex and takes time. This paper offers a cross-sectional analysis with a numerical approach that is implemented in a computer program. Several cross-sectional forms from the results of previous studies were adopted for validation purposes. The selection of the cross-section considers the representation of the cross-section shape and the configuration of the reinforcement. In addition to the cross-sectional shape, the method of analysis is also a consideration for selection. From the results of the analysis using numerical methods and comparison of the analysis of previous researchers, it shows a fairly good level of accuracy with an average deviation of 2.93%. The largest deviation was in sections 10 and 8 with a deviation of 9.19% and 7.93%, respectively. This deviation is more due to the analysis method. Analysis by using finite element method for sections, 9 and 10 show slightly higher than the numerical method due to neglecting tensile strength of concrete and strain hardening of steel on the numerical method. On the other side, the analysis with the cross-section conversion approach shows lower results. This software may be used to solve the nonrectangular or the irregular section.

**Keywords:** Irregular section, Numerical, Flexural.

Paper ID : 062

## **Key performance indicator for analytical hierarchy process used for determining the effect of reverse supply chain toward green building projects**

**Abstract.** The Indonesian state also assesses that construction is an important part of the development of a country. Concern about the negative impact of construction waste is increasing every year and encourages the development of green or sustainable buildings. Reverse supply chain aims to obtain a production output from an end-of-life process that is environmentally friendly as much as possible. The calculation of the final performance of the supply chain can be done using the Key Performance Indicator weights obtained from the Analytical Hierarchy Process method. Key performance indicator (KPI) is determined to measure the level of achievement of objectives in the supply chain.

**Keyword:** green building, reverse supply chain, analytical hierarchy process, key performance indicator

Paper ID : 063

## **Influence of The Number and The Height Steps of Terraced Model on Slope Stability Analysis**

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**Abstract.** Wonogiri is an area that has a high volume of vehicles, such as motorized, private, public, and logistics vehicles. This condition because Wonogiri is located in the border area among East Java, Central Java, and the Special Region of Yogyakarta. This area also has high susceptibility to landslide due to its topography. The landslides occur are not only due to the weight of the slope itself but also because of excess external loads, specifically traffic loads. The road class was designed with an assumption of Average daily traffic (ADT) of 3,000 pcu / day (local road) and the width of the road is 3 m [1]. This paper used 3 types of traffic loads: Own Weight (BS) + pavement + truck's load on two paths, BS + pavement + truck's load on one path, and BS + pavement. Slope stability analysis using the limit equilibrium method. The addition of steps affects increasing the value of the safety factor(SF), even though many models have not reached the SF of Bowles recommendation but the result has increased the safety factor significantly. The more steps of terracing model, the higher the SF value of slope stability. The height variation in the same number of steps proves that the height of steps can affect the safety factor value in the same number of step variations. Therefore, the more step height design, the higher the steps could resist the vertical load (in this case is the traffic load).

**Keywords:** Terracing, Steps, Safety factor, Slope.

Paper ID : 064

## **Identification of Traffic Accident Hazardous Location and Cost of Accidents in Developing Country (Case Study of Tabanan Regency, Bali-Indonesia)**

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**Abstract.** Road traffic accidents have long become a major issue in Indonesia. The number of accident fatalities has increased following the increase in population and motor vehicle ownership. The increase in traffic accidents will be followed by an increase in traffic accident costs. As limited funds are available, one important step required is to identify traffic accident hazardous locations. Previous studies on black spots in developing countries such as Indonesia mainly did not consider the frequency of each type of accident, the impact on mitigation measures such as shortcuts development in reducing accidents, and the cost of traffic accidents. The objectives of this study were to identify black sites and black spots, calculate economic loss due to road traffic accidents, and evaluate the impact on the shortcut's development. This study applied a z-score to identify black sites and CUSUM to identify black spots. The cost incurred due to the accident was analyzed by using the gross output method. Three road sections

were found to be the locations of accident-prone areas (black sites). By comparing conditions before and after three shortcuts were built on black spot location, it was found that the existence of the shortcuts has reduced the number of traffic accidents by 70%. The refinement of the road infrastructure has reduced the number of traffic accidents significantly. The average annual cost of accidents in the Tabanan Regency was IDR 10,115,918,496/year.

**Keywords:** Accident Costs, Black-Sites, Black-Spots, CUSUM, Z-score.

Paper ID : 065

## **Assessment of Flash Flood Susceptibility Potential Based on Frequency Ratio Approach in the Wonoboyo Watershed in East Java, Indonesia**

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**Abstract.** Flash floods that occur suddenly, which cause damage to the weirs or embankments, immediately threaten human life. Identifying the causes of a flash flood is very important to do to reduce its negative impact. This paper examines changes in flash flood disasters in the Wonoboyo watershed based on estimates of flash flood hazard, land-use changes, and rainfall depth distribution patterns. The method of predicting susceptibility to flash flood hazards is based on various environmental factors that are integrated with GIS. Three bivariate statistics consisting of the Statistical Index (SI), Frequency Ratio (FR), and Predictor Rate (FP-PR) model are applied to select the best Flash Susceptibility Index (FFHSI) model. Changes in land use are then explored based on the conditioning factor for a flash flood. In the final stage, the estimation of areal rainfall uses Inverse Distance Weighting (IDW) to describe the position of rain and flash flood events. The best statistical bivariate statistical approach for the FFHSI is FR. Assessment of environmental factors using the FFHSI shows that 21% of the catchment area has moderate to high until very high vulnerability levels. Changes in land cover significantly affect flash floods, especially changes from forest to agricultural land or settlements. The distribution pattern and intensity of rainfall are closely related to the location of the flash flood. This study results can guide future flood mitigation measures.

**Keywords:** Flash Flood, FFHS, Land-Use Change, Rainfall Distribution, Wonoboyo Watershed

Paper ID : 066

## **Incorporating Cultural Attributes into Disaster Risk Reduction-Based Development Plans in Indonesia**

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**Abstract.** Frequent occurrences of natural disaster in Indonesia cause major problems in the form of financial losses and social disturbances. Disasters with tremendous impacts disrupt the administration of state and hinder the development processes, mainly because the events require expensive and long recovery process. The issuance of Law No. 24 of 2007 on Disaster Management has triggered a paradigm change in disaster management in Indonesia. The management of disaster which previously tended to be responsive and spontaneous has shifted toward preventive and more focused on disaster preparedness and risk reduction. This law explicitly states the responsibility of the government in the implementation of Disaster Management in the form of disaster risk reduction and its integration to development programs. In addition, in the implementation of Disaster Management the government has the authority in determining disaster management policies in line with national development policies. But it is undeniable that there were many cases where different approaches between government and community emerged and become sensitive issues in dealing with disasters management particularly in disaster risk reduction. In this paper a series of intensive community involvement in the form of focus group discussions has been proposed and should be carried out by government in the preparation of development plans. This includes early round of activities followed by formal round of consultation before a draft document of development plans is prepared. Accommodating local wisdom through this robust community engagement is essential in the governmental strategy preparation process. It is a valuable addition and an effective integration in the action strategies of integrated disaster risk reduction so that an appropriate planning decision including the resulting mitigation plan and disaster-resistant infrastructure accepted by the community can be implemented in the disaster prone areas.

**Keywords:** Disaster management, disaster risk reduction, data and geospatial information, cultural attributes, disaster-resistant infrastructure

Paper ID : 067

## **Evaluation of the Implementation of Fire Safety Management Based on Work Breakdown Structure Affecting the Insurance Premium Costs of High-Rise Lecture Buildings**

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**Abstract:** High-rise buildings, especially lecture buildings, have the potential for fire hazards which can cause large losses. Fire risk is one of the factors that must be minimized in a building operation where insurance is a way of transferring the risk. However, the amount of fire insurance premiums in various insurance institutions

varies greatly due to differences in the determinants of insurance premium costs. The purpose of this study is to evaluate the application of fire safety management in high-rise lecture buildings in Jakarta and determine the determinants of premium costs that are influenced by the implementation of fire safety management. This determining factor is a tool to determine the amount of the insurance company's fire insurance premiums. This research refers to literature studies, surveys, interviews, and data obtained using a questionnaire instrument. This study uses the work breakdown structure as a tool to detail indicators that meet the fire safety management criteria and the data are analyzed using the SmartPLS 3.0 software. Based on the survey results, the data shows that the lecture buildings in Jakarta haven't fully implemented fire safety management. In addition, there is no clear relation regarding the role of insurance in fire protection financing in lecture buildings. To address this, we propose to consider the extent to which high-rise lecture buildings implement fire safety management in determining insurance premium rates to improve the application of fire safety management in high-rise buildings, by processing the data using SmartPLS 3.0 and average analysis in order to obtain priority factors in fire safety management which can be used as a determinant of realistic premium costs. As the result, the most priority factor in fire safety management which can be used as a determinant of realistic premium costs is fire prevention in lecture buildings, and the least priority factor is safety of people in the event of fire.

**Keywords:** Fire Safety Management, Work Breakdown Structure, Insurance Premium Costs, Lecture Buildings

Paper ID : 069

## **Implementation of Microbially Induce Calcite Precipitation (MICP) by Bacillus Subtilis and Adding Sand in Repairing Shear Strength Parameters of Peat**

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**Abstract.** These days, the utilization of microbially induced calcite precipitation (MICP) has gotten mainstream as a ground improvement strategy for sandy soil. In any case, this strategy was not all that much applied to peat soil. This research focused on bacterial calcium carbonate precipitation from Bacillus Subtilis and its impact on shear strength parameter of peat soil. An uncommon injection framework was ready for actuating bacterial solution for the examples. The bacterial arrangement provided to the examples by gravity for 7 days in explicit molds intended for this work. From this exploration. The most noteworthy compressive strength esteem is found in the expansion of 15% cementation arrangement of 0.42 kg/cm<sup>2</sup> of the first soil test + 5% sand, which has a free compressive strength worth of 0.30 kg/cm<sup>2</sup>.

**Keywords:** Bacillus Subtilis, Organic Soil, Peat Soil, Shear Strength.

Paper ID : 070

## Identification Factors of Safety Climate, Awareness, and Behaviors to Improve Safety Performance in Telecommunication Tower Construction at PT X

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**Abstract.** Telecommunication infrastructure has an important role in economic development in Indonesia. Along with the development of the times, the need for a network to access the internet increases in demand. This has resulted in increased demand for telecommunications tower infrastructure development as the infrastructure for telecommunications operators in Indonesia to develop their businesses. However, with the high development of infrastructure development, there is a possibility that there will be risks to worker safety. This study aims to describe the safety climate in the construction of PT X Telecommunication Tower which consists of, a form of work safety awareness among business owners and service providers, forms of work safety behavior from workers to business owners and service providers, as well as knowing, and overcoming obstacles or obstacles to the concept with the hope of reducing the number of work accidents. The research method used is literature review and case study review to obtain variables and indicators that show the relationship and influence of safety climate, safety behavior, and safety awareness to improve safety performance in PT X telecommunication tower construction. Then the selected variables and indicators will go through the expert validation process. The results of data collection from experts and interviews that have been conducted, obtained 6 indicators of safety climate, 5 indicators of safety behavior, 3 indicators of safety awareness, and 3 indicators of safety performance.

**Keywords:** Telecommunication, Safety Climate, Safety Behavior, Safety Awareness, Safety Performance

Paper ID : 073

## Cable Force Prediction Technique Using Subspace and Effective Vibration Length Method

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**Abstract.** Inevitably, cable structure is often used as a structural part of either a middle or long-span bridge, so its existing tension force is essential to be evaluated and monitored periodically. This research aims to demonstrate the use of covariance type of Stochastic Subspace Identification (SSI-COV) to identify the dynamical system properties of bridge's cable and estimate the cable tension. The concept of effective vibration length proposed by previous researchers is implemented in this research to overcome the unknown rotational stiffness of the cable's supporting system. During the measurement, multiple-synchronized vibration measuring devices are deployed on a cable to get the corresponding eigenvector and its effective

length. The cable force of an existing bridge is revealed using two different approaches, the least-square approximation and the two-frequency method. It is found that the deviation between those two mentioned approaches is very small. The overall process evidence that this non-destructive testing procedure is practicable to estimate the internal force of a cable in real structures.

**Keywords:** Cable force, Subspace Method, Effective Vibration Length.

Paper ID : 074

## **Risk Allocation Implementation Analysis of Public-Private Partnership for Infrastructure Project (Case Study of the Solo-Yogyakarta-NYIA Kulon Progo Highway Project)**

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**Abstract** Indonesia is now concentrating on infrastructure development; the construction of roads, bridges, airports, dams, and toll roads are seemingly given more attention in comparison to others. As the infrastructure sector rapidly grows, it opens wider opportunities for investors. This study aims to identify and monitor the risk allocation process and preferences along with risk response(s) applied by related parties due to critical risk variables that might have happened in highway projects-- especially Public-Private Partnership based infrastructure projects situated in Central Java, Indonesia; the Solo – Yogyakarta – NYIA Kulon Progo Highway Project. The result from collected questionnaires-- processed with descriptive analysis-- shows that: (1) 15% of the risk variables are allocated to the Ministry of Public Works and Housing (the Government), (2) 50% are allocated to private parties, and (3) 35% of the variables are shared between both public and private parties. Using the Risk Failure Mode and Effect Analysis (RFMEA), Risk Score and Risk Priority Number of each risk variable is compared, resulting in the knowledge that 7 out of 60 risk variables related to the project completion experienced: delays, budgetary and work schedule amendment, project supervision and control, and risk events that occur due to force majeure. Those are 7 of critical risks that would need to be responded or mitigated.

**Keywords:** Risk, Public-Private Partnership, Highway, Risk Failure Mode and Effect.

Paper ID : 076

## **Analysis of Community Satisfaction Level on the Road Rehabilitation and Reconstruction Project (learn from Palu Disasters Area)**

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**Abstract.** The rehabilitation and reconstruction project stages after the Palu disaster were almost completed. The massive earthquake disaster followed by the tsunami and the liquefaction required a relatively complex pre-during-past rehabilitation and reconstruction series. These stages will certainly be considered successful if the community affected by the disaster can feel performance satisfied. This research was conducted in the project area of rehabilitation and reconstruction of roads and bridges in Palu, Sigi, and Donggala. The research method was carried out through a questioner distributed to all communities around the project site. The analysis is carried out using a community profile and importance-performance analysis. The results showed that the community got satisfaction above the average (almost 4.00). The community is satisfied with the road's condition and the bridge's current state compared to the past. Meanwhile, essential indicators that must be improved are information and socialization and street lighting.

**Keywords:** Community Satisfaction, liquefaction, Rehabilitation, Reconstruction.

Paper ID : 077

## **Application of the Updated PSHA on the Stability Analysis of the Meninting Diversion-Spillway Tunnel in Lombok Island-Indonesia**

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**Abstract.** The Meninting diversion-spillway tunnel is a part of the Meninting dam project located in West Lombok District. The construction commenced in 2017; then, a series of severe Lombok earthquakes halted the construction for a while in 2018, where some landslides occurred around the site. This possibly caused rock masses around the tunnel to be sheared off during the earthquake events. Updated probability seismic hazard analysis shows increased

seismic parameters, including peak ground, short spectrum and long spectrum accelerations, which then resulted in increased stresses around the tunnel. Thus, the stability of the tunnel decreased in terms of its factors of safety. Although, the overall factor of safety was about 2.5, the tunnel was still stable in current conditions; the tunnel certainly requires more stability improvements to face possible similar severe earthquakes in future.

**Keywords:** Lombok Earthquake, Meninting Tunnel, Updated PSHA, Stress around Tunnel, Factor of Safety, Stability Improvement.

Paper ID : 078

## The Effect Of P-Delta And P-Delta Plus Large Displacements Modelling on Lateral and Axial Displacement

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**Abstract.** The structural analysis programs have become increasingly sophisticated along with the advancement of science. However, engineers need to be more careful and understand the use of the options in the program. One program that can incorporate non-linear effects is SAP2000. In the SAP2000 program, non-linear modeling options are classified into two options, namely non-linear and non-linear plus large displacements. The SAP2000 program is a finite element-based program. The finite element method is a method that solves problems by dividing a large element into several small element segments or commonly referred to as meshing. The smaller the meshing segment used, the more accurate the output will be. However, its significance remains to be studied further. Therefore, this study was conducted to determine the significance of differences in modeling options (linear, non-linear, non-linear plus large displacements), as well as the effect of segment division in the analysis. The analysis results show that the linear model cannot capture the effect of the lateral displacement that changes due to the incremental of the compression force. The compression force has significant effect to moment value especially for the higher compression force. Therefore, the P-Delta effect should be analyzed carefully, especially for element with high compression force since the linear model could not capture this effect. The meshing by divide segment does not provide significance difference for both P-Delta and P-Delta plus large displacement model in this case.

**Keywords:** P-Delta, P-Delta plus Large Displacements, Lateral Displacement.

## Fault Structure Interpretation on The Western Part of East Java Using Second Vertical Derivative

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**Abstract.** The National Earthquake Center (PusGeN) in 2017 stated that East Java was traversed by several active faults that extended towards Bali and Flores. The gravity research was carried out to map the fault structure in the western part of East Java. Gravity method is applied to identify subsurface geological structures by utilizing variations in Earth's gravity caused by differences in density of subsurface rocks. The processed data is satellite gravity data (TOPEX) as many as 110 data spread in Lamongan, Gresik, and Surabaya City. Gravity Topex is a Geodesy satellite altimeter launched by NASA to measure the altitude of the satellite above the closest sea surface point to a very high precision. Gravity data that collected from Topex/Poseidon satellite are already processed into free air anomaly, further, it is performed Bouguer Correction and Terrain Correction, resulting in Bouguer Anomaly data which is then filtered using Second Vertical Derivative (SVD). The results of SVD 2-D modeling have a high level of accuracy because the faults are well identified and highly correlated with the PuSGeN faults map (2017). The curve of the slice profiling results on the Surabaya Fault shows that the maximum value of SVD is 0.1 mGal/m<sup>2</sup> and the minimum value is 0.2 mGal/m<sup>2</sup> which is identified as a reverse fault. The curve of the slice profiling results on the Waru Fault shows that the maximum value of SVD is 0.2 mGal/m<sup>2</sup> and the minimum value is 0.3 mGal/m<sup>2</sup> which is identified as a reverse fault.

**Keywords:** Bouguer Anomaly, TOPEX Gravity, Fault, Second Vertical Derivative (SVD)

## Development of Blockchain and Machine Learning System in The Process of Construction Planning Method of The Smart Building to Save Cost and Time

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**Abstract.** Achieving project objectives that are effective, efficient, and safe requires careful planning of construction methods. The construction method of a project may vary depending on the description and design of the project. Planning for construction methods generally takes a long time to review, involves many parties, and requires consideration in terms of costs, resources, and safety. And the need for construction planning characteristics for smart buildings recently. Machine learning combined with the blockchain system is an instrument that can accommodate processes in the construction method. Start from planning to integration-evaluation with a historical database. This instrument is expected to be able to provide suggestions and evaluation of methods, to be able to assist the planning process of construction methods so that the application of work methods will be more effective and efficient.

**Keywords:** Construction Method, Smart Building, Machine Learning, Blockchain.

Paper ID : 081

## **Sensitivity analysis on the effect of reinforcement materials addition for soil stabilization**

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**Abstract.** Sensitivity analysis is a widely used method to analyze uncertainty in the model. The sensitivity is calculated as the ratio of the output changes and parameters changes. This study was performed using a sensitivity index for sensitivity analysis to determine the effect of reinforcement material addition on clay soil. In this study, 54 samples of soil with additional material have been prepared for the unconfined compression test. The reinforcement materials used in this test are cement, tire waste, and water-cement ratio for the hydration process. The unconfined compression test results were then analyzed for sensitivity analysis input. Based on this study, it can be concluded that the addition of reinforcement material, including cement, and tire waste, and water-cement ratio, can increase the unconfined compression strength of high plasticity clay. The maximum unconfined compressive strength value is 577.10 kN/m<sup>2</sup> with 3% of tire waste, 20% cement, and 35% water-cement ratio. The cement proportion is the most sensitive variable for unconfined compression strength from the sensitivity analysis. The sensitivity analysis results can help to become the baseline to help design improvement using tire waste strips on high plasticity clay.

**Keywords:** Sensitivity analysis, sensitivity index, unconfined compression test.

## Analysis of the Behaviour Model of Foreign Motorcyclists in Tourism Areas in Bali

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**Abstract.** Foreign motorcyclists are prone to greater risks than the locals in most countries around the world. Some of the risk parameters that can be identified, such as lack of knowledge of traffic regulations, inadequate driving skills, different seasons, and general attitudes towards traffic safety that are reflected in driving behaviour. Along with the development of tourism, the number of foreign motorcyclists also increases. Therefore, the safety measures are essential.

In this research, we study the influence of local road and traffic conditions, the influence of local motorcyclists and law enforcement on the behaviour of foreign motorcyclists around tourism areas in Bali. The method used is Structural Equation Modeling (SEM). The expected contribution is a model that finds the dominant factors influencing foreign motorcyclists' behaviour, which can significantly reduce the risk of accidents involving foreigners.

The results are the local road and traffic factors affect foreign motorcyclists' behaviour with a bootstrapping value of 2.426. And local motorcyclists and law enforcement also affect with a bootstrapping number of 3.874. Both factors positively affect foreign motorcyclists' behaviour with a coefficient of 0.217 and 0.371.

The research concluded that the behaviour of foreign motorcyclists in tourist areas in Bali is highly influenced by the behaviour of local motorcyclists and law enforcement by authorized officials. It shows that the more stringent enforcement of the law, the better the behaviour of foreign motorcyclists. Additionally, road and traffic conditions also affect the behaviour of foreign motorcyclists. The better foreign motorcyclists' behaviour will reduce the risk of accidents.

**Keywords:** motorcyclist, foreigner, behaviour, model

## Rubberized Asphalt Pilot Road Trial in Kuwait

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**Abstract.** Results of an investigation carried out at the Kuwait Institute for Scientific Research (KISR) are presented showing the advantages of incorporating PelletPave (a rubber-bitumen additive in pelletized form) as partial substitute to conventional bitumen in rubberized hot mix asphalt (rubberized-HMA). The Pelletpave was composed of 18% tire derived crumb rubber blended with 60/70 open grade bitumen and processed by USA technology provider Phoenix

Industries LLC into easy to handle granular/pellet form. Laboratory mix designs were followed up with full scale asphalt plant trials and the construction of a pilot trial (mill & replace an old wearing course) to test out the technology. The trial comprised 3 different test sections to compare the performance of rubberized-HMA with polymer modified Marshall asphalt and polymer modified SuperPave asphalt mix formulations. The test sections were laid on a low-medium trafficked road and one year following the trial, the performance of the rubberized-HMA appears to be on par with Polymer Modified HMAs.

**Keywords:** Hot Mix Asphalt, Rubberized Asphalt, PelletPave, Pelletized.

Paper ID : 084

## Impact of Climate Change on the Safety of Dam

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**Abstract.** Dams are built to overcome surface water problems. The problems include excess water in the raining seasons and scarcity of water in the dry seasons. As climate change occurrence has been believed by people around the world, engineers have to be able to consider the impact of climate change on the safety of dams. This study proposes a procedure for studying the impact of climate change on the safety of gated spillway dams. The procedure consists of a statistical consistency test, selection of global climate change variables, modeling of local climate change, calculating flood discharge due to climate change, and evaluation of dam safety. This study was conducted at the Batujai Dam, Central Lombok Regency. Global climate change data from 1998 to 2100 taken from the Intergovernmental Panel on Climate Change (IPCC) and maximum daily rainfall data from 1998 to 2020 from the Pengadang Station were used in this study to demonstrate the application of the proposed procedure. The results show that the proposed procedure can be used to evaluate the impact of climate change on dam safety. It is also known that climate change has a significant effect on the tendency of increasing flood discharge entering the Batujai Reservoir. The four spillway gates: P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub> and P<sub>4</sub> have to be opened 1.0 m, 1.2 m, 1.2 m, and 1.0 m, respectively to anticipate the 1000 year return period of flood due to climate change, 1833.54 m<sup>3</sup>/second.

**Keywords:** Climate change, Maximum daily rainfall, Gated spillway dams, Safety of dam.

Paper ID : 085

## The Stability of the Napun Gete Dam in Flores Island Constructed on Jointed and Porous Rocks

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**Abstract.** The Napun Gete Dam located in Flores Island has been constructed on highly weathered jointed volcanic breccias and tuffaceous sandstone. The rocks are porous, and had high permeability values. Excessive groundwater created stability problems to the dam during construction. Modeling was then conducted using a Phi-C reduction method to evaluate the stability of the dam, which were extensively grouted. Results show that the safety factor of the dam increased about 17% after grouting installations; but, unfortunately, when the capacity of grouting installations was increased by changing the patterns and depths of grouts, the SF reduced about 10% from those planned. Thus, it seems that the excessive water problems on foundations are still obvious that might still provide stability problems to the Napun Gete Dam.

**Keywords:** Napun Gete Dam, Porous volcanic rock, Excessive water, Grouting, Modeling, Stability.

Paper ID : 087

## **Lesson Learned from Weathering Clay Shale Residual Interface Shear Strength Testing Method**

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**Abstract.** Clay shale has been a problematic soil due to its weathering characteristic. Weathering is the degradation of shear strength due to exposure to water and air. As the depth of soil increases, the weathering effect would decrease, leading to different weathering grades. On a slope, the different weathering grades would lead to an interface slope failure. Until now, laboratory methods on finding the interface shear strength between the weathering grades seldom been investigated. This research will propose a method and give an evaluation of the results. An interface direct shear test has been conducted until its residual state between an undisturbed clay shale and weathering clay shale. The weathering condition of the bottom clay shale is achieved by soaking and drying the bottom of the sample using a two-days wetting-drying cycle. Results showed scattered values with different behavior for the soaked and unsoaked conditions for increasing weathering days. The soaked condition resulted in an increasing cohesion, increasing average stress ratio, and decreasing friction angle. The unsoaked condition resulted in decreasing cohesion, increasing friction angle, and increasing

average stress ratio. Previous research shows that, the residual shear stress should have decreased as the weathering days increases. The cause for the contrary results is due to soil swelling and the absence of a separator when weathering the bottom clay shale. In conclusion, the test conducted is not quite suitable to understand the interface shearing behavior of weathering clay shale. Thus, a modification is suggested for future research according to the identified causes.

**Keywords:** Clay Shale, Interface Shear Strength, Direct Shear Test, Residual Shear Stress, Weathering. – List according to alphabetical order

Paper ID : 088

## **Application of Fuzzy Inference System Mamdani at Pelican Crossing**

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**Abstract.** Fuzzy logic is one of soft computing methodology which aims to analyze the system that contains fuzziness. Fuzzy inference system (FIS) defines as a decision-making process based on fuzzy set theory, fuzzy rules, and fuzzy reasoning. In this research we use FIS Mamdani which has been used in several applications, especially transportation. Pedestrians are the weakest mode of transportation that requires an infrastructure which are safe and comfortable when crossing the road. Pelican crossing is one of the pedestrian crossing types. Pelican crossing in Indonesia based on fixed time where the pedestrian time are fixed. It is not effective because the pedestrian time are not based on the volume of traffic condition. To overcome this problem, FIS Mamdani method is used. Mamdani method composed of three steps to obtain an output, namely pedestrian time. Fuzzification with two input variables, namely pedestrian and vehicle volumes, and output variable is pedestrian time. Inference engine which executes all logic with if-then rule. Apply defuzzification with Centroid method to obtain the output result. The purpose of this research is to determine the pedestrian time on pelican crossing using FIS Mamdani. The result shows the pedestrian time change according to the volume of pedestrians and vehicles. FIS Mamdani can adjust the traffic light signal time to the traffic conditions that occurs on pelican crossing.

**Keywords:** Fuzzy Logic, Fuzzy Inference System, Pelican Crossing.

Paper ID : 089

## **The sustainability aspect of the consulting firm in terms of its competitiveness in Indonesia**

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**Abstract.** Infrastructure development aims to improve services and accessibility. In terms of realizing the ideals of independence, the development of infrastructure for economic growth is a must. The government increased the budget for infrastructure in the posture of the 2020 State Revenue and Expenditure Budget or RAPBN by 4.9%. To achieve this economic growth scenario, we need the support of quality human resources, thus contributing to Indonesia's competitiveness in the 4.0 industrial era. Reliable, competent and quality resources to compete will also encourage the growth of business entities in all areas, including consulting firms. The term competitiveness comes from the word power which means strength, and the word competitiveness which means to achieve more than others, or differ from others in terms of quality, or have certain advantages. The determinants of competitiveness are determined by factor conditions, demand conditions, relevant supporting industries and company strategy & competitive structure. In this study, a literature review methodology is used to see what competitiveness factors are needed by a consulting firm to be able to sustain the sustainability of getting a project every year. The results of this study obtain 13 competitiveness factors and 2 determinant factors that have an impact on the sustainability of consulting companies validated by expert.

**Keywords:** Sustainability aspect, consulting firm, competitiveness.

Paper ID : 090

## **Strengthening of Non-Engineered Building Beam-Column Joint to Increase Seismic Performance with Variation of Steel Plate Width**

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**Abstract.** Most of the residential buildings were built without following the requirements specified in the design Code of earthquake-resistant building. Such non-engineering buildings (NEB) are susceptible to seismic hazard. Beam-column joint failure is a typical example of structural failure in NEB induced by seismic load. Strengthening of the beam-column joint by mean of external steel plate is expected to increase the seismic performance of NEB. This study aims to find the most effective plate width as a strengthening material for the beam-column joint. ATENA software will be used for the investigation. The structural model is portal structure without strengthening as a control, namely the PU-200 model and with an external steel plate, namely PUP-200 with various width of plates. From the results of the analysis, it is found that strengthening joint with a plate width of 50 mm has better performance than plate widths of 100 mm and 150 mm. The increase performance is quantified in term of increase of load by 14.60%, reduction of displacement by 18.43% and reduction of crack width by 23.65% .

**Keywords:** Strengthening, Steel Plate, Non-engineered Building

Paper ID : 091

## **Analysis of the Influence of Region Development Factors, Individual and Activity, Internal Operator and External Operator on the Demand for the Jakarta Bandung High-Speed Rail**

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**Abstract.** For the last few decades the High-Speed Rail has been growing quite rapidly in various parts of the world. However, many High-Speed Rail Projects were not as successful as expected. Most of the contributing factors were over-estimate demand and cost-overrun. This study aims to formulate a strategy in order to increase the demand for the Jakarta-Bandung High-Speed Rail by investigating the factors of region development, individuals and activities, internal operators and external operators. In conducting this research, the primary data collection was done by using a stated preference questionnaire and the data analysis used the structural equation modeling (SEM) method with the help of Lisrel software. The analysis results concluded that the strong factors influencing the demand for the Jakarta-Bandung High-Speed Rail are region development and external operators. This result is useful as a reference for planners in planning the next similar project.

**Keywords:** High-Speed Rail, Demand, Region Development, Individuals and Activities, Internal Operators, External Operators, Structural Equation Modeling (SEM).

Paper ID : 092

## **Development of Blockchain Based Knowledge Management System Model in EPC Projects to Improve Project Time Performance**

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**Abstract.** EPC projects are a complex type of construction project and have different characters from ordinary construction projects, so that project delays are a phenomenon that often occurs in EPC projects. EPC projects tend to be labor-intensive and knowledge-intensive. Inputs and outputs in EPC project management involve a variety of knowledge and intellectual creative activities. Thus, the EPC project management process is a knowledge management process. Knowledge Management System (KMS) aims to improve the quality of human resources in an organization by improving communication between all parts of the organization and increasing knowledge mastery

by transferring knowledge. The application of KMS with a blockchain-based system is expected to be a solution for the needs of distributed knowledge transfer, high-speed transfer of knowledge and information, fast access to knowledge and high information security. This study uses the Tiwana model framework, and for organizational knowledge mapping uses the Zack KM model cycle, while the SECI model is used for knowledge formation. The quality of the resulting blockchain-based KMS platform is tested by experts validation. The result of this research is that this blockchain-based KMS model can be well implemented with excellent validation so that it can be a solution to increase knowledge and improve project time performing in implementing the EPC-X project.

**Keywords:** Knowledge Management System, EPC Project, Blockchain

Paper ID : 094

## **Sustainability Analysis of Minimization of Spills From a Reservoir**

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**Abstract.** Reservoir operation in general is planned towards either maximization of benefit or minimization of loss. The operation plans may take form in optimization, simulation or combination of the two. Spills from reservoir or system of reservoirs can be considered as a loss, so that it must be minimized. In order to get a better perception of a study reservoir's behavior to which minimization of spills is implemented, sustainability of the plan needs to be assessed. The present work is aimed to evaluate the sustainability of an optimization-simulation model applied to the Batujai reservoir in Lombok Island, Central Indonesia. The model is set to minimize the spills from the study reservoir system, after which the sustainability of spill minimization is appraised in terms of reliability, resilience and vulnerability. The model was run at three consecutive years (2014-2017) so that sensitivity of the model to hydrologic variability can be evaluated. Results show that reliability, resilience and Sustainability Index (SI) clearly have same trends while vulnerability is in inversely trend with these three measures. In contrast, no conclusion can be made about the trade-offs between SI and irrigable area.

**Keywords:** Sustainability, Minimization, Spills.

Paper ID : 095

## **Evaluation of the Public Procurement Principles Implementation in Surabaya Construction Projects**

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**Abstract.** Public procurement is essential to the success of infrastructure development as through this process the best service providers can be selected. Within Indonesian context, there are seven basic principles of good public procurement, namely: efficient, effective, transparent, open, competitive, fair and accountable. This study aims to investigate and assess seven principles implementation based on the providers perceptions in the public construction procurement in Surabaya as the second biggest city in Indonesia. Importance Performance Analysis (IPA) was employed to analyze the level of importance and performance of each principle's indicator. The result shows that the implementation of the construction procurement principles in Surabaya obtained score of 87.55% which can be considered quite good as the score were relatively high and close to the maximum (100%). In more detail from each procurement's principle, the implementation of the 'efficient' principle had score of 87.91%, 'effective' was 86.31%, and 'transparent' was 86.18%. Meanwhile 'open' principle was 89.87%, 'competitive' was 89,11%, 88.90% for 'fair', and 85.61% for 'accountable'. However, there were some gaps between the importance and the performance levels. This means the Surabaya City Government still needs to improve or at least to maintain the existing performance to promote a successful infrastructure development in their region

**Keywords:** Public Procurement Principle, Construction Procurement, Importance Performance Analysis.

Paper ID : 096

## **Seepage and Piping Control of Earth Fill Dam (Case study of Pidekso Dam Indonesia)**

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**Abstract.** The Pidekso Dam is one of the major dams in the Central Java, situated in Wonogiri Indonesia. The stability analysis of the dam is required due to this dam is planned for national water and food security program covering the irrigation area of 1,500 Ha, increasing the planting intensity from 2000 Ha to 3600 Ha and as a source of water around 300 liter/second for Wonogiri, Sukoharjo, Solo and their surroundings. The control is needed for the safety of the dam from seepage and piping. Excessive seepage can cause piping and lead to dam failure. Seepage control is carried out by 3 alternatives, extended curtain grouting, cut off wall and upstream blanket respectively. Each alternative is divided into 4 models : 1) original length (L), 2) 2/3L, 3) 1/3L and 4) 2/3L with doubles in the upstream and downstream of the dam. The result indicates that, the installation cut off wall with model 1) is the most effective alternative to reduce seepage up to 42.42% of dams.

**Keywords:** Cut off wall, extended curtain grouting, seepage control, upstream blanket.

Paper ID : 097

## Crack and Corrosion Inspections for Coastal and Marine Concrete Infrastructure: A Review

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**Abstract.** As one of the biggest archipelago countries, Indonesia has an extensive coastline where concrete was used as a construction material. Concrete can suffer cracks that may stimulate the ingress of chloride to the rebar then induced corrosion. Coastal and Marine Infrastructure (CMI) that are vulnerable to corrosion due to chloride attack should be considered for continual inspection or monitoring system. The inspection must use the optimal techniques to achieve the objectives of the investigation. However, some developing countries, such as Indonesia, have no standard related to corrosion investigation resulting in the lack of understanding and awareness of concrete deterioration due to corrosion. This paper compares some inspection techniques consist of visual observation of cracking and corrosion investigation. This paper provides the utilization condition and the limitation of the inspection technique. The paper also contributes to knowledge related to cracking and corrosion inspection in coastal and marine concrete structures by providing a readily available reference for researchers, practitioners, and society.

**Keywords:** Coastal Infrastructure, Concrete Inspection, Crack, Corrosion.

Paper ID : 098

## Analysis of Train Derailment Factors (Case study: Wijayakusuma Train)

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**Abstract.** Readiness and suitability of transportations infrastructure components such as railway structures is absolutely required to assure performance of the train trip runs fluently. One of certain disturbance which often threatens this performance is derailments. Derailments is a conditions when the train couldn't perform its trip safely by slipped out from their tracks caused of mechanics disruption on rail such as broken rail and railway structure supporting components like rail fastenings and rail sleepers that is not functioning very well. Derailments must involve as a consideration for performing a safety of a train trips moreover if it carrying hazardous material goods. A related derailment situation was occurred to Wijayakusuma train (Surabaya Gubeng – Cilacap route) on date Tuesday 5<sup>th</sup> of November 2019 at Barat - Ngawi Railway Station

railyard. From this situation can be noticed that train derailments have brought a serious problems to settled schedule of existing thoroughly train trips. This research mainly carried out to obtain factors that affected derailment of Wijayakusuma train with railway structures standard analysis method views.

As a solutions results, rail switches design modifications is bringing out. Approved train speed when approaching and entering railway station is changed from 50 km/h to 35 km/h according to rail switch number parameters. Rail switches properties also changes from design results. Length of blade rail ( $t$ ) is 3,70 m, length of frog rail ( $P$ ) is 2,12 m, direct crossing angle ( $\alpha$ ) is  $5,71^\circ$ , base angle ( $\beta$ ) is  $2,29^\circ$ , radius of blade rail outer curve ( $R$ ) is 170,125 m and radius of blade rail inner curve ( $R_d$ ) is 157,051 m.

**Keywords:** train, derailment, railway structure, rail switches.

Paper ID : 099

## **Development of Preventive Maintenance Guidelines for Electrical Components on Government Building Based on Work Breakdown Structure**

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**Abstract.** This research aims to create preventive maintenance guidelines for electrical components in buildings, especially government buildings, by breaking down electrical components using work breakdown structures so that the identification of electrical components is complete and well-structured. The methodology used in this research uses archive analysis with validation by experts through a questionnaire based on the legislations and applicable research and previous research. The results of this research are guidelines for preventive maintenance for electrical components in government buildings that contain preventive maintenance steps for each component at an alternative design level with a time interval for each component. Preventive maintenance guidelines for electrical components in this building are formed using work breakdown structure described from level 1 to level 4 with their derivatives, namely alternative designs. From the results of the validation, there are 22 (twenty-two) work packages and 45 (forty-five) alternative designs for electrical components in buildings that need preventive maintenance with each activity, procedure and preventive action and time intervals.

**Keywords:** Government building, Guideline, Preventive maintenance, Work Breakdown Structure.

Paper ID : 100

## Cost Effectiveness Analysis of Greenhouse Gas Emissions Reduction in the Flexible Pavement Material Transportation Process Unit

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**Abstract.** The activity of material transportation regarding the project of road construction indicated several negative impacts on the environment including the greenhouse gas emissions release. In developing sustainable development strategy especially in transportation infrastructure, it is necessary to find a strategy in reducing greenhouse gas emissions of road construction cycle. This study aimed to estimate and evaluate the greenhouse gas emissions reduction in the flexible pavement material transportation process unit. The life cycle assessment was used to estimate the emissions produced. The greenhouse gas emissions evaluation did not only underline the reduction percentage, but also on the relative cost of the reduction. The approach of cost effectiveness analysis concept was implemented to estimate the cost effectiveness. The results showed that the greenhouse gas emissions in the dump trucks use variation in the flexible pavement material transportation process unit ranged from 2.99% to 6.23%. Every alternative in emissions reduction showed the potential to decrease the greenhouse gas emissions at a cost comparable to emissions that could be reduced.

**Keywords:** cost effectiveness, greenhouse gases, flexible pavement.

Paper ID : 101

## A Systematic Review of Concrete Material for Noise Reduction of Transportation Sectors

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**Abstract.** Noise is a sound whose presence is considered to interfere with hearing which can cause health problems and is caused by noise sources. The most common source of moving noise is transportation. Therefore it is necessary to have a noise absorber to reduce noise levels. The most used noise-reducing material is concrete. This paper using a systematic review method and aims to investigate the development of concrete materials as a noise barrier wall. Concrete for noise absorbers is divided into

two, conventional and non-conventional. Non-conventional concrete is a mixture of concrete with added material and is generally a waste material. Non-conventional concrete with different added materials produces other characteristics and different noise attenuation results. Some examples of added materials such as waste materials from burning coal, fishery waste, waste ceramics, and polymeric materials provide significant results. The absorption coefficient was able to reach 0.9, and the NRC value earned 0.61. However, a higher ability to absorb noise, smaller compressive strength of the concrete produced. It is necessary to understand the characteristics of the material for use in applications in transportation.

**Keywords:** Reducing Noise, Transportation, Material Concrete

Paper ID : 102

## **Investigating Materials for Refurbishment Strategy in the Heritage Building: a Case *Soesman Kantor* Semarang**

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**Abstract.** Managing heritage buildings presents complex challenges for local authorities regarding repair methods, selection of materials, and post-repair impacts. Restoring the function of heritage buildings from several countries' experience is still constrained by the purpose of commercialization and the problem of maintaining socio-cultural values. What approach strategy is most suitable for heritage buildings' characteristics in the city of Semarang in the long term? The research method is a case study with material laboratory test strategy of the heritage buildings. The parties involved include local authorities, architects, heritage building experts, and academics. Three technical assessments have been conducted: Test material using XRF analysis, brick compression test, and paint adhesion test. This study provides an overview of the strategic approach from the parties' aspects of measuring, interpreting, and providing the best solutions for heritage buildings' material elements in the future. The results recommend improving heritage buildings from stakeholder mapping and building material improvement strategies. This research contributes to local authorities in arranging heritage buildings with technical considerations that are by the buildings' characteristics and in line with development programs that consider the local wisdom

**Keywords:** strategy, refurbishment, heritage.

Paper ID : 103

## **Knowledge and Practice of Helmet Usage among Senior High School Students in Klaten Regency**

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**Abstract.** Indonesia is one of the countries with the largest number of motorcycle users in Southeast Asia, it's because of the heavy traffic and high price of cars make most of Indonesians choose to use two-wheeled vehicles. The accidents that occurred in Klaten Regency in 2019 to early 2020 increased by 30% from 2018 and dominated by teenage riders (16-25 years old) with one of the main causes namely driving behavior. The aim of this research to obtain the correlation between the characteristics of respondents and their practice in using helmets. Only 4 characteristic from 9 characteristic that related to the habit of using helmet and one of the characteristic is the sanctions if the driver does not use the helmet correctly while driving. The results of the data analysis obtained no correlation between knowledge about helmets and the practice of helmet usage while driving. This research has never been done in detail by linking the respondent's characteristics with the habit of respondent's in using helme, it is worth doing further research. This research applied to the proportion of respondents by 75% female & 25% male senior high school students in Klaten Regency.

**Keywords:** Chi-square Test, Cross Tabulation, Helmet Usage, Knowledge Practice Attitude (KPA)

Paper ID : 104

## Hourly Rainfall Simulation Using Daily Data

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**Abstract.** Rainfall is one of the main inputs in the analysis of the hydrological system. However, rainfall data are often found to be inadequate in length and completeness. The purpose of this study is to overcome the problem of the limited availability of high resolution of rainfall data. Rainfall data on a daily scale generally have a better quantity and quality of data available to be used as a basis or reference for deriving hourly rainfall data. The research location is limited to Java Island, with 25 rain stations used. Hourly rainfall has a diurnal cycle, where some rainfall is concentrated in the afternoon or evening. The result of the evaluation using Root Mean Square Error, Mean Absolute Error, Pearson Correlation, and Spearman Correlation shows that the hourly rain simulation model using daily rainfall data can be used for design, especially in the field of water structures due to producing similar statistical characteristics.

## Multi-Attribute Analysis of Raw Water Treatment from Deep Wells at PDAM Tirta Mahottama, Klungkung Regency, Bali

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**Abstract.** PDAM Tirta Mahottama is a regional drinking water company located in Klungkung Regency, Bali Province. The community uses 21 deep wells to meet their water needs for daily activities. This study aims to determine the reliability characteristics of raw water from deep wells and the quality of raw water used in the Klungkung Regency. This study was conducted to determine what processing can be done to improve raw water quality using the Multi-Attribute Utility Theory (MAUT). The deep well used has a production capacity of 1-9 L/s. In terms of raw water quality, the parameter that does not meet the quality standard is aluminum, followed by color and TDS. The selected processing is adsorption with consideration of its high ability to remove color and aluminum. Based on MAUT analysis, the best adsorbents are using GAC (granular activated carbon).

**Keywords:** Sludge treatment, water treatment, decision analysis

## Small Debris Flow Simulation Using MORPHO2DH

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**Abstract.** The effect of debris flow from eruption of volcanoes on river morphology was reported by several studies on the basis of experiment or field survey. However, there has been a notable absence of scientific literature dealing with the prediction of river morphology at the middle or downstream after several weeks or months due to the remain of material sediment from eruption. The remain material sediment at the upstream will produce small debris flow during rainy season. This study aims to analyze the riverbed change due to small debris flow using the 2-dimensional numerical simulation in iRIC-Morpho2DH. The predicted of riverbed erosion on several segment shows that the erosion increases when the small debris occurs. The maximum erosion occurs when the sediment discharge ratio is 2 times, then decreases in the simulation of the

sediment discharge ratio 3 times. Based on field survey, the river segment with maximum erosion, the bank protection was failed.

**Keywords:** Erosion, sedimentation, Morpho2DH, sediment discharge ratio, Gajah Wong River.

Paper ID : 108

## **Tsunami Hazard in Cilacap City due to the Megathrust of West-Central Java Segment**

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**Abstract.** The source of the earthquake and tsunami in the Indian Ocean, particularly in South Java, is needed for mitigation purposes that are beneficial to life on the expanding south coast of Java. Cilacap City is one of the important cities in driving development in south coast of Java. This study aims to perform a tsunami simulation with the study area of Cilacap City. The simulations are carried out with software which is based on the shallow water equations. The epicenter varies in the form of coordinate points in the megathrust segment of west-central Java. The simulation results show that Cilacap City is prone to tsunami disasters because the tsunami amplitude on the coast can reach 10.7 m and the arrival time of the tsunami is between 10 and 20 mins. These results may complement previous data assessing the potential for tsunamis along the Sumatran Java Ring of Fire.

**Keywords:** Tsunami Hazard, Megathrust, Java, Cilacap.

Paper ID : 109

## **Determination of Produced Wastewater Treatment Systems for Reclaim Water in the Oil and Gas Industry**

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**Abstract.** Reclamation of water from the oil and gas industry activities from the produced water can reduce the environmental impact and increase its proactive efforts.

This study was conducted to assess the appropriate treatment system for produced water. This study was conducted by taking a case study at the Lindai Gathering Station (GS). The highest quality parameters that do not meet the quality standards for class III water reclamation are COD and oil and grease. Some of the recommended processing units are the American Petroleum Institute (API) separators, Parallel Plate Interceptors (PPI), and Corrugated Plate Interceptors (CPI). Each alternative is given the addition of ultra-filtration technology to improve the quality of the effluent produced water. The results of selecting the best technology using the Analytical Hierarchy Process (AHP) method show the use of the most suitable CPI to be applied for water reclamation.

**Keywords:** Produced Water, CPI, reclamation water

Paper ID : 111

## **Preference of Sludge Treatment Plan in IPA II Pejompongan Water Treatment Plant**

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**Abstract.** Water treatment is inseparable from the processing of sludge resulting from the deposition process. IPA II Pejompongan currently has no sludge treatment, where the treated sludge is discharged directly into the surrounding water bodies. This research was conducted to determine the suitable sludge treatment system for existing conditions. This study was conducted using data on the quantity of sludge and the quality of the resulting sludge, which was then discussed descriptively. This study also uses a literature review to find various appropriate treatments for the Pejompongan II IPA. The alternative is selected with the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method. The highest mud generation in 2019 is during the rainy season, namely January-June. In terms of quality, the parameters of suspended solids, iron, nickel, lead, manganese, organic (KMnO<sub>4</sub>), BOD, and COD do not meet Jakarta City's quality standards government. There are two alternatives: the belt filter press and the screw press, where the decision analysis results show a better screw press.

**Keywords:** Sludge treatment, water treatment, decision analysis

Paper ID : 112

## A Critical Review of Bridge Management System in Indonesia

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**Abstract.** The bridge is a crucial infrastructure in public mobilization. Recently, the utilization of old bridges has intensely come into an option during limited funds in many developing countries. Hence, the bridge management system plays an important role in maintaining and reducing bridge failure. In Indonesia, the bridge management system is called Interurban Bridge Management System (IBMS). However, the IBMS implementation in Indonesia is still poor. The IBMS has been implemented throughout all provinces in Indonesia since 1992, yet many bridges were still found damaged, even worse, was collapsed. Indonesia still focuses on construction, not maintenance work. Some developed countries like the United States of America and Japan have expanded a complex system for a bridge management system, Pontis, and J-BMS. Thailand as a developing country is the same as Indonesia has also realized the importance of having a bridge management system. Thailand has established a Bridge Maintenance and Management System (BMMS) to guide the periodic bridge inspection and maintenance program. In this study, the authors intend to grow the awareness of the IBMS application in Indonesia which consist of the development of bridge management system, the causes of poor IBMS implementation, the improvement needs to enhance the IBMS implementation, and recommended aspects may extend to current IBMS implementation in Indonesia by elaborating the existing bridge management system (BMS) that has been established and implemented in the U.S., Japan, and Thailand.

**Keywords:** bridge, IBMS, maintenance, management system

Paper ID : 113

## Comparison of Suitable Drought Indices for Over West Nusa Tenggara

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**Abstract.** The drought has had a significant impact on West Nusa Tenggara. Drought experienced in some areas almost every year, causing crop failure and even causing famine in 1954 and 1966. This study was conducted to find the best method for obtaining

the meteorological drought index. It is essential to understand the characteristics of drought in the study area in guiding policymakers in early anticipation of this region's drought hazard. This study compares two drought index methods, SPI and PDSI, and tests their proximity to drought data in these locations. Evaluation is carried out to determine the best approach to choose for conducting a drought assessment. The best-fitted method was determined statistically by counting the number of dry months produced by the model and comparing it with the drought experienced over West Nusa Tenggara. The results obtained are the SPI method has an accuracy rate of 58% and a correlation coefficient  $r$  about 0,06. Meanwhile, the PDSI method has a better accuracy rate of 75% and a correlation coefficient  $r$  about 0.51. The PDSI method is also the most superior in accurately predicting the arrival of a dry month compared to SPI. So it can be concluded that the PDSI method is the better method for evaluating and detecting dry periods in West Nusa Tenggara.

**Keywords:** SPI, PDSI, drought Index.

Paper ID : 114

## **Effect of Regulatory Change in Earthquake Load Analysis on Structures with Irregular Shapes**

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**Abstract.** The effect of the earthquake must be reviewed in the planning of the building structure. The development of ASCE 7-10 and ASCE 7-16 regulations was followed by the development of earthquake-resistant building regulations in Indonesia, namely SNI 1726-2019. On developments in Indonesia SNI 1726-2019 was followed by the publication of the Indonesian Spectra Design in 2021 which replaced the Indonesian Spectra Design in 2011. The development of this regulation was followed by concerns that buildings designed before this regulation were implemented would behave differently when they were tested with the latest SNI 1726-2019 regulations. In this study, a response spectrum analysis was carried out based on the Indonesia Spectra Design 2021 against the planned building using the Indonesian Spectra Design 2011. The building under study has an L shape with a difference in length on the side of the X direction and the Y direction. The shape of a building like this has a high irregularity. The results of this analysis indicate that there is a change in the level of safety in the structure. It is necessary to conduct a study on the planned building before the implementation of the SNI 1726-2019 regulations which are accompanied by Indonesian Spectra Design 2021.

**Keywords:** earthquake, regulation, response spectra,

Paper ID : 115

## Residual Stress Evaluation on Cold-Formed Steel C-Section by X-Ray Diffraction

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**Abstract.** It is known that the existence of residual stress in cold-formed steel profile play an important role in determining the nominal strength of the profile in resisting the external forces. Ignoring the residual stress will be very risky due to the serviceability and ultimate strength requirements of the structure constructed from these profiles. This study focuses on the determination of residual stress from local manufactures cold-formed steel lip channel C-sections which are widely used today for the construction of residential roof truss. Two types of cold-formed steel from two different manufactures have been investigated from the residual stresses in the cold-formed lip channel C-sections and the flat steel sheets before being formed into the lip channel C-section by X-Ray Diffraction apparatus. The results show that the tension stress is measured on the flanges surface while the compression stress is found in the web surface. The residual stress in the bent area of lip channel C-section changes significantly while the residual stress in flat steel sheet is compression. In addition, the residual stress in PC-065-1 specimen is around 200 MPa while in LB-065-1 is about 150 MPa, meanwhile for the flat steel sheet specimen of PC-065-1 is around 100 MPa while in LB-065-1 is as high as 240 MPa.

**Keywords:** Residual Stress, Cold-Formed Steel, X-Ray Diffraction.

Paper ID : 116

## Liquefaction Potential of Volcanic Deposits During Lombok Earthquake in 2018

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**Abstract.** The Lombok earthquake and the Palu earthquake in 2018 were earthquakes that caused major damage in the two areas. The Lombok earthquake occurred in a longer period of time than the Palu earthquake, but the Palu earthquake was able to cause enormous liquefaction. This study aims to determine the behavior of the volcanic deposits of Mount Samalas during an earthquake. Research includes: physical properties test, SEM photos, shear strength test, shaking table test, and grading tests before and after soil samples are given cyclic loads. The results of the grading test after the

shaking table test showed that there was the addition of fine grains from before and after the shaking table test. This indicates that the pumice particles are scoured on their surface, the small grains become locks between the large particles. This condition causes the shear strength to increase and the pore pressure to decrease significantly. The cavity in the pumice particles is thought to reduce seismic waves during an earthquake. For large particles, although the gradation curve has the potential for liquefaction, the pore water pressure does not increase significantly. However, pumice has a diameter of less than 0.075 mm, because it does not have a cavity so that it has the potential to experience liquefaction such as sand boil.

**Keywords:** Lombok Earthquake, Pumice Sand, Liquefaction.

Paper ID : 117

## Secondary AE analysis of Pre-Corroded Concrete Beam

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**Abstract.** Acoustic emission technique of non-destructive testing (NDT) method is the more successful method of corrosion assessment of reinforced concrete (RC) structures for the evaluation of pre-corroded concrete beam specimens under load testing. The tests were used for small scales of pre-corroded concrete beams subject to cyclic loading before the first visible cracks for secondary AE source. The secondary AE source caused by the cyclic load at the maximum load level is half of the estimated first visible cracks (i.e., 4 kN). To study the impact of significant damage due to corrosion before the first visible cracking occurs, the AE parameters included the cumulative signal strength (CSS) and *I<sub>b</sub>*-value are proposed. The results showed that the high CSS ratio (more than 69%) is related to the damage growth of the beam specimens. The *I<sub>b</sub>*-value tends to decrease from loading cycle 2 to cycle 3, indicates that the occurrence of damage.

**Keywords:** AE, NDT, Corrosion, Assessment, Secondary AE

Paper ID : 119

## Simulation of Debris Flow Using "SIMLAR" in the watershed of Gendol River, Indonesia

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**Abstract.** The eruption of Mount Merapi in 2010 released more than 140 million cubic meters of pyroclastic material, which still settles on cliffs and riverbeds. Gendol River is one of the rivers affected by the accumulation of sediment. When there is heavy rain in the river's upper reaches, rainwater will carry lava material at high speed called debris flow, which will cause damage to the area in its path. Sediment control buildings such as sabo dams are built to reduce the impact of debris flows. To predict the impact of debris flows, it could be used using a software application. In this study, the debris flow simulation is used the SIMLAR V.2.1 application. The simulation uses data, namely rain data, to calculate the flood hydrograph using the Nakayasu method. The other data are grain size distribution data to determine the sediment material and a topographic map in the form of DEM to determine the length and area of the simulated watershed and modify the sabo dam building's existing conditions in Gendol River. The simulation results show that at the beginning of the simulation hour to 0.5 with a discharge of 0.299 m<sup>3</sup>/s produces a debris volume of 539.997 m<sup>3</sup> with a velocity of 0.198 m/s, at peak discharge with a discharge of 107.729 m<sup>3</sup>/s has a debris volume of 452129.320 m<sup>3</sup> with a velocity of 1.916 m/s. The simulation at hour of 15 with a discharge of 2.909 m<sup>3</sup>/s, produces a volume of 75038.150 m<sup>3</sup> with a velocity of 0.451 m/s.

**Keywords:** SIMLAR V.2.1, Sabo Dam, Debris Flow, Merapi

Paper ID : 120

## **Adaptive Traffic Signal Control using Fuzzy Logic under Mixed Traffic Conditions**

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**Abstract.** The effectiveness of the intersection control performance is very influential on the occurrence of vehicular delays and traffic accidents. One of the systems for controlling vehicle movements at intersection is a traffic signal control. Traffic signal control widely used in Indonesia is Fixed Time Control (FTC). The deficiency of the FTC is that it cannot accommodate high traffic flow fluctuations, which causes excessive vehicle delays. The purpose of this study is to evaluate the Fuzzy Logic Traffic Signal Control (FLTSC) algorithm on the VISSIM simulation model for an isolated four-way intersection with two-stage signal type 42 and compare its performance with the optimized FTC under various traffic conditions. The simulation results indicate that the performance of the proposed FLTSC is generally better than the optimized FTC, especially in time-varying traffic cases.

**Keywords:** Fuzzy Logic, Signal Control, Mixed Traffic.

Paper ID : 121

## **Flood management strategies in Indonesia, a lesson learned from case study in Pepe River, Central Java**

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**Abstract.** Flood phenomenon happens every year and becomes a threat worldwide. Indonesia also faces this problem without a significant solution. Even Java as business and technology centered, they cannot deal with flooding in better performance. To develop further understanding regarding flood damage, this research aims to investigate the flood management through the structural mitigation by normalization of river hydraulics. The analysis was supported by HEC-RAS to observe the river capacity. The existing condition of Pepe River reveals that the river cannot accommodate design flood return periods from Nakayasu hydrograph synthetic unit result. After the mitigation scenario of hydraulics modification, flood risk can be reduced with the decreasing water level of the river. The paper also discuss Indonesia needs to have more concern other aspects on ecological, green infrastructure, and water governance to achieve the better flood mitigation because structural mitigation only provides temporary satisfaction.

**Keywords:** Flood Risk, Disaster Mitigation, Operation and Maintenance.

Paper ID : 122

## **Various Strut – Macro Modelings for Infilled Frame Analysis**

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**Abstract.** Equivalent diagonal strut is a simple macro model used to represent the behavior of masonry wall as an infilled frame structure when exposed to lateral loads. The model has been shown capable to produce the response of an infilled frame structure which is comparable to the experiment results. There are several important parameters that need to be considered when initiating diagonal strut modeling. The selection of strut type related to the number of struts, i.e single, double, or triple struts will greatly affect the behavior of infill walls. In addition, the residual area after crack ( $A_{m2}$ ) is a very important parameter to be defined properly when modeling the strut. This study shows that the double strut (DS) and triple strut (TS) give response of infilled frame structure

close to testing, with an error is around 9% - 35% when the response is assessed on the basis of peak load, displacement at peak load, and initial stiffness of structure. For DS model, further improvement can be made by assigning the Am2 to around 55% and 78%.

**Keywords:** Macro Modeling of Masonry, Diagonal Strut, Number of Struts, Residual Area of Strut

Paper ID : 124

## **Experimental Investigation on the Shear Behavior of Patched RC Beams without Web Reinforcements: Efficacy of Patching Position with Respect to the Shear Span**

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**Abstract.** Spalling on concrete covers is a type of degradation that commonly appeared in reinforced concrete structures. This form of degradation could occur at the web of shear-span due to, for example, corrosion of reinforcements within the shear span. The degradation will eventually affect the shear strength of that particular section, resulting in un-conservative shear capacity. Patch repair may be an option for restoring the strength of the damaged RC beam. The shear behavior of patched RC beams without web reinforcements is investigated in this study, with a particular focus on determining the effectiveness of patching position with respect to the shear span. Unsaturated Polyester Resin (UPR)-mortar was used in this investigation as a patch repair material. UPR-mortar was applied to patch RC beam web damage at 0.25 and 0.5 of the shear span (measured from the loading point). The RC patched beams accompanied by some normal beams were loaded until failure in the laboratory. The results indicate that patched RC beams exhibit a higher shear capacity than the original undamaged RC beam. Furthermore, UPR-mortar is more effective when applied at 0.25 of the shear span rather than 0.5 of the shear span. This is demonstrated by the evidence that after an initial diagonal crack was formed, the RC beam with patching at 0.25 of the shear span still carries a substantial load before the diagonal crack propagates, causing the beam to fail in shear. Whereas in RC beam with patch repair position at 0.5 of the shear span, the RC beam immediately fails in shear once the significant diagonal crack was formed. However, in NC beams the shear failure occurred earlier than in patched RC beams.

**Keywords:** Crack, Patch repair, RC beam, Shear, UPR-mortar

## **Compressive and Flexural Strength Behavior of Banana Tree Fiber Hybrid Concrete**

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**Abstract.** The purpose of this study to discusses the utilization of banana tree fiber as additional material to improve hardened concrete properties. The existence of banana tree waste from the agriculture business has not been optimally utilized. Using banana tree waste as a constituent of concrete is expected to improve the quality of the concrete and reduce waste. The fibers used in this study are placed in the tensile part of the specimen because concrete has a weakness in resisting tensile forces, so it is hoped that the fibers can increase the tensile capacity of the concrete. The test consisted of checking the workability level of fresh concrete, while the hardened properties tested consist of compressive and flexural strength. Banana tree fiber are varied from 0% to 0.24% of weight of cement. The results of the fresh properties show that the workability of concrete is reduced when amount of fiber is increased. The hardened properties result show that the increasement of amount of fiber did not affect to compressive strength. However, the bending test results show that the flexural strength is improved when the amount of fiber increased.

**Keywords:** Fiber Concrete, Banana Tree, Hybrid Concrete, Compressive strength, Flexural Strength.

## **Relationship Model Between Conceptual Cost Estimation Process of Flyover Development in the Provincial Government of DKI Jakarta with The Accuracy Level**

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**Abstract.** The conceptual cost estimate for flyover development is the cost estimate when the flyover construction does not yet have complete planning data. In the DKI Jakarta Provincial Government, the forecast is used for the proposed flyover construction budget in the 5 Year Strategic Plans and Multi-Year Activities. In the

estimation process, there is a level of accuracy that still needs to be improved, which causes the regional development planning to be less effective because other allocations have shifted in priority. Various factors can cause this in the estimation process that affects the level of accuracy. This study aims to identify the factors or variables in flyover construction's conceptual cost estimation process in the DKI Jakarta Provincial Government that affect accuracy. And then, to analyse the model of the relationship between variables of conceptual cost estimation process to the level of estimation accuracy, using the SEM-PLS method. 8 variables in the conceptual cost estimation process, which affect the estimation accuracy, have been identified through literature studies and expert validation. The variables are information quality, scope quality, estimator performance, estimating procedures, project definition, cost information, project characteristics, and government regulations. Based on respondents' results and the relationship model's analysis with the SEM-PLS method, the model produces 12 significant relationships between the variables of the conceptual cost estimation process for flyover development, with an R-square value of 0, 279.

**Keywords:** Conceptual Cost Estimation Process, Flyover Development, Accuracy, Structural Equation Modeling

Paper ID : 128

## **Development of Preventive Maintenance Guidelines for Simple-Classification Government Buildings based on Work Breakdown Structure within the DKI Jakarta Provincial Government**

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**Abstract.** DKI Jakarta, as the capital of the Republic of Indonesia, has the highest population density in Indonesia, with a population of 16,334 people / km<sup>2</sup>. Therefore, community facilities and infrastructure within the DKI Jakarta Provincial Government play an important role so that community service can be carried out properly. As one of the main infrastructures, State Buildings must have building reliability as stated in the technical requirements stipulated in Presidential Regulation Number 73 of 2016. Building maintenance is an activity to maintain the building's reliability and infrastructure, and facilities so that the building always functions properly. Based on a survey conducted by the DKI Jakarta Provincial Office for The Creation of Works, Spatial Planning and Land Use in 2019, the building assets of Province DKI Jakarta are 9823. 60% of those buildings were classified as Simple-Building category. Due to numerous building assets, building maintenance activities need to be supported by an adequate maintenance guideline especially for the simple-classification building. This study aims to develop preventive maintenance guidelines based on Work Breakdown Structure. The Work Breakdown Structure (WBS) will be used as the basis for maintenance guidelines, including maintenance activities and frequency. The methodology used in this research is study literature, survey and expert validation for WBS for Simple-Building component and Preventive Maintenance Guidelines.

**Keywords:** Simple-Building Maintenance, Maintenance Guidelines, Preventive Maintenance.

## Seismic Performance of Tall and Slender Minaret Structure with Hexagonal RC Wall Section by Means Fragility Curve Development

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**Abstract.** Currently, there are 278,629 mosques registered in the information system of the Indonesian Ministry of Religion. This number is believed to keep growing. One of them is a mosque that was being built in Surakarta, namely Taman Sriwedari Mosque. This building is equipped with 114 m height minaret and is claimed to be the tallest in Indonesia. Considering that Indonesia is located in an earthquake-prone region, it is important to assess the seismic performance of this structure. This research aims to evaluate the seismic performance of the minaret using fragility function. The fragility function is a function that correlates the damage level with an intensity measure. The structural model of the minaret was developed using Seismostruct. Furthermore, the structural response is obtained from the structural model analyzed using static nonlinear pushover. Based on this analysis result, a structural capacity curve is obtained which is then used in constructing the fragility curve. The fragility curve shows that the damage probability of minaret structure on spectral acceleration,  $S_a = 0.098$  g based on the material strain limits criteria for damage states DS1, DS2, DS3, and DS4 is 57%, 29%, 19%, and 12% respectively. On the other hand, based on the maximum base shear criteria for the damage states DS1, DS2, and DS3 is 50%, 20%, and 12% respectively. Perceiving the fragility curve for the structure under review, building owners can predict the probability of structural damage due to other earthquake intensity scenarios and carry out evaluations to determine retrofitting strategies rationally.

**Keywords:** Seismic Performance, Minaret Structure, Fragility Curve.

## Potentials of Internet of Things (IoT) and Intelligent Building System for Building Management

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**Abstract.** The complex interaction between multiple disciplines such as mechanical, electrical, plumbing, HVAC, fire protection etc. make efficient facility management (FM) a challenging task. Internet of Things (IoT) is a new concept for the FM Industry. It is essential to understand the main concept of IoT in terms of managing development, its effectiveness, and the benefits of using it for the FM industry. In this paper, an in-depth study of integrating the Internet of Things (IoT) into the facility management is conducted for commercial buildings through an extensive survey. An Intelligent building with the use of IoT can save maintenance and operation costs by optimizing the management process efficiently and effectively. The survey results depict that there is a positive trend of IoT implementation into FM operation. Yet, there are several challenges ahead for successful implementation. It is revealed that implementing IoT required huge capital investment costs, which can be difficult to convince the business owner for spending investment costs though implementing IoT will likely see the result in the longer run. Data security was another challenge that both survey results and interviewees highlighted IoT required multilayers network to operate, and which is difficult to implement security measure.

**Keywords:** Internet of Things, Intelligent Building System, Building Management.

Paper ID : 132

## **Cost Structure of Construction Safety on High Residential Buildings in Indonesia**

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**Abstract.** The plan for the Cost implementation of Construction Safety Management System in the PUPR sector is part of the Construction Safety Plan, which is agreed upon and approved at the preparatory meeting for the implementation of construction work (Pre Construction Meeting). This study aims to identify and analyze the cost structure of safety in high residential buildings in Indonesia. The methodology used in this study is to use Bill of Quantity data from 16 projects in various regions in Indonesia and then analyzed using the Monte carlo software to determine the optimal cost of safety. The results of this study indicate that the component of expert consultation related to construction safety is the least priority component, followed by the insurance and licensing component, then the construction safety personnel component which is not prioritized. For the construction safety personnel component, according to the construction cost budgeting, the personnel cost has been included, so that it is no longer budgeted for construction safety costs.

**Keywords:** Cost Structure, Construction Safety, High Residential Buildings

Paper ID : 134

## Role of Diagonal Bars in Reinforced Concrete Deep Beams Tested under Static Load

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**Abstract.** Four deep beam specimens were tested to investigate the role of diagonal bars. This study shows that the presence of diagonal bars increases the shear strength and ductility of deep beam specimens. In addition, test results also show that specimens loaded through stub generally gives higher shear strength due to steeper strut inclination angle. The strength capacity of a deep beam can be predicted using ACI 318 strut-and-tie model with conservatism.

**Keywords:** Deep beam, diagonal bar, strut-and-tie.

Paper ID : 135

## Design of Typical Rainwater Harvesting Storage Tanks Based on Housing Type (Case Study in Indonesia)

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**Abstract.** Indonesia is a tropical country which has high rainfall intensity which have an opportunity to be harvested as daily water supply. However, most of Indonesians still rely on the groundwater or tap water as their main water source. Rainwater harvesting is a feasible technology to be applied to decrease the dependency to the current water source. A simple rainwater harvesting using rooftop is considered to be applicable to be used in residential area. This study calculated the typical storage tank for rainwater harvesting based on the house type in Indonesia. Two scenarios were used during calculation. In the first scenario, storage was designed to collect water during rainfall to be used during rainy season only. In the second scenario, tank was designed to collect rainwater to be used for the whole year. Calculation results showed the number of typical storage tank ( $\varnothing$  1.8 m and height of 1.9 m) required for the small house type was 1 tank,

the medium house type was 1-2 tanks, and the large house type was 3-6 tanks. In the second scenario, the number of storage tanks for each type of house was 25 tanks. First scenario is suggested to be used in areas where water scarcity is the main issue during dry season, while second scenario is suggested to be applied for user with no land availability and construction cost issues.

**Keywords:** Design, Rainwater harvesting, Storage tank



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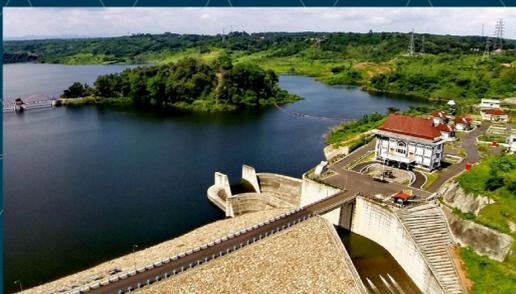
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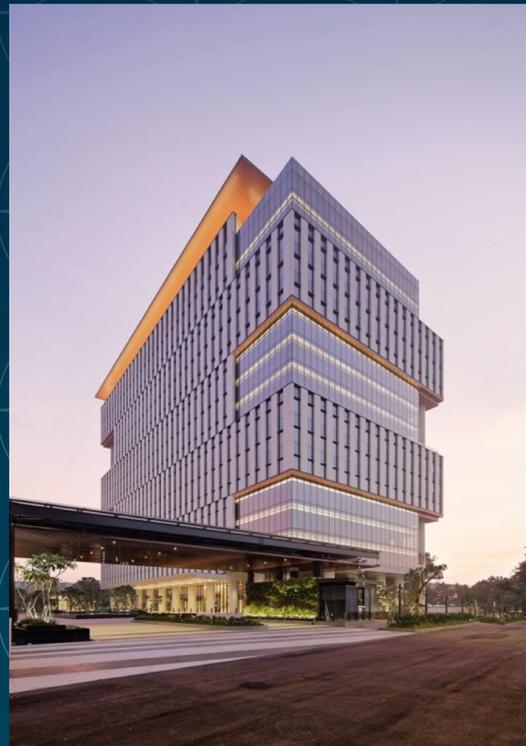
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