

LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah : The Effect of Earthquake on Architecture Geometry with Non-Parallel System Irregularity Configuration

Jumlah Penulis : 4 Orang (Livian Teddy, Gagoek Hardiman, **Nuroji**, Sri Tudjono)

Status Pengusul : Penulis ke-3

Identitas Prosiding :

- a. Judul Prosiding : IOP Conference Series: Earth and Environmental Science Vol 99 (2017) 012004 International Conference on Sustainability in Architectural Design and Urbanism (ICSADU 2017)
- b. ISBN/ISSN : ISSN: 1755-1307; e-ISSN: 1755-1315
- c. Thn Terbit, Tempat Pelaks. : 2017, Semarang, Indonesia, 9-10 Agustus 2017
- d. Penerbit/Organiser : IOP Publishing
- e. Alamat Repository/Web : <https://iopscience.iop.org/article/10.1088/1755-1315/99/1/012004/meta>
- Alamat Artikel : <https://iopscience.iop.org/article/10.1088/1755-1315/99/1/012004/pdf>
- f. Terindeks di (jika ada) : Scopus

Kategori Publikasi Makalah : ☒ *Prosiding* Forum Ilmiah Internasional
 (beri ✓ pada kategori yang tepat) ☐ *Prosiding* Forum Ilmiah Nasional

Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Reviewer		Nilai Rata-rata
	Reviewer I	Reviewer II	
a. Kelengkapan unsur isi jurnal (10%)	1	1	1
b. Ruang lingkup dan kedalaman pembahasan (30%)	2,3	3	2,65
c. Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	2,3	2,67	2,49
d. Kelengkapan unsur dan kualitas terbitan/jurnal (30%)	2,67	2,33	2,5
Total = (100%)	8,27	9	8,64
Nilai Pengusul = $40\%/3 \times 8,64 = 1,15$			

Reviewer 1



Prof. Ir. M Agung Wibowo, M.M., M.Sc., Ph.D.
 NIP. 196702081994031005
 Unit Kerja : Departemen Teknik Sipil FT UNDIP

Semarang, Oktober 2022
 Reviewer 2



Prof. Dr. Ir. Han Ay Lie, M. Eng.
 NIP. 195611091985032002
 Unit Kerja : Departemen Teknik Sipil FT UNDIP

Prof. Ir. M. Agung Wibowo, M.M., M.Sc., Ph.D.
NIP. 196702081994031005
Unit Kerja : Departemen Teknik Sipil FT UNDIP

LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah : The Effect of Earthquake on Architecture Geometry with Non-Parallel System Irregularity Configuration

Jumlah Penulis : 4 Orang (Livian Teddy, Gagoek Hardiman, Nuroji, Sri Tudjono)

Status Pengusul : Penulis ke-3

Identitas Prosiding : a. Judul Prosiding : IOP Conference Series: Earth and Environmental Science Vol 99 (2017) 012004 International Conference on Sustainability in Architectural Design and Urbanism (ICSADU 2017)

b. ISBN/ISSN : ISSN: 1755-1307; e-ISSN: 1755-1315

c. Thn Terbit, Tempat Pelaks. : 2017, Semarang, Indonesia, 9-10 Agustus 2017

d. Penerbit/Organiser : IOP Publishing

e. Alamat Repository/Web : <https://iopscience.iop.org/article/10.1088/1755-1315/99/1/012004/meta>

Alamat Artikel : <https://iopscience.iop.org/article/10.1088/1755-1315/99/1/012004/pdf>

f. Terindeks di (jika ada) : Scopus

Kategori Publikasi Makalah : ☒ Prosiding Forum Ilmiah Internasional
 (beri ✓ pada kategori yang tepat) ☐ Prosiding Forum Ilmiah Nasional

Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Prosiding		Nilai Akhir Yang Diperoleh
	Internasional <input type="checkbox"/>	Nasional <input type="checkbox"/>	
a. Kelengkapan unsur isi prosiding (10%)	1.00		1.00
b. Ruang lingkup dan kedalaman pembahasan (30%)	3.00		3.00
c. Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	3.00		2.67
d. Kelengkapan unsur dan kualitas terbitan /prosiding (30%)	3.00		2.33
Total = (100%)	10.00		9.00
Nilai Pengusul = 40%/3 x 9 = 1.2			

Catatan Penilaian Paper oleh Reviewer:

1. Kesesuaian dan kelengkapan unsur isi prosiding:

Karil mencakup abstrak, pendahuluan, metoda, bahasan dan kesimpulan tetapi tidak ditemukan kata kunci. Prosiding merupakan conference arsitektur dan perencanaan wilayah dimana karil ini membahas struktur sebuah bangunan dengan ketidakseragaman sebagai dampak desain arsitektur

2. Ruang lingkup dan kedalaman pembahasan:

Ketidakseragaman denah bangunan dibahas sebagai respon gempa. 5 prototype konfigurasi bangunan dianalisa menghasilkan kesimpulan yang cukup jelas dan sangat sesuai dengan perilaku bangunan sejenisnya. Analisa seluruhnya dilakukan secara numeris, namun validasi terhadap temuan dilakukan dengan meninjau respon pada bangunan eksisting yang runtuh akibat gempa

3. Kecukupan dan kemutakhiran data/informasi dan metodologi:

Topik cukup menarik dan ide dibalik analisa sangat kuat dijadikan sebagai dasar peninjauan aspek ketidakberaturan sebuah gedung. Simulasi numeris bukan hal baru, dan beberapa tulisan yang digunakan sebagai pustaka menunjukkan itu. Pustaka cukup terbatas dan tidak seluruhnya langsung terkait dengan isi karil.

4. Kelengkapan unsur dan kualitas terbitan:

IOP merupakan penerbit prosiding. Adapun proses review dan seleksi karil merupakan tanggung jawab panitia. Peserta hanya terwakili oleh 3 dari syarat minimum 4 negara

Semarang, Juni 2020

Reviewer 2

DocuSigned by:



5D535F69BD8D411...

Prof. Dr. Ir. Han Ay Lie, M. Eng.

NIP. 195611091985032002

Unit Kerja : Departemen Teknik Sipil FT UNDI



CERTIFICATE OF PARTICIPATION

BASED ON SK REKTOR UNDIP NO. 536/UN7.P/HK/2017

This is to certify that

LIVIAN TEDDY

*Has participated in the International Conference on Sustainability
in Architectural Design and Urbanism (ICSADU) 2017*

as **AUTHOR**

held in Aston Hotel, Semarang, Indonesia, at August 9th, 2017.

Dean of Faculty of Engineering
Universitas Diponegoro



Ir. M. Agung Wibowo, MM, MSc, PhD.

Head of Department of Architecture

Dr. Ir. Agung Budi Sardjono, MT

Chair of ICSADU 2017

Dr. Ir. Atiek Suprapti, MT



1 of 1

📄 Export [Download](#) 🖨️ Print ✉️ E-mail 📄 Save to PDF ☆ Save to list More... >

[View at Publisher](#)

Document type	Source type	ISSN	DOI	View more
Conference Paper	Conference Proceedings	17551307	10.1088/1755-1315/99/1/012004	▼

IOP Conference Series: Earth and Environmental Science • Open Access • Volume 99, Issue 1 • 5 January 2018 • Article number 012004 • International Conference on Sustainability in Architectural Design and Urbanism 2017, ICSADU 2017, 9 August 2017 - 10 August 2017

The effect of earthquake on architecture geometry with non-parallel system irregularity configuration

Teddy L.^a ✉️, Hardiman G.^b, **Nuroji**^c, Tadjono S.^c

📁 Save all to author list

^a Doctoral Program of Architecture and Urban, Diponegoro University, Indonesia

^b Departement of Architecture, Faculty of Engineering, Diponegoro University, Indonesia

^c Doctoral Program of Civil Engineering, Diponegoro University, Indonesia

Abstract

Author keywords

Indexed keywords

Topics of prominence

Funding details

Abstract

Indonesia is an area prone to earthquake that may cause casualties and damage to buildings. The fatalities or the injured are not largely caused by the earthquake, but by building collapse. The collapse of the building is resulted from the building behaviour against the earthquake, and it depends on many factors, such as architectural design, geometry configuration of structural elements in horizontal and vertical plans, earthquake zone, geographical location (distance to earthquake center), soil type, material quality, and construction quality. One of the geometry configurations that may lead to the collapse of the building is irregular configuration of non-parallel system. In accordance with FEMA-451B, irregular configuration in non-parallel system is defined to have existed if the vertical lateral force-retaining elements are neither parallel nor symmetric with main orthogonal axes of the earthquake-retaining axis system. Such configuration may lead to torque, diagonal translation and local damage to buildings. It does not mean that non-parallel irregular configuration should not be formed on architectural design; however the designer must know the consequence of earthquake behaviour against buildings with irregular configuration of non-parallel system. The present research has the objective to identify earthquake behaviour in architectural geometry with irregular configuration of non-parallel system. The present research was quantitative with simulation experimental method. It

Metrics 🔍 [View all metrics](#) >

1 Citation in Scopus
64th percentile

10 Views Count 2020 ⓘ
Last updated on:
27 April 2021

8 2019
39 2011-2021

0.80 Field-Weighted
Citation Impact ⓘ



PlumX Metrics

Usage, Captures, Mentions,
Social Media and Citations
beyond Scopus.

Cited by 1 document

Verification of irregularities in a reinforced concrete tall structure

Raju, P.K. , Ravindra, V.
(2021) *IOP Conference Series: Materials Science and Engineering*

[View details of this citation](#)

Inform me when this document is cited in Scopus:

[Set citation alert >](#)

Related documents

The effect of architectural form on the earthquake behavior of symmetric RC frame systems

Inan, T. , Korkmaz, K. , Cagatay, I.H.
(2014) *Computers and Concrete*

The structural damages and collapse types in Turkey, observed after the recent earthquake

Korkmaz, S.Z. , Korkmaz, H.H.



Source details

IOP Conference Series: Earth and Environmental Science

Scopus coverage years: from 2010 to Present

ISSN: 1755-1307 E-ISSN: 1755-1315

Subject area: Environmental Science: General Environmental ScienceEarth and Planetary Sciences: General Earth and Planetary SciencesPhysics and Astronomy: General Physics and Astronomy

Source type: Conference Proceeding

CiteScore 2020

0.5



SJR 2020

0.179



SNIP 2020

0.436

[View all documents >](#)[Set document alert](#)[Save to source list](#)[Source Homepage](#)[CiteScore](#) [CiteScore rank & trend](#) [Scopus content coverage](#)

i Improved CiteScore methodology



CiteScore 2020 counts the citations received in 2017-2020 to articles, reviews, conference papers, book chapters and data papers published in 2017-2020, and divides this by the number of publications published in 2017-2020. [Learn more >](#)

CiteScore 2020

$$0.5 = \frac{25,463 \text{ Citations 2017 - 2020}}{49,883 \text{ Documents 2017 - 2020}}$$

Calculated on 05 May, 2021

CiteScoreTracker 2021

$$0.4 = \frac{26,529 \text{ Citations to date}}{59,330 \text{ Documents to date}}$$

Last updated on 04 June, 2021 • Updated monthly

CiteScore rank 2020

Category	Rank	Percentile
----------	------	------------

Environmental Science	#183/220	17th
General Environmental Science		
Earth and Planetary Sciences	#157/186	15th
General Earth and Planetary Sciences		

[View CiteScore methodology >](#) [CiteScore FAQ >](#) [Add CiteScore to your site](#)

About Scopus

[What is Scopus](#)[Content coverage](#)

Language

[日本語に切り替える](#)[切换到简体中文](#)

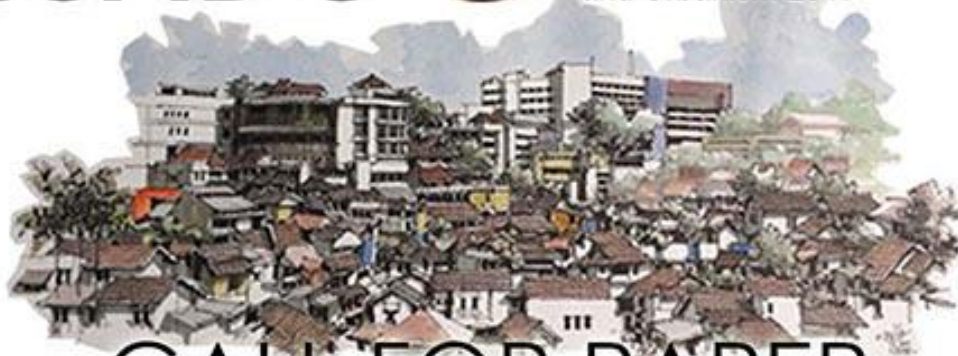
Customer Service

[Help](#)[Contact us](#)

ICSADU



International Conference on
Sustainability in Architectural Design
and Urbanism 2017



CALL FOR PAPER

The issue of resilient design rewarmed in a decade mainly related to the rise of some natural disasters. Learn from the best practices of resilient city is very interesting and inspiring to synthesis solution for better space quality of community life. All honourable author are kindly encouraged to contribute and shape the conference through submissions in forms of research paper and posters.

Theme:

Resilient Design and Resilient City
Toward A Better Living Space

Potential Topics to be Discussed,
but are not Limited to:

- Management and policy
- Vulnerability of Cities
- Adaptation Resilience
- Public Participation
- Building Technology
- Preservation and Conservation
- Resilient Design

For further information

Contact us:

web : www.icsadu.undip.ac.id

e-mail : admin@icsadu.org

Important Dates:

Abstract Submission Deadline	March 31
Acceptance	April 15
Full Paper Submission Deadline	June 01
Acceptance	June 30
Early Bird Registration Deadline	June 30
Deadline of Registration	July 30
Conference Date	August 9-10

Keynote Speakers

1. Prof. Yoshida Tomohiko
(Ritsumeikan University)
2. Assc. Prof. Kim Saehoon
(Seoul National University)
3. Prof. Mads Gaardboe*
(University of South Australia)
4. Prof. Gagoek Hardiman
(Diponegoro University)

*in confirmation



Early Bird			Regular		
International Student	Indonesian Student	Non Student	International Student	Indonesian Student	Non Student
USD 250	IDR 1,500.000	IDR 2,500.000	USD 350	IDR 2,000.000	IDR 3,000.000
PARTICIPANT WITH PAPER					
PARTICIPANT ONLY					
USD 125	IDR 500.000	IDR 750.000	USD 175	IDR 800.000	IDR 1,000.000

Held by:
Department of Architecture
Faculty of Engineering
Diponegoro University



Scan here
and directly go to
online submission page

SCOPUS
INDEXED
PUBLICATION

VENUE
ASTON HOTEL
Semarang, Indonesia

PREFACE

The Conference on Sustainability in Architectural Design and Urbanism (ICSADU 2017) is an international scientific forum for discussing and sharing ideas, thoughts, practices from around the world in the field of architecture and urbanism. The first ICSADU was held by Department of Architecture, Faculty of Engineering, Universitas Diponegoro in Aston Hotel Semarang, Indonesia as part of their annual international program. We highly appreciated the authors and audience contribution for the conference program and have made their way to attend the conference.

Resiliency is the issue in 21st century regarding urbanism & architecture. Climate change, environmental degradation, inaccurate and risky in urban planning process, and the emergence of the hazards have become major problems in human habitation on earth. A few things can be done to anticipate them to occur so human existence can be sustained. Some communities have been launched plethora of design innovations as one of the solutions that pay attention to the environment. However, if those problems emerge, the risk is unlikely inevitable.

Based on the afore mentioned facts, it is necessary to remind designer and planner to think carefully and eager in providing solutions in the form of a design that can make a building and its surroundings more comfortable, safer and more sustainable when exposed to incoming risks.

The objective of this conference are to be an international forum for the academia, researchers, practitioners, governments, students, and other parties in communing their research and development results on fundamental and applicable of architecture and urban planning, to extensively share and exchange ideas, and thoughts related to the themes, to facilitate network among participants for improving the quality and benefits of the researches. The Conference theme was 'Resilient City and Resilient Design toward a Better Living Space'. The range of topics includes: (1) management of policy, (2) infrastructures, (3) environment, (4) communities & societies, (5) housing, also (6) building technologies.

Putting together ICSADU 2017 was a team effort. We first thank the authors for their contributions to the program. We must also thank the organizing and scientific committee for their invaluable efforts in reviewing papers and constructive feedback to the authors. We are very grateful for Prof. Tomohiko Yoshida from [Ritsumeikan University](#), Prof. Gagoek Hardiman from [Diponegoro University](#), Dr. Saehoon Kim from [Seoul National University](#), and Thana Chirapiwat, Ph.D from [Silpakorn University](#) for their contribution as keynote speakers in this conference; Journal of Architecture and Urbanism, especially for editor in chief - Prof. Almantas Samalavicius; IOP Conference Series Earth and Environmental Sciences; and finally we would like to thank Department of Architecture, Faculty of Engineering, Universitas Diponegoro for the support in putting together this first ICSADU.

We hope that this conference will foster the exchange of new ideas and promote new contacts between researchers on the field of urbanism and architecture.

Sincerely,
On behalf of the conference committee,
Dr. Atiek Suprpti
Chair of ICSADU 2017



Steering committee

Dr. Ir. Atiek Suprpti, MT
Edward Pandelaki, ST, MT, PhD
Satriya W Firmandhani, ST, MT
Chely N Bramiana, ST, BBE, MSc
Ratih Widyastuti, ST, MT
Dr. Eng. Bangun I R H, ST, MT
Anang W Sejati, ST, MT
Hana Faza S R, ST
Mustika Wardani, ST
Rizqi Jamaludin, ST
Aldilla H Latifa
Irfan F Zuhair
Hira Kemala
Farello Artha

Scientific committee

Prof. Tomohiko Yoshida (Ritsumeikan University, **Japan**)
Prof. Gagoek Hardiman (Universitas Diponegoro, **Indonesia**)
Assoc. Prof. Sae-hoon Kim (Seoul National University, **South Korea**)
Thana Chirapiwat, Ph.D (Silpakorn University, **Thailand**)
Prof. Alamantas Samalavicius (Vilnius Gediminas Technical University, **Lithuania**)
Dr. Ir. Bram Entrop (University of Twente, The **Netherlands**)
Prof. Dr. Jun-Ichiro G. Tsutsumi (University of the Ryukyus, Japan)
Dr. Atiek Suprpti (Universitas Diponegoro)
Edward E Pandelaki, Ph.D (Universitas Diponegoro)
Prof. Bambang Setioko (Universitas Diponegoro)
Dr. Erni Setyowati (Universitas Diponegoro)
Dr. Agung Budi Sardjono (Universitas Diponegoro)
Dr. R. Siti Rukayah (Universitas Diponegoro)
Dr. Suzzana Ratih Sari (Universitas Diponegoro)
Dr. Djoko Indrosaptono (Universitas Diponegoro)
Dr. Sunarti (Universitas Diponegoro)

Table of contents

Volume 99

2018

◀ Previous issue Next issue ▶

International Conference on Sustainability in Architectural Design and Urbanism 2017 9–10 August 2017, Semarang, Indonesia

Accepted papers received: 05 December 2017

Published online: 05 January 2018

Open all abstracts

Preface

OPEN ACCESS 011001

International Conference on Sustainability in Architectural Design and Urbanism 2017

+ Open abstract  View article  PDF

OPEN ACCESS 011002

International Conference on Sustainability in Architectural Design and Urbanism 2017

+ Open abstract  View article  PDF

OPEN ACCESS 011003

Peer review statement

+ Open abstract  View article  PDF

Papers

OPEN ACCESS 012001

The Role of Stakeholders Related to the Management of Ecological Function of Urban Green Open Space. Case Study: City of Depok, Indonesia

Andy Anton Mangopa Malik

+ Open abstract  View article  PDF

OPEN ACCESS 012002

Passive fire protection in high density village (case study, Bustaman Semarang) find out more, see

our Privacy and Cookies policy.
Sukawi Sukawi, Satriya Wahyu Firmandhani and Gagoek Hardiman



[+ Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012003

The evaluation the magnitude radiation exposure dose rate in digital radiography room design

Agung Dwiyanto, Wahyu Setia Budi and Gagoek Hardiman

[+ Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012004

The effect of earthquake on architecture geometry with non-parallel system irregularity configuration

Livian Teddy, Gagoek Hardiman, Nuroji and Sri Tudjono

[+ Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012005

The uniqueness and complexity of kampung city Bustaman Semarang Indonesia

Budi Sudarwanto, Gagoek Hardiman, Atiek Suprapti and Agung B Sarjono

[+ Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012006

Building resilience in heritage district: lesson learned from Kotagede Yogyakarta Indonesia

Dwita Hadi Rahmi

[+ Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012007

Study on the alternative mitigation of cement dust spread by capturing the dust with fogging method

Jaka Purwanta, Tjukup Marnoto, Prabang Setyono and Ari Handono Ramelan

[+ Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012008

Resilient design in the conservation of Johar market heritage building

Totok Roesmanto

[+ Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012009

Socio spatial adaptation as a resilience form of native unplanned settlement in confrontation with new planned settlement development pressure (case study: enclave native settlement in Serpong, Tangerang)

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



PAPER • OPEN ACCESS

Community participation towards the value of traditional architecture resilience, on the settlements' patters in Tenganan village, Amlapura

Listyana Febriani¹ and I Gede Wyana Lokantara²

Published under licence by IOP Publishing Ltd

IOP Conference Series: Earth and Environmental Science, Volume 99, International Conference on Sustainability in Architectural Design and Urbanism 2017 9–10 August 2017, Semarang, Indonesia

Citation Listyana Febriani and I Gede Wyana Lokantara 2017 *IOP Conf. Ser.: Earth Environ. Sci.* **99** 012018


listyanafebriani@gmail.com

¹ Policy Science, Ritsumeikan University, Ibaraki, **Japan**

² Urban and Regional Planning, Selamat Sri University, Semarang, **Indonesia**

<https://doi.org/10.1088/1755-1315/99/1/012018>

Buy this article in print

 Journal RSS

Sign up for new issue notifications

Create citation alert

PDF

Help

Abstract

Ecological conditions such as landslide, flood, and the global warming issues are the disasters that should be anticipated. The value of traditional architecture resilience has a role towards a city as cultural heritage. Based on that influence, the role of architecture is needed in fostering the environment to be able to survive and sustain just as an architectural concept that considers human needs and natural balancing. The purpose of this study is to analyse the concept of traditional architecture and community participation in maintaining this condition, so it would be able to have a value of sustainability. The research method used is mix method that is start from observation and macro analysis element (main building and public facility) and micro element (house of resident) to analyse community participation



PAPER • OPEN ACCESS

Problems of low-rise residential area of Seoul - Focused on Malmi village of Guemcheon-gu, Seoul, Korea -

Yeoryung Seo¹ and Saehoon Kim¹

Published under licence by IOP Publishing Ltd

IOP Conference Series: Earth and Environmental Science, Volume 99, International Conference on Sustainability in Architectural Design and Urbanism 2017 9–10 August 2017, Semarang, Indonesia

Citation Yeoryung Seo and Saehoon Kim 2017 *IOP Conf. Ser.: Earth Environ. Sci.* **99** 012032

yeoroong@naver.com

¹ Department of Landscape Architecture, Urban Design Concentration, Graduate School of Environmental Studies, Seoul National University, Seoul, **Korea**

<https://doi.org/10.1088/1755-1315/99/1/012032>

Buy this article in print

 Journal RSS

Sign up for new issue notifications

Create citation alert

Abstract

In Korea, there are many low-rise dwellings that are under five floors. In Seoul, for instance, about 38.2% of the total residential area is occupied by low-rise dwellings. The area has a wide variety of problems, like Malmi village. Among the many low-rise buildings, Malmi village of Guemchoen-gu, Seoul, is constructed spontaneously. Infrastructure problems such as narrow roads and the lack of parking lots, pose great challenges. When the infrastructure was initially made, the plan was based on the traditional spatial use. The infrastructure problem came out continuously due to the increases in the size of houses and density. These problems are commonly found in many low-rise dwellings in Seoul as well as in the Malmi village. Therefore, it is the time to look into the problems of the low-rise dwellings and seek solutions.

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.

PDF

Help



The Effect of Earthquake on Architecture Geometry with Non-Parallel System Irregularity Configuration

by Nuroji Nuroji

Submission date: 16-Jun-2021 07:59AM (UTC+0700)

Submission ID: 1607194688

File name: Geometry_with_Non-Parallel_System_Irregularity_Configuration.pdf (829.92K)

Word count: 2870

Character count: 14881

PAPER • OPEN ACCESS

The effect of earthquake on architecture geometry with non-parallel system irregularity configuration

3
To cite this article: Livian Teddy *et al* 2017 *IOP Conf. Ser.: Earth Environ. Sci.* **99** 012004

4
View the [article online](#) for updates and enhancements.

Related content

- [Earthquake of November 6 \(October 6?\), 1711](#)
- [Analysis of an Irregular RC Multi-storied Building Subjected to Dynamic Loading](#)
AkashRaut, Prabodh Pachpor and Sanket Dautkhani
- [Earthquake of June 20, 1897 \(Oakland\)](#)
Allen H. Babcock

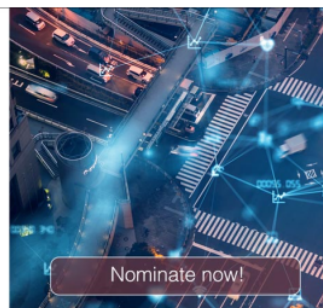


The Electrochemical Society
Advancing solid state & electrochemical science & technology

The ECS is seeking candidates to serve as the
Founding Editor-in-Chief (EIC) of ECS Sensors Plus,
a journal in the process of being launched in 2021

The goal of ECS Sensors Plus, as a one-stop shop journal for sensors, is to advance the fundamental science and understanding of sensors and detection technologies for efficient monitoring and control of industrial processes and the environment, and improving quality of life and human health.

Nomination submission begins: May 18, 2021



The effect of earthquake on architecture geometry with non-parallel system irregularity configuration

Livian Teddy^{1*}, Gagoek Hardiman², Nuroji³, Sri Tadjono⁴

¹Doctoral Program of Architecture and Urban, Diponegoro University, Indonesia,

²Departement of Architecture, Faculty of Engineering, Diponegoro University, Indonesia,

^{3,4}Doctoral Program of Civil Engineering, Diponegoro University, Indonesia

*Corresponding e-mail: livianteddy@gmail.com

Abstract. Indonesia is an area prone to earthquake that may cause casualties and damage to buildings. The fatalities or the injured are not largely caused by the earthquake, but by building collapse. The collapse of the building is resulted from the building behaviour against the earthquake, and it depends on many factors, such as architectural design, geometry configuration of structural elements in horizontal and vertical plans, earthquake zone, geographical location (distance to earthquake center), soil type, material quality, and construction quality. One of the geometry configurations that may lead to the collapse of the building is irregular configuration of non-parallel system. In accordance with FEMA-451B, irregular configuration in non-parallel system is defined to have existed if the vertical lateral force-retaining elements are neither parallel nor symmetric with main orthogonal axes of the earthquake-retaining axis system. Such configuration may lead to torque, diagonal translation and local damage to buildings. It does not mean that non-parallel irregular configuration should not be formed on architectural design; however the designer must know the consequence of earthquake behaviour against buildings with irregular configuration of non-parallel system. The present research has the objective to identify earthquake behaviour in architectural geometry with irregular configuration of non-parallel system. The present research was quantitative with simulation experimental method. It consisted of 5 models, where architectural data and model structure data were inputted and analyzed using the software SAP2000 in order to find out its performance, and ETAB2015 to determine the eccentricity occurred. The output of the software analysis was tabulated, graphed, compared and analyzed with relevant theories. For areas of strong earthquake zones, avoid designing buildings which wholly form irregular configuration of non-parallel system. If it is inevitable to design a building with building parts containing irregular configuration of non-parallel system, make it more rigid by forming a triangle module, and use the formula. A good collaboration is needed between architects and structural experts in creating earthquake architecture.

Keywords: earthquake, non-parallel system irregularity configuration

1. Introduction

Indonesia is an area prone to earthquake that may cause casualties and damage to buildings. The fatalities or the injured are not largely caused by the earthquake, but by building collapse. The collapse of the building is resulted from the building behaviour against the earthquake, and it depends on many factors, such as architectural design, geometry configuration of structural elements in horizontal and vertical plans, earthquake zone, geographical location (distance to earthquake center), soil type, material quality, and construction quality^[1,2]. One geometric configuration that may result in building collapse is irregular configuration of non-parallel system (figure 1). According to FEMA-451B [3],



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Published under licence by IOP Publishing Ltd

irregular configuration of non-parallel system is defined to have existed if the vertical lateral force-retaining elements are neither parallel nor symmetric with main orthogonal axes of the earthquake-retaining axis system.

Such configuration may happen on: 1). The building is regular, however as the walls of the room are tilted, the wall slides (figure 1a) or the beam arranged is also tilted (figure 1b), 2). The building is regular, but column arrangement is not in one axis, making the beam connecting the column tilted (figure 1b), 3). The building is irregular, for adjusting to the shape of the site, or the building is deliberately tilted for architect's aesthetic consideration (picture 1c). The irregular configuration of parallel system may lead to torsion, instability and local damage to buildings^[4]. It does not mean that non-parallel irregular configuration should not be formed on architectural design; however the designer must know the consequence of earthquake behaviour against buildings with irregular configuration of non-parallel system. The present research has the objective to identify earthquake behaviour in architectural geometry with irregular configuration of non-parallel system.

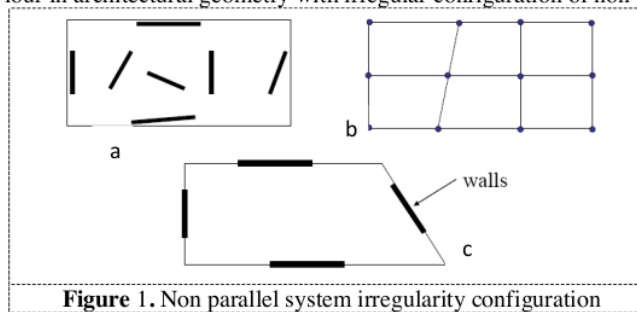


Figure 1. Non parallel system irregularity configuration

2. Methods

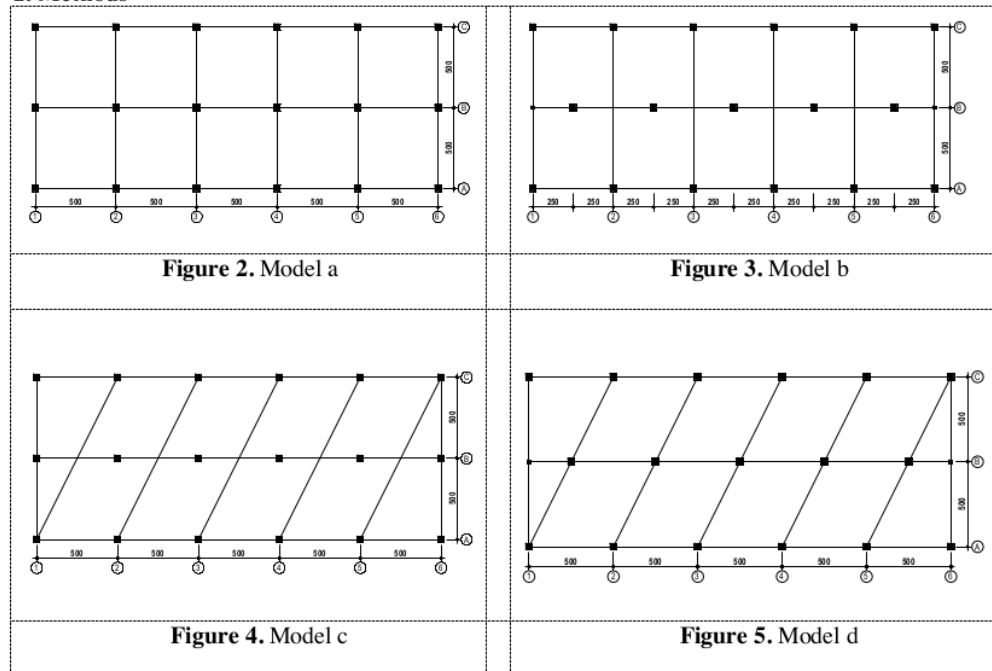
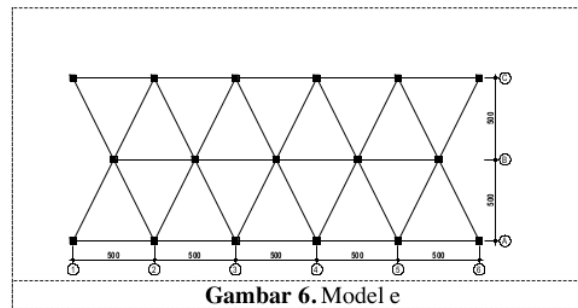


Figure 2. Model a

Figure 3. Model b

Figure 4. Model c

Figure 5. Model d

**Table 1.** The property of structure model a-e

Model	Number of floors	Dimension beam (cm)	Dimension column (cm)	Thickness of floor plate (cm)	Dimension building (m)
a	4 (16 m)	25X40	40X40	12	10X25
b	4 (16 m)	25X40	20X20, 40X40	12	10X25
c	4 (16 m)	25X40	40X40	12	10X25
d	4 (16 m)	25X40	20X20, 40X40	12	10X25
e	4 (16 m)	25X40	40X40	12	10X25

Table 2. Grade of structure model a-e

Model	Grade		
	Concrete (Kg/cm ²)	Reinforcement (Kg/cm ²)	Stirrup (Kg/cm ²)
a	300	3000	2400
b	300	3000	2400
c	300	3000	2400
d	300	3000	2400
e	300	3000	2400

It is a simulated experimental study by using pushover analysis, and center of mass and rigidity analysis. In order to conduct both analyses above using the geometry model of the buildings (figure 2 to 6) and the structural properties (table 1 and 2), those were inputted to SAP2000/ETABS softwares, and were then analyzed by static pushover earthquake analysis method to be identified for its performance level and to be analyzed for its eccentricity to find out the potential torque occurred. The numerical outputs of the analyses were tabulated and compared between models and graphs. It is assumed that the models are in a high earthquake zone with spectral value of $S_s = 0.97$ g and $S_1 = 0.328$ g with medium soil (D) condition and office function.

3. Discussion

3.1. Target displacement

Pushover analysis is a static non-linear analysis in which the effect of earthquake plans on the structure of a building is considered as a static load capturing at the center of mass of each floor, which value is gradually increased to exceed the loading that causes the first yield (plastic joint) in the

structure of the building, then through further load increase, it has a changing major post-elastic shape until it reaches the expected target displacement or until it reaches the plastic condition ^[3].

Table 3. Target displacement model a-e

Model	Target displacement	
	X (m)	Y (m)
a	0.187	0.197
b	0.201	0.246
c	0.183	0.235
d	0.158	0.208
e	0.163	0.178

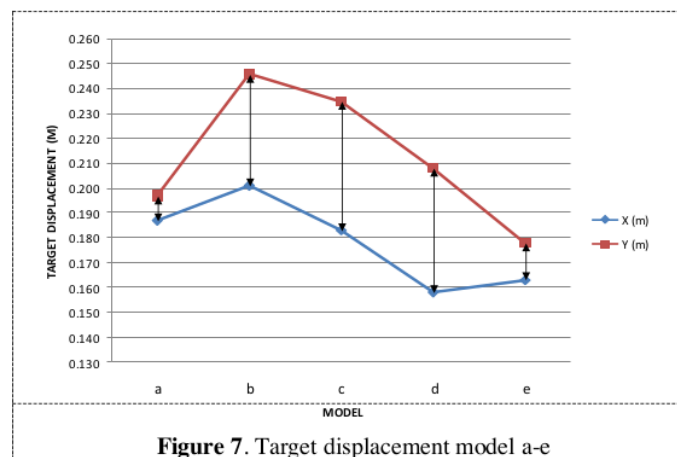


Figure 7. Target displacement model a-e

Reviewed from the results of pushover analysis in table 3 and figure 7, it can be concluded as follows:

- For the $-X$ axis, all columns in one axis and its rigidity are dominated by the models with tilted beams (model c, d and e) rather than those that do not have tilted beams (model a and b). It means that there is an angle formation on the beams which can give additional rigidity to the structure of the building.
- For the $-Y$ axis, model a and b of all beams are in one axis, while model c, d and e have their beams not in one axis. For columns in one axis are model a and c, while model b, d and e the columns are not in one axis. On the $-Y$ axis, model a and e have the largest rigidity compared to other models, whereas the weakest rigidity is in model b. It means that the ideal building structure is when the beams and columns are in one axis but if it is inevitable, connect the columns with the triangle module beams so that it will have more rigidity. In addition, the columns which are not in one axis have weaker rigidity than the beams which are not in one axis.
- For regular buildings, the target displacement for the $-X$ and $-Y$ axes are generally relatively similar (model a and d), and the more irregular the building geometry the larger the target displacement of both axes, $-X$ and $-Y$. It should be avoided, since both axes should have the same ability in facing the seismic loads.

It is similar with Shopping Center in Ercis District's-Turkey which has an irregular geometry (see figure 8). In order to reduce the irregularity, the building is blocked and separated by dilatation, but from these three blocks A to C, block C have greater non-parallel irregular configurations than others. When the earthquake stroke Ercis District's -Turkey in 2011, from the three blocks, block C

was more severely damaged than blocks A and B. Based on the research results, the non parallel irregular configuration in the two-way axes -X and -Y, block C compared to blocks A and B which only on the X-axis, gives a significant contribution to the severe damage of block C in this shopping center building [6].

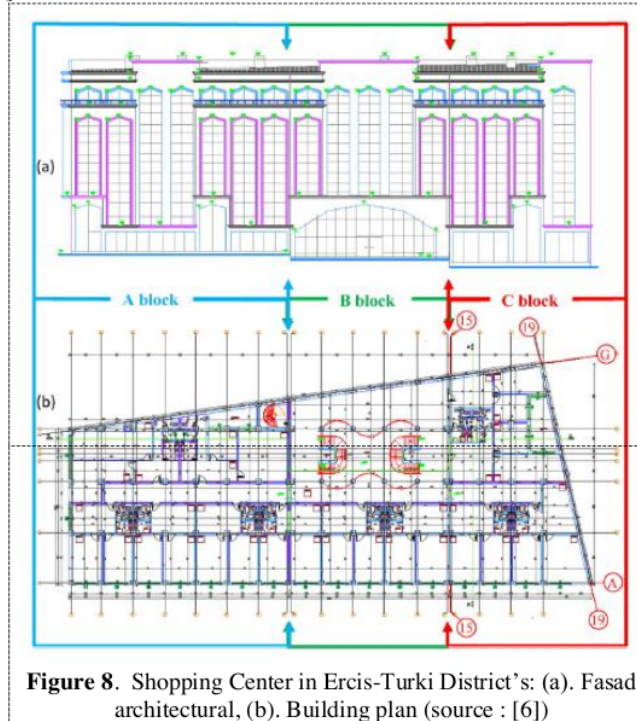


Figure 8. Shopping Center in Ercis-Turki District's: (a). Fasad architectural, (b). Building plan (source : [6])

In order to avoid the occurrence of the above, simple formula is proposed to evaluate the potential for the formation of non-parallel irregular configuration in the building that is still in the process of architectural design:

$$j_r = \Sigma j / \Sigma j_t \quad (1)$$

Table 4. Ratios quality level of the number of beams, columns and shear walls elements (j_r) irregular configuration of non-parallel system

Source	Quality Level		
	Good	Moderate	Poor
Recommendation	$j_r < 30\%$	$30\% \leq j_r \leq 50\%$	$j_r > 50\%$

Where, j_r = ratios quality level of the number of beams, columns and shear walls elements, Σj =the number of beams, columns and shear walls elements that do not follow the orthogonal axis and Σj_t =the total number of beams, columns and shear walls elements at the level being reviewed . The result of j_r is then compared with table 4 so as to find out whether the formation of non-parallel system irregular configuration is still in tolerance level (good), moderate or poor.

3.2. Eccentricity

The torque force formed inside the building is caused by the lack of balance between the location of the retaining elements and the mass structure of the building. It is the eccentricity between the center

of mass and rigidity which makes the building experience a twisting ground motion around the center of rigidity, which results in torque - twisting effects in the building plan. This effect is undesirable and allows the danger of stress concentration ^[2].

Table 5. Eccentricity model a-e

Floor	Center of mass (m)		Center of rigidity (m)		Eccentricity (e)	
	Xm	Ym	Xr	Yr	X=Xm-Xr	Y=Ym-Yr
1 st Floor	12.5	5	12.5	5	0	0
2 nd Floor	12.5	5	12.5	5	0	0
3 rd Floor	12.5	5	12.5	5	0	0
Roof Floor	12.5	5	12.5	5	0	0

According to table 5, the models a-e does not form eccentricity or in other words, the center of mass and the center of rigidity are overlapped, making its eccentricity= 0. It also negates the potential for torsion in the building model. Therefore, the main eccentricity occurs by building mass geometry form, and the irregularity effect of the beam/column arrangement is relatively minimal but it can cause another irregularity, i.e. non-parallel irregular configuration. Eccentricity can cause torsion in the building, the causes include uneven loading, rigidity and strength, and others ^[7] (see figure 9).

For avoiding excessive torque, then a simple formula is propose to evaluate the potential for the formation of torsional irregularity configuration in buildings that are still in the process of architectural design :

$$e_r = e/w \quad (2)$$

Where, e_r = the ratio between the length of eccentricity (e) and the width of the building being reviewed (w).

Table 6. The eccentricity ratio quality level (e_r) of torque irregularity configuration

Source	Quality Level		
	Good	Moderate	Poor
JBDPA [8]	$e_r \leq 0.1$	$0.1 < e_r < 0.3$	$e_r \geq 0.3$

The result of e_r is then compared with table 5, so it is known whether the configuration of torque irregularity being formed is included in tolerance level (good), moderate or poor.



Figure 9. Building damage from torque eccentricity (source : [2]).

4. Conclusion

From the explanations above, there are some conclusions that could be useful for architects in designing the building, as follows:

- The ideal building structure is when the beams and columns are in one axis but if it is inevitable, connect the columns with the triangle module beams so that it will have more rigidity.
- Columns which are not in one axis have weaker rigidity than the beams which are not in one axis.
- The random seismic motion requires both axes to have equal ability in facing the seismic loads.
- Primarily, eccentricity occurs by the geometric shape of the building mass and the effect of irregularity of the beam/column arrangement is relatively minimal but can cause another irregularity, the non-parallel irregularity configuration.
- Avoiding the excessive formation of torque irregular configuration and non-parallel irregular configuration in the building design can be done by evaluation using formula 1 and 2 above.

For future research can be investigated the effect of earthquake on geometry architecture with non-parallel system irregularity configuration in irregular form.

5. Acknowledgments

The authors thank to the Faculty of Engineering of Sriwijaya University which has funded the publication of the part research of the authors' dissertation, especially for the staffs of finance in the Faculty of Engineering, Hermawan Yuliansyah, SE dan Herman, SE, who had helped the authors in processing the administration of funding distribution.

6. References

- [1] Inan T, Korkmaz K. Evaluation of structural irregularities based on architectural design considerations in Turkey. *Struct Surv* [Internet]. 2011;29(4):303–19. Available from: <http://dx.doi.org/10.1108/02630801111162378>
- [2] Özmen C, Ünay AI. Commonly encountered seismic design faults due to the architectural design of residential buildings in Turkey. *Build Environ*. 2007;42(3):1406–16.
- [3] FEMA. NEHRP Recommended Provisions for New Buildings and Other Structures: Training and Instructional Materials-FEMA 451B. Washington DC: Federal Emergency Management Agency (FEMA); 2007.
- [4] Arnold C. Seismic Issues In Architectural Design. In: *Designing For Earthquakes A Manual For Architects - FEMA 454*. California: Engineering Research Institute (EERI); 2006.
- [5] Pranata YA, Wijaya PK. Kajian Daktilitas Struktur Gedung Beton Bertulang dengan Analisis Riwayat Waktu dan Analisis Beban Dorong. *J Tek Sipil Univ Atmajaya* [Internet]. 2008;8(3):250–63. Available from: <http://cpanel.petra.ac.id/ejournal/index.php/uaj/article/viewArticle/17538>
- [6] Bıkçe M, Çelik TB. Failure analysis of newly constructed RC buildings designed according to 2007 Turkish Seismic Code during the October 23, 2011 Van earthquake. *Eng Fail Anal* [Internet]. 2016;64:67–84. Available from: <http://dx.doi.org/10.1016/j.engfailanal.2016.03.008>
- [7] Crisafulli F, Reboredo A, Torrisi G. Consideration of Torsional Effects in the displacement control of ductile buildings. *13th World Conf Earthq Eng*. 2004;(1111).
- [8] Okada T, Murakami M, Kabeyasawa T, Katsumata H, Nakano Y, editors. *Guidelines for Seismic Retrofit of Existing Reinforced Concrete Buildings*. Tokyo: The Japan Building Disaster Prevention Association (JBDPA); 2005

The Effect of Earthquake on Architecture Geometry with Non-Parallel System Irregularity Configuration

ORIGINALITY REPORT

7 %

SIMILARITY INDEX

7 %

INTERNET SOURCES

4 %

PUBLICATIONS

1 %

STUDENT PAPERS

PRIMARY SOURCES

1

www.emeraldinsight.com

Internet Source

2 %

2

journalarticle.ukm.my

Internet Source

1 %

3

leonpanjtar.eu

Internet Source

1 %

4

mafiadoc.com

Internet Source

1 %

5

Rinta Kridalukmana, Budi Cahyo S.P., Deddy Kurniawan W, Fahmi Arifan. "RC Hovercraft: An I-Bylogical Enzyme (I-BE) Biosensor Carrier", International Journal of Electrical and Computer Engineering (IJECE), 2017

Publication

1 %

6

iconarp.selcuk.edu.tr

Internet Source

<1 %

7

www.jurnal.unsyiah.ac.id

Internet Source

<1 %

8

archive.org

Internet Source

<1 %

9

eprints.undip.ac.id

Internet Source

<1 %

10

irjet.net

Internet Source

<1 %

11

Geotechnical Geological and Earthquake
Engineering, 2016.

Publication

<1 %

Exclude quotes On

Exclude matches Off

Exclude bibliography On

The Effect of Earthquake on Architecture Geometry with Non-Parallel System Irregularity Configuration

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8