

STRUCTURAL PERFORMANCE AND SPACE CONFIGURATION OF SENJA COFFEE AND MEMORIES, GODEAN

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ABSTRACT: *Coffee, a beverage made from the roasted and ground seeds of African-grown tropical evergreen coffee bushes. Coffee, along with water and tea, is one of the world's three most popular beverages and one of the most profitable worldwide commodities. Because of the popularity of the coffee, there are many coffee shops that established in Yogyakarta. The urgency to design the building that prone to disaster especially the earthquake prone building by considering more the structural behavior is because in The Special Region of Yogyakarta often occurred natural disaster especially the seismic activity in a year, tectonically or volcanically. The paper aims to know the structural performance of the coffee shop and to know about the space configuration of the building. By knowing the structural performance of the coffee shop and its space configuration, it can be used as the reference to create more comfortable and safe spaces especially for the coffee shop itself. The method used in this research is a case study, a descriptive qualitative approach with data collection techniques in the form of direct observation and document or literature study, also the computational simulation conducted in this study. Senja Coffee and Memories Godean is a fantastic coffee shop with a sturdy and long-lasting steel frame and concrete as construction components. As well as a welcoming atmosphere for its customers, who include both coffee shop employees and customers with a variety of needs. It can be concluded that Senja Coffee and Memories Godean resists the earthquake and wind forces that can occur anytime.*

Keywords: *Coffee shop, space configuration, structural.*

Introduction

Coffee, a beverage made from the roasted and ground seeds of African-grown tropical evergreen coffee bushes. Coffee, along with water and tea, is one of the world's three most popular beverages and one of the most profitable worldwide commodities. Despite the fact that coffee provides the base for a plethora of beverages, its appeal is mostly due to the energizing impact provided by caffeine, an alkaloid found in coffee. (Myhrvold, n.d.) Based on Ukers (2012), customers rediscover the joy of fresh-roasted, fresh-ground, fresh-brewed coffee and espresso made from the best beans in the world, as mini roasters revive the fine art of coffee blending and customers rediscover the joy of fresh-roasted, fresh-ground, fresh-brewed coffee and espresso made from the best beans in the world. Many more individuals are purchasing Fair Trade and other certified beans in an attempt to rectify the global coffee economy's imbalances.

The Special Region of Yogyakarta is a province that is located in the middle of Java that has tendencies where a disaster can occur at any time because the province is also located between Mount Merapi and the South Sea. The urgency to design the building that prone to disaster especially the earthquake prone building by considering more the structural behavior is because in The Special Region of Yogyakarta often occurred natural disaster especially the seismic activity in a year, tectonically or volcanically. Most of the seismic activities that had been recorded in BMKG were located around the South Sea is about 3-5 SR. (*Gempabumi Terkini*, n.d.) Based on Tribun News, the Yogyakarta Earthquake in 2006 had reached 5.9 SR with a depth of epicenter of 33 km that made the Earthquake greater. By this data, it can be concluded that the urgency of strong, durable, and flexible structures is prone to disaster, especially the seismic activities.

These days, the needs of coffee are increasing due to the demand and tendencies, especially in the Special Region of Yogyakarta. The coffeeshops numbers are greatly increasing due to the demand and trend of the coffee itself. The Special Region of Yogyakarta is a province that is known for its city for the students and heritage, where people from many parts of Indonesia will come and do their activities based on their affairs and interests. Yogyakarta is also known for the numerous coffee shops that as many as Bandung has, another city with densest population of the coffee shops. Most of the occupants of the coffee shops are the students who need a place to study and hangout. Based on this matter, it should be noted that a good coffee shop should have good construction and space configuration to make the user comfortable inside the building. In Yogyakarta, most of the coffee shops made of steels, concrete, and woods for the structural and façade. There are many considerations of the usage of materials, including the strength and the aesthetic.

The coffee shop that will be taken as the study case is Senja Coffee and Memories Godean. Senja Coffee and Memories Godean is a coffee shop that is located in Jalan Gading Sari I No.2, Banyuraden, Gamping, Sleman Regency, Special Region of Yogyakarta. Senja Coffee and Memories Godean has a unique concept where the use of the container and the building are combined to create a unique space that can be enjoyed by the users. People that come there usually hang out with friends and colleagues, do their work or have a meeting session, or come in solitary and enjoy the moments. The questions that will be drove in this research are:

1. How is the structural performance of the Senja Coffee and Memories Godean in order to give shelter and comfort to the users of the coffee shops?
2. How is the space configuration of the building, the user comfort aspect in specific?

The paper aims to know the structural performance of the coffee shop and to know about the space configuration of the building. By knowing the structural performance of the coffee shop and its space configuration, it can be used as the reference to create more comfortable and safe spaces especially for the coffee shop itself. To achieve these aims, the observation and interview will be conducted in order to collect the data.

Research Objectives

1. To know the structural performance of the coffee shop.
2. To know about the space configuration of the building.

Observed Aspects

1. The building structure.
2. The space configuration of the building.

Independent Variable

1. Structural performance.
2. Space configuration.

Dependent Variable

1. Materiality of the building.
2. The height of the wall.
3. The storey's height.
4. Hazard factors.
5. Bay length.
6. Floor width.
7. Column size.
8. Spatial quality of the coffeeshop.
9. Movement of the users.

Literature Review

A. Structure Performance

As the definition of the structure, based on Bechthold & Schodek (2014) and Macdonald (2019) structure, is a device or part of the building that has the function to channel the load and to resist the loads that are placed upon it, as the result of the presence of the building itself to the ground. Macdonald (2019) also stated that a structure may be thought of as just an envelope that encloses and subdivides space to produce a safe environment. The surfaces that make up the building's envelope, namely the walls, floors, and roof, are subjected to various types of loading: external surfaces are subjected to climatic loads such as snow, wind, and rain; floors are subjected to the gravitational loads of the occupants and their effects; and most of the surfaces must also carry their own weight.

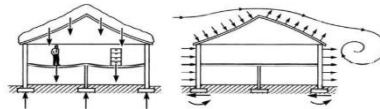


Image 1 Load distribution of a building and forces influence the load itself on a building

Source: Macdonald, 2019

According to Charleson (2015), structure can be columnar, planar, or a blend of the two, which a designer might utilize to reinforce or materialize concepts. Columns, walls, and beams can be conceived of in terms of periodicity, pattern, simplicity, regularity, unpredictability, and complexity. Structure can therefore be utilized to define space, construct units, express circulation, imply movement, or produce compositions and modulations. Suspended ceilings conceal beams, while vertical structural components such as columns, cross-bracing, and structural walls are either wrapped inside partition walls or visually indistinguishable from them.

Charleson (2015) also stated that structure does not have to be architecturally silent just because it is necessary for built architecture, giving it the necessary stability, strength, and stiffness.

Charleson (2021) stated that there are seven key principle of architectural seismic design that have to be considered to make building structure. Those seven key principles are stated below.

1. Provide seismic resisting structure in plan in two directions at right angles.

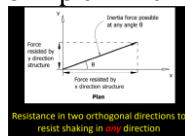


Image 2 Resisting seismic structure in two directions

Source: Charleson, 2021

2. In each direction in plan, provide a minimum of two lines of separated structure.
3. In each primary direction, choose just one structural system (out of three) that rises from foundations to roof to resist seismic forces.
4. Provide sufficient structure in each direction to resist seismic forces. To see the structure's strength, it can be evaluated by resist software.
5. Provide a structural diaphragm at roof and each floor level. A diaphragm ties the building together at each level so it doesn't shake apart. A diaphragm also acts as a horizontal beam. It transfers inertia forces to the seismic-resisting structure, like shear walls or moment frames. Avoid re-entrant corners, large floor penetrations and

different floor levels over one floor. These features prevent a floor diaphragm tying a building together.

6. Avoid critical structural weaknesses, especially soft stories. Soft storey – the most dangerous structural weakness which consist of columns weaker than beams and or one floor or story is more flexible or weaker than a floor above.

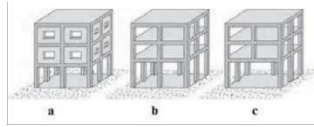


Image 3 Soft stories on buildings

Source: Charleson, 2021

7. Design and detail masonry infills to both prevent injuries and avoid damage to the primary structure.

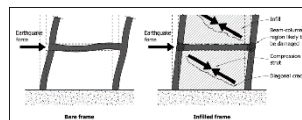


Image 4 Masonry infills in building structure

Source: Charleson, 2021

Space Configuration

According to Du et al. (2019), Space is an important feature of contemporary architectural design since it affects building functions and aesthetics, as well as the physical and psychological feelings of occupants. The space of a building, as the fundamental volume for human activity, is also the basic element of a living environment. A specific place can give a unique atmosphere as well as a microclimate that is important to the residents' living quality, which is influenced by physical and psychological needs.

On the building scale, distinct types of spaces are traditionally classified as indoor space, outdoor space, and semi-outdoor space, reflecting their architectural functional design. Indoor space is defined as space that is enclosed by walls, windows, or doors and is covered by ceilings, roofs, or roof windows.

Size, height, area, horizontal position, vertical placement, and orientation are the basic spatial geometric properties that transmit information about a space. These characteristics determine the volume of the space as well as its relationship to the surrounding environment: sun, earth, wind, and other structures.

As previously stated, another role of spatial design is to create diverse areas that allow inhabitants to adjust their thermal comfort. This document divides living styles into three categories: everyday life, sleep, and study. Movement is an important adaptive behavior, according to adaptive thermal comfort theory. If individuals are free to pick their location, it helps if there is a wide range of thermal diversity, allowing them to choose the regions they want. Buildings with a variety of areas allow for mobility. The three most common types of spaces are indoor space, semi-outdoor space, and outdoor space.

Based on Haval the ideal layout of the coffee shop is the layout of the coffee shop should be in accordance with the available area in order to run and move about the business efficiently.

Before setting up their coffee shop floor layout, they must complete their menu planning. The menu will specify what equipment you'll need in your kitchen and at the coffee bar.

Finding the ideal amount of space for your employee workstation is a delicate balancing act. To be efficient and safe, avoid having staff cross paths frequently.

Consider how a long queue of customers may affect your cafe's overall user experience. You don't want a line to make it seem cluttered and uneasy.

This design of the back of the bar is important because it will increase the efficiency of the employee work in serving the customer. These words are related to the bar flow term. According to Morrow the bar flow term means the movement of bodies behind the bar. The idea is to move people from point A to point B using the most efficient, least crowded route possible.

Method of Collecting Data

The method used in this research is a case study, a descriptive qualitative approach with data collection techniques in the form of direct observation and document or literature study. The purpose of qualitative descriptive research is to gain a better understanding of the nature of the events being investigated. As a result, data collection comprises a limited number of structured, open-ended, individual or focus group interviews, ranging from few to many (Lambert, 2012).

1. Observation.

The data collection will be using the observation, which conducts the direct survey to the location and collects data such as photos and measurements.

Analysis Method

1. Simulation by resist.

The data that has been collected will be processed in resist application to see the structural performance of the building.

2. Descriptive.

The data that has been collected will be analyzed through the descriptive analysis.

Finding

(1) Building Structure Elements

1. Materiality



Image 5,6,7 Senja Coffee and Memories Building

Source: Author, 2022

In Senja Coffee and Memories Godean, there are some materials that have been used in this building, which are:

1. Concrete
2. Steel frame
3. Steel
4. Container (steel panels)
5. Gypsum
6. Wood panel
7. Tiles
8. Glass

2. Stories



Image 8 and 9 Senja Coffee and Memories Building
Source: Author, 2022

In Senja Coffee and Memories Godean, there are two stories that have been built.

3. Stories' Height

Floor 1: a. 3.913 meters → tall area (concrete, steel frame - glass area)

b. 2.290 meters → container area

Floor 2: 2.577 meters → container area

4. Hazard Factors

Hazard Type	Hazard Source	Exposure Effect
Chemical	Poisonous Food Ingredients	Food poisoning
		Diarrhea
Physical	Earthquake	Structural destruction
		Structural deterioration
		Structural work equipment
		Damage
Safety	Electrical	Electrocuted
		Structural equipment
Ergonomics	Slabbing parts (stairs etc)	Slipping
		Injury
Ergonomics	Furniture	Structural furniture (could injure the users)
		Slipping

Image 10 Hazard Risks in Senja Coffee and Memories
Source: Author, 2022

Based on Spektrum Respon Desain (2022), it can be known that the PGA of Senja Coffee and Memories is 0.433.



Image 11 Hazard Factor in Godean, Sleman
Source: Author, 2022

5. Column Size

a. Steel column; H profile = 0.103 m x 0.226 m



Image 12 and 13 Steel Column, H profile in Senja Coffee and Memories
Source: Author, 2022

b. Reinforced concrete column; square-shaped = 0.437 m x 0.305 m

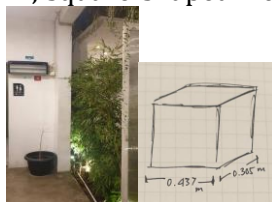


Image 14 and 15 Reinforced concrete Column, Square-shaped in Senja Coffee and Memories
Source: Author, 2022

- c. Reinforced concrete column; L-shaped = $(0.287 \times 0.632) + (0.384 \times 0.155)$



Image 16 and 17 Reinforced concrete Column, L-shaped in Senja Coffee and Memories

Source: Author, 2022

- d. Steel column; square profile = 0.320 m x 0.209 m

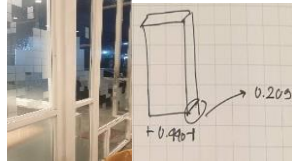


Image 18 and 19 Steel Column, Square Profile in Senja Coffee and Memories

Source: Author, 2022

- e. Reinforced concrete column; square-shaped = 0.366 m x 0.251 m



Image 20 and 21 Reinforced concrete Column, Square-shaped in Senja Coffee and Memories

Source: Author, 2022

6. Floor Width and Bay Length

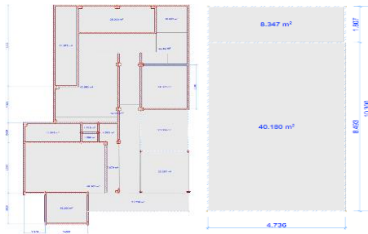


Image 22 and 23 Senja Coffee and Memories Godean Floor Plan

Source: Author, 2022

7. Concrete part size and Steel frame part

- Concrete = $15.2 + 48.3 + 11.95 + 1.79 + 1.59 + 42.7 + 22 + 25 + 10.062 + 13.75 + 24.52 + 52.4 + 7.9 = 277.16 \text{ m}^2$
- Steel frame = $21.74 + 23.39 + 23.06 + 40.2 + 8.35 = 116.74 \text{ m}^2$

(2) Spatial Configuration

1. Outdoor, indoor and semi-outdoor spaces

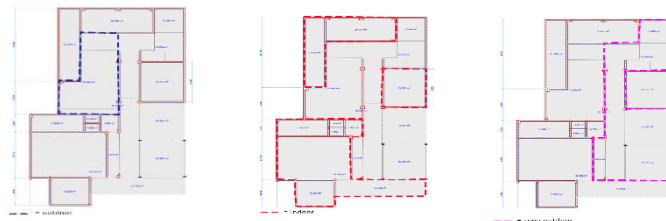


Image 24, 25, 26 Senja Coffee and Memories Godean Floor Plan

Source: Author, 2022

2. Spatial geometric features and spatial boundary conditions

a. Height

Floor 1: a. 3.913 meters → tall area (concrete, steel frame - glass area)

b. 2.290 meters → container area

Floor 2: 2.577 meters → container area

b. Area

• Concrete = $15.2 + 48.3 + 11.95 + 1.79 + 1.59 + 42.7 + 22 + 25 + 10.062 + 13.75 + 24.52 + 52.4 + 7.9 = 277.16 \text{ m}^2$

• Steel frame = $21.74 + 23.39 + 23.06 + 40.2 + 8.35 = 116.74 \text{ m}^2$

• Total Area = $277.16 + 116.74 = 393.9 \text{ m}^2$

c. Horizontal position

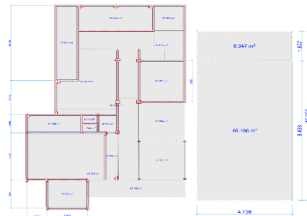


Image 27 Senja Coffee and Memories Godean First and Second Floor Plan

Source: Author, 2022

d. Vertical Placement



Image 28 Senja Coffee and Memories Godean Facade

Source: Author, 2022

e. Orientation

The building orientation is oriented to the west direction and faces the artery road.



Image 29 Surrounding of Senja Memories and Godean

Source: googlemaps.com, 2022

f. Surrounding

The surrounding of the Senja Coffee and Memories Godean mostly residential area. There is also a mosque, another coffee shop, a warehouse, and small food vendors.



Image 30 Surrounding of Senja Memories and Godean

Source: googlemaps.com, 2022

3. Spatial design and adaptive comfort opportunities

a. Air circulation system

This building is using the natural air circulation and artificial air conditioning system. The natural air ventilation is created through the opening and the artificial ventilation is using the air conditioner. Mainly, this building is using the artificial one.

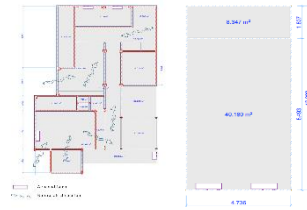


Image 31 and 32 Air Circulation System Diagram in Senja Coffee and Memories Godean

Source: Author, 2022

b. Bar flow pattern

The flow of the bar is from the cashier to the serve/take away section.



Image 33 Bar flow of Senja Coffee and Memories Godean

Source: Author, 2022

c. User circulation

Data Analysis

Building Performance Analysis by Resist

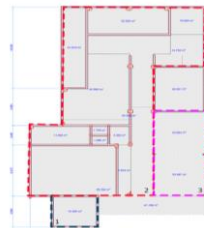


Image 34 Senja Coffee and Memories Godean First Floor Plan

Source: Author, 2022

(1) Front Common Room

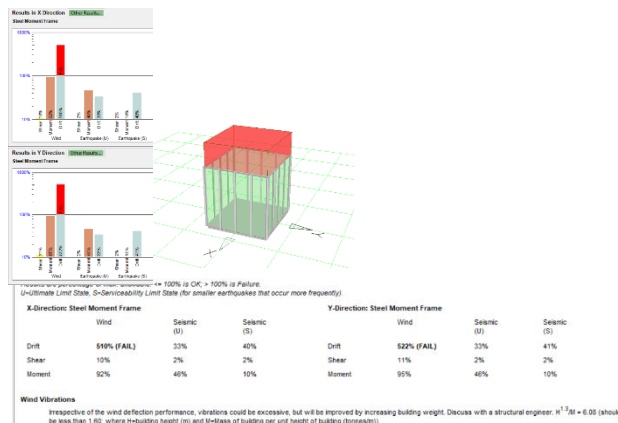


Image 35, 36, 37 Resist Simulation of front common room

Source: Author, 2022

(2) Main Building

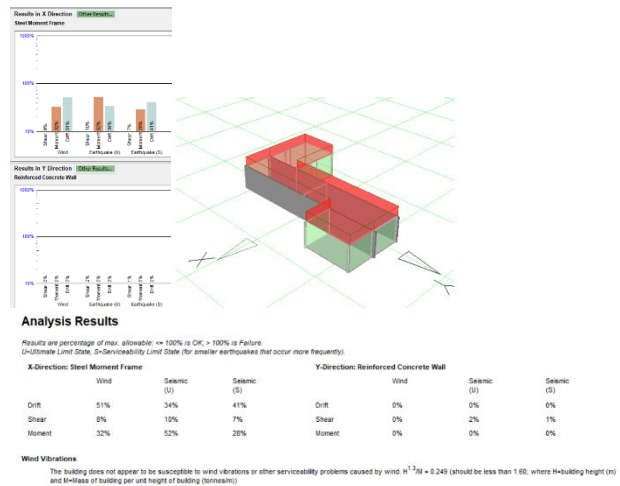


Image 38, 39, 40 Resist Simulation of Main Building
Source: Author, 2022

(3) Rear Outdoor Common Room

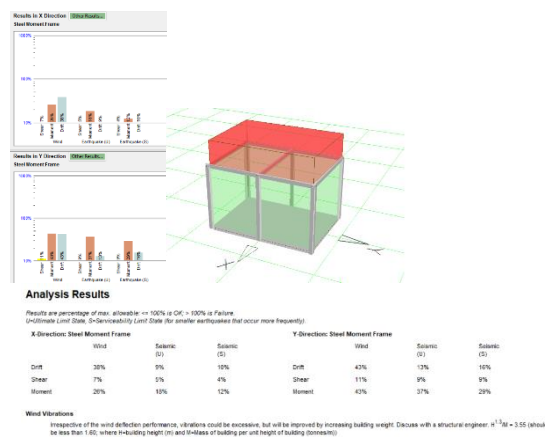


Image 41, 42, 43 Resist Simulation of rear outdoor common room
Source: Author, 2022

Discussion

1. Building structure performance

Based on the seven key principle of architectural seismic design that stated by Charleson (2021) that stated above and the finding that had been found, it can be concluded that:

- a. The resist simulation showed that there are three separated areas that being simulated, namely: the front common room, main building, and rear outdoor common room. This part can resist the volcanic and seismic earthquake's shear, moment, and drift from any directions. The main building can resist the volcanic and seismic earthquake in x direction and fully resist the volcanic and seismic earthquake in y direction which in this direction the shear, moment, and drift level is in 0%-1%. The rear outdoor common room can resist fully at earthquake part which has 1%-9% on shear, moment, and drift level.
- b. There is no soft story since the upper level is smaller than the lower level.

From the plan, it can be seen that the part of indoor area is mostly tied one to another but there is an outdoor area inside of the building. Since the upper level is only a small part and located on the container part, it wouldn't be a problem, it can be concluded that the building has not a soft story.

From these two points it can be conclude that the building performance especially in the seismic architecture is already in a great condition since the building masses are tied together and it is already safe for the users that use the building for any purposes that they want to do inside the building.

2. Spatial configuration

Based on Du et al. (2019), there are several aspects of the spatial configuration system of the building, which are: (1) Outdoor, indoor and semi-outdoor spaces; (2) Spatial geometric features and spatial boundary conditions; (3) Spatial design and adaptive comfort opportunities. In this paper, the coffeeshop spatial configuration will mostly determine by the spatial design and adaptive comfort opportunities.

From the observation that had been conducted based on the literature review to the coffeeshop has these criteria in its spatial configuration:

a. Air circulation system

The air circulation of this building is using two kinds of systems, namely the artificial one that is using the air conditioner and the natural one that only depends on the opening of the building and the outdoor side that allows many airs circulation that circulates throughout the building.

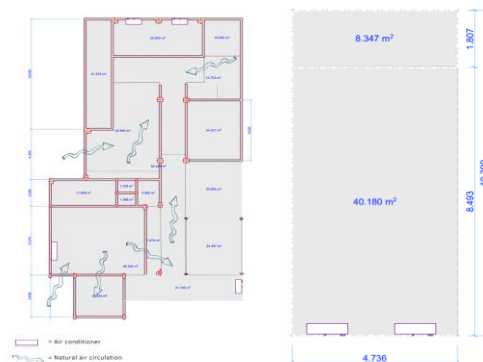


Image 44 and 45 Air Circulation System Diagram in Senja Coffee and Memories Godean
Source: Author, 2022

b. Bar flow pattern

Every coffee shop that has bar side will have bar flow. In Senja Coffee and Memories, the bar flow has from cashier to the serve area pattern. From the observation, this bar flow is very effective and not disturbing the employee's circulation in bar area.

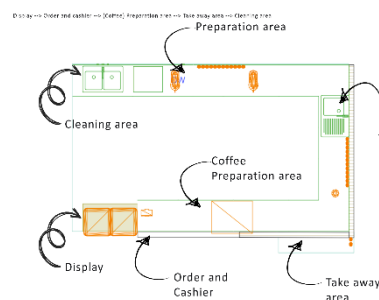


Image 46 Bar flow of Senja Coffee and Memories Godean
Source: Author, 2022

c. User circulation

From the observation that had been done in Senja Coffee and Memories, there are two types of the user circulations, namely customer and employee circulation. There are slight differences between the customer and employee circulation, which is to the private part of the coffeeshop, the employee room that located behind the bar and the roastery room. Beside of those rooms, all rooms can be accessed by both the employee and customer and the circulation is similar. The toilet is also easy to access. Although the circulation between the customer and employee is similar, it doesn't disturb the comfort of both users.
First Floor:



Image 47 amd 48 User Circulation on First Floor of Senja Coffee and Memories Godean
Source: Author, 2022

Second Floor:

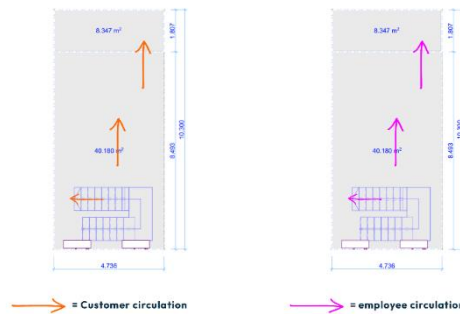


Image 49 amd 50 User Circulation on Second Floor of Senja Coffee and Memories Godean
Source: Author, 2022

From the finding and discussion above, it can be concluded that Senja Coffee and Memories Godean is a strong and comfortable coffee shop that located in Godean, Yogyakarta. It supports the comfortability of the users by giving a strong, durable, and comfortable space. The material of the building is not only channelling the load, shelter the user from the climate and disaster, and has disaster prone physical appearance, but also give some vibe and aesthetics to the building; on the façade and the interior of the building. The space that created from the structure also easy to access and let the wind comes easily and make the ventilation better.

Conclusion

Based on the study above, it can be concluded that Senja Coffee and Memories Godean is a great coffee shop that has strong and durable structure and comfortable coffee shop for the users which are the employee of the coffee shop itself and the customer that has many purposes to do in that coffee shop. Senja Coffee and Memories is mostly using the air conditioner as the main air circulation system inside the building. The barflow is easy to

access by the employee and it is not disturbing the movement of every employee who work there. The circulation of the user is also easy to access.

The paper aims to know the structural performance of the coffee shop and to know about the space configuration of the building. By knowing the structural performance of the coffee shop and its space configuration, it can be used as the reference to create more comfortable and safe spaces especially for the coffee shop itself.

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