



ICEED 2019

# CERTIFICATE

THIS CERTIFICATE IS GRANTED TO

**Ade Lisantono**

In Recognition as

**Presenter**

in The 3<sup>rd</sup> International Conference on Eco Engineering Development (ICEED),  
“Sustainable Environment, Engineering, Energy and Technology Development”  
held in Lorin Hotel, Solo - Indonesia, on 13<sup>th</sup> - 14<sup>th</sup> November 2019



**Dr. Ir. John Fredy Bobby Saragih, M.Si.**  
General Chair of ICEED 2019



**Prof. Tirta Nugraha Mursitama, S.Sos., M.M., Ph.D.**  
General Chair Binus Joint International Conference



**Dr. Ir. Oki Setyandito, S.T., M.Eng.**  
Conference Chair of ICEED 2019



INTERNATIONAL CONFERENCE ON  
ECO ENGINEERING DEVELOPMENT  
**2019**

NOVEMBER 13<sup>th</sup> - 14<sup>th</sup> 2019, SOLO, INDONESIA

Jakarta, Oktober 15<sup>th</sup>, 2019

Letter Number : 2554/ICEED/IX/2019  
Subject : Letter of Acceptance ICEED 2019  
To : Ade Lisantono ([adelisantono@mail.uajy.ac.id](mailto:adelisantono@mail.uajy.ac.id)), Y P B Pratama

Dear Author,

On the behalf of the ICEED Organization Committee, it is my pleasure to inform you that your paper, entitled:

**Effect of silica fume on the Compressive Strength and Modulus Elasticity of Self-Compacting High Strength Concrete**

has been accepted for proceeding publication and conference presentation for The 3rd International Conference on Eco Engineering Development (ICEED 2019). Thereby, you are cordially invited to present the paper at ICEED 2019, which will be held in Solo, Jawa Tengah, Indonesia during November 13-14, 2019. We request at least one of the authors listed in the paper must register with the necessary registration fee, and make presentation of the paper in the conference. All of the registered and presented papers will be published in IOP Conference Series: Earth and Environmental Sciences (EES), which is an open-access proceedings publication indexed by ISI Web of Science, SCOPUS and EI Compindex. Once again, Congratulation to you and we look forward to seeing you in the Conference.

Warmest Regards



ICEED 2019

Dr. Oki Setyandito  
Conference Chair ICEED2019.



↶ Jawab semua ∨ 🗑 Hapus 🗑 Sampah 🚫 Blokir ...

## Rundown and presentation schedule ICEED 2019 Solo 13-14 Nov 2019

🗑 Terjemahkan pesan ke: Indonesia | Jangan pernah terjemahkan dari: Inggris

ICEED <iceed@binus.edu>

Sen 11/11/2019 13.46

richard\_husada@yahoo.com; achristiani73@gmail.com; DEWI HANDAYANI <dewi@ft.uns.ac.id>; Johr



Dear Respected Authors,

Kindly find the link for your presentation schedule at ICEED 2019:

[bit.ly/iceed2019](http://bit.ly/iceed2019)

Allow us to inform you again the venue address:

Hotel Lorin D'wangsa

Jl. Adi Sucipto No. 47

Gonilan, Kartasura,

Kota Kartasura, Jawa Tengah, 57714

If you any question do not hesitate to contact us.

Looking forward to seeing you soon.

Warmest regards,  
ICEED 2019 Committee

**Dr. Oki Setyandito**  
**Civil Engineering Department,**  
**Faculty of Engineering**  
**Binus University, Jakarta**

⏪ Jawab semua ▾ 🗑 Hapus 🚫 Sampah 🚫 Blokir ...

## Payment Confirmation - ICEED 2019

🗣 Terjemahkan pesan ke: Indonesia | Jangan pernah terjemahkan dari: Inggris

I ICEED <iceed@binus.edu>  
Rab 30/10/2019 18.43  
Ir.AM.Ade Lisantono M.Eng ☑



Dear Authors,

We would like to inform you that we have received the the registration fee payment for ICEED 2019 Conference. Thank you so much, and we look forward to seeing you in Conference venue at Lorin Solo Hotel, Solo, Indonesia

Warm regards,

ICEED 2019 committee



## [ICEED 2019] Submission Acknowledgement

Oki <iceed@binus.edu>

Kam 24/10/2019 19.47

Kepada: Ir.AM.Ade Lisantono M.Eng <adelisantono@mail.uajy.ac.id>

Ade Lisantono:

Thank you for your submission, "Effect of silica fume on the compressive strength and modulus elasticity of self-compacting high strength concrete" to The 3rd International Conference on Eco Engineering Development (ICEED 2019). With the online conference management system that we are using, you will be able to track its progress through the editorial process by logging in to the conference web site:

Submission URL:

<https://conference.binus.ac.id/ocs/index.php/iceed/ICEED2019/author/submission/2569>

Username: adelisantono

If you have any questions, please contact me. Thank you for considering this conference as a venue for your work.

Oki

The 3rd International Conference on Eco Engineering Development (ICEED 2019)

---

THE 3RD INTERNATIONAL CONFERENCE ON ECO ENGINEERING DEVELOPMENT (ICEED 2019)

<http://conference.binus.ac.id/ocs/index.php/iceed/ICEED2019/index>

## Re: Submit paper for ICEED 2019

ICEED 2019 <okisetyanditoiced2019@gmail.com>

Sel 22/10/2019 10.51

**Kepada:** Ir.AM.Ade Lisantono M.Eng <adelisantono@mail.uajy.ac.id>

**Cc:** iceed@binus.edu <iceed@binus.edu>; osetyandito@binus.edu <osetyandito@binus.edu>

 2 lampiran (1 MB)

Review\_2554-6029\_Lisantono and Yoga\_ICEED 2019.doc; 2554\_LOA\_iceed 2019 .pdf;

Dear Authors,

Congratulation,

Your papers with have been accepted for proceeding publication with **minor revision** (please revise according to the highlighted comments in the document attached). Also, your paper has been accepted for conference presentation in The 3rd International Conference on Eco Engineering Development ICEED 2019 (kindly find an Letter of Acceptance attached) . Thereby, you are cordially invited to present the paper at ICEED 2019, which will be held in Lorin Solo Hotel,Solo, Jawa Tengah, Indonesia during November 13-14, 2019.

We request at least one of the authors listed in the paper must register with the necessary registration fee before November 3, 2019 and please send the copy proof of the payment to [iceed@binus.edu](mailto:iceed@binus.edu) as a confirmation.

Rupiah Currency:

Account number : 527-170-6678

Account name : Univ. Bina Nusantara

Bank name : Bank Centra Asia (BCA)

Branch name : Univ. Bina Nusantara

Bank address : Kampus II Univ. Bina Nusantara,

JL. Anggrek Cakra 10, Kebon Jeruk, Jakarta 11530

Country : Indonesia

Swift Code : CENAIDJA

2. Other Currency:

Account number : 527-029-7970

Account name : Univ. Bina Nusantara

Bank name : Bank Centra Asia (BCA)

We would also like to inform you that you still have time to prepare the camera ready paper until November 3, 2019. It has to be noted that the camera ready paper is the final manuscript that not allowed for any revision, thus it is the paper that ready to be published. Therefore, you are encouraged to prepare it more carefully. Please upload your revised manuscript through the ICEED 2019 (see the 2 steps procedure for uploading the manuscript, below)

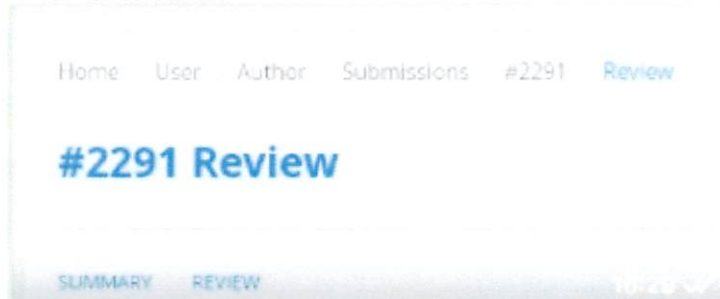
Thank you so much, and we look forward to seeing you in Conference venue at Lorin Solo Hotel, Solo, Indonesia

Warm regards,

ICEED 2019 Committee

**How to upload Revised Manuscript:**

1. Go to 'Review'



2. Choose 'Director Decision', then upload your revised manuscript

**Director Decision**

Decision	Revisions Required 2019-09-20
Notify Director	<input type="checkbox"/> Director/Author Email Record 2019-10-04
Director Version	None
Author Version	2291-6049-1-DR.PDF 2019-10-04 <a href="#">DELETE</a>
Upload Author Version	<input type="text" value="Choose File"/> No file chosen <input type="button" value="UPLOAD"/>

On Sun, Oct 13, 2019 at 10:29 AM Ir.AM.Ade Lisantono M.Eng <[adelisantono@mail.uajy.ac.id](mailto:adelisantono@mail.uajy.ac.id)> wrote:  
Dear: Organizing Committee of ICEED 2019.

Here by, I send my full paper for possibility to joint in ICEED 2019 which is carried out by Binus University (see attachment). Thank you very much for your kind attention and cooperation.

Best regards,  
Ade Lisantono  
Department of Civil Engineering  
Faculty of Engineering  
Universitas Atma Jaya Yogyakarta  
Jalan Babarsari 44, Yogyakarta 55281, Indonesia.



# The 3rd International Conference on Eco Engineering Development (ICEED 2019)

## Conference Archives

### THE 3RD INTERNATIONAL CONFERENCE ON ECO ENGINEERING DEVELOPMENT (ICEED 2019)

Solo City, Indonesia  
TBA  
Solo, ID

November 13, 2019 – November 14, 2019

Eco engineering embraces both green and ecological engineering that emphasize to protect human health and environment. The main objective of eco engineering is to develop sustainable ecosystems, manufacturing processes, building design and construction, disaster management and climate change impact, smart material and communication, renewable energy, that have more ecological values as well as to restore the disrupted ecosystems and polluted environment. It challenges for engineering professionals and scientists as well as researchers and academics, to achieve this goal. The appearance of the fourth industrial revolution or IR 4.0 in the direction of automation, big data, cloud, sensors, robotics, predictive maintenance, connectivity, 3D printing, cyber security, augmented reality, digital innovation, etc., can enhanced the performance of eco engineering. Although IR 4.0 is still in its very early stages, the industry, government and academia will all have the role to introduce it for sustainable environment, engineering, energy and technology development. The 3rdInternational Conference on Eco Engineering Development (ICEED 2019) goal, therefore, is to provide the knowledge enrichment and innovative technical exchange between International researchers/scholars and practitioners from the academia and industries. The conference will cover a spectrum of topics, from theoretical results to concrete applications and solutions.

**All accepted papers in ICEED 2019 will be published in IOP Conference Series: Earth and Environmental Science. IOP Conference Series is an open-access proceeding publication indexed by ISI Web of Science, Scopus, EI Compendex.**

**Link to IOP Conference Series : [IOPScience](#)**

[VIEW CONFERENCE DETAILS](#)

### The 2nd International Conference on Eco Engineering Development (ICEED 2018)

Binus University  
Jl. Anggrek Cakra No. 10, Kebon Jeruk

West Jakarta, ID

September 5, 2018 – September 6, 2018

## Open Conference Systems

### Conference Help

### User

Username

Password

Remember me

[LOG IN](#)

### Notifications

- [View](#)
- [Subscribe / Unsubscribe](#)

### Conference Content

#### Search

All ▼

[SEARCH](#)

#### Browse

- [By Conference](#)
- [By Author](#)
- [By Title](#)

#### Font Size

#### Information

- [For Readers](#)
- [For Authors](#)

The 2nd International Conference on Eco Engineering Development (ICEED 2018) goal is to provide the knowledge enrichment and innovative technical exchange between International researchers/scholars and practitioners from the academia and industries in the field of ecological engineering as listed at the related topic of interests.

The ICEED 2018 invites the unpublished and original research works related to the topics to be submitted to this conference in the form of manuscript paper that should contain 4 - 10 pages, including figures, tables, references, acknowledgements and appendices. Any extra page(s) of your manuscript paper will be charged by US\$15 per page.

The 2nd International Conference on Eco Engineering Development (ICEED 2018) will be held at Binus Campus at Alam Sutera, Tangerang, West Java, Indonesia.

**All accepted papers in ICEED 2018 will be published in IOP Conference Series: Earth and Environmental Science. IOP Conference Series is an open-access proceeding publication indexed by ISI Web of Science, Scopus, EI Compendex.**

[VIEW CONFERENCE DETAILS](#)

## International Conference on Eco Engineering Development 2017

Sheraton Mustika Hotel Yogyakarta

Jl. Laksda Adisucipto KM 8.7, Maguwoharjo, Depok Sub-District, Sleman Regency, Special Region of Yogyakarta 55282, Indonesia

Yogyakarta, ID

November 14, 2017 – November 15, 2017

The International Conference on Eco Engineering Development (ICEED 2017) goal is to provide the knowledge enrichment and innovative technical exchange between International researchers/scholars and practitioners from the academia and industries in the field of ecological engineering as listed at the related topic of interests.

The ICEED 2017 invites the unpublished and original research works related to the topics to be submitted to this conference in the form of manuscript paper that should contain 4 - 10 pages, including figures, tables, references, acknowledgements and appendices. Any extra page(s) of your manuscript paper will be charged by US\$15 per page.

The International Conference on Eco Engineering Development (ICEED 2017) will be held at Sheraton Mustika Hotel, Yogyakarta, Central Java, Indonesia on November 14-15, 2017.

**All accepted papers in ICEED 2017 will be published in IOP Conference Series: Earth and Environmental Science. IOP Conference Series is an open-access proceeding publication indexed by ISI Web of Science, Scopus, EI Compendex.**

[VIEW CONFERENCE DETAILS](#)



This work is licensed under a [Creative Commons Attribution 3.0 License](#).

Welcome to The 3rd International Conference On Eco Engineering Development (ICEED 2019)



**ICEED 2019** The 3<sup>rd</sup> International  
Conference on  
Eco Engineering Development

SUSTAINABLE ENVIRONMENT,  
ENGINEERING, ENERGY AND  
TECHNOLOGY DEVELOPMENT

CONFERENCE  
PROGRAM BOOK





# ICEED 2019

13<sup>th</sup> and 14<sup>th</sup> November  
Puri Nalendra Ballroom  
Lorin D'Wangsa Hotel  
Solo - Indonesia

*“THE KEY TO  
UNDERSTANDING THE  
FUTURE IS ONE WORD:  
SUSTAINABILITY”*

-Patrick Dixon  
(founder of Global Change)





**Prof. Dr. Tirta Nugraha Mursitama, Ph.D.**  
General Chair of BJIC 2019

Minister for Public Works and Housing  
Professor Masayuki Ichinose, Tokyo Metropolitan University, Japan  
Professor Radianta Triatmadja, Gadjah Mada University,  
Yogyakarta  
Dr. Imam Santoso, Indonesia Organization of Hydraulic Engineers

Associate Professor SMN Arosha Senanayake, Universiti Brunei Darussalam  
Professor Koen Venema, Maastricht University, the Netherland  
Professor Danang Parikesit, Bureau of Toll Road Management  
Ir. Dwi Agus Rahsetiyo, M.Tech., PT. Waskita Karya  
Ir. Putut Ariwiboto, PT. Hutama Karya

Ladies and Gentlemen,

First of all, I would like to thank all invited speakers for taking the time to share your knowledge, insight and experiences with us today.

It is an honor for Bina Nusantara University especially Faculty of Engineering become an organizer of ICEED 2019. As Vice Rector of Research & Technology Transfer, this conference is one of our achievements, and it is a result of the growing awareness and willingness of the faculty member for sharing and gathering knowledge with practitioners, researcher, and community toward the green concepts. The appreciation of the participants makes this event rich with update knowledge that are ready to share with the community.

This year Binus Joint International Conference (BJIC) consists of 5 international conferences covering many disciplines ranging from sustainability and development, information management, engineering, technology, computer science, business, international relations, social science and humanities, namely:

1. International Conference on Biospheric Harmony (ICOBAR), chaired by Dr. Juneman Abraham, S.Psi., M.Si., was held successfully in Jakarta, 27 – 28 June 2019;
2. International Conference on Information Management and Technology (ICMTech), chaired by Drs. Suroto Adi, M.Sc., D.M.S, was held successfully in Bali and Jakarta, 19 – 20 August 2019;
3. International Conference on Computer Science and Computational Intelligence (ICCSCL), chaired by Dr. Derwin Suhartono, S.Kom., M.T.I., was successfully held in Yogyakarta, 12 – 13 September 2019;
4. International Conference on Business, International Relations, and Diplomacy (ICOBIRD), chaired by Moch. Faisal Karim, S.Sos., M.A., Ph.D, was successfully held in Jakarta, 9 – 10 October 2019;
5. International Conference on Eco Engineering Development (ICEED), chaired by Dr. Ir. Oki Setyandito, S.T., M.Eng., will be held in Solo, 13 – 14 November 2019.

These conferences show the strong commitment of BINUS University as world class university that ranked 801-1000 in QS World University Ranking 2020 to continuously produce, share knowledge, foster and empower the society. We collected more than 1,200 papers last year. We hope that we will get a similar number this year. But the most important thing is that these conferences become the best venue for networking for all participants. Therefore, I do appreciate for their tremendous contribution to these conferences.

Hopefully, this event can be held again in the coming year and become a house to discuss and share an up to date research and thoughts that are useful for Indonesia and the world. We really hope that you will enjoy ICEED 2019 and had a wonderful experience in the beautiful city of Solo as one of the tourist destinations in Indonesia.

Thank you very much.

Prof. Dr. Tirta Nugraha Mursitama, Ph.D  
Vice Rector of Research & Technology Transfer BINUS University  
General Chair BJIC 2019

---



**Ir. John Fredy Bobby Saragih, M.Si**  
ICEED 2019 General Chairman

First of all, on behalf of the organizing committee of ICEED 2019, we would like to welcome all delegates, all participants to Solo, Indonesia with great pleasure. Being held on November 13-14, 2019 at Lorin D'Wangsa Hotel Solo, proudly the third event of International Conference on Eco Engineering Development (ICEED 2019) is organized by the Faculty of Engineering, Bina Nusantara University.

The big theme of ICEED 2019 is Sustainable Environment, Engineering, Energy and Technology development, and we would like to give our appreciation and thank you to the conference organizers, all of reviewers, as well as all valuable authors for their contribution for making the successful of the event of ICEED 2019. We also greatly acknowledge our publishing partner, IOP Publishing, for their collaborative support in publishing the conference proceedings.

There are hundreds of manuscript papers have presented in the conference and hopefully become our contribution for the society as a role to bridge the harmony of the human wellbeing and the nature through the new advanced eco technology. In this event, we also spread eco-engineering concept to young generation through student competition consisting of posters and bursary essay.

Thank you very much.

Dr. Ir. John Fredy Bobby Saragih, M.Si  
Dean of Faculty of Engineering, BINUS University  
ICEED 2019 General Chairman





**Dr. Ir. Oki Setyandito, S.T., M.Eng.**  
ICEED 2019 Conference Chair

Dear distinguished invited speakers, colleagues, ladies and gentlemen.

It gives me a great pleasure to welcome you to **The 3rd International Conference on Eco Engineering Development**. This event is an annual event in Engineering Faculty, Binus University, where each year it has different theme. For this year the theme is **"Sustainable Environment, Engineering, Energy and Technology development"**. The first ICEED conference was held in Yogyakarta, in 2017. The main purpose of ICEED is to provide the knowledge enrichment and innovative technical exchange between International researchers/scholars and practitioners from the academia and industries in the field of ecological engineering. Eco engineering development plays an important role to bridge the harmony of the human wellbeing and the nature through the new advanced technology. The second ICEED 2018 was conducted di Jakarta, with the theme of "Sustainable Engineering in Architectural Design, Construction, Industry and ICT Transformation". The ICEED 2019 aims to developing a better understanding of eco engineering, Industry 4.0 and the Internet of things, considering the key changes towards sustainable development. In order to achieve this objective, ICEED 2019 focuses on five cores sub topics:

1. Sustainable Infrastructure and Transportation, Energy, Water and Renewable Energy
2. Sustainable Industry and Green Manufacturing
3. Sustainable Architecture
4. Integrated Smart Computing and Communication
5. Green Food Technology

Ladies and gentlemen, since 2011, when the term Industry 4.0 was first publicly introduced, its revolution has attracted attention from all around the world. The digital technologies' evolution has become a challenge of an anticipated change in paradigms and approaches to environment, engineering, energy and technology development. The new technological trends and the Internet of things (IoT), therefore, must reflect on development strategies with respect to the new technological context. Eco Engineering development need to define new strategies, new implementation modalities, different methods and tools to succeed in this new scenario. However, it is not possible to talk about innovation and industry without reference to sustainable development and sustainability.

Sustainability represents the main aim of achievement for strong willing to effectively competing in the nowadays scenario. It very important that technological and industrial developments allow the achievement of environmental, economic and, of course, social sustainability objectives. Therefore, stakeholders should be able to effectively use tools and opportunities to adapt to Industry 4.0, by in shaping their organization, strategies, policies and operations to achieve a sustainable development.

I wish you a most fruitful conference, and we will have a wider perspective and knowledge about sustainable environment, engineering, energy and technology development.

Thank you very much,

Dr. Ir. Oki Setyandito, S.T., M.Eng.  
Head of Civil Engineering Department, BINUS University  
ICEED 2019 Conference Chair



**WASKITA**

BANGGA BERKARYA  
BERSAMA WASKITA

ICEED 2019  
OFFICIAL SPONSOR.

# TABLE OF CONTENTS



## **6** One Day Seminar

## **7** Conference Day 1 (13<sup>th</sup> November 2019)

7 Parallel Session 1

## **19** Conference Day 2 (14<sup>th</sup> November 2019)

18 Parallel Session 2

26 Parallel Session 3

31 Parallel Session 4

36 Parallel Session 5

## **39** Committee



# 1 DAY SEMINAR



Registration  
08.00-08.30



**Dr. Ir. Mochamad Basoeki Hadimoeljono, M.Sc**  
Minister of Public Works and Housing  
"Water Resources Management and Renewable Energy  
Infrastructures in Indonesia"  
09.00-10.00



08.30-09.00

Opening Ceremony

Coffee Break  
10.00-10.15

**Dr. Imam Santoso**  
HATHI (Himpunan Ahli Teknik  
Hidrolik Indonesia)  
"Sustainable Water  
Management for Industry 4.0"



**Assoc. Prof. Masayuki Ichinose**  
Tokyo Metropolitan University, Japan  
"BIM for Project and the  
Facility Management"



11.07-11.33

10.15-10.41

10.41-11.07



**Prof. Ir. Radiana Triatmadja, Ph.D.**  
Universitas Gadjah Mada  
"Sustainable Disaster Management and Water Resilience in Coastal Area"



**Assoc. Prof. SMN Arosha  
Senanayake**  
Universiti Brunei Darussalam  
"Cyber - Physical System for  
Smart Environment"



**Prof. Dr. Techn. Ir. Danang Parikesit, M.Sc**  
Director of Toll Road Management Bureau  
**Harya Setyaka Dillon, Ph.D.**  
MTI General Secretary  
"Vision 2045: Urban mobility planning  
in modern Indonesia"

11.33-12.00

13.00-13.30



12.00-13.00

Lunch

**Prof. Koen Venema**  
Maastricht University, Netherland  
"Use of beneficial microbes to increase  
nutrient efficiency of natural resources,  
with a focus on plant protein digestion  
and recalcitrant fiber fermentation"

**Ir. Dwi Agus Rahsetyo, M.Tech.**  
Engineering Manager  
PT. Waskita Karya (Persero) Tbk.  
"Sustainability in Construction  
for Industry 4.0"



15.00-15.30

Coffee Break

14.30-15.00



14.00-14.30



**Gatot A. Purboyo, S.T., M.T.**  
Investment & Business Development Manager  
PT. Hutama Karya (Persero)  
"Sustainable Infrastructure"

# CONFERENCE DAY 1

Wednesday, 13<sup>th</sup> November 2019

## PARALLEL SESSION 1

9 Nalendra 1

Time	Paper Number	Author(s)	Title
16.00-16.10	2257-5454-1	Tjie Liong Gouw	Vacuum preloading, an alternative soft ground improvement technique for a sustainable development
16.10-16.20	2264-5475-1	Fikri Aris Munandar, Radianta Triatmadja, Nur Yuwono	The performance of low crested breakwater as a sand trap for shore protection
16.20-16.30	2288-5625-1	Van Basten, Mohammed Ali Berawi, Yusuf Latief, Igor Crévits	Role of green building developer and owner in sustainability construction: investigating the relationships between green building key success factors and incentives
16.30-16.40	2292-5536-1	Jazaul Ikhsan, S M Assabiqi, P Harsantom Nursetiawan	Evaluation of infrastructures and riparian area toward the potency of debris flow effect in Putih river watershed, Indonesia

Time	Paper Number	Author(s)	Title
16.40-16.50	2305-5559-1	Ni Komang Ayu Agustini, A Triwiyono, D Sulistyo, Suyitno	Effects of water to solid ratio on thermal conductivity of fly ash-based geopolymers paste
16.50-17.00	2322-5592-1	Rizky Maulida Zulaichatin, G A Kristanto	Analyzing the stability level of organic waste by the static respiration index and dynamic respiration index
17.00-17.10	2262-5467-1	Anthony Gunawan	Geofoam: a potential for Indonesia's soil problem
17.10-17.20	2326-5598-1	Febrian Hera Pratama, Yusuf Latief, Rossy A Machfudiyanto	Standard operational procedures development for government building's care and maintenance work of structure component to improve work effectiveness and efficiency using risk-based approach
17.20-17.30	2330-5607-1	Ayasha Tamara, Yusuf Latief, Rossy Armyn Machfudiyanto	The development of safety plan to improve OHS (Occupational Health and Safety) performance for construction of irrigation channel based on WBS (work breakdown structure)



Time	Paper Number	Author(s)	Title
17.30-17.40	2332-5613-1	Khairunnisa Khairunnisa, Yusuf Latief, Leni Sagita Riantini	Standard Operational Procedure (SOP) Auditing Process In integrated management system to improve the efficiency of organizational performance
17.40-17.50	2342-5627-1	Van Basten, Mohammed Ali Berawi, Yusuf Latief, Igor Crévits	Green building incentive model during design recognition to ensure the reliability of green building operations and maintenance achievement
17.50-18.00	2331-5609-1	Nurul Inayah Wardahni, Yusuf Latief, Rossy Armyn Machfudiyanto	Development of safety plan to improve OHS (Occupational Health and Safety) performance for constructions of dam (Supporting Infrastructure) based on Work Breakdown Structure (WBS)

**PARALLEL SESSION 1**

Nalendra 2

Wednesday, 13<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
16.00-16.10	2333-5615-1	Fathiyah Hakim Sagitaningrum, Samira Albati Kamaruddin, Ramli Nazir, Budi Susilo Soepandji, Idrus Muhammad Alatas	Soil-Solid Interface Shear Strength Review and Its Possibility on Interlayer Slope Stability Analysis
16.10-16.20	2336-5972-1	Nisrina Hanan	Effectivity analysis of the application of TIA (Total Impervious Area) and EIA (Effective Impervious Area) in a micro scale watershed (Case Study on Sugutamu Sub-Watershed)
16.20-16.30	2339-5630-1	Harsawardana, Reza Rahutomo, Bharuno Mahesworo, Tjeng Wawan Cenggoro, Arif Budiarto, Teddy Suparyanto, Don Bosco Surya Atmaja, Bayu Samodro, Bens Pardamean	AI-based ripeness grading for oil palm fresh fruit bunch in smart crane grabber
16.30-16.40	2323-5595-1	Afifah Dewi, Yusuf Latief, Leni Sagita	Activity and risk identification in audit process on integrated management system to increase performance efficiency of construction services organization in Indonesia
16.40-16.50	2343-5632-2	Riana Ayu Kusumadewi, Fahd Ligar Tinimbang, Hernani Yulinawati	The impact of port traffic activities on noise level at Jakarta International Container Terminal I (JICT I) Port of Tanjung Priok, North Jakarta

Time	Paper number	Author(s)	Title
16.50-17.00	2344-5633-1	Harsawardana, Bayu Samodro, Bharuno Mahesworo, Teddy Suparyanto, Don Bosco Surya Atmaja, Bens Pardamean	Maintaining the quality and aroma of coffee with fuzzy logic coffee roasting machine
17.00-17.10	2345-5637-1	Rendy Sinulingga, G A Kristanto	Analysis of biodegradation level and sludge stabilization with Static respiration index and Dynamic respiration index method
17.10-17.20	2351-5646-1	Rivania Delaroza, Asih Wijayanti, Riana Ayu Kusumadewi, Rositayanti Hadisoebroto	The Effect of mixing speed to absorption heavy metal Cu+2 and color using Kepok Banana Peel Waste
17.20-17.30	2352-5649-1	Muhammad Rifandy Fadhillah, Leni Sagita Riantini, Yusuf Latief	Objective identification from every success factors or clause of the integration process management system to increase performance efficiency of state-owned construction services organization in Indonesia
17.30-17.40	2353-5651-1	Riana Ayu Kusumadewi, Indry Kemala Sani, Winami Winami	Optimizing of Cipageran Water Treatment Plant, Cimahi
17.40-17.50	2374-5697-1	Firda Aulia Sartika	Analysis of classification hydrologic soil group distribution based on infiltration rate of Horton method in the Upper Ciliwung Watershed
17.50-18.00	2385-5715-1	Purnawan Adi Wicaksono, Diana Puspitasari	Comparison of Simulated annealing, Nearest neighbour, and Tabu search methods to solve vehicle routing problems



**PARALLEL SESSION 1**

Nalendra 3

Wednesday, 13<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
16.00-16.10	2426-5793-1	Agung Sutrisno	Categorization of failure factors affecting fragility in disaster relief operation
16.10-16.20	2361-5673-1	Faray Faray, Wiwik Rahayu	Durability and strength improvement of clay shale using various stabilized materials
16.20-16.30	2377-5701-1	Rossy Armyn Machfudiyanto	Identification of institutional safety factors affecting safety culture in construction sector in Indonesia
16.30-16.40	2380-5707-1	Chindika Ashilah, Mulia Orientilize, Josia Irwan Rastandi	Comparative study of reduced beam section modelling on SMRF steel structure
16.40-16.50	2384-5713-1	Shabrina Asmarani, Josia Irwan Rastandi, Bastian Bangkit Okto Sentosa, Mulia Orientilize	Damage assessment of moment resisting frame structures using correlation between damage index and natural frequency
16.50-17.00	2453-5901-1	Jakobis Johanis Messakh, Rolland E. Fanggidae, Daniel Lay Moy	Study on the perception of rural communities in the provision of sustainable clean water in the arid tropics of Indonesia
17.00-17.10	2409-5764-1	Raymond Saerang, David Wiliem, Feraldy Tinggogoy, Deddi Carles, Muhammad Dani Laksono, Endra Oey, Sofyan Tan	3D printed 6-Axis collaborative arm robot using force limiting feature for service robot

Time	Paper number	Author(s)	Title
17.10-17.20	2489-5895-1	Jakobis Johanis Messakh, Defritus Punuf	Study on accessibility to water sources and the effect on meeting the clean water needs of rural communities in semi-arid regions of Indonesia
17.20-17.30	2314-5571-1	Rahmat Khamdani, Dwita Sutjiningsih, Evi Anggraheni	Evaluation of micro-scale drainage systems in Kelapa Gading, North Jakarta
17.40-17.50	2404-5758-1	Rheza Maulana, Jamal M. Gawi, Suyud Warno Utomo	Architectural design assessment of Javan Leopard rehabilitation facility regarding the occurrence of stereotypical pacing

**PARALLEL SESSION 1**

📍 Secretariat

Wednesday, 13<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
16.00-16.10	2360-5665-1	Previanto Pradipta, Martha Leni Siregar	Modeling of severity level causes factors of traffic accident victims in the province of West Nusa Tenggara
16.10-16.20	2362-5675-1	Himamul A'la, Wiwik Rahayu, Puspita Lisdiyanti	Effect of increasing urease enzyme concentration on shear strength properties sand clay bio cementation
16.20-16.30	2416-5777-1	Danio Putra Nusantara, Dwita Sutjiningsih, Evi Anggraheni	Water quality index response of UI cascade-pond system on catchment imperviousness temporal variation
16.30-16.40	2456-5844-1	Richard Husada, Ig. Jaka Mulyana	Achieving sustainability through Industrial Revolution 4.0: an example in a small company in Surabaya
16.40-16.50	2466-5861-1	Helena J Kristina, Agustina Christiani, Eric Jobi	Measurement of perception and implementation of sustainable supply chain management at PT Tetra Pak Indonesia
16.50-17.00	2529-5977-1	Dewi Handayani, RA Dynasty Purnomoasri, Syafi'i, AMH Mahmudah	Analysis of car speed reduction due to concrete speed bumps on local roads in Surakarta city
17.00-17.10	2530-5979-1	Dewi Handayani, Widi Hartono, Alfin Wirawan Bagaskara	Factors affecting Junior High school students' bike to school in Surakarta



Time	Paper number	Author(s)	Title
17.10-17.20	2569-6138-1	Ade Lisantono	Effect of silica fume on the compressive strength and modulus elasticity of self-compacting high strength concrete
17.20-17.30	2537-6001-1	J T Hatmoko, L Handoko	Effect of organic content and cement quantity on the shear behavior of artificially cemented soil
17.30-17.40	2442-5814-1	Priskila Christine Rahayu, Agustina Christiani, Patrick Supangi	Analysis of implementation and proposal development of ERP system in CV Indah Jaya
17.40-17.50	2567-6041-1	Michael Tedja	Integrated area based on highest & best use

**PARALLEL SESSION 1**

📍 Bale Raos

Wednesday, 13<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
16.00-16.10	2387-5721-1	Euardi Prahara, Hanna Annisa Rachma	The Effect of cumulative damage factor value on existing runway life service
16.10-16.20	2389-5725-1	Euardi Prahara, Rico Giyar Pionar	Traffic management for MRT construction phase II Bundaran HI – Kota
16.20-16.30	2390-5727-1	Euardi Prahara, Chesia Claudia Hangewa	Analyze Marshall characteristic and cantabro abrasion loss of Laston-WC with high-density polyethylene variations
16.30-16.40	2483-5883-1	Yosica Mariana, Ardhito Yulis	Redesign pedestrian-way in Blok M area as a pathway of sustainable urban mobility
16.40-16.50	2468-5864-1	Yosica Mariana, Yulianto Wijaya	Healing garden implementation in rehabilitation center at Jakarta as a concept of Eco-architecture design
16.50-17.00	2581-62191-1	Sigit Wijksono, Sasmoko, Yasinta Indrianti	Information seeking behaviour of residents towards the work of the architect
17.10-17.20	2574-6048-1	Rika Ismalia, Michael Isnaeni Djimantoro	Creating healing environment in cancer rehabilitation center - a comparison study

Time	Paper number	Author(s)	Title
17.20-17.30	2549-6021-1	Meme Sarjani, John Fredy Bobby Saragih, Vivien Himmayani	Healing spaces: exploring therapeutic concept for breast cancer clinic
17.30-17.40	2550-6024-1	Berin Filadelfia Rieuwpassa, John Fredy Bobby Saragih, Vivien Himmayani	Therapeutic garden setting in rehabilitation post-stroke building
17.40-17.50	2401-5753-1	Andi Bayu Putra, Caroline Maretha Sujana, Putri Arumsari	Analysis on construction services laws for civil engineering projects on building failures

# CONFERENCE DAY 2

Thursday, 14<sup>th</sup> November 2019

## PARALLEL SESSION 2

9 Nalendra 1

Time	Paper number	Author(s)	Title
08.30-08.35	Preparation		
08.35-08.45	2319-5584-1	Adelia Dwidarma Nataadmadja, Oki Setyandito, Made Suangga, Sonny Kosasi	The influence of crystalline material to slump value and compressive strength of concrete
08.45-08.55	2348-5642-1	Adelia Dwidarma Nataadmadja, Eduardi Prahara, Oki Setyandito, Rizma Winna Ananditha	The effect of hydrated lime addition in improving the moisture resistance of Hot Mix Asphalt (HMA)
08.55-09.05	2400-5992-1	Putri Arumsari, Muhammad Malik Ikram	Identification of dominant factors for the delays in building construction project in Kepulauan Anambass
09.05-09.15	2410-5767-1	Putri Arumsari, Christopher Xavier, Andryan Suhendra	Cost and time analysis on the selection of formwork installation method
09.15-09.25	2418-5779-1	Irpan Hidayat, Andrew John Pierre	Seismic performance of reinforced concrete structures with pushover analysis
09.25-09.35	2388-5723-1	Oki Setyandito, Alexander Michael, Juliastuti, Andrew J. P., Yureana W	The effect of bridge abutment shape variation toward flow velocity characteristic
09.35-09.45	2055-4615-1	Ari Ramadhan Hidayat, Radianta Triatmadja, Intan Supraba	The impact of earthquake on clean water demand and supply at North Lombok Regency, Indonesia
09.45-09.55	2577-6051	Made Suangga, Yensen Alvianus	Galloping performance of various chape of bridge hanger
09.55-10.05	2551-6026-1	Muhammad Chairul Furqon, Made Suangga	Evaluating performance of different shear wall shapes using pushover analysis method (case study: Green Sedayu Tower 1 Apartments, Cengkareng, Jakarta Barat)



**PARALLEL SESSION 2**

Nalendra 2

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
08.30-08.35	Preparation		
08.35-08.45	2386-5719-1	Jimmy Linggarjati	Advanced PID simulation for DC motor using Scilab
08.45-08.55	2293-5540-1	Lukas Tanutama, Ricardo Seikka, Albert Hardy	QR label for handicapped exhibition visitors queue Built-Up Avoidance
08.55-09.05	2294-5539-1	Lukas Tanutama, Wioedjaja Atmadja	Home security system with IOT based sensors running on house infra-structure platform
09.05-09.15	2297-5553-1	Jimmy Linggarjati	DC Motor Simulation using LTspice
09.15-09.25	2317-5580-1	Rionaldy Triantoro, Richard Chandra, Daniel Patricko Hutabarat	Multifunctional aromatherapy humidifier based on ESP8266 microcontroller and controlled using Android smartphone
09.25-09.35	2358-5662-1	Daniel Patricko Hutabarat	Eco friendly emergency alert system (EFEAS) based on microcontroller and Android application
09.35-09.45	2371-5691-1	Suryadiputra Liawatimena	Computer vision and fuzzy logic for sustainable Indonesian fisheries
09.45-09.55	2373-5695-1	Suryadiputra Liawatimena	Drones computer vision using deep learning to support fishing management in Indonesia
09.55-10.05	2284-5532-1	Bens Pardamean, Tjeng Wawan Cenggoro, Bloomest Jansen Chandra, Reza Rahutomo	Data annotation system for intelligent energy conservator in smart building

**PARALLEL SESSION 2**

Nalendra 3

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
08.30-08.35	Preparation		
08.35-08.45	2417-5852-1	Bagus Wira Pratama, Fabian Glenn, Wiedjaja Atmadja, Suryadiputra Liawatimena, Rudy Susanto	Design and implementation artificial grow light for germination and vegetative growth
08.45-08.55	2571-6157-1	Ata Aditya Wardana, Natasya Hermawan, Andreas Romulo	Development and texture profile of wood-ear mushroom ( <i>Auricularia auricula</i> ) sausage formulated with carrageenan
08.55-09.05	2310-5567-1	Reggie Surya	Mechanistic hypotheses on colorectal cancer and red meat intake: a review
09.05-09.15	2370-5689-1	Ronald Horison, Ingrid Suryanti Surono	Half-life estimation of encapsulated enterococcus faecium IS-27526 by accelerated shelf life testing (ASLT)
09.15-09.25	2441-5812-1	Said Naufal Hibatollahman, Hiroshi Koyama, Satomi Kameo Kameo, Priyo Waspodo, Ata Aditya Wardana, Ingrid Suryanti Surono	Effect of cocoyam modified starch (xanthosoma sagittifolium), beetroot juice, cocoyam modified starch adsorbing beetroot on plasma selenium and glutathione peroxidase of pre-diabetic rat
09.25-09.35	2372-5693-1	Nathalia Hosiana, D I Astuti, Ingrid S Surono	Physio-chemical, Microbiology, and Preference of Probiotic Fresh Soft Cheese Using <i>Lactobacillus plantarum</i> IS-10506 and <i>Streptococcus</i> <i>thermophilus</i> as Mixed Starter Culture

Time	Paper number	Author(s)	Title
09.35-09.45	2324-5593-1	Leonardus Wahyu wasono Mihardjo, Sasmoko Sasmoko, Firdaus Alamsjah, Elidjen Elidjen	Moderating effect of green IS on relationship between organizational agility, customer experience and digital service innovation to achieve sustainable performance
09.45-09.55	2311-5605-1	Andreas Romulo	The Principle of some in vitro antioxidant activity methods: Review
09.55-10.05	2281-5518-1	Andreas Romulo	Extraction of phenolic compounds using subcritical hot water extraction: a review

**PARALLEL SESSION 2**

Secretariat

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
08.30-08.35	Preparation		
08.35-08.45	2285-5542-1	Reynetha Dwi Soliandra Rawendra, Vini Octaviani Puspita	Use of Six sigma methods to reduce packaging defect in sweetened condensed milk sachets: a case study in XYZ milk industry, Indonesia
08.45-08.55	2494-5903-1	Dwiyantari Widyaningrum, Bayu Meindrawan	The application of microbial extracellular polymeric substances in food industry
08.55-09.05	2394-5736-1	Vivien Himmayani Soebiyani	Thermal comfort mapping on Pasar Gedhe Hardjonegoro to obtain passive cooling strategy in warm humid tropics.
09.05-09.15	2398-5749-1	Kevin Kristofer Kosasih, Winda Astuti, Endra Oey	License plate recognition system based on principal component analysis and one-against-one multi-class support vector machine
09.15-09.25	2399-5751-1	Hadistian Muhammad Hanif, Zener Sukra Lie, Winda Astuti, Sofyan Tan	Road detection system design with proximity sensor to provide electric motor driver warning
09.25-09.35	2367-5679-1	Hauw Sen Rimo Tan	Conceptual development of learning factory for industrial engineering education in Indonesia context as an enabler of students' competencies in industry 4.0 era
09.35-09.45	2397-5747-1	Muhammad Rangga Dzulfiqar Agung, Adrian Adhe Elian, Winda Astuti, Muhammad Nurul Puji	Development of fish separator conveyor based on fish identification system



Time	Paper number	Author(s)	Title
09.45 -09.55	2406-5762-1	Rosiana Hutabarat, Tan Hauw Sen Rimo, Meilani Meilani, Aditya Andika	Improving delivery performance by using simulation, FMEA and FTA
09.55-10.05	2378-5704-1	Aina Sofia Sari, Ingrid Surono	The effect of different starter cultures and dextrose on viability of lactic acid bacteria and h of fermented milk at 43°C
10.05-10.15	2460-5854-1	Nesti Fronika Sianipar, Khoirunnisa Assidqi, Bahtiar Saleh Abbas	The eEffects of subculture on the mutant plant regeneration of rodent tuber (typhonium flagelliforme) in vitro mutagenesis using gamma-ray irradiation

**PARALLEL SESSION 2**

📍 Bale Raos

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
08.30-08.35	Preparation		
08.35-08.45	2296-5550-1	Dian Pramudianti Sabar, Michael Isnaeni Djimantoro	The application of healing space concept in holistic care facilities: a brief for design
08.45-08.55	2328-5601-1	Sigit Wijaksono, Sasmoko, Yasinta Indrianti	Architect's adaptive capacity: public perception of the Architect Adaptive Capacity in coping with disaster
08.55-09.05	2532-5986-1	Albertus Galih Prawata	Playful urban intervention as creative place making strategy in Jakarta
09.05-09.15	2578-6207-1	Sigit Wijaksono, Sasmoko, Yasinta Indrianti, U Rosyidi	Architect's earthquake readiness
09.15-09.25	2562-6112-1	Albertus Galih Prawata	Creative sustainability initiative for Jakarta's Urban Spaces
09.25-09.35	2561-6109-1	KA Salim, R Hendarti, R Tomasowa	Parametric facade for an office design in Jakarta to reduce the irradiance level

Time	Paper number	Author(s)	Title
09.35-09.45	2559-6033-1	Saputra, Hendarti, Tomasowa	A study of an adaptive building façade in West Jakarta
09.45-09.55	2560-6034-1	Nurdiani, Katarina, Grestio	The universal design approach on sport center in Jakarta to create livable public facilities
09.55-10.05	2337	Reynetha Dwi Soliandra Rawendra	Enrichment of soft ice cream with different fibrous fruit Puree: physicochemical, Textural characteristics and sensory properties

**PARALLEL SESSION 3**

Nalendra 1

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
10.30-10.35	Preparation		
10.35-10.45	2564-6038-1	Yanita Mila Ardiani	Application of Biofilic architecture in apartment design fixed
10.45-10.55	2565-6039-1	Yanita Mila Ardiani	Lay out typology in medium housing
10.55-11.05	2562-6036-1	Dennis, Nurdiani, Katarina	The application of threshold space concept on culinary center in Jakarta for sustainable architectural design
11.05-11.15	2252-5445-1	Dave Mangindaan, Ronald Horison, Evi, Michelle Muliawidjaja, Vini Octaviani Puspita	Preliminary design and sustainability study of rosella jam factory utilizing renewable solar energy
11.15-11.25	2576-6050-1	Tota Pirdo Kasih, Dave Mangindaan, Ovitadani Ayuputri, Andreas Romulo, Dwiyantari Widyaningrum	Corona discharge development and its application to eliminate microorganism in raw milk
11.25-11.35	2251-5443-1	Dave Mangindaan, Tota Pirdo Kasih	Innovation and development of polyetherimide-diaminoethane nanofiltration membrane for textile wastewater dye removal towards sustainable environment of Indonesia
11.35-11.45	2521-5962-1	Andryan Suhendra, Eduardi Prahara, Putri Arumsari, Titut Wulandari, Juliastuti	Efficiency measurement of Transjakarta corridors towards people activities using DEA method (study case: corridor 1 and corridor 2)



**PARALLEL SESSION 3**

Nalendra 2

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
10.30-10.35	Preparation		
10.35-10.45	2287-5525-1	Rienna Oktarina, Sigit Wijksono	Model of stakeholder collaborative for disaster logistics in Indonesia
10.45-10.55	2289-5528-1	Safarudin Gazali Herawan, Mohd Azhar Ahmad	Study on adsorption of methylene blue using activated carbon from Pinang frond to determine the optimum operating parameters
10.55-11.05	2290-5530-1	Dwiyantari Widyaningrum	Beneficial potency of algae-based polyunsaturated fatty acids (PUFAs) for cancer therapy
11.05-11.15	2346-5639-1	Rienna Oktarina, Senator Nur Bahagia, Lucia Diawati, Krishna S. Pribadi	Artificial neural network for predicting earthquake casualties and damages in Indonesia
11.15-11.25	2341-5623-1	Safarudin Gazali Herawan, Anjas Bagaskara	Design an innovative waste recycling trash bin based on the requirements from customers (Binusian) in Bina Nusantara University
11.25-11.35	2273-5544-1	Januar Nasution, Karunia Agung Mahardini	Economic analysis for solvent recovery system (solvent as cleaning liquid for the processing equipment)
11.35-11.45	2335-5628-1	Usin Darmalim, Ferdinan Darmalim, Sutristo Darmalim, Alam Ahmad Hidayat, Arif Budiarto, Bharuno Mahesworo, Bens Pardamean	IoT solution for intelligent pond monitoring

**PARALLEL SESSION 3**

Nalendra 3

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
10.30-10.35	Preparation		
10.35-10.45	2277-5511-1	Robertus Nugroho Perwiro Atmojo, Tota Pirdo Kasih	Alternative financing model for smart cities initiatives programme in Indonesia
10.45-10.55	2334-5617-1	Wahyu Sardjono, Harisno Harisno, Widhilaga Gia Perdana	Improve understanding and dissemination of disaster management and climate change by using knowledge management systems
10.55-11.05	2570-6044-1	Vivien Himmayani Soebiyani; J F Bobby Saragih, K Wondoamiseno	Model development of Pasar Gedhe Hardjonegoro, Surakarta for sustainable tourism
11.05-11.15	2355-5655-1	Dyah Lestari Widaningrum, Aditya Andika	Analysis of campus locations in relation to it's nearby point of interests and public facilities
11.15-11.25	2356-5657-1	Nabil Gangsarwijaya, Rischa Anindhita, Dyah Lestari Widaningrum	Decision tree analysis approach to determine factors that affect the quote order lead time fulfillment
11.25-11.35	2412-5773-1	Denny Setiawan	Designing co-living housing with green and ecology architecture concept

**PARALLEL SESSION 3**

📍 Secretariat

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
10.30-10.35	Preparation		
10.35-10.45	2286-5523-1	Fransisca Dini Ariyanti, Senny Chan	Kansei engineering, Manova and Quality Function Deployment to design bottle packaging and seasoning quality
10.45-10.55	2563-6169-4	Fransisca Dini Ariyanti, Anastasia Alowisius Joseph	Partial least squares structural equation modelling approach: How E-service quality affects customer satisfaction and behavior intention of E-money
10.55-11.05	2552-6027	Yosua Christian and Taufik Roni Sahroni	Green productivity methodology for furniture industry
11.05-11.15	2566-6165-1	Taufik Roni Sahroni	Heat transfer analysis for new product development
11.15-11.25	2525-5967-1	Caroline Maretha Sujana, Wehandi Nobeltio Salim	Project delay analysis of high rise building project in Jakarta
11.25-11.35	2270-5491-1	Caroline Maretha Sujana	Contractor project manager leadership style based on path goal theory to support construction sustainability
11.35-11.45	2579-6210-1	Sasmoko, S Wijaksono, and Yasinta Indrianti	Disaster awareness scale
11.45-11.55	2329-5603-1	Sigit Wijaksono, Sasmoko, Yasinta Indrianti	Urban planning Jakarta settlement area based on earthquake mitigation: socio-cultural ecology study

**PARALLEL SESSION 3**

📍 Bale Raos

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
10.30-10.35	Preparation		
10.35-10.45	2569-6043-1	Bunga Sakina	A study on crime prevention through environmental design concept application in a private house in Yogyakarta, Indonesia
10.45-10.55	2303-5557-1	Bunga Sakina	Material conservation as part of environmental sustainability in architecture- case study: Mesvara house, Yogyakarta, Indonesia
10.55-11.05	2568-6042-1	Wiyantara Wizaka	Experimental testing the effect of teaching method with multimedia
11.05-11.15	2358-5662-1	Daniel Patricko Hutabarat	Eco friendly emergency alert system (EFEAS) based on microcontroller and android application
11.15-11.25	2274-5505-1	Welly Wangidjaja	Equitone fibre cement for exterior wall
11.25-11.35	2275-5507-1	Welly Wangidjaja	Modified Clay Material As An Alternative For Wall Covering
11.35-11.45	2555-6054-1	Suharjanto, Salim, Mariana, Wijaksono	The implementation of Biophilic design in coworking space design as a concept of healthy sustainable architecture
11.45-11.55	2556-6056-2	Suharjanto, Salim, Mariana, Wijaksono	Perforated metal made from recycled material in the application of building Facade



**PARALLEL SESSION 4**

Nalendra 1

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
13.00-13.35	Preparation		
13.35-13.45	2269-5488-1	Kahfi Ridho Santoso, Irpan Hidayat	Displacement and curvature ductility in mid-rise reinforced concrete buildings
13.45-13.55	2432-5804-1	Christanto Roesli, Sri Rachmayanti, Polin. M Simanjutak	The application of Batak Karo ornaments in the architecture of the Catholic Church as an effort to design sustainable traditions
14.05-14.15	2437-5836-1	Riza Suwondo, Lee Cunningham, Martin Gillie	Progressive failure modelling of steel moment frames exposed to localized fire
14.15-14.25	2438-5826-1	Riza Suwondo, Sohaib Alama	Seismic assessment of RC building designed by local practice
14.25-14.35	2445-5820-1	Riza Suwondo, Sohaib Alama	Seismic evaluation of reinforced concrete moment resisting frame using pushover analysis

**PARALLEL SESSION 4**

📍 Nalendra 2

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
13.00-13.35	Preparation		
13.35-13.45	2428-5797-1	Sri Rachmayanti, Christianto Roesli, Polin. M. Simanjutak	Eco friendly concept in colonial residential in Lasem
13.45-13.55	2545-6011-1	Nida Nurlivi Fauziyah, Eko Prasetyo, Nugroho Adi Sasongko	Study of green gasoline life cycle assessment (ICA) with crude palm oil (CPO) as raw materials
13.55-14.05	2479-5871-1	Hwi-Chie Ho, Armansyah, Juri Saedon, Shahrman Adenan	Temperature distribution in friction stir spot welding of aluminum alloy based on finite element analysis
14.05-14.15	2480-5873-1	Hwi-Chie Ho, Armansyah, Juri Saedon, Shahrman Adenan	Back propagation (BP) algorithm for property prediction in friction stir spot welding of aluminum alloy

**PARALLEL SESSION 4**

Nalendra 3

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
13.00-13.35	Preparation		
13.35-13.45	2405-5761-1	Rida Zuraida, Bahtiar S. Abbas	The differences of workload, fatigue, emotional intelligence and driving behavior based on age, experience, time on task per trip among Indonesian inter-city bus drivers
13.45-13.55	2316-5578-1	Karyawan Setiadi, Muhtadi, Rida Zuraida	Musculoskeletal disorders and posture analysis of ethylene dichloride (EDC) production operator
13.55-14.05	2350-5648-1	Susanti Margaretha Kuway, Edi Abdurahman, Ngatindriatun MP, Wendy	The influence of information technology capabilities and E-Tenun on the business performance of weaving SMI's in West Kalimantan Province
14.05-14.15	2464-5877-1	Octaviana Sylvia Caroline, Silvia Meliana, Ade A.S. Fajarwati, Yunida Sofiana	Nostalgic element to support the sustainable reasons for architecture preservation – case study Metropole XXI, Jakarta
14.15-14.25	2422-5805-1	Dian Safira, Fakhnida Safitri, Hilwa Kamal, Meilani Meilani, Caroline Maretha Sujana, Aditya Andika	Time acceleration of offshore EPC project using FMEA, FTA, CPM and Crashing method at PT XYZ
14.25-14.35	2559-6136-1	Rudy Susanto, Walliandra Oktavianus, Willy Prayogo, Santoso Budijono, Rico Wijaya	Wearable device for restaurant operational that employs deaf people

**PARALLEL SESSION 4**

📍 Secretariat

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
13.00-13.35	Preparation		
13.35-13.45	2354-5653-1	Religiana Hendarti	Economic analysis on the application of solar panels on an aquaculture
13.45-13.55	2515-5954-1	S Chadijah and Ade A S Fajarwati	Re-programming Sa'o, pursuing sustainable architecture in Ngada traditional house: a recommendation
13.55-14.05	2557-6031-1	Bob Saragih	Play on the street: children's strategy to fulfill play needs
14.05-14.15	2455-5842-1	Wiyantara Wizaka, Gatot Suharjanto, Welly Wangidjaja	The new teaching method using Virtual Reality technology in Building Technology Subject
14.15-14.25	2315-5576-1	Noegi Noegroho	Spatial plan based on disaster mitigation in the city of Mukomuko, Bengkulu
14.25-14.35	2573-6047-1	Noegi Noegroho, Y M Ardiani, F A Khafiz	Home industry area based on sustainable urban neighbourhood study case: SMEs industry area in Pulogadung Jakarta
14.35-14.45	2408-5771-1	Bonny Suryawinata	Portable architecture studio recording video as solution for space limitation



**PARALLEL SESSION 4**

📍 Bale Raos

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
13.00-13.35	Preparation		
13.35-13.45	2573-6179-1	Tota Pirdo Kasih, Rudy Purwondho, Daliansyah Danil, Reinhart Radjagukguk, Anjas Bagaskara	Germination enhancement of green bell pepper ( <i>Capsicum annuum</i> L) by using non thermal argon plasma
13.45-13.55	2572-6163-1	Muhamad Nasir, Putri Putih Puspa Asri, Rana Ida Sugatri	Electrospun SiO <sub>2</sub> /PVDF Copolymer Composite Nanofiber: effect of SiO <sub>2</sub> Content on nanostructure, morphology, and thermal property
13.55-14.05	2567-6131-1	Riva Tomasowa	An exercise on a sustainable design aspiration with the situated FBS ontology of designing
14.05-14.15	2280-5514-1	Nina Nurdiani, Taufik Taufik	The study of application green architecture concept at residential area in Jakarta
14.15-14.25	2561-6035-1	Nurdiani, Katarina, Masyitoh	The behaviour architectural approach on children public space in Jakarta to create sustainable environment
14.25-14.35	2306-5561-1	Fauzi Khair, Dendhy Indra Wijaya, Hubertus Davy Yulianto, Khristian Edi Nugroho Soebandrija	Designing the performance measurement for sustainable supply chain of the crude palm oil (CPO) companies using Lean & Green Supply Chain Management (LGSCM) approach (case study: Indonesia's Palm oil company)
14.35-14.45	2273-5544-1	Januar Nasution, Karunia Agung Mahardini	Economic analysis for solvent recovery system (solvent as cleaning liquid for the processing equipment)
14.45-14.55	2563-6037-1	Aror, Nurdiani, Katarina	The study of physical condition of settlement in Penjaringan – Jakarta to build liveable human settlement

**PARALLEL SESSION 5**

Nalendra 1

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
15.25-15.35	preparation		
15.35-15.45	2553-6028	Yureana Wijayanti, Markus Fittkow, Kadarwati B, Purwadi, Oki Setyandito	Sustainable water management: a review study on integrated water supply (case study on special district of Yogyakarta)
15.45-15.55	2575-6049-1	Yureana Wijayanti, Martin Anda, Ayu Febrianie, Dimas D Puruhito, Oki Setyandito, Juliastuti, S W	Water -Energy Nexus development for sustainable water management in Indonesia
15.55-16.05	2368-5687-1	Khristian Edi Nugroho Soebandrija, Fauzi Khair, Dendhy Indra Wijaya	Sustainable industrial systems through strategic laboratory equipment industry
16.05-16.15	2246-5928-1	Juliastuti, S W Alijahbana, D M Ma'soem, R Soegiarso, Najid, O Gondokusumo, R Lopa, Widagdo, A Jatiwiryono	Build the assessment model of vegetation performance on embankment dam by using knowledge based system
16.15-16.25	2245-5799-1	Dinda M Savitri, Juliastuti	Clash detection analysis with BIM-based software on midrise building construction project (case study: 8 storeys office building)
16.25-16.35	2463-5859-1	Noerlina, Agus Chandra, Tirta Nugraha Mursitama	Revenue sharing model using Dynamics NAV Modification in health industries

**PARALLEL SESSION 5**

Nalendra 2

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
15.25-15.30	preparation		
15.30-15.40	TF-1	A R Keumala, Y M Ardiani, I Tjahjani	Townhouse with application of Hydroponic in Lebak Bulus
15.40-15.50	TF-2	B A M S Maldini, A G Pratawa, Indratoyo	Apartments with organic architecture approach in Cilandak South Jakarta
15.50-16.00	TF-3	Aryo, Made Suangga	Outtrigger effect on seismic distribution force in case study on building 40 and 50 storey
16.00-16.10	TF-4	N F Ramadhan, P utri Arumsari	Study priority assessment of building component maintenance (Case study : traditional market building)
16.10-16.20	TF-5	Rhomy Prasetyadi, E Prahara	Comparison analysis of operational costs vehicles (BOK) and perception of Transjakarta bus passengers type of Zhongtong LCK6180GC and type of Scania K3201A (Case studies: Transjakarta corridor 9)
16.20-16.30	TF-6	N Dewantoro, P N Fernando, Sofyan	Yolo algorithm accuracy analysis in detecting amount of vehicle at the intersection
16.30-16.40	TF-7	A F Sugondo, R Bahana	Chat bot as an alternative means to access online information systems
16.40-16.50	TF-8	N Ranugalih, V M Riyadie and S. Herprayoco	Analysis and evaluation of EB connect portal in PT. Asuransi Jiwa Sequis Financial by using Technology Acceptance Model (TAM)
16.50-17.00	TF-16	R Sarasati, E D Madyatmadja	Evaluation of e-government LAKSA service to improve interest of use application using Technology acceptance model (TAM)

**PARALLEL SESSION 5**

Nalendra 3

Thursday, 14<sup>th</sup> November 2019

Time	Paper number	Author(s)	Title
15.25-15.30	preparation		
15.30-15.40	TF-9	J Gunawan, RR Kosala	Genie ERP for small medium enterprises implementing single page web application
15.40-15.50	TF-10	C W Hon and I K Hartono	Analysis and design of E-commerce on the game information portal
15.50-16.00	TF-11	L N Handoyo, M F Saputro, D K Djaja, J Barun	Business process management for photo and video process on Beritagar.id
16.00-16.10	TF-12	M F Alaydrus, F Farhanudin, F S Ismail, D Lahukuy	Designing web-based database application in CV Bahagia
16.10-16.20	TF-13	A A Permatasari, F N Pramandha, MI Karima, E Santoso	Re-layout factory facility to reduce material handling cost
16.20-16.30	TF-14	K Agusrianto, T Chandra, A T Wijono, A C Sari	Android-base member card "DigiCard" storage application
16.30-16.40	TF-15	A Sulaiman, Devin, S N F Almunawaroh	Analysis of quality control in the production process of making NYY cable using DMAIC method in PT. Kabelindo Murni Tbk.
16.40-16.50	2291-5534-1	Raditya Eko Prabowo, Nicholas Julian, Johannes Mae, Rudy Susanto, Rinda Hedwig	Navigation assistant for vision impaired people using ultra sonic (sonar vision) and Global Positioning System (GPS)
16.50-17.00	2554-6041-1	Johannes Mae, Endra Oey, Ferdian Stanley K.	IoT based body weight tracking system for obese adults in Indonesia using real time database



## ICEED 2019 COMMITTEE

### Advisory Board

---

- Prof. Dr. Ir. Harjanto Prabowo, M.M - Bina Nusantara University, Indonesia
- Prof. Tirta Nugraha Musitama, Ph.D - Bina Nusantara University, Indonesia

### General Chair

---

- Dr. Ir. John Fredy Bobby Saragih M.Si. - Bina Nusantara University, Indonesia

### Conference Chair

---

- Dr. Ir. Oki Setyandito, ST., M.Eng - Bina Nusantara University, Indonesia

### Publication Chair

---

- Ir. Tota Pirdo Kasih, PhD. - Bina Nusantara University, Indonesia
- Ir. Dave Mangindaan, ST. MT. Ph.D, AMRSC, AMICHEM, IPM - Bina Nusantara University, Indonesia
- Dr. Nina Nurdiani, S.T. M.T. - Bina Nusantara University, Indonesia

### Technical Program Committees

---

- Prof. Masayuki Ichinose - Tokyo Metropolitan University, Japan
- Associate Prof. SMN Arosha Senanayake, University of Brunei Darussalam
- Professor Ir. Radiana Triatmadja, Ph.D., Universitas Gadjah Mada
- Prof. Dr. Techn. Ir. Danang Parikesit, M.Sc, Director of Toll Road Management Bureau
- Prof. Koen Venema, Maastricht University, Netherland
- Dr. Abdul Munir Hidayat Syah Lubis- Universiti Teknikal Malaysia Melaka
- Dr. Imam Santoso - HATHI
- Prof. Bahtiar Saleh Abbas, Ph.D - Bina Nusantara University, Indonesia
- Dr. Mohd Rizal Alkahari - Universiti Teknikal Malaysia Melaka
- Filbert Juwono Ph.D - University of Indonesia, Indonesia
- Dr. Tjie Liong Gouw - Podomoro University, Jakarta, Indonesia
- Dr. Lukas Tanutama - Bina Nusantara University, Indonesia
- Dr. Ir. Oki Setyandito, ST., M.Eng - Bina Nusantara University, Indonesia
- Dr. Rinda Hedwig - Bina Nusantara University, Indonesia
- Ir. Tota Pirdo Kasih, S.T., M.Eng., Ph.D., IPM - Bina Nusantara University, Indonesia

ICEED 2019 Program Book

- Safarudin Gazali Herawan, S.T., M.Eng., Ph.D. - Bina Nusantara University, Indonesia
- Religiana Hendarti Ph.D. - Bina Nusantara University, Indonesia
- Dr. Rienna Octarina, S.T., M.T. - Bina Nusantara University, Indonesia
- Adelia Dwidarma Nataadmadja, BE(Hons), BCom., Ph.D - Bina Nusantara University, Indonesia
- Dr. Rida Zuraida, ST., MT. - Bina Nusantara University, Indonesia



**Akreditasi Institusi Perguruan Tinggi  
(AIPT) - BAN PT**  
2991/SK/BAN-PT/Akred/PT/XII/2016



**Perguruan Tinggi Swasta Terbaik  
Sejak 2012**  
Oleh KOPERTIS Wilayah III



**The 2016 Asian  
Most Admired Knowledge Enterprise  
(MAKE) Winner**



**Awarded World's 3-star University**  
By QS Stars University Ratings



Engineering  
Accreditation  
Commission



**THANK YOU**  
**FOR YOUR SUPPORT AND TRUST**

**Fostering And Empowering The Society  
In Building And Serving The Nation**

 **BINUS UNIVERSITY**

 **@binusuniversityofficial**

**www.binus.ac.id**



For inquiries, please contact us at  
email [iceed@binus.edu](mailto:iceed@binus.edu)  
Learn more at [www.binus.edu/iceed](http://www.binus.edu/iceed)



# Effect of silica fume on the compressive strength and modulus elasticity of self-compacting high strength concrete

A Lisantono<sup>1</sup> and Y P B Pratama<sup>2</sup>

<sup>1,2</sup>International Civil Engineering Program, Faculty of Engineering,  
Universitas Atma Jaya Yogyakarta, Jalan Babarsari 44, Yogyakarta, Indonesia.

E-mail: [adelisantono@mail.uajy.ac.id](mailto:adelisantono@mail.uajy.ac.id); [yogapatrial@gmail.com](mailto:yogapatrial@gmail.com).

**Abstract.** Self-compacting high strength concrete is one of the concrete that is needed in a green construction of building. In order to improve the workability of self compacting high strength concrete with silica fume which can be applied on the green construction building is needed. This study is aimed to get the optimum percentage substitution of silica fume by 0%, 5%, 10%, 15%, and 20% of cement on the self-compacting high strength concrete. The workability of the concrete will be tested using slump flow test and L-shaped box test then compared to EFNARC requirement for self-compacting concrete. The results show that the slump flow test and L-shaped box test of the concrete comply with the EFNARC requirement. The compressive strength of the concrete tested at 28 days with substitution of silica fume of 0%; 5%; 10%; 15%; and 20% were 34.33 MPa, 36.78 MPa, 50.98 MPa, 52.82 MPa, and 36.78 MPa, respectively. While the modulus elasticity of the concrete tested at 28 days with substitution of silica fume of 0%, 5%, 10%, 15%, and 20% were 21883 MPa, 22410 MPa, 22590 MPa, 22680 MPa, and 21874 MPa, respectively. So the optimum substitution of silica fume in self-compacting high strength concrete using local quartz sand and quartz powder is 10% up to 15%.

## 1. Introduction

Concrete is one of useful materials in construction building which is composed of cement, coarse and fine aggregate, water, and sometimes added by additives (admixture) if necessary. Generally, concrete that is used in the construction building is normal weight concrete. The normal weight concrete usually has the compressive strength between 20-40 MPa and pouring, flowing, and compacting in the formwork by using a vibrator and it has a noise in the construction of building. One of concrete technology to reduce the noise and support the green construction is self-compacting concrete (SCC).

Self-compacting concrete is a new type of concrete that differs from the normal weight concrete. The self-compacting concrete can fill any part of formwork by the gravity. According to Okamura and Ouchi [1] that the concept of Self-Compacting Concrete (SCC) was proposed by Okamura and developed by Maekawa et al. at the University of Tokyo [2] and [3]. It is a good alternative for structural elements which has complex and difficult shapes, e.g. very thin or curved members, especially in the element of structures which has the presence of congested reinforcement. Moreover, SCC offers many health and safety benefits. The elimination of vibratory compaction on site means that the workers are no longer used the vibrator and providing a quieter working environment. The

---

<sup>1</sup> Corresponding author.

SCC also has many advantages, such as good filling ability, passing ability and segregation resistance. However it still prone to be low durability and low tensile capacity similar to the normal weight concrete.

In building of structures, sometimes it is needed to have a higher compressive strength for some reasons, for examples an element of structures such as column which has a dominant compressive forces needs high compressive strength of concrete. Therefore, it is needed a high strength concrete to accommodate a higher compressive strength. According to SNI 03-6468-2000 [4] that concrete which has a compressive strength more than 41.4 MPa can be classified as high strength concrete. One method to make a high strength concrete is adding silica fume in the concrete.

Silica fume is an ultrafine powder materials which has the particle sizes 50 to 100 times finer than cement and can fulfil the voids created by the free water in the cement matrix. Chemically, it reacts with Calcium Hydroxide (CH) to produce additional Calcium Silicate Hydrate (CSH). The reaction between hydrated Portland cement compounds and Silica fume produces a very dense microstructure and thus improves the bond between the cement and the aggregates.

Chen and Kwan [5] analysed the effects fly ash microsphere and condensed silica fume on packing density and measure the flow spread, flow rate, cohesiveness, adhesiveness, and cube strength of cement paste samples mixed with different fly ash microsphere, condensed silica fume and water contents. The result show that fly ash microsphere and condensed silica fume significantly increase the packing density; the finer condensed silica fume is recommended. Also, adding fly ash microsphere and/or condensed silica fume can more substantially increase the flow spread, flow rate, and compressive strength (10%) at low W/CM ratio than at high W/CM ratio. Al-Sanusi [6] analysed the influence of silica fume on the properties of self-compacting concrete by preparing nine trial mixes with three level of silica fume (3%, 6%, 9%) of powder volume, and three level of water powder ratio (0.3, 0.34, 0.37). The study suggested that no more than 6% silica be replaced by mass and gave recommendation that Slump test, U-Box Test and L-box at the minimum should be performed for the laboratory verification test.

Turk et al. [7] analysed the effect of fly ash and silica fume on compressive strength, sorptivity and carbonation of Self-Compacting Concrete. They experimented adding different volume of fly ash (25%, 30%, 35%, 40%) and silica fume (5%, 10%, 15%, 20%) as the replacement of the Portland cement. The study concluded that SCC with silica fume had the highest compressive strength at 7, 28, and 130 days. Viviek and Dhinakaran [8] also analysed the effect of silica fume in flow properties and compressive strength of self-compacting concrete. He experimented adding different volume of silica fume (5%, 10%, 15%, 20%) as the replacement of the Portland cement. The result showed that the compressive strength increased with increasing of fly ash and silica fume.

Rahul, et.al [9] studied about macro level properties of SCC using silica fume and fly ash by using robosand. Their experiment to replace Portland cement with either silica fume (10%) or fly ash (25%) using fineness modulus of fine aggregates are 2.5, 2.7, and 2.9. They concluded when cement is replaced with silica fume by 10% and Fly ash 25% both fresh and hardened properties were optimum. They added, mix (10% Silica fume, 25% Fly ash powder, and 65% Cement) has the maximum compressive strength and fineness modulus of 2.7 is recommended.

Quartz powder usually can be used for high strength concrete. In some part of Indonesia produces local quartz powder that can be used for high strength concrete. However, it is still few studies of utility of local quartz powder for self-compacting high strength concrete. Also, it is still a question the optimum amount of silica fume for self-compacting high strength concrete using local quartz powder.

Therefore, it is needed to study the optimum amounts of silica fume for self-compacting high strength concrete using local quartz sand and quartz powder through an experimental program.

## 2. Experimental Program

### 2.1 Materials

#### 2.1.1. Portland Cement

Portland Pozzolan Cement (PPC) which is classified as Portland Cement Type II.

#### 2.1.2. Aggregates

Coarse aggregates were taken from Merapi Mountain which is passed to sieve number 12.

#### 2.1.3. Quartz Sand

Quartz sand were taken from Bangka Belitung Island with diameter of 0.125 mm – 0.5 mm and quartz powder with diameter size less than 0.074 mm were also taken from Bangka Belitung Island.

#### 2.1.4. Silica Fume

Silica Fume was used in this study which has density of 0.65 kg/L. The silica fume in this study was taken as 0%; 5%; 10%; 15%; and 20% with respect to total cementitious materials.

#### 2.1.5. Admixtures

Superplasticizer that is used in this study was Sika Viscocrete 1003. The superplasticizer percentage that is used in this study was 2% - 2.2% with respect to the Portland cement.

## 2.2 Mix Design and Specimens

### 2.2.1 Mix Design of Concrete

Water cement ratio (WCR) of self compacting high strength concrete was taken 0.35. The example mix design of the self-compacting high strength concrete with silica fume 15% can be seen in Table 1.

**Table 1.** The mix design of self compacting high strength concrete per m<sup>3</sup>.

No	Materials	Kg/m <sup>3</sup>
1	Portland Cement	510
2	Silica Fume (15%)	90
3	Water (WCR 0.35)	178.5
4	Fine Aggregates (Quartz Sand)	485.52
5	Quartz Powder	208.08
6	Coarse Aggregates	749.7
7	Superplasticizer	10.2

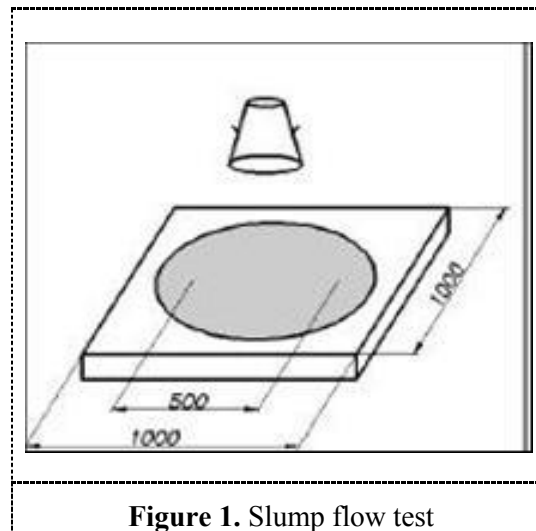
### 2.2.2 Cylinder Specimens

The variation of silica fume substitution were 0%; 5%; 10%; 15%; and 20% with respect to total cementitious materials. Sixty (60) cylinder specimens with the size of (150×300) mm<sup>2</sup> were made and tested in this study. Twelve cylinder specimens were made in every variation substitution of silica fume. The mechanics properties of concrete were tested at the age of concrete of 7 days, 14 days, 21 days, and 28 days. In addition, the specimen at age of 28 days was also tested to investigate the modulus of elasticity of the concrete.

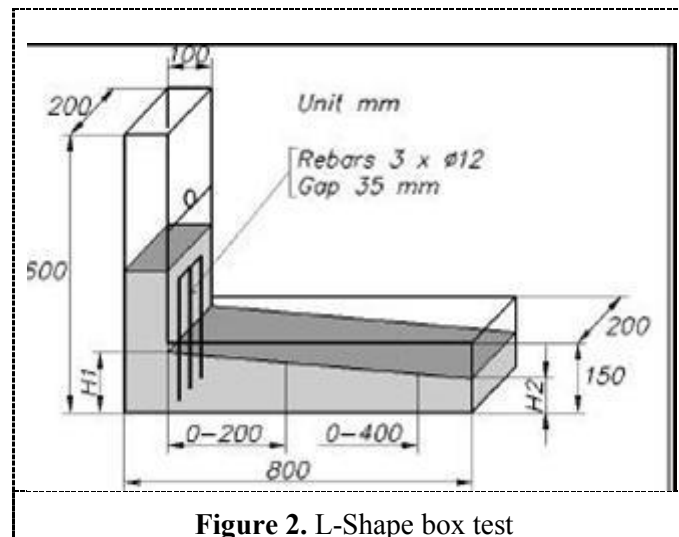
### 2.3 Testing Specimen

#### 2.3.1 Testing of Fresh Concrete

The requirement test for self-compacting concrete (SCC) were slump flow test and L-Shape box test. These testing were conducted in this study to carry out the filling ability and passing ability of the fresh concrete mixture EFNARC [10]. The slump flow test was depicted in Figure 1.



While the L-shape box testing is using the standard L-shape box size as shown in Figure 2.



#### 2.3.2 Testing of Cylinder Specimens

Universal Testing Machine (UTM) with the capacity of 30,000 kgf as shown in the figure 3 was used to conduct the testing of compressive strength and modulus of elasticity of concrete.



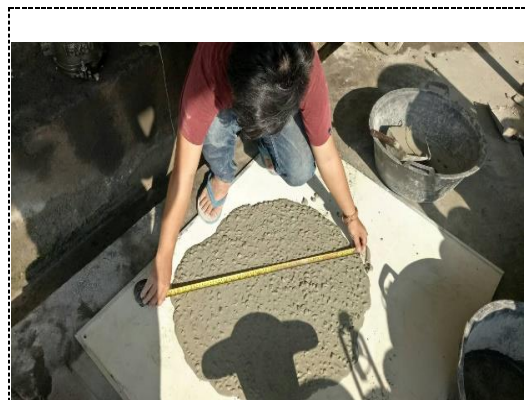


**Figure 3.** Universal Testing Machine

### 3. Results and Discussion

#### 3.1 Slump flow and L-shape box test

The slumps flow test of self compacting high strength concrete was conducted in this study (see Figure 4).



**Figure 4.** Slump Flow Test

The result of slump flow test of the self-compacting high strength concrete can be seen in Table 2. The slump flow results of the self-compacting concrete were in the range of EFNARC requirement. The requirement for the slump flow is 600 to 800 mm. It can be seen from the result of slump flow of this research were in the range of EFNARC requirement.

**Table 2.** The slump flow test of self compacting high strength concrete.

Silica Fume (%)	Mixing for testing of 3 Day	Mixing for testing of 7 Day	Mixing for testing of 14 Day	Mixing for testing of 21 Day	Mixing for testing of 28 Day	EFNARC
0%	640	630	630	620	640	600 up to 800
5%	730	740	730	690	700	

Silica Fume (%)	Mixing for testing of 3 Day	Mixing for testing of 7 Day	Mixing for testing of 14 Day	Mixing for testing of 21 Day	Mixing for testing of 28 Day	EFNARC
10%	640	640	700	710	700	mm
15%	640	640	650	680	680	
20%	620	620	630	630	630	

Another testing of fresh concrete was L-shape box test. The L-shape box test can be seen in Figure 5.



**Figure 5.** L-Shaped Box Test

According to EFNARC that one of the tests of the self-compacting concrete is L-Box test. This test is measuring the block ratio which is the comparison between two ends (starting point is when concrete poured and the end point when the concrete stopped). Regarding to EFNARC that the standard number of blocking ratio should be in the range of 0.8 – 1.0.

The result of L-shape box test was shown in Table 3. It can be seen that the result of L-shape box test of the concrete follows the requirement of EFNARC. The result of L-shape box test of the concrete in this research was in the range of 0.8 to 1.0. According to the slump flow test and L-shape box test, it can be said that the concrete in this study can be classified as self-compacting concrete.

**Table 3.** The L-shape box test of self-compacting high strength concrete

Silica Fume (%)	Blocking Ratio			Average	EFNARC
0%	0.82	0.82	0.85	0.830	
5%	0.85	0.88	0.85	0.860	
10%	0.85	0.83	0.85	0.843	0.8<H<1
15%	0.83	0.85	0.84	0.840	
20%	0.80	0.83	0.82	0.817	

Compressive strength testing of the concrete was conducted at the age of concrete 7 days, 14 days, 21 days, and 28 days. The result of compressive strength of the concrete can be seen in Table 4.

**Table 4.** The compressive strength of self compacting high strength concrete

Silica Fume	Day of Testing							
	7 days	Average	14 days	Average	21 days	Average	28 days	Average
0%	28.29		32.82		42.44		36.22	
	28.29	28.48	31.12	30.75	28.29	33.01	35.08	34.33
	28.86		28.29		28.29		31.69	
5%	32.82		33.95		36.22		36.22	
	29.43	32.07	36.22	34.33	38.48	36.97	37.91	36.78
	33.95		32.82		36.22		36.22	
10%	36.22		43.01		51.50		49.80	
	33.95	35.84	45.27	43.38	49.80	51.12	52.06	50.93
	37.35		41.88		52.06		50.93	
15%	38.48		41.88		53.19		52.06	
	39.05	38.67	44.14	44.52	50.93	50.74	53.19	52.82
	38.48		47.53		48.10		53.19	
20%	32.82		33.95		36.22		37.91	
	31.12	32.63	37.35	35.65	31.12	35.08	35.08	36.78
	33.95		35.65		37.91		37.35	

The average compressive strength were plotted to compare among the variation of silica fume was shown in Figure 6.

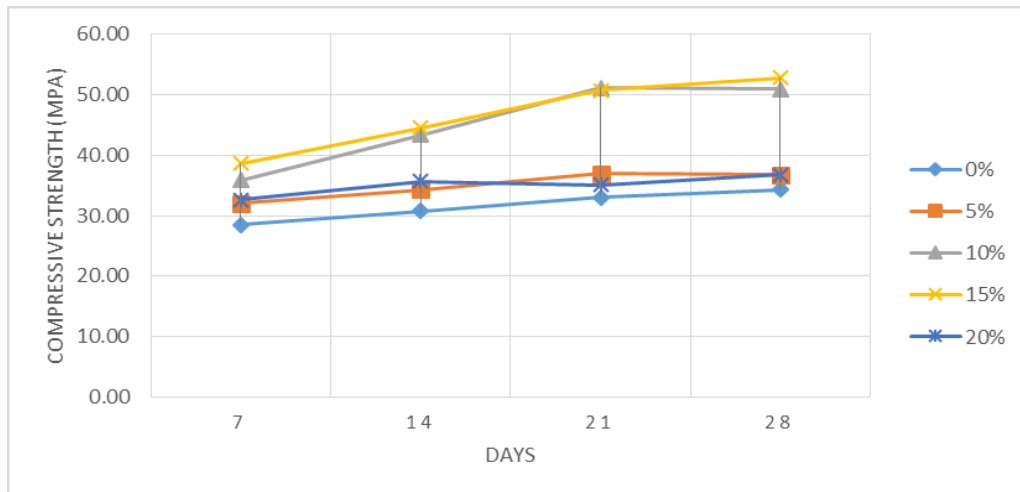
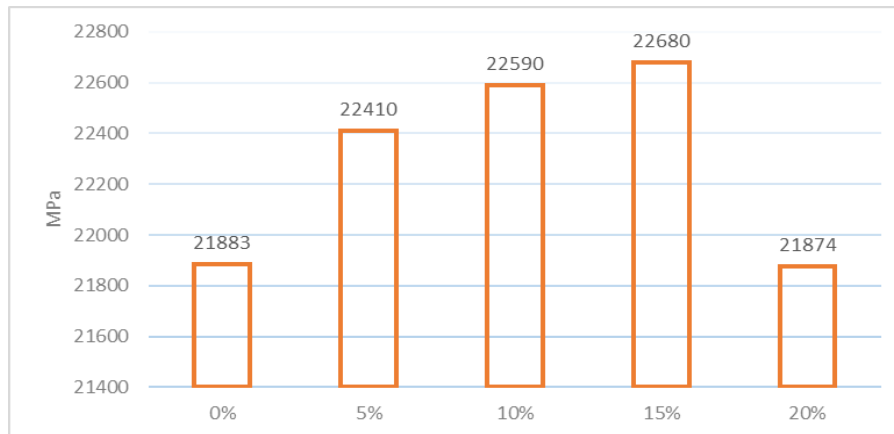
**Figure 6.** The comparison of average compressive strength

Figure 6 shows that the average compressive strength of self-compacting concrete with substitution of silica fume 10% and 15 % have the compressive strength more than 41.4 MPa. It means that the optimum of silica fume for self-compacting high strength concrete were 10% and 15% which gave the average compressive strength 50.93 MPa, and 52.82 MPa, respectively. While others percentage of silica fume (0%; 5%; and 20%) gave the compressive strength less than 41.4 MPa which cannot be classified as high strength concrete.

The modulus of elasticity of the self-compacting high strength concrete was conducted at 28 days. The comparison of modulus of elasticity of the concrete was depicted in Figure 7. Figure 7 shows that modulus elasticity of self compacting high strength concrete with silica fume 10% and 15 % were 22,590 MPa, and 22,680 MPa, respectively. These confirmed to the results that the optimum compressive strength of self compacting high strength concrete were 10% and 15%.



**Figure 7.** The comparison the modulus elasticity of concrete

#### 4. Conclusion

Based on the result of experiments program, several conclusions can be drawn as follow:

1. Based on the testing of fresh concrete it can be concluded that the concrete can be classified as self-compacting concrete, because the fresh concrete testing of slump flow test and L-shape box test comply to EFNARC standard.
2. The average compressive strength of self compacting high strength concrete with silica fume 10% and 15% were 50.93 MPa, and 52.82 MPa, respectively.
3. The modulus elasticity of self compacting concrete modulus elasticity of self compacting high strength concrete with silica fume 10% and 15 % were 22,590 MPa, and 22,680 MPa, respectively. These confirmed to the results that the optimum compressive strength of self compacting high strength concrete were 10% and 15%.
4. Recommendation the silica fume for self-compacting high strength concrete using local quartz sand and quartz powder were 10% up to 15%, because these percentages gave the optimum compressive strength and modulus of elasticity.

#### 5. References

- [1] Okamura, H. and Ouchi M., 2003, Self-Compacting Concrete, *Journal of Advanced Concrete Technology*, Vol. 1 No. 1, April 2003, pp. 5-15.
- [2] Ozawa, K., Maekawa, K., Kunishima, M., and Okamura, H., 1989, Development of performance concrete based on the durability design of concrete structures. *Proceeding of the*



*Second East Asia and Pasific Conference on Structural Engineering and Construction (EASEC-2)*, **1**, pp. **445-450**.

- [3] Okamura, H., Maekawa, K., and Ozawa, K., 1993, *High Performance Concrete*, Gihodo Publishing.
- [4] SNI 03-6468, 2000, *Tata Cara Perencanaan Campuran Tinggi Dengan Semen Portland Dengan Abu Terbang*, Badan Standardisasi Nasional.
- [5] Chen, J. J. and Kwan, A. K. H., 2013, "Triple Blending with Fly Ash Microsphere and Condensed Silica Fume to Improve Performance of Cement Paste", *Journal of Materials in Civil Engineering*, Vol. 25, No. 5, ASCE, pp. **618-626**.
- [6] Al-Sanusi, S., 2013, "Influence of Silica Fume on the Properties of Self Compacting Concrete", World Academy of Science, *Engineering and Technology International Journal of Civil and Environmental Engineering*, Vol.7, No. 5.
- [7] Turk, K., Karatas, M., Gonen, T., 2013, "Effect of Fly Ash and Silica Fume on compressive strength, sorptivity and carbonation of SCC", *KSCE Journal of Civil Engineering*, Vol. 17, Issue 1, pp. **202-209**.
- [8] Vivek, S. S. and Dhinakaran, G., 2015, "Effect of Silica Fume in Flow Properties and Compressive Strength of Self Compacting Concrete", *International Journal of ChemTech Research*, Vol. 8, No. 1. pp. **01-05**.
- [9] Rahul, V., Sashidhar, C., Guru Jawahar, J., and Kumar, D. P., 2017, "Study of Macro Level Properties of SCC using Silica Fume and Fly Ash by using Robosand", *International Journal of Civil Engineering and Technology*, Vol. 8, Issue 2, pp. **182-189**.
- [10] EFNARC 2002 *Specification and Guideline for Self Compacting Concrete*, EFNARC Association.

### **Acknowledgments**

The Authors are wishing to thanks to the Head and Staff of the Laboratory of Structures and Materials, Department of Civil Engineering, Faculty of Engineering, Universitas Atma Jaya Yogyakarta for their facilities of the Laboratory to the authors, so that the research of self compacting high strength concrete using local quartz powder can be conducted.