

## ANALYZING KITCHEN WORKSPACE FOR FOOD TRUCKS IN SELECTED AREAS OF KUALA LUMPUR AND SELANGOR

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### ABSTRACT

*This research aims to explore the various workspace of food truck kitchen focusing on those operated in Kuala Lumpur and Selangor areas. Therefore, the objective of this research is 1) to determine existing types of food trucks in selected areas and 2) to identify the workspace of kitchen for the food trucks in selected areas. Observation on physical elements of 17 food trucks were done. Data collection has been analyzed on the types of food trucks by line up analysis to categorize the type of menu served and location. The number of movements during food preparation were analyzed as well to obtain the work triangle ratio. The result showed that there are two types of food truck menu; fusion cuisine and western cuisine. The western fusion showed the highest number of movement during food preparation. The more numbers of preparation movements shows that the preparation of the meal was more complicated. Only 8 out of 17 food trucks were installed with either fan or exhaust fan. Food truck with fan improved the air ventilation in the workspace. This study also found that there are food truck workspace with work triangle and without work triangle. The wider work triangle in the kitchen will give a better workspace for food preparation. Most of the food trucks samples have ideal work triangle. However, many food truck samples still having safety issues such as discomfort and uncomfortable workingspace. To ensure the adequate and proper food truck kitchen working space, there is a need to improve the work triangle area, as well to consider following aspects; 1) to create bigger empty space in the middle of the kitchen, 2) maximum 2 workers, 3) plan zoning and suitable kitchen equipments 4) edequate entrance area 5) to install exhaust fan. Due to there is still no proper business guideline for Food Truck, it is hope that these recommendation will contribute to the Food Truck Bussiness Operation Guideline under government and non-government agencies. By the enforcement of proper guideline for food truck business, as well as to the food truck vendors.*

Keywords Workspace, Food Truck, Kitchen layout

### INTRODUCTION

In 2014, it was reported that food truck business became the biggest trend in Food & Beverages (F&B) industry in Kuala Lumpur, Malaysia. There are 820 food trucks operators have registered as members of Malaysian Food Truck Association (MAFTA) in 2019 (The Star, 2014). According to The New Straits Times, the Malaysian government giving various initiatives through Malaysian Budget 2018, where by this initiatives will help about 1000 food truck business to operate thorough out the country (NST, 2019). It was reported that, some of the non-government institution such as Perbadanan Islam Johor also gaving grant to Small and Medium Enterprises (SME) as a starter kit for food truck business (Gerakan Muafakat, 2016). Food truck by definition is an adopted compact kitchen from the restaurant into mobile kitchen (Beylen. J.L., et al, 2011). The compact kitchen of food truck plays the biggest roles, where the main activity of food preparation is done in that space. With the high popularity of food truck dining nowadays, the highest numbers of customers can up to 300 person per day, where the food truck working hours can take more than 8-12 hours per day. This condition may lead to safety risk in discomfort and health issues to the workers. Untill today, there is still no specific guideline for food truck operation in its service or facilities. Without the specific guidelines, the food truck operators facing many difficulties to run the business following the current regulation especially to ensure the safety of the workers. As such, the study on workspace of food truck kitchen is important to help the food truck operators as a initial consideration in designing the food truck kitchen workspace. This research aims to explore the various workspace of food truck kitchen focusing on those operated in Kuala Lumpur and Selangor areas. Therefore, the objective of this research are: 1) to determine the existing types of food trucks and 2) to analyzed the workspace of kitchen for selected food trucks.

### FOOD TRUCK AS A MOBILE KITCHEN

The soaring and innovative food industry player has shifted their games where food vendors sell their food using moving vehicles allowing them to become portable, thus inviting bigger number of customers segment. The strategy of setting up easy and fast food to serve from vehicle is known as food truck. (Shawahid, Bakar, & Eksan, 2018). Food trucks may have started out as a cheap alternative to a brick-and-mortar restaurant, but they have become one of the strongest business models in the food and beverage industry (Lorri M., 2017). Ibrahim N. (2011) justified the food truck as a vehicle that is completed with the equipment to prepare and cook food and has portability to move from one strategic location to another. Although food truck was initiated in America, this trend was rapidly expanding and adopted by other countries including countries in Asia. These food truck vendors were starting to have positive competition and mushrooming their business around Kuala Lumpur and Selangor, Malaysia as well. The food truck vendors started to renovate and improve their truck's interior and exterior to look good and convenience for the business. The kitchen layout of food truck is depends on the menu or food being sell as well as the workers safety, happiness and efficiency. According to M. Aptel et.al, the food truck vendor needs to consider implementing the ergonomic elements into interior design process, where the user, tool and workplace interlaced with one another.

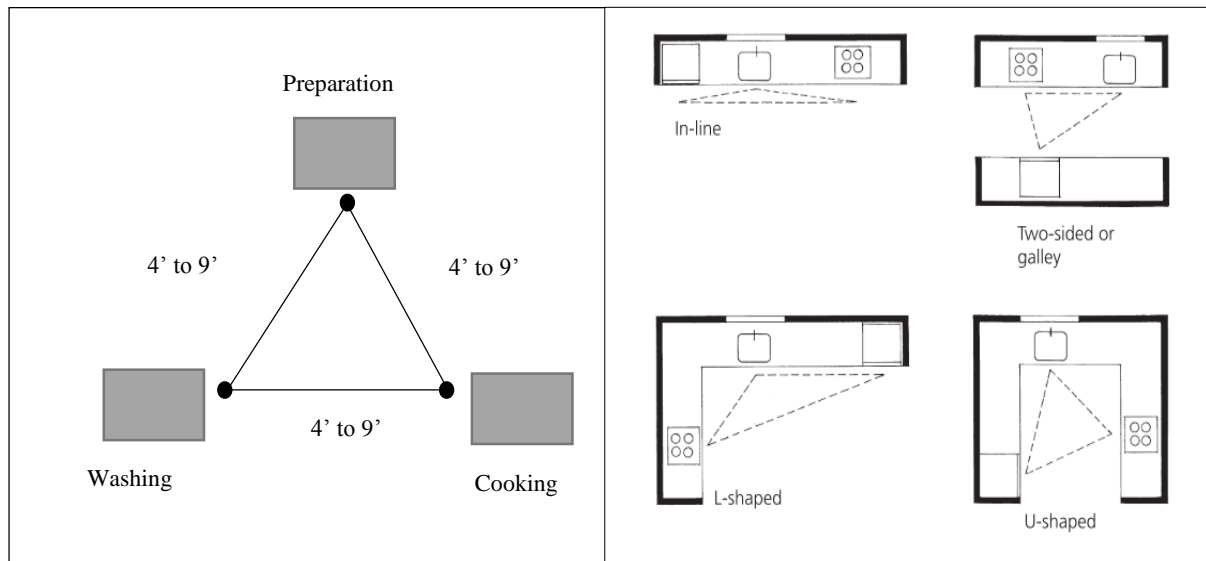
**WORK TRIANGLE IN A KITCHEN**

One of the ergonomic workings in kitchen developed at the University Illinois in the 1940s is the kitchen ‘work triangle.’ This model is based on the three work centres in the kitchen which are: refrigerator, sink or dishwasher, and cooker (Baden-Powell, 2005). From center points in front of each work centres, it suggests that they should form a triangle with legs no less than 4 feet or not more than 9 feet and the total of all three legs should be between 13 and 26 feet (Figure 1). The idea is to put these three centres to form a triangle shape steps to have most efficient distances apart to reach the best arrangement for the space available and to minimise traffic within the work space. Kishtwaria, Mathur, & Rana, 2007 supported the suggestion for normal kitchen layout and stated that the perimeter of the work triangle should not exceed 7 metres.

**Table 1: Items include in cooking and dining process**

Preparing meals	Cooking	Cleaning
Refrigerator	Refrigerator	Sink
Sink	Gas stove	Dining table
Countertop	Sink	Gas stove

In addition, work triangle concept is also affected by behavior inside the kitchen, where it is depends on the menu prepared and type of kitchen activity involved. According to Chen, 2015, they found that cooking and dining process can be divided into three stages; preparing meals, cooking and cleaning; where these stages involves several kitchen appliances. For example, during preparing the meals, refrigerator, sink and countertop are involve. For cooking stage, refrigerator, gas stove and sink are the appliances that involve. Sink, dining table and gas stove are required items in the cleaning stage (Table 1). The action of doing all these three stages, called as dinner preparation behavior, cooking behavior and cleaning behavior. Christ & Mimi, 2013 stated that work triangle can be the best instrument to have a good working environment in workspace. (Christ & Mimi, 2013) . Hence, work triangle is the closest and optimal method that could measure the kitchen’s efficiency. The measurement for work triangle can be modified and customized by following the feet ratio between triangle which are 1:2:2 or 1:1:1. Therefore, this principal of work triangle will be applied to identify the type of kitchen and work triangle measurement in the food truck kitchen. There are four kinds of kitchen which are In-Line, Two-sided or Gallery, L-shaped and U-shaped, where all of them has its own kind of work triangle pattern. (Figure 1)



**Figure 1: Work Triangle Idea Length, Types of Kitchen**

**BEHAVIOR AND FOOD PREPARATION ZONING**

The behavior study is important, especially during chores to know the pattern inside the kitchen. To ensure a smooth-working environment and safe circulation in the kitchen hence, basic behavior such as preparation zone, washing and cooking zone has been categorized accordingly. However, vendor’s behavior depends on the menu provided. Based on observation, food truck in Malaysia is categorized into several types. First and foremost is the local food cuisine, but since Malaysian cuisine comes from a very wide and multicultural races, The Malaysian Government has incorporates the local cuisine as part of its national multicultural identity by using the terms “fusion cuisine” and this is for food tourism purposes. Others are western food by means, European countries of France, Italy, and Spain are well known worldwide and have become an attraction to visitors. (Hairi, Deborah, Markwelb, 2014).

**ERGONOMIC IN FOOD TRUCK SPATIAL PLANNING**

There is still lacking in ergonomic study and spatial planning in food truck kitchen in literature review or in detail studies. Ergonomic study of space area and working space in compact designed food truck is very important since the ergonomic is the study of people, it is often convenient to think of problems that related to type of body system (Jeffrey, 1995). Food serving business uses a lot of hand tools, hence, the workspace interior should have criteria related to human hand tools operation design. M. Aptel (2002) explained criteria that contribute to design of hand tools; tool design, user element, environmental factor, work task, and work situations. Kitchen area should consider as the priority as it is a facility to carry out activity, hence, reducing accident in the kitchen. According to Jatinde, Puja and Aruna (2007) their recommendation of proper guideline for designing kitchen is the size of kitchen that needs to consider how many family members and depends of availability of space. In another research, the requirement of ergonomic in the kitchen workspace concerns primarily the targeted of the size and proposition of the room, organization of workflow, lighting of the entire room, sustaining and comfortable microclimate conditions, and removing accident-causing threats (P. Nowakowski, 2018) . As the food truck is considered as compact kitchen, the food truck vendor should consider the guideline for proper design and space planning for a home kitchen. A checklist guideline provided by Tiffany (2018) is the main consideration in workspace planning for food truck kitchen layout. (Table 2)

**Table 2: Checklist for food truck layout (Tiffany, 2018)**

Checklist	Standard
<b>Floor</b>	Durable, non-slip, inflammable floors like commercial grade laminate or vinyl
<b>Ventilation</b>	Proper ventilation in the form of a hood fan and roof vent, with additional windows if you can swing it
<b>Layout and spatial</b>	Room for staff to move around freely while carrying hot pots and pans
<b>Storage &amp; cabinets</b>	Easy access to inventory and ease of transition between workstations
<b>Emergency exits</b>	Emergency exits exists.

**RESEARCH METHOD**

This study employed qualitative method of data collection. To determine the existing food trucks, an observation has been done on physical elements of food trucks to has been done on 17 food trucks in Kuala Lumpur (KL) and Selangor areas; Mobile Chef Thai, Chef Pakcik Kluang, D’sstreet Lorry, Danau Grill, Impressza Seafood Connection and Hungry Thug, Yaqin Sk Rambo, Nasi Lemak Pak Teg, Brader Bob and Sit at Zul, Penyet Street, Iza Station, Baboor, Jejak Pelangi, Mantop, Daddy Pasta, and Little Lily. The sites were selected based on the total distribution of search engine using keyword of ‘food truck’, where the result showed that the highest percentage were 21% for food trucks in Kuala Lumpur and 19% for food trucks in Selangor areas. During observation, several elements in the food truck were taken and recorded such as work triangle, number of workers and type of kitchen layout. In addition, some of issue for example the collision, discomfort, ventilation, storage and cabinets were discussed. Based on the data from observation, a line-up analysis were prepared to analyze the workspace in each food truck.

**RESULT AND FINDINGS**

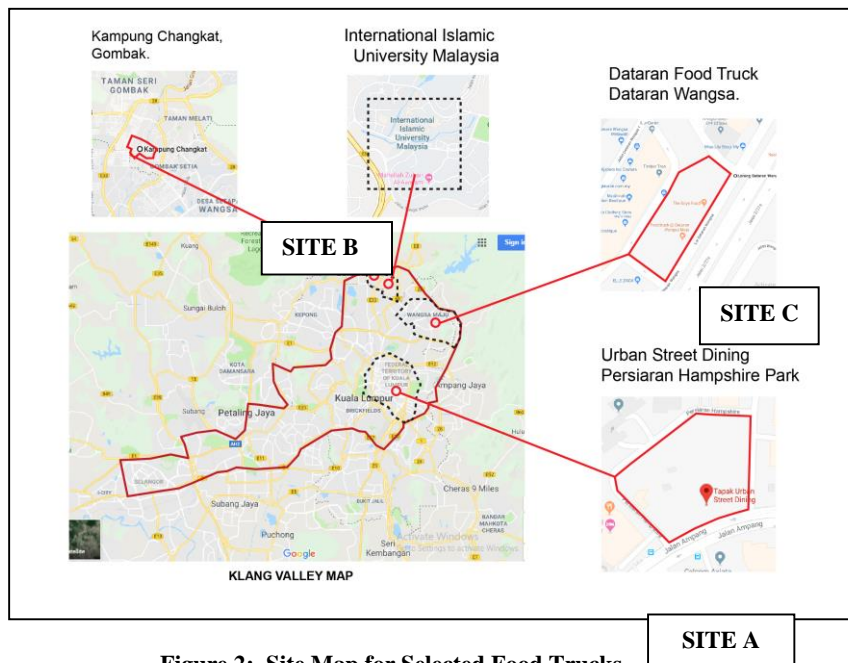
**Types of food truck**

A total of 17 samples of food trucks have been analyzed as shown in Table 2; 13 food trucks in Kuala Lumpur (KL) and 4 food trucks in Selangor. The food trucks areas were divided into 3 places, which are Site A at ‘Tapak’ KLCC, Persiaran Hampshire, Site B at IIUM Gombak and Site C at Tapak in Dataran Wangsa, Wangsa Maju. (Figure 2). There are 2 sites for Kuala Lumpur areas which are Site A and C. Other 1 site located in Selangor area, which are Site B. Six food trucks were located in Site A, which are 1) Mobile Chef Thai, 2) Chef Pakcik Kluang, 3) D’sstreet Lorry, 4) Danau Grill, 5) Impressza Seafood Connection and 6) Hungry Thug. There are four food trucks located in Site B at IIUM Gombak, which are 7) Yaqin Sk Rambo, 8) Nasi Lemak Pak Teg, 9) Brader Bob and 10) Sit at Zul. Seven food trucks were allocated at the Site C, which is Tapak, Dataran Wangsa, which are 11) Penyet Street, 12) Iza Station, 13) Baboor, 14) Jejak Pelangi, 15) Mantop, 16) Daddy Pasta, and 17) Little Lily. (Table 3)

The results show that the food trucks are categorized into 2 types of menu; fusion cuisine and western cuisine 9 samples of food trucks selling fusion cuisine, and 8 samples selling western cuisine. Types of menu under fusion cuisine are such as nasi lemak and fried noodle and for western cuisine are fish and chips and burger. The activities of meal preparation were identified as well. For western cuisine, it is found that there are 7 types of activities were done during the meal preparation; cooking, frying, grilling, pan-frying, chopping, mashing, marionette. For fusion cuisine, there are 4 types of activities; boiling, frying, cooking and steaming. These activities have a strong relationship with the kitchen layout arrangement, as well as with the user behavior during meal preparation.

**Table 3: Food trucks distribution and their location.**

Site	Location of the survey	Food truck	Menu	Total
<b>A</b>	TAPAK (KLCC, Persiaran Hampshire)	1) Mobile Chef Thai	Fusion Cuisine	6
		2) Chef Pakcik Kluang	Fusion Cuisine Western Cuisine	
		3) D'street Lorry	Western Cuisine	
		4) Danau Grill	Fusion Cuisine	
		5) Impressza Seafood Connection	Western Cuisine	
		6) Hungry Thug		
<b>B</b>	IIUM Gombak	7) Yaqin Sk Rambo	Fusion Cuisine	4
		8) Nasi Lemak Pak Teh	Fusion Cuisine	
		9) Brader Bob	Fusion Cuisine	
		10) Sit at Zul	Fusion Cuisine Fusion Cuisine	
<b>C</b>	TAPAK (Dataran Wangsa), Wangsa Maju	11) Penyet Street	Fusion Cuisine	7
		12) Iza Station	Fusion Cuisine	
		13) Baboor	Western Cuisine	
		14) Jejak Pelangi	Fusion Cuisine	
		15) Mantop	Fusion Cuisine	
		16) Daddy Pasta	Western Cuisine	
		17) Little Lily	Western Cuisine	



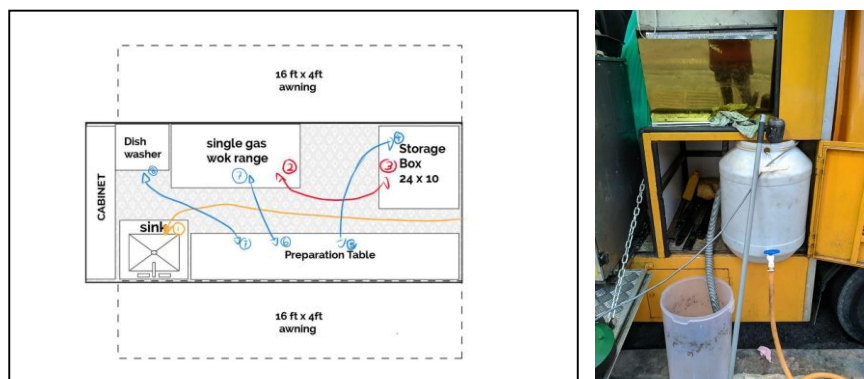
**Figure 2: Site Map for Selected Food Trucks**

**KITCHEN LAYOUT AND MOVEMENTS IN FOOD TRUCKS**

For fusion cuisine, the number of movements recorded were as minimum of 8 movement and up to maximum of 18 movements, for one meal preparation. The flow in the workspace has been marked from the starting point; which is the entrance from back door by using ladder. Most of the food preparation activities start at the sink area for example washing the food sources; vegetables and fruit. Based on information provided by the food truck handlers, starting from 2018, it is compulsory for all food trucks operator to install sink. However, there were trucks that do not install sink, inside or outside the truck. The vendors are

just using water dispenser because the sink is unnecessary for them. Four food trucks without sinks, which were Bakhtiar Enterprise, Impressza Seafood Connection, Sit At Zul and Nasi Lemak Pak Teh.

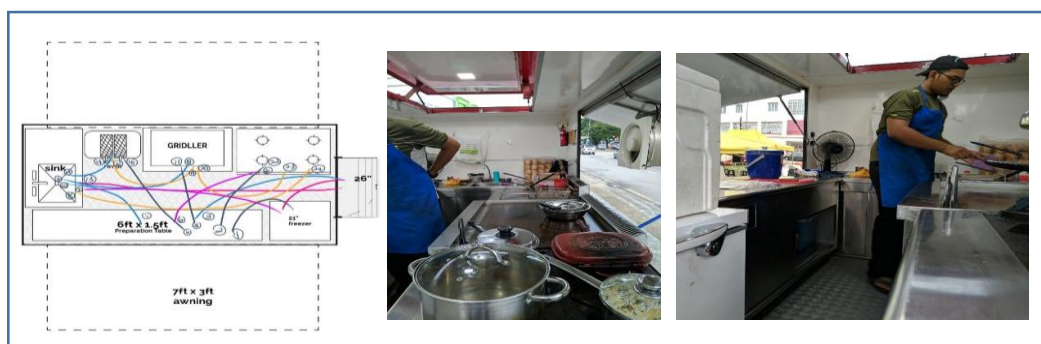
Most of food trucks of fusion cuisine are dealing with different kind of stoves, utensils, tools and ice box or chiller. They are involves in food preparation activities such as cooking rice, boiling and frying. The main activity in the food preparation flow is working in these 3 kinds of areas; sink area, food preparation area, and cooking area. Most of the sinks were installed near the preparation table, which at the left side from the drawing because the setting up of piping and extra storage. For example, number of movement recorded in Kitchen of Fusion Cuisine, Yaqin SK Rambo food truck is 8, and the sink installed near the preparation table for easy access to extra storage installed near to that area. (Figure 3). This storage usually used for the airconditioner, air ventilation purposes, and work as extra storage below the food truck. This could give disadvantages for the food truck operation because the location of sink is too near to the location of the installed cabinets. The food truck worker felt discomfort and difficult to assess the sink area, which is located at the back of the workspace and its created discomfort and difficulty for operator to move to the sink area. This situation happened to every food truck including the western cuisine food trucks as well as the beverages food truck in Malaysia. It is good if the location of the sink area is near to the entrance area for easy access to the sink.



**Figure 3: Numbers of Movement Recorded in Kitchen of Fusion Cuisine Food Truck (Yaqin SK Ramboo), Storage Tank (Penyet Street)**

For western cuisine food preparation, the number of movements were recorded as minimum as 14 up to the maximum of 21 movements for one meal preparation. The flow goes; from the entrance, they went to kitchen to wash their hands, took out the fries, marinated food from the freezer, put it into the sink and waited to defrost it. Next, they went to frying and in the meantime, they cooked the meat/marinated chicken, plus they mashed the potatoes and served it with their special sauces. In addition, western food used many utensil, stoves and space to prepare it. From the safety perspective, two trucks are having substandard risk arrangement; which are Iza Station and Little Lilly food trucks. Both are putting the frying area near to the entrances and exit of the truck, this exposes to risk of small accident when they are trying to enter or go outside the truck while the pan is still being used.

Figure 4 shows the inside Little Lilly Food kitchen. They installed the 4-eyes stove near the entrance and the sink at the back of the workspace. According to the layout, this space is not suitable to work with more than 1 person, this creates discomfort to include one more worker inside. When they were preparing the dish, the top part of stainless-steel cabinet became heated up. This scenario can expose to a small burn accident if the vendors not giving full attention on safety during the exit and entrance activities as well as during the food preparation



**Figure 4: Little Lilly Food Truck; Numbers of movements and inside the kitchen senario**

**Table 4: Food trucks distribution and its location.**

No	Food truck	Food Truck Label	No of movement	Min Movement	Max Movement
<b>1</b>	<b>Fusion Cuisine</b>				
1)	Yaqin SK Rambo	FT-A	8	8	18
2)	Penyet street	FT-B	13		
3)	Mobile Chef Thai Cuisine	FT-C	18		
4)	Nasi Lemak Pak Teh	FT-D	11		
5)	Jejak Pelangi	FT-E	12		
6)	Sit At Zul	FT-F	9		
7)	Impresza Seafood Connection	FT-G	11		
8)	Mantop	FT-H	18		
9)	Brader Bob	FT-I	8		
<b>2</b>	<b>Western Cuisine</b>				
1)	D'street Lorry	FT-J	19	14	24
2)	Danau Grill	FT-K	21		
3)	Daddy Pasta	FT-L	17		
4)	Iza Station,	FT-M	21		
5)	Little Lilly Food	FT-N	24		
6)	Baboor	FT-O	14		
7)	Hungry Thug	FT-P	17		
8)	Mobile Chef Pak Cik Kluang	FT-Q	21		

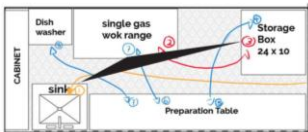
Table 4 shows 17 food trucks distribution including its location. There are 9 food trucks selling fusion cuisine and 8 food trucks selling western cuisine. In relation, all food trucks are labeled as FT – (alphabet). For example, Yaqin SK Rambo is labeled as FT-A in this research to help easy understanding on the explanation. Number of movements in one meal preparation for fusion cuisine; min 8, max 18, and for western cuisine; min 14, max 24. The more movement during preparation of meal, the more complicated food preparation activities. Thus, there is a need to consider the workspace arrangement in the food truck kitchen.

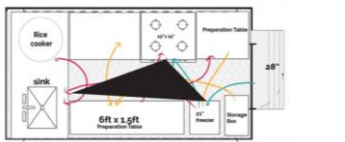
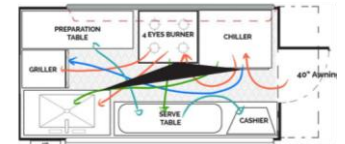
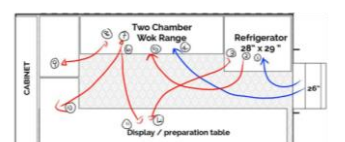
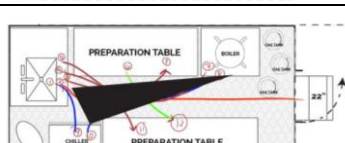
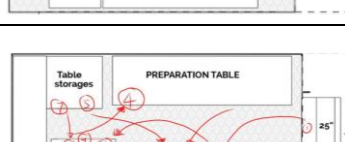
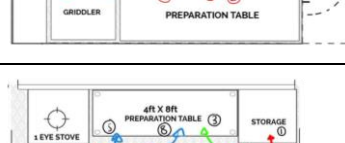
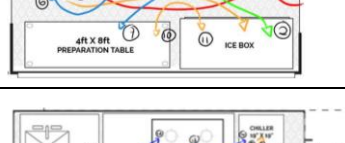
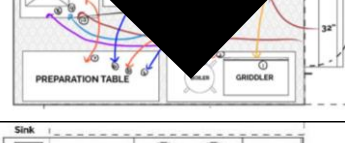
**WORK TRIANGLE OF KITCHEN IN FOOD TRUCKS**

Work triangle in the kitchen workspace has been analyzed based on spatial study. The layout of the food truck kitchen has been mapped into three zoning; first, the preparation area that usually contains of chiller or refrigerator, second is washing/sink area, and lastly the cooking area. The ideal total length of each segment in the work triangle is 12 to 22 feet (3658 to 6705 millimeters). However, in the case of food truck adapting the compact kitchen, the scale of work triangle has become smaller.

Table 5 is the compilation of profiling of work triangle sketches with several elements that taken as consideration for workspace in food truck kitchen which are dimension of the triangle, ratio of work triangle, total of movements, kitchen type, optimum workers suggested for the kitchen, discomfort stated by the workers, collision happened during working hour. ‘Others’ in the last column also were recorded to highlight the food truck issue. FT-A until FT-I are the food trucks for fusion food, while FT-J until FT-Q are the western food.

**Table 5: Work Triangle for Fusion Cuisine**

FT	Work Triangle	Fusion Cuisine						
		Dimension (feet) / work triangle ratio	Movement	Kitchen type	Optimum workers	Discomfort	Collision	Others
A		4 x 6 1:2:3	8	Galley Kitchen	2	yes	-	No refrigerator

<b>B</b>		5 x 6 2:2:1	13	U shaped Kitchen	2	yes	-	- fan
<b>C</b>		4 x 6 2:2:1	18	U shaped kitchen	2	yes	-	Movable cabinet
<b>D</b>		No work triangle	11	Galley Kitchen	2	-	-	Not cooking on truck
<b>E</b>		6 x 7 1:3:3	12	U shaped kitchen	2	Yes - floor	yes	- fan
<b>F</b>		No Work triangle	9	Galley Kitchen	1	yes	-	Without sink
<b>G</b>		No Work triangle	11	Galley kitchen	2	Yes	-	Without sink
<b>H</b>		8 x 6 1:1:1	1	Single wall kitchen	1	yes	-	-
<b>I</b>		6 x 7 1:3:3	8	Galley Kitchen	1	yes	-	-

There are 2 types of workspace in the fusion cuisine food trucks, which are with work triangle and without a work triangle (Table 5). There are 5 food trucks that have work triangles, which are FT - A, B, C, E and I. Another 4 food trucks are without a work triangle, which are FT- D, F, G and H. FT- F and G do not have work triangle because its kitchen do not install with sinks, which can be considered as improper kitchen layout. The other food truck, which is FT-D also do not has a work triangle because the vendor do not cook in the truck where they only serve ready-made food.

Most of the fusion food truck with work triangle meet the standard requirement of work triangle, which is 1:1:1 or 1:2:2. The maximum length of work triangle is 6x7 feet, which is FT-I. The work triangle ratio for FT-I is 1:3:3, which is bigger than the standard ratio of work triangle. The minimum size is 4x6 feet, which is FT- A and C, where both food truck meets the standard requirement of work triangle ratio. There are 3 types of kitchen type which are gallery, u-shape and single wall kitchens. The optimum numbers of workers in all food trucks' kitchen are 2 people. Despite the ideal work triangle ratio, most of the food trucks reported that they sometime feel discomfort of their compact workspace. FT-E complained that they had experience on collision during working hours. Sometimes, they had 3 people or workers at a shift, where this exceed the optimum number of workers at a time.

There is only one type of workspace in the western cuisine food trucks, which is workspace with a work triangle (Table 6). All of the western cuisine's food trucks have work triangles. Most of the western food trucks meet the standard requirement of work triangle, which is 1:1:1 or 1:2:2. The maximum length of work triangle is 8x7 feet, which is FT-J and FT-N. The minimum size is 4x4 feet, which is FT-P. There are 2 types of kitchen type which are gallery and u-shape kitchens. The optimum numbers of workers in all food trucks' kitchen are 2 people. Although the western food trucks have ideal ratio for work triangle, some of the food trucks reported that they sometime feel discomfort of their compact workspace because of the arrangement in the kitchen. For example, FT-N and Q reported that they had too small entrance that contribute to the discomfort of workspace in the kitchen. Meanwhile, FT-K mentioned that they feel discomfort because the workspace is too crowded with their kitchen appliances. Moreover, it has no entrance and no emergency exit, and they are using the driver's door to go inside the food truck. This condition contributed to smaller work space and feeling too crowded even only for 1 person. It has been identified that some of the food trucks had experience on collision during working hours. FT-Q has a movable cabinet installed, where it help to ease the feeling of discomfort and to avoid certain collision during working hour. By having the movable cabinets, the workers can easily moves their kitchen cabinets accordingly to create more comfortable workspace whenever they need it. (Figure 5). This study also found that FT-O had a foldable table on the kitchen cabinet, where it help to improve the workspace inside the kitchen. With the u-shaped kitchen and the foldable table, the workers informed that they feel comfortable working in the kitchen. (Figure 6).



Figure 5: Movable Cabinets in Chef Thai Cuisine (FT-C) and Chef Pakcik Kluang (FT-Q)

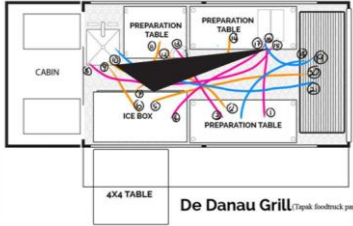
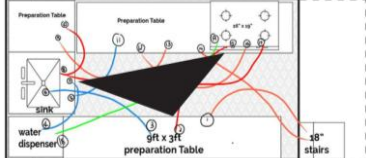
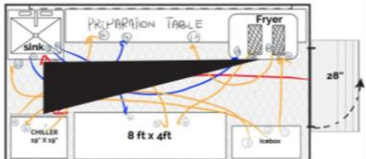
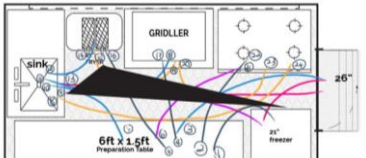
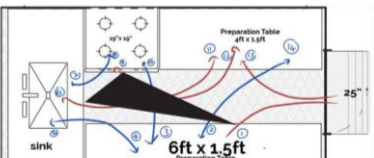
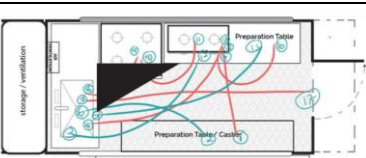
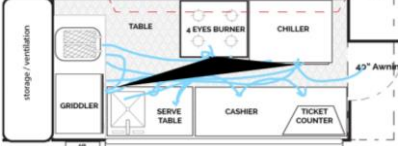


Figure 6: Folding Table [Movable] and U-shaped Kitchen Used in the Workspace

Table 6: Work Triangle for Western Cuisine

FT	Work triangle	Western Cuisine						
		Dimension (ft)	Movement	Kitchen type	Optimum workers	Discomfort	Collision	Others
J		8 x 7 2:2:3	19	Galley kitchen	2	Too much ice box	yes	fan



K		7 x 6 1:2:2	21	Galley Kitchen	1	Too Crowded	yes	No entrance No emergency exit fan
L		6 x 6 1:1:1	17	U shaped kitchen	2	-	-	Movable cabinet.
M		7 x 8 1:3:3	21	Galley Kitchen	2	-	-	fan
N		7 x 8 1:3:3	24	U Shape kitchen	1	Entrance too small	-	fan
O		5 x 6 1:2:2	14	U Shaped kitchen	1	-	yes	
P		4 x 4 2:2:2	17	U Shaped kitchen	2	-	yes	fan
Q		5 x 6 2:2:3	21	Galley kitchen	1	Entrance too small	yes	Movable cabinet fan

Air ventilation also one of the consideration in the food truck workspace. The meal preparation activities can produce unbearable smoke and hot temperature especially when involving frying, grilling and cooking. Out of 9 fusion cuisine food trucks, there are only 2 food trucks which installed fan or exhaust fan in their kitchen; Penyet Street (FT-A) and Jejak Pelangi (FT-D). In relation, out of 8 western cuisine food trucks, there are only 6 food trucks installed fan or exhaust fan in its kitchen; D'street Lorry (FT-J), Danau Grill (FT-K), Iza Station (FT-M), Little Lilly Food (FT-N), Hungry Thug (FT-P) and Mobile Chef Pak Cik Kluang (FT-Q). According to the Dobbin et al (2018), by installing kitchen exhaust fan, it will reduce the cooking emission in two ways; first is by eliminating directly at the stove before they got mix into the surrounding air and second is accelerating overall air mix substitute in the home to remove pollutants from the indoor environment. There are two kinds of ventilation fans installed in the food trucks, which are stand fan or wall mounted fan. Another type of ventilation fan is exhaust fan, where it can be either wall mounted or ceiling mounted. The exhaust fan is more noise reducing and designed to increase air ventilation in required spaces. Figure 7 shows the location of air ventilation in food truck of Chef Pak Cik Kluang (FT-Q). Exhaust fan was installed with another opening to improve the air ventilation in their truck.



**Figure 7: Air Ventilation in Food Truck Chef Pak Cik Kluang (FT-Q)**

In conclusion, the effectiveness of workspace and smoothness of working area in the food truck kitchen can be identified through the condition of the work triangle. The more even of triangle side, the more effective workspace in kitchen could be created. The work triangle area can be identified through several elements in the food truck kitchen, which are the pattern of worker movements and allocation of washing, preparation and cooking areas. Based on this study, most of the food trucks have ideal work triangle ratio. However, the vendors of food truck still complained on discomfort and possibility of collision during their working hour. Therefore, to have effective workspace, the vendor not only has to consider the work triangle ratio, but also to consider other kind of elements that contribute to the smooth running in the kitchen activities. For example, to create bigger empty space in the middle of the food truck, where it will allows vendors to move easily during food preparation. The entrance of the food truck should have at least minimum of 28 inches length, and 36 inches for walk path clearance to avoid accidents and discomfort at the entrance area.

This study also recommend the vendors to do a measurement before installing any cabinet and appliances to have a better work triangle. For the selection of kitchen equipment, the vendors need to list out all the equipment that needed to be installed and to decide zones for washing, preparation and cooking. The suitable equipment should be placed according to the zones. The optimum number of workers in the kitchen is 2 people at a time for a better working space and to ensure safety in the food truck kitchen. The air ventilation should be consider as one of the important element for a good cooking environment. This will help the worker to have more fresh air as well as to reduce hot temperature in their working environment. With all the above recommendation, this study hopes that a better working environment can be developed for smooth activities in the food truck. The outcome of this study will help the F&B food truck business starter, i.e. vendor in planning their food truck kitchen layout. Since there is still no single comprehensive guideline for foodtruck operators to facilitate their trading activities, it is hope that this study can contribute to the food truck business operation guideline under MAFTA, National Entrepreneur Institute, Kuala Lumpur City Hall (DBKL) or related municipal authorities.

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