

Coffee Shop Re-Design for Low-Vision Baristas and Visitors (Case Study at Café X Bandung)

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Abstract

Café X is a coffee shop managed by 3 low-vision baristas. Visitors to this cafe are also dominated by visitors with visual impairments. Due to the limited visibility of the barista and some cafe visitors, several problems were found that could cause discomfort for workers and cafe visitors. Therefore, it is necessary to adjust the cafe's operating system to support performance and provide security and comfort to the baristas and visitors who come. The data collected are data on raw materials, machinery, and equipment for cafe operational activities, data on physical facilities, layout and actual physical environment of cafes, data on the application of 5S around the cafe area, as well as data on potential accidents that may arise while around the cafe area. Then the data will process using the method of comparison with anthropometric data and design concepts in improvement for physical facilities and cafe layouts. Standardization comparisons to improve physical environment. Radar maps to determine the application of 5S culture. Fish bones and 5W+1H to describe the causes of potential accidents in the cafe area. The suggestions given are the adjustment of the machines and equipment used, redesign of the physical facilities and layout of the cafe, the proposed design of tools in the form of tactile stickers and the application of guiding blocks as directions, improvement of the physical environment, application of 5S culture to maintain the work area and provide suggestions prevention of accidents in café area.

Keywords: *Blind Sensory Disabilities, Coffee Shop, Work System Adjustment.*



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INTRODUCTION

Café X is one of the unique coffee shops in Indonesia. In its operational activities, this café is managed by 3 low-vision baristas who have been given training. Visitors who come to this café also consist of non and people with visual impairments. Due to the limited visibility of the barista and some café visitors, several problems were found that could hinder performance and cause inconvenience to both workers and café visitors. The problems at Café X are machines and equipment that do not support the performance of the barista, inadequate physical facilities so the barista doesn't feel comfortable while working, the layout of the café is not right, the physical environment of the café is still not good, there is no application of marking in the form of using symbols or some special colors that can help simplify the viewing process for baristas and café visitors, 5S culture has not been actively implemented, and there are potential hazards around the café area. Therefore, it is necessary to make adjustments to the café's operational system according to the needs of the baristas and visitors. At the end of this study, it is hoped that the author can provide suggestions for improving the environment and work system at Café X to support performance and provide security and comfort for both baristas and visitors who come.

LITERATURE REVIEW

1. Blindness

Blindness is a condition where a person has a visual accuracy level of less than 6/60 m or 20/200 feet after being corrected using visual aids or no longer has a vision. In general, blind people are classified into two groups, total blind, and low-vision. People with low-vision are usually unable to use their vision to read text written in 12-point size (normal size) in normal light conditions even though they have used assistive devices. (Daniel P. Hallahan, James M. Kauffman & Paige C. Pullen. 2009).

2. Ergonomic

Ergonomics is defined as a study of human aspects in their work environment which is reviewed in terms of anatomy, physiology, psychology, engineering, management, and design. The goal of Ergonomics is to create a productive work system and have the best system to provide convenience, security, and comfort, as well as increase work efficiency and effectiveness. (Nurmianto, 2004)

3. Anthropometry

Anthropometry is the study of measuring the dimensions of the human body. Anthropometry can be used as an ergonomic consideration in the design of a product or work system that requires human interaction to obtain the appropriate size and according to the dimensions of the user's body. Factors that affect a person's anthropometry are age, gender, racial and ethnic differences, socioeconomic conditions, type of work and daily activities, and conditions at the time of measurement (Nurmianto, 2004). In calculating anthropometric data, 3 types of percentiles can be used, namely P5, P50, and P95.

4. Concept Design

The ergonomic product design must be based on the capacity and limitations of human physiological and psychological abilities, to improve the work performance of human and machine systems (Wingjosoebroto, 2008). In designing an ergonomic product or equipment, it is necessary to know the purpose of the manufacture of the product, it is also necessary to know who will use it and feel the benefits, so it is necessary to make adjustments to humans (prospective users) and their environment.

5. Physical Environment

The physical work environment is all physical conditions that exist around the workplace that can affect workers either directly or indirectly. The physical work environment must be able to provide a sense of security, comfort, and peace so that workers can maximize their work performance. (Sedarmayanti, 2011). The physical environment consists of several factors, namely lighting, color, noise, temperature, humidity, odors, air circulation, and mechanical vibrations.

6. Layout Design

Facility layout design is a process that aims to determine how activities and various work facilities can be arranged in such a way that they can support efforts to achieve the objectives of the work carried out effectively and efficiently. The application of an ergonomics system in setting the layout of the work area aims to facilitate all activities that occur in the work area, provide security, safety, and comfort guarantees for the workers to maximize their performance of the workers.

7. 5S Method

5S is a method of structuring and maintaining an intensive work area originating from Japan which is used to maintain order, efficiency, and discipline at the worksite while improving the overall performance of workers. The 5S method consists of sorting goods that are still and not used in the workplace (*seiri*), arranging goods (*seiton*), cleaning (*seiso*), maintaining good working conditions (*sheiketsu*), and maintaining the habits needed to carry out the work. Job well (*shitsuke*) (Osada, 2004).

8. Occupational Health and Safety

Occupational Health and Safety (K3) is an effort to create a workplace that is safe, healthy, and free from environmental pollution to reduce work accidents and occupational diseases. This condition is ultimately expected to increase work efficiency and productivity.

RESEARCH METHODOLOGY

The research scenario is divided into several parts. Starting with direct observation and data collection at the research site, data processing is carried out using the comparison method of anthropometric data and design concepts improvement for physical facilities and café layouts, comparison of good physical environment standardization proposals, checklists, and radar maps to determine the application 5S culture, as well as fishbone diagram analysis and 5W+1H to describe the potential causes of accidents in the internet café area.

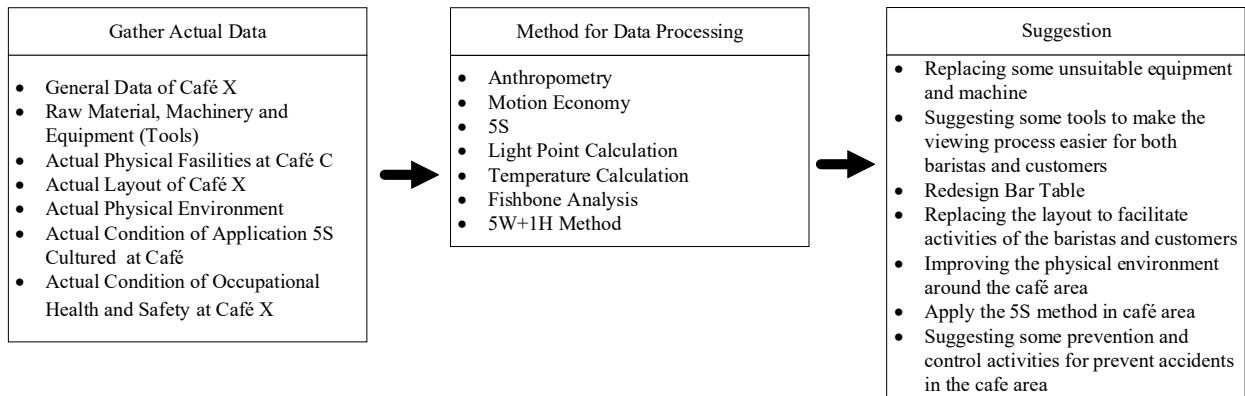


Figure 1 Research Methodology

FINDING AND DISCUSSION

1. Machinery and Equipment

There is several supporting equipment for café operations that are not suitable by the conditions and needs of the baristas with low vision as users. In addition, there are also several machines and equipment that aren't in accordance with the café's operational capacity. The machines and equipment used are in a large size, that are less effective and efficiend in their use. Therefore, it is proposed to replacing machines and equipment that are not yet suitable to support user activities as well as to adapt to the physical facility design and proposed layout, so it can be more optimal and can save more storage space at the same time.

Table 1 The Requirement Data of Suggestion Machinery









DATA OF SUBSTITUTIONAL MACHINE & EQUIPMENT FOR CAFE X						
No	Item	Function	Actual Equipment	Size (cm)	Quantity (Pcs)	Substitutional Equipment
1	Mini Showcase Cooler	Milk storage		60 x 65 x 210	1	
2	Electric Dispenser	Mineral water storage		13,5 x 6,5	1	
3	Ice Bin	Ice cube storage		80 x 22 x 34,5	1	
4	Shaker (530 ml)	Mixing beverages		8,3 x 5,5 x 17,5	1	
				9 x 6 x 19	2	





Figure 2 Tactile Sticker and The Application at Customer Table

A tactile sticker is a bright yellow embossed sticker with a black background that is printed in 2 types of letters, namely the alphabet and braille. Tactile stickers can be affixed in various places to help make it easier for baristas and visitors to identify the product or equipment that will be used. The writing on the tactile sticker will be printed in 150 mm font size so that the writing can be read easily but does not dominate the appearance of the object on which it is attached.

2. Physical Facilities

For service area there is suggestion for redesign bar table, so it can provides a place to store specific equipment. The various machines and equipment used in cafe operations have become tidier in their and storage. Arrangement and storage of various items used in a neat and orderly manner will greatly help make it easier for baristas when they want to find, use or store the equipment used.

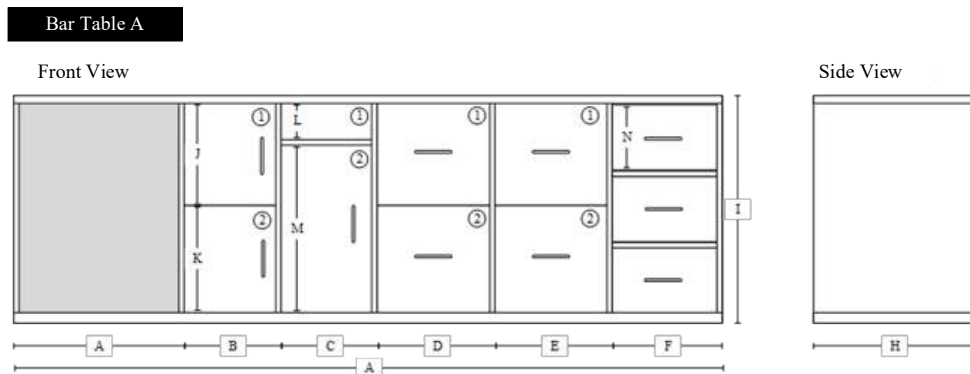


Figure 3 Design for Bar Table A

Tabel 2 Anthropometric Data for Bar Table A

The Anthropometry of Bar Table A								
Dimension	Point	Description	Anthropometric Data Used or Other Benchmarks	Percentile	Gender	Size (cm)	Additional Size List (cm)	Total Value Rounded Up (cm)
Length	A	Beverage packaging	According to the width of the cabinet A,B,C	-	-	62	-	62
	B1	Raw material cabinet	The width of shoulder	5%	Women	34,2	2	36,2 ≈ 37
	B2	Equipment cupboard						
	C1	Tissue storage	Lebar galon + allowance 5 cm	-	-	30 + 5 = 35	2	37
	C2	Mineral water gallon cupboard						
	D1	Powder & topping storage cabinet	The width of shoulder	95%	Women	42,8	2	45
	D2	Cup storage cupboard						
	E1	Storage cupboard for silverware.	The width of shoulder	95%	Women	42,8	2	45
	E2	Serving plate storage cupboard						
	F	Barista wardrobe	The width of shoulder	50%	Women	38,5	2	42
G	Total length of bar table A	Total length of bar table A	-	-	-	-	270	
Width	H	Bar table width	The distance from the grip of the hand (grip) to the back in the position of the hand forward (horizontally)	5%	Women	61	1	62
Height	I	Total height of bar table C (includes list of top and bottom of the table bar, also shoe heights used by baristas)	The height of elbow	5%	Women	88,6	-	89
	J	Height of cabinets : B1, D1 and E1	5 % percentile elbow height - the size of the top list is 3 cm and the size of the bottom list is 4 cm and the middle list is 2 cm, then divided into 2 cabinets	5%	Women	$(89-7) : 2 = 41$	-	41
	K	Height of cabinets : B2, D2 and E2		5%	Women	$(89-7) : 2 = 41$	-	41
	L	Tissue cabinet	Kitchen tissue roll diameter size	-	-	12	3+2	17 ≈ 19
	M	Mineral water gallon cabinet	19 L gallon height + portable dispenser height + remaining cupboard height	-	-	$48,5 + 13,5 + 4 = 66$	4	70
	N	Cabinet : F1, F2, F3	Total height - the size of the top list is 3 cm, the bottom list is 4 cm, and the middle list is 2 cm each as many as 2 pieces. Next divided into 3 partitions	-	-	$(89-3-4-2-2) / 3 = 26$	-	26

Bar table A is divided into 11 compartments that can be used to store various main items in cafe operations.

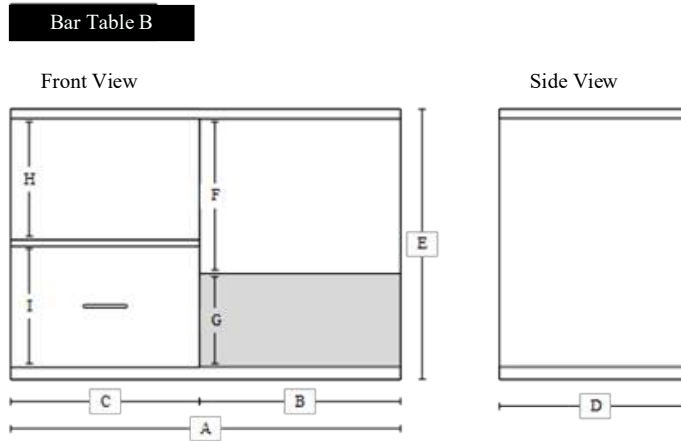


Figure 4 Design For Bar Table B

Tabel 3 Anthropometric Data of Bar Table B

The Anthropometry of Bar Table B								
Dimension	Point	Description	Anthropometric Data Used or Other Benchmarks	Percentile	Gender	Size (cm)	Additional Size List (cm)	Total Value Rounded Up (cm)
Length	A	Total length of bar table B	Service area width measure - A & C bar table width	-	-	$250 - 62 - 62 = 126$	-	126
	B	Cupboard for ice bin (ice cube holder)	Ice bin length + allowance 2 cm	-	-	$60 + 2 = 62$	2 + 2	66
	C	Additional storage cabinet, the top is used as a place to store the mini showcase cooler	Overall length of bar cabinet B - length of cupboard for ice bin - thickness of left side list 2 cm	-	-	$126 - 66 - 2$	-	58
Width	D	Bar table width	The distance from the grip of the hand (grip) to the back in the position of the hand forward (horizontally)	5%	Women	61	1	62
Height	E	Total height of bar table B (includes list of top and bottom of the table bar, also shoe heights used by baristas)	The height of elbow	5%	Women	88,6	-	89
	F	Ice bin storage cabinet height	The height of ice bin	-	-	50	-	50
	G	Ice bin support height	Total height - ice bin height - bottom list height 4 cm	-	-	$89 - 50 - 4 =$	-	35
	H	Height of an additional storage cabinet height	Total height - the height of the top list is 3 cm, the height of the middle list is 2 cm and the height of the bottom list is 4 cm. Then divided for 2 storage spaces	-	-	$(89 - 3 - 2 - 4) : 2 = 40$	-	40
	I							

Bar table B consists of 3 partitions. The B partition will be used as a place to store the ice bin.

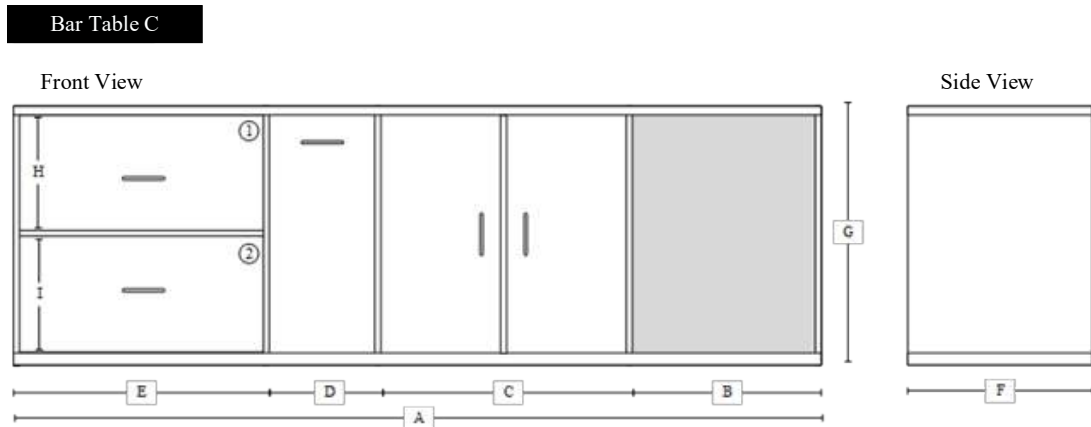


Figure 5 Design For Bar Table C

Tabel 4 Figure and Anthropometric Data of Bar Table B

The Anthropometry of Bar Table C								
Dimension	Point	Description	Anthropometric Data Used or Other Benchmarks	Percentile	Gender	Size (cm)	Additional Size List (cm)	Total Value Rounded Up (cm)
Length	A	Total length of bar table C	According to the total length of bar table A	-	-	270	-	270
	B	Dish rack storage cabinet	According to the width of the cabinet A,B,C	-	-	62	-	62
	C	Dishwashing area	Dishwasher sink length	-	-	80	6	86
	D	Cabinet for trash bin	Trash can length	-	-	36	2	38
	E1	Additional storage cabinets (3 containers)	Remaining length of storage cabinet C	-	-	82	2	84
	E2	Supplies packaging storage cabinet						
Width	F	Bar table width	The distance from the grip of the hand (grip) to the back in the position of the hand forward (horizontally)	5%	Women	61	1	62
Height	G	Total height of bar table C (includes list of top and bottom of the table bar, also shoe heights used by baristas)	The height of elbow	5%	Women	88,6	-	89
	H	The height of the additional storage cabinet (3 containers)	Total height - the height of the top list (3 cm) the height of the middle list (2 cm) and the height of the bottom list (4 cm). Then divided for 2 storage spaces	-	-	(89 - 3 - 2 - 4) : 2 = 40	-	40
	I	The height of the packaging inventory storage cabinet						

The bar table C consists of 4 room dividers and is equipped with a washing area in the C and D sections.

For public area, to improve the safety and comfort of cafe visitors, it is proposed to make some improvements by replacing some of the customer's chairs using a sitting booth, applying the use of tactile stickers to inform the customer's table number, covering the corners of the table using a protector so not to cause injury if the visitor accidentally nodding off at the end of the table, and proposing the creation of a tactile map to make it easier for visitors (especially customers with visual impairments) to know the overall location of the cafe.

3. Layout Facilities

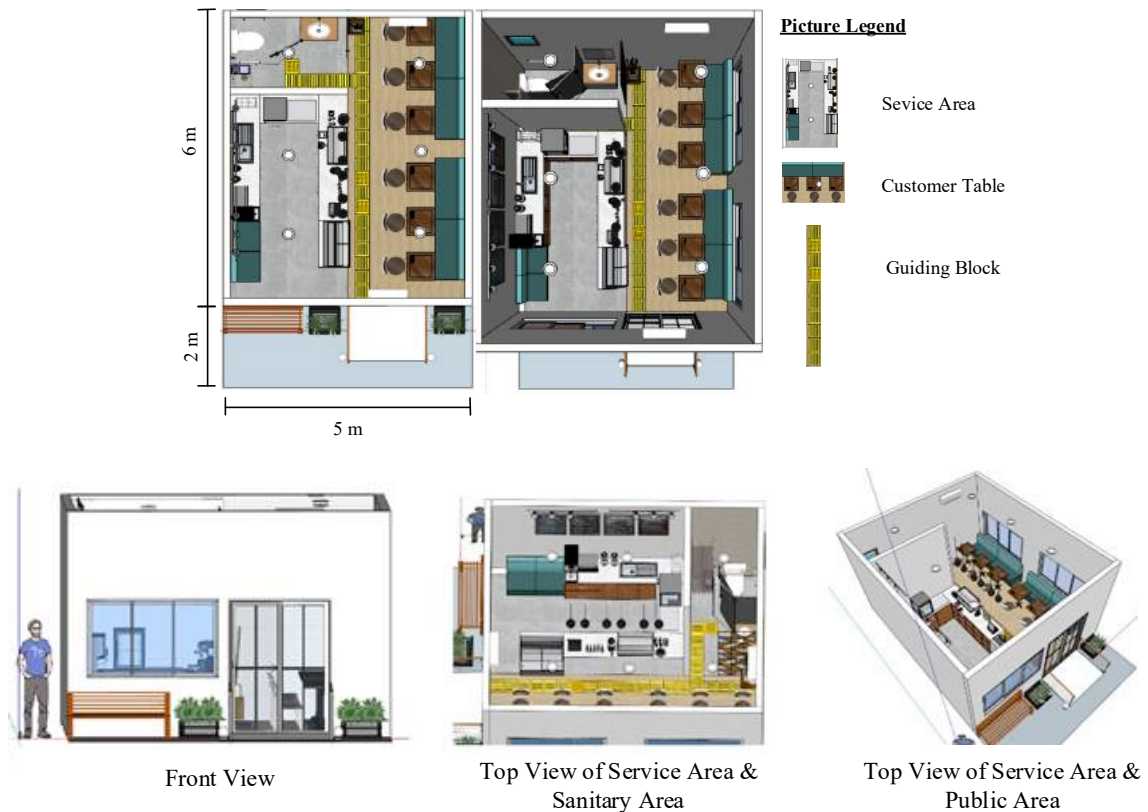


Figure 6 The Suggestion Layout for Café X

The service area and public areas were moved in the proposed layout design to facilitate the flow of activities for workers and cafe visitors. The proposed layout has a better layout in structuring various storage locations for machines and equipment used in cafe operations. In the cafe public area, guiding blocks are applied to show directions to customers by using markings in the form of a dot pattern indicating an order to stop and a line pattern indicating an order to move. From the rotation of the layout, we get an empty area at the back of the cafe building that can be used as a sanitation area.

4. Physical Environment

Suggestion for better lightning must consider two type of people, namely people with visual impairment and normal people. For people with low-vision, the minimum level of lighting needed to work is 500 lux with the help of artificial lighting (Damayanti, 2016). For normal people, the recommended level of interior lighting for activities carried out in the food industry has a minimum luminance value of 300 lux (Kementrian Kesehatan Republik Indonesia, 2002). In this case, because cafe visitors consist of non-disabled visitors, the minimum lighting level for public areas in Cafe X is 350 lux. For parking areas and courtyards, the minimum recommended lighting level is between 20 - 50 lux (Kementrian Kesehatan Republik Indonesia, 2002).

* The example of calculating number of light points for a public area (*Downlight - LED 8 watt*) :

$$\begin{aligned} E &= 350 \text{ lux} \\ L &= 6 \text{ m} \\ W &= 2.5 \text{ m} \\ \emptyset &= 68 \times 75 = 5100 \text{ lumen} \\ LLF &= 0,75 \\ Cu &= 0,6 \\ n &= 1 \end{aligned}$$

$$\begin{aligned} N &= \frac{E \times L \times W}{\emptyset \times LLF \times Cu \times n} \\ N &= \frac{350 \times 6 \times 2,5}{5100 \times 0,75 \times 0,6 \times 1} \\ N &= 2,288 \approx 3 \text{ light} \end{aligned}$$

For temperature and humidity, under normal conditions, during the afternoon to evening, the air temperature around the cafe area ranges from 26°C - 27°C with humidity around 40%-60%. If the cafe has a lot of visitors, the air temperature in the cafe area will rise high enough so that the air becomes hot and stuffy. At night, the air temperature around the cafe area will decrease, so the temperature becomes cooler and humid. To solve the problem, it is proposed to increase the number of air conditioners used to 2 AC units of 1 PK each.

- 1 m² = 600 BTUH
- Room size = 30m² (length = 6m , width = 5m)

$$\begin{aligned} \text{Air Conditioner Requirement (PK)} &= \text{Room Size} \times \text{Air Conditioner Capacity} \\ &= 30\text{m}^2 \times 600 \text{ BTUH/m}^2 \\ &= 18000 \text{ BTUH} \end{aligned}$$

1 PK = 9000 - 10000 BTUH. The amount of coolant needed is 2 units of AC with a power of 1 PK each.

For better air circulation, the use of sliding windows can be a solution to overcome the problem of obstructing air circulation in the cafe area due to the push windows installed in the cafe area currently not allowed to be opened because it is feared that it will disturb other road users passing around the cafe area. After the implementation of the sliding window, there are now 5 air circulation paths from windows and doors and 2 air circulation paths from 2 AC units installed in the cafe area.

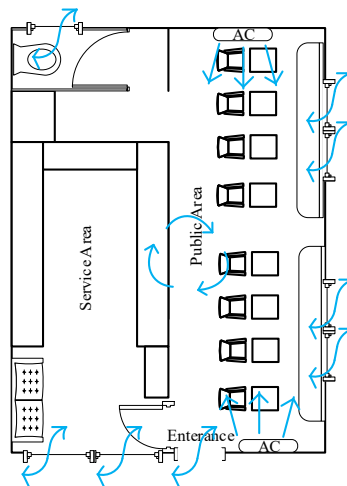


Figure 7 The Suggestion of Sliding Window and Air Circulation Path for Cafe X

The cleaning equipment storage area that was originally placed in the service cafe area was moved to the janitor area. In this area, the floor mop can be washed and dried before being stored so it doesn't smell bad because it has been soaked in the water for a long time. In the cafe area, several striking colors are applied, such as blue, yellow, brown, and black. These colors, especially the combination of yellow and black, have a sharp enough contrast so that they can help improve vision for both baristas and cafe visitors.

5. The 5S Conditions

The 5S culture that suggests being implemented in the Café X area are for *Seiri* (Sorting) is make an SOP regarding the management of raw materials & various other goods. For *Seiton* (Setting) are redesign the bar table to provide a more specific storage area, organize goods according to their respective functions, the intensity of use, and storage areas, and make tactile stickers as labels to provide information on goods. For *Seiso* (Cleaning) is make a schedule for picket cleaning & waste recycling schedule. For *Sheiketsu* (Maintaining) is provide suggestions for improving the cafe's physical environment to provide a more comfortable environment for both baristas and customers. For *Shitsuke* (Building a Self Habit) is placing posters containing written regulations regarding 5S as well as a campaign effort regarding 5S culture. It is important to understand to keep the work environment clean, neat, and orderly, so the baristas will become more comfortable and productive.

6. The Occupational Health and Safety Condition

There are several preventive activities that could do, such as changing the staircase area into a rough inclined plane equipped with a handrail as access to the café, installing lights in the courtyard area to provide lighting at night, ensure electrical installations are installed properly and correctly, ensure that the electronic equipment used is always in good condition, placed in a wet area, and has an appropriate power with a strong electric current to prevent a short circuit, provide fire extinguishers made of foam to deal with all types of fires, suggested the use of a tray organizer to separate items according to their function, propose the use of table corner protectors to minimize the occurrence of injuries or bruises due to hitting the edge of the table, put the hot spring in a place that is easily accessible but still safe, provide a first aid kit including burn ointment for accident first aid.

CONCLUSION AND FURTHER RESEARCH

- 1) Machines and equipment that are not by the needs of the user are replaced by using machines and equipment that more suitable and can support the work of the baristas. In addition to replacing the machine, suggestions for assistive devices, namely tactile stickers, are given to provide information on machines, equipment, and packaging of raw materials to make it easier for users to identify goods when they want to use them.
- 2) Improvements were made to the actual bar table which was still inadequate by redesigning the bar table and separating it into several room dividers to divide the storage space for goods according to

- their function and intensity of use. In addition, it is proposed to replace and add some attributes of physical facilities in the visitor area to increase the safety and comfort of visitors while around the cafe area.
- 3) Improvements to the layout of the cafe are carried out by changing the position of the service area and public areas and adding markings in the form of using guiding blocks as a tool for guiding directions to facilitate the activities of baristas and low-vision visitors. Another improvement is to propose making toilets and janitors cafe sanitation areas.
 - 4) Improvements to the physical environment were carried out, namely providing a proposal for calculating power and lighting points according to the needs of workers and cafe visitors, proposing an increase in the number of air conditioners to cool the room, proposing a replacement for the type of window installed in the cafe area, and proposing the construction of a janitor in the sanitation area as a place to stay. store cleaning equipment so that it can overcome odors that can be smelled around public areas.
 - 5) 5S culture needs to be actively implemented to create a comfortable environment for cafe workers and visitors through making SOPs for arranging goods, cleaning schedules, implementing the use of labels (tactile stickers) as information, and displaying 5S posters as an effort to campaign for 5S culture.
 - 6) To overcome the risk of work accidents that arise around the cafe area, it is proposed to always provide a first aid kit as first aid in the event of an accident. Preventive measures can be taken using several methods: ensuring that electrical installations are installed correctly, removing ladders to reduce the potential for accidents (falling), providing foam fire extinguishers to deal with minor fires, and proposing several other tools to reduce the risk of accidents.

Subsequent research can add various other variables regarding the limitations and abilities of people with low-vision as topics to be researched, reviewed, and also given suggestions for improvement so that more aspects are considered and also improvements are proposed to help other blind people with disabilities in carrying out their daily activities.

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