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Mokhtar Awang *Editors*

ICSDEMS 2019

Proceedings of the International
Conference on Sustainable Design,
Engineering, Management and Sciences

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Seyed Sattar Emamian · Timothy O. Adekunle ·
Utaberta Nangkula · Mokhtar Awang
Editors

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Management and Sciences

Editors

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ISBN 978-981-15-3764-6

ISBN 978-981-15-3765-3 (eBook)

<https://doi.org/10.1007/978-981-15-3765-3>

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This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd. The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Acknowledgements

The editors would like to thank all the members of the local organizing committee who helped organize the International Conference on Sustainable Design, Engineering, Management and Sciences (ICSDEMS 2019), held in Kuala Lumpur, Malaysia. We would like to thank the colleagues and staff members at the institutions and organizations that served as partners for the international conference. Their support in organizing a successful conference has helped the editors to gather ideas and papers presented in this book. The editors are grateful to all the speakers who attended the conference and shared from their wealth of experience some exciting findings who have further propelled us to publish this book.

The editors also appreciate various people, including the production team at Springer, who helped and contributed to the creation of this book. We thank all the authors and contributors who presented at the conference and sent us their papers for peer review. The editors would like to thank and appreciate the peer reviewers for their suggestions, comments, efforts, and time spent to go over all the papers. Their contributions have helped the editors to reach final decisions on many chapters included in this book. The editors also appreciate the following organizations, including Linton University College, Universitas Indonesia, WARIS Research Group, Universiti Putra Malaysia, Collaboration with Relife Green Development, Rumah Intaran, FUSI Foundation, BUPiBE Research, and University of Hartford (USA), for their contributions and support to the overall success of the conference.

The editors appreciate the support of the leadership team of their respective institutions for the support, encouragement, and enabling environment created to prepare this book. The conference has inspired and brought the editors together from different disciplines, institutions across different countries, and continents of the world to work on this book. The creation of this book has helped us to become a formidable team. The process has been enjoyable, challenging, inspiring, and more peaceful than we ever thought. Lastly, the editors would like to thank all

the team members at Springer for their unstinting support of this book, especially the production manager, the commissioning editor, and the managerial team. We are grateful for your support. We thank you all!

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Introduction

This book captures the research outcomes presented during the International Conference on Sustainable Design, Engineering, Management and Sciences (ICSDEMS 2019). The international conference was held from October 16 to 17, 2019, with a focus on “Sustainable Environment.” The overarching theme of the conference centered on “Towards a Sustainable Environment: Exploring the Solutions for the Future.” The conference was created to provide a platform to researchers, engineers, building scientists, designers, planners, project managers, and professionals from different sectors across the globe to present, share, and exchange their research outcomes and developmental activities on all aspects of green built environment. This book showcases the efforts of the presenters and contributors regarding their research findings and how the results could promote a global partner for research collaboration in future. The conference provides an opportunity for delegates to have face-to-face discussion and thus establishes the expected research networking for participants in various specializations related to sustainable architecture, building, construction, engineering, planning, information technology, and project management. The editors carefully considered the peer reviewers’ reports and comments which were sent to the presenters and contributors. The comments, suggestions, and recommendations have shaped and strengthened the quality of the chapters presented in this book.

This book comprises 29 chapters from various presenters and contributors. The first five chapters (Chapters [Eco-Friendly Masonry Products for Affordable Housing—Perspective of Positive Social Impact–Service Quality Gap Analysis of Water Supply in Urban Areas](#)) capture a range of topics from application of eco-friendly masonry products for affordable housing to conformity of the use of space and land use in a metropolis. The first section also captures the factors influencing the perception of people in the surrounding community of a village to analyze the pedestrian movements due to the operational activities in a transit station. Additionally, the first section considers a study on service quality gap analysis of water supply in a water supply company of urban areas. The first five chapters show a strong connection between the applications of eco-friendly products for affordable housing to use of land and space. The first five chapters also

discuss the factors affecting people's perception of the immediate environment to understanding how operational activities affect pedestrian patterns in a transit station to understanding the service quality gap of water supply in many urban areas.

The second five chapters (Chapters [Review on Research Methods in Performance-Based Building Design of High-Rise Residential Property–Analysis of Gen Y Lifestyle Based on Life Cycle on Housing Preferences in Depok City](#)) of this book focus on topics such as review of research methods in performance-based multi-story residential buildings, an investigation on non-destructive tests of old concrete specimens under different load and unload conditions. Other topics include the use of polyethylene terephthalate plastic bottle waste for modification of asphalt concrete mix, analysis of land carrying capacity and population capacity around a toll road of a metropolitan area, and analysis of a lifestyle based on life cycle on housing preferences in a city. The topics would help readers understand how the use of materials and waste products can help attain a sustainable environment due to a paradigm shift in our lifestyle.

The third five chapters (Chapters [Architect's Knowledge and Perception to Apply Green Building Aspect in Design–Pesangrahan River Management in the Recent Times, The Anthropocene Era: A Case Study of Sangga Buana Urban Forest, Jakarta](#)) focus on collection of work on topics including architect's knowledge and perception to apply green building concept in design, analysis of the impact of urban development on river water quality: a case study of a metropolitan area, spatial assessment of micro-hydro power plant in subsidized housing in a community, cost–benefit analysis of hybrid retaining walls construction, and river management in the recent times: a case of an urban forest. The third five chapters emphasize the importance of different aspects of sustainable environment, including river water quality, spatial assessment of hydro power plant, and cost–benefit analysis of green built environment. The chapters would also help readers understand some overarching issues regarding river management in urban forests.

The fourth five chapters (Chapters [Simulation of Damage due to Alkali-Silica Reaction in a Concrete Model at the Macroscale Level–Sustainability in Architectural Conservation of Heritage Building: A Qualitative Approach](#)) discuss a range of topics from simulation of damage due to alkali–silica reaction in a concrete model at the macroscale level to combination of LEM and FEM analysis for stability of concrete cantilever retaining wall. The fourth five chapters also contain other topics such as application of waste low-density polyethylene (LDPE) as bitumen modifier in asphalt concrete-binder course (AC-BC) mix, comparative study of energy efficiency and thermal comfort technology: case studies of eco-friendly studio and house, and a qualitative approach to sustainability in architectural conservation of heritage buildings. This part of the book would help readers capture how technology has helped promote sustainable environment from the perspective of engineering, building science, and architectural conservation.

The fifth five chapters (Chapters [Analysis of Road Traffic Services due to the Operation of Cibubur Greater Jakarta Light Rail Transit Station–Bearing Strength of Concrete Blocks with External Wrapping of Carbon Fibre Reinforced Plastic \(CFRP\)](#)) of the book capture and present some interesting topics such as analysis of

road traffic services due to the operational activities at a light rail transit station and analysis of pedestrian scenarios in public spaces: a case study of a metro light rail transit station. Other topics include changes of facades in a building with commercial function in an urban area, bearing strength of reinforced concrete blocks axially loaded through different sizes of steel plates, and bearing strength of concrete blocks with external wrapping of carbon fiber-reinforced plastic (CFRP). The topics present in Chapters “[Analysis of Road Traffic Services due to the Operation of Cibubur Greater Jakarta Light Rail Transit Station](#)”–“[Bearing Strength of Concrete Blocks with External Wrapping of Carbon Fibre Reinforced Plastic \(CFRP\)](#)” would help readers capture the various developmental activities regarding the aspects of sustainable built environment in light rail transit stations, building facades, reinforced concrete structures, and carbon fiber-reinforced plastic.

The last four chapters (Chapters “[Mechanical properties of Engineered Cementitious Composite \(ECC\): An Overview](#)”–“[Impact of Urban Configurations on Airflow: Tropical Context Study](#)”) discuss a selection of topics that range from an overview of mechanical properties of engineered cementitious composite (ECC) to a comparative study of solar heat transmission through single-skin façade (SSF) and naturally ventilated double-skin façade under a hot and humid climate. The last four chapters also capture topics on responsible waste management of micro, small, and medium enterprises (MSMEs) toward sustainable development in a case study city and impact of urban configurations on airflow: tropical context study. Chapters “[Mechanical properties of Engineered Cementitious Composite \(ECC\): An Overview](#)”–“[Impact of Urban Configurations on Airflow: Tropical Context Study](#)” provide insight on various ways we can promote a sustainable environment through use of single-skin façade and naturally ventilated double-skin façade. This part of the book also includes information on responsible waste management at various levels toward attaining sustainable development in different locations and contexts.

The editors hope the collections of chapters in this book will help readers, including researchers, academia, and industrial professionals, reach out to the presenters and contributors for continued networking and collaboration toward attaining a sustainable environment. We are optimistic that readers would find the research findings in this book helpful and promote future discussion on how some of the research projects could be further developed. It is our hope the collection of work in this book would help provide answers or hints to some unanswered questions in the fields of sustainable architecture, building technology, construction, engineering, planning, information technology, and project management. We hope you enjoy reading the book. We also hope we can build on this work in the future.

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sustainable school building development in the Northeast region of the United States. He has published his research outputs as peer-reviewed articles in numerous top-ranking journals, has presented peer-reviewed papers in professional conferences, and is a reviewer for top journals (Energy and Buildings, Automation in Construction, Architectural Science Review, Building and Environment, Sustainable Cities and Society, Energies, Building Research and Information among others). He is an implementation partner for a National Science Foundation (NSF) nation-wide funded research project on passion-driven data. Professor Adekunle is a member of many professional and academic organizations, including a Fellow of the UK Higher Education Academy (now Advance HE), an Associate Member of the American Institute of Architects (AIA), a member of the Society of Building Science Educators (SBSE), and a full member of the Chartered Institute of Building (CIOB).



Utaberta Nangkula is an International Writer, Professor and Researcher who has written 22 academic research books, 52 chapters in books, more than 400 papers in indexed journals (SCOPUS & WoS), 139 papers in indexed proceedings and over 30 articles in newspaper of Architecture in Indonesia and Malaysia. Born in Jakarta, Nangkula obtained his Doctor of Philosophy and Master of Architecture degree from Universiti Teknologi Malaysia in Johor Bahru as the Best Graduate of Architecture in 2005 and 2009.

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As an academic since 2009, he has graduated 11 Ph.D. and 17 Master of Architecture (by research) students. Lead in 20 major research projects in Malaysia including the Fundamental Research Grant, Trans Disciplinary Research Grant (TRGS), Flood Disaster Management, Group Putra Initiative Putra, Impact Putra, Putra Grant, Graduate Putra, Graduate Research University (GUP), Community-University Grant and Industrial University Grant worth RM1,195,763.00 and involved in many Malaysian Government Major Research Projects such as Permata Project, Lake Chini Biosphere Research and Flood Disaster Management worth more than RM2,512,958.00. He is also involved in several interdisciplinary and industrial research projects since 2010, bringing him the High Impact Industry and Community Award from the UPM Vice-Chancellor for the Design of Indonesian School of Kuala Lumpur in 2016.



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The Changes of Facades in Jengki Building with Commercial Function in Yogyakarta



Noor Zakiy Mubarrok and Sidhi Pramudito

Abstract Jengki is one of the architectural styles that was developed and spread in several regions of Indonesia between the 1950s and 1960s. Buildings with Jengki architectural style have their own values and identity as part of the development of authentic modern architecture in Indonesia. Until now, the existence of buildings with Jengki architectural style still can be found in Indonesia, one of them is Yogyakarta. But over time, the existence of buildings with Jengki style has changed because of several interests. The Jengki buildings often to be abandoned, they become unmaintained, damaged, or sold and then turned from residential into another function. This condition also occurs in Jengki buildings in Yogyakarta. In this research, the authors try to study the façade changes of Jengki buildings due to the function changes as commercial buildings. Through the research, it is expected to be able to identify which of the element on the facades of Jengki architectural style is still surviving, change, or disappear, and also how far is it still recognized as a Jengki building. This is qualitative-descriptive research with a purposive sampling technique. The building samples categorized in Jengki architectural style, then analyzed based on phenomena, especially in façades element which currently function as commercial buildings. Based on the analysis, it was found that the changes in the façade elements mostly occur in buildings that have functional change from the residential to commercial. The addition or changes in the façade element make the characteristic of the Jengki architecture less visible.

Keywords Changes · Façade · Jengki · Commercial

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1 Introduction

Jengki is an architectural style that was developed and spread in several regions of Indonesia in the 1950s–1960s [1–3] in [4]. According to some literature, there is a mention that Jengki is a modification and not an advanced stage of the previous architectural style, The Dutch Colonial Architecture [5]. Other sources also mentioned, although synchronically not contemporaneous, the spirit of Jengki that emerged could be called a typical Indonesian style [1]. Jengki is also said to be the style of Indonesian’s modern architecture after independence.

As an architectural style, buildings with Jengki style are basically more dominated with functional purposes related to the tropical climate. Such as the slope of the roof is rather steep to facilitate the flow of rainwater, the formation of a pentagonal that extends upward on the wall for sun shading, the terrace to reduce the heat of the indoor area, and the roster to providing natural air inside buildings [3]. But Silas [1] said that the Jengki is also an architectural expression that illustrates the spirit of freedom and independence from colonial politics in Indonesia around 1950s–1960s. Therefore, in fact, buildings with Jengki architectural style have their own values and identities as part of the development of modern authentic architecture in Indonesia. The expression of freedom then combined with the functional aspect related to the tropical climate, which becomes the main priorities in the Jengki buildings to create a distinctive design.

Jengki as a modern Indonesian architectural style certainly has distinctive characteristics, especially in its facade. The “eccentric” form mark the spirit of freedom from colonialism in the past. Some of the characteristics of the facade elements of Jengki buildings [3] in [6] are: The type of roof that is commonly used in Jengki buildings is a gable roof with a slope of approximately 35° , with different height, Concrete folded structure above the terrace, Pentagon wall at the front of buildings, roster as an aesthetic element not only for providing natural air inside the building, and asymmetrical composition of doors and windows in the façade.

Nowadays, the existence of the buildings with Jengki style can still be found in Indonesia, for example in Malang, Surabaya, Lawang, and Bandung (documented through several scientific articles). But over time, the existence of buildings with Jengki style has changed because of the demands of time. Its existence can even be said to be threatened with disappearing because more and more buildings are not used, old, not maintained, sold by the owner then the new owner changed the functions and its form. And in the end, the buildings with Jengki style will become a rare piece of architecture.

The same condition also occurs in Jengki buildings in Yogyakarta. Some buildings were abandoned by their owners and are poorly maintained. However, some of these buildings have changed its functions into other forms of private buildings (residential houses) into limited public buildings (commercial). The good side is that with changes in function, indirectly, the Jengki buildings will continue to be preserved and its existence will remain in the present. In this research, the authors try to study the changes in building facades with Jengki style in Yogyakarta. Through

the façade some information related to the culture since the buildings were built can be gathered. Facade can also uncover the criteria of order and arrangement and is credited with providing possibilities and creativity in ornamentation and decoration [7].

Facade becomes important in architecture because from façade, an architectural work can be recognized for its function, style, and even its meaning. The facade is an element that connects the exterior and interior in architectural works, an element in the enclosure of a building that has a meaning as the face of architectural work [8] in [9]. Facades cannot be separated from architectural works. The facade is an element that records the history of human civilization [10] in [9].

Some of the facade elements are roofs, walls, windows, doors, and floors [11], while Krier [7] describes in more detail about the elements forming the facade, which consists of: entrance, the entrance is a transition area between exterior and interior. An element of self-declaration of building occupants. The second is floors: the floor is a building base, an element that has strong ties with urban areas. This is because the floor has a direct connection to the ground/road. Commercial buildings and offices often accommodate floors as part of identity. The third is windows and doors: the window is related to the breadth of the view for the occupants in the building, ensuring the penetration of sunlight into the room, as well as being a decorative element in the facade. Doors have an important role in buildings. An element that allows humans to penetrate a vertical wall, which can be made firm like a gate, or can be the simplest way by punching holes in the wall. Placement of the entrance is also related to the circulation of patterns of activity in space. The fourth is a fence (barrier): is a physical boundary that separates the use of space. The fifth is roofs: This is the element that is at the top of a building. Also, regarding the skyline of buildings, related to the context of the surrounding environment. And the last is sign and ornament: as a sign installed by the building owner, providing building identity information to the public. Ornaments are a complement to the visual aesthetics of the building. As a decorative element, the attraction to attract public attention.

Over time, the facade of an architectural work can change. This change can result in the erosion of architectural identity, and can even erode the identity of an area/region. Economy factors, social, and cultural factors, as well as environmental ecology, are the main factors that influence the changing of a facade [9].

The purpose of this research was to determine changes in the facade of the Jengki building where the building currently functions as a commercial building. It is also hoped that specific architectural elements of Jengki style can be identified which still survives or disappear.

2 Methods

This research is included in a qualitative-descriptive study with a purposive sampling technique. Building samples categorized in the Jengki architectural style, then analyzed based on phenomena, through the façade elements: entrance, floors,

windows, doors, fences, roof, sign and ornaments [7] to see how far the façade changes in the commercial building with Jengki architectural style, and also how far is it still recognized as a Jengki building.

3 Result and Discussion

The research sample located in the commercial area in Yogyakarta. First sample in the Jl. Cik Di Tiro as a Café, the second sample in the Jl. Kartini as a Course place and the third located in the Jl. Brigjend Katamso as a franchise restaurant. These three sample objects can be accessed easily because they are located near the downtown of Yogyakarta.

3.1 1st Sample Object; Coklat Café

Located in Jl. Cik Di Tiro no. 19, Gondokusuman, Yogyakarta, been a café since 1994. Several architectural elements can be identified as the characteristic of Jengki; the folded concrete structure above the terrace, natural tone materials as decorative façade, various applications of aesthetic elements (trellis pattern, fence), and various window shapes with asymmetrical composition.

The existence of the café function in the Jengki building since 1994 has resulted in several changes to the building façade. Analysis of changes that occur in the building façade elements is as follows:

3.1.1 Entrance

The entrance to the site is designed without borders to show openness as a commercial building. Entrance to the building was changed by adding enclosure on the terrace as an expansion area, with doors and glass windows in aluminum frame.

3.1.2 Floor

The site is located higher than the road, parallel to the pedestrian area, with a concrete block, as a visitor parking area, and an outdoor café area at night. The floor of the building is higher than the parking area as seen by the stairs to enter the building.



Fig. 1 Changes to the Coklat cafe entrance building

3.1.3 Windows and Doors

The windows and doors at the entrance of the building were changed due to the expansion area on the terrace. The old window is still maintained, but the old entrance is demolished to expand the indoor area (Fig. 1).

3.1.4 Fence

The café owner changes the fence by dismantling the original fence. The café design has no barriers with the pedestrian ways, and makes it open to attract visitors.

3.1.5 Roofs

The Coklat café retains the original roof, the limasan. Changes occur with the addition of a canopy with zinc and polycarbonate material at the front of the building, as a sun shading and expansion of the outdoor cafe area. The installation of the canopy adjusts to the existing concrete folded structure in the facade.

3.1.6 Sign and Ornaments

The building sign is placed separately from the building, which is in the building yard, in the form of a vertical single sign (billboard) so it does not cover the building appearance. The original ornament that is still preserved is Javanese letters (Wisma Badra Naya) using metal material that describes the building owner, located on the front wall of the building, which is emphasized against the background of black natural stone (Fig. 2).



Fig. 2 Changes to the fence, canopy additions and ornaments in the Coklat cafe building

3.2 Sample Object; Neutron Building

Neutron Building, a tutoring institution located at Jl. Kartini No. 1 Gondokusuman Yogyakarta. It has the characteristics of Jengki style which can be seen from the shape of the gable roof with a slope of approximately 35° , concrete folded structure above the terrace. Asymmetry composition in the facade can be seen from the articulation of the facade, which is strengthened by the use of different natural stone materials as decorative elements on the facade.

This building often changes its function, among others, into offices and cafes. Since 2018 this building has been used by Neutron as a tutoring institution. Analysis of changes that occur in the building facade elements:

3.2.1 Entrance

The entrance to the site has not changed while the entrance to the building is converted into a 12 mm tempered glass door, frameless, give a welcoming impression to the visitors.

3.2.2 Floors

The site is at a higher level compared to the road, with concrete block for the visitor parking area. The terrace and the indoor area still maintains the original level and material.

3.2.3 Windows and Doors

The main windows and doors of the building have been changed by Neutron, using tempered glass, 12 mm frameless with the position still maintaining the composition of the original building façade to give a welcoming impression to the visitors.



Fig. 3 The main entrance and parking area of neutron building

3.2.4 Fence

Neutron is still maintaining the original fences of the building (Fig. 3).

3.2.5 Roofs

The main roof of the building and also the concrete folded structure above the terrace does not change.

3.2.6 Sign and Ornaments

Billboard located in the front of the site, while banners hanging in the concrete folded structure. The banner position makes the concrete folded structure less visible (Fig. 4).

3.3 2nd Sample Object; Olive Chicken

Olive Chicken, a franchise restaurant located on Jl. Brigjen Katamso, Yogyakarta. This building was originally a house and shop building, seen from the proportion of openings in the facade. The left is a shop and the right is the entrance to the house.

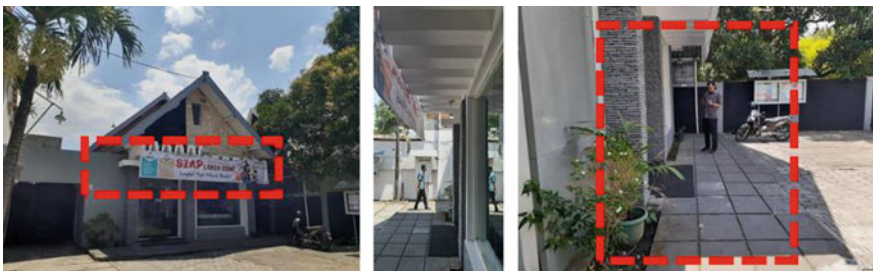


Fig. 4 The sign and ornaments at neutron building



Fig. 5 The entrance and floors in olive chicken

Been used by Olive Chicken since 2018. It has the architectural characteristics of Jengki seen from the use of a saddle roof with a slope of approximately 35°, with the position of the roof ridge that jutted forward, the concrete folded structure above the terrace, asymmetry composition of the openings in the façade, blinds, and roster to maximize natural ventilation above the window frame. Description of changes in this building is as follows:

3.3.1 Entrance

The entrance does not change since the building was built. The sliding doors for the shop and entrance to the house are still maintaining the original material. The divider between the shop and house area was removed to accommodate more visitors.

3.3.2 Floors

This building does not have a terrace nor a yard. It is directly adjacent to pedestrian ways. The level of the building's floor is slightly higher than pedestrian ways with white ceramics tiles (Fig. 5).

3.3.3 Windows and Doors

The windows and doors do not change since the building was built. Wood sliding door for the shop and wood door and window to entrance the house.

3.3.4 Fence

This building does not have a fence, it is directly adjacent to the pedestrian ways.



Fig. 6 The entrance and floors in olive chicken

3.3.5 Roofs

The main roof of the building does not change, as well as the concrete folded structure above the terrace. There is additional galvalume roof below the concrete folded structure to reduce the penetration of sunlight and rainwater. This addition makes the compositions of the roster in the façade not visible.

3.3.6 Sign and Ornaments

A signboard placed at the top of gable wall, which is blocking the blinds at the gable wall. Banner hanging at the additional roof of the façade (Fig. 6).

Overall, based on the analysis of each sample object, some propensities in structuring the façade are as follows (Table 1).

4 Conclusions

Based on the analysis of the three sample objects, the most changes of the building façade most occurred in samples 1 (Coklat Café) and 2 (neutron), especially in the type and material of openings (doors and windows). This is due to the fact that the two buildings changed their function from a residential function (since the building was built) to a commercial function. In contrast to sample 3 (Olive Chicken) does not change its function since the building was built, but the divider of the indoor area was removed, to accommodate more visitors. The addition elements such as banner/sign on the façade, and additional canopy make the characteristic of Jengki architecture less visible. It is considered for the owner/tenant of the building about the façade composition when adding a new element to it, so the new addition element does not interfere with the visibility of the Jengki architectural characteristic.

Table 1 Comparative analysis of facade change in the research samples

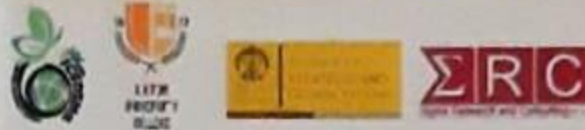
Façade elements [7]	Jengki building sample category		
	Coklat café	Neutron	Olive chicken
Entrance	Changed in part due to area expansion	Changed material at the entrance of the building	Does not changed
Floors	Changed in the function of outdoor space into parking area with concrete and grass divider	Changed in the function of outdoor space into parking area with concrete block	Changed in floor material in indoor area with 40 × 40 ceramics tile
Windows and doors	Changed in part: There are additional doors and windows on the terrace due to the expansion of the area	Material changed using frameless tempered glass door and window	Does not change
Fence	Changed: several fences are removed for openness impression	Does not change	Without fence
Roofs	The main roof does not change. Canopy was added because of the expansion area, covering the concrete folded structure	Does not changed	Main roof and concrete folded structure do not change. Galvalume canopy was added above the openings
Sign and ornaments	Billboard placed separately from the building, it does not cover the building façade	Billboard placed separately from the building, there are additional banners attached to the eaves	Sign attached in the top gable wall, additional banner attached in the galvalume canopy

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Paper ID: 1914056



CERTIFICATE OF PRESENTATION




This is to certify that

Noor Zakiy Mubarrok

delivered an oral presentation during the International Conference on Sustainable Design, Engineering, Management and Sciences (ICSDEMS 2019) in Swiss Garden Hotel Kuala Lumpur, Malaysia, 16th – 17th October 2019.

Paper Title: The Changes of Facades in Jengki Building with Commercial Function in Yogyakarta



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UNIVERSITAS ATMA JAYA YOGYAKARTA
Fakultas Teknik

SURAT TUGAS
NOMOR : 2821/X/U/2019

Dekan Fakultas Teknik Universitas Atma Jaya Yogyakarta, dengan ini memberikan tugas kepada :

Noor Zakiy Mubarrok, S.T.Ars., M.Ars.

Tugas yang diberikan : mempresentasikan makalah dengann judul "The Changes of Facades in Jengki Building with Commercial Function in Yogyakarta" dalam acara "International Conference on Sustainable Design, Engineering, Management and Science" di Swiss Garden Hotel, Kuala Lumpur, Malaysia.

Lamanya menjalankan : selama 3 (tiga) hari terhitung mulai tanggal 16 s.d 18 Oktober 2019.

Harap yang berkepentingan maklum dan bersedia memberikan bantuannya apabila diperlukan

Dikeluarkan di : Yogyakarta
Pada Tanggal : 16 Oktober 2019

Dekan,

Dr. Eng. Luky Handoko, S.T., M.Eng.

Tembusan Yth. :

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- Arsip

