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Accommodation Building Designing for Construction Labor Basic Life Quality Promoting

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Abstract

Since the problem in temporary accommodation for construction labor about space and building for supporting basic living, these are composed as bedding, toilet and showering, cafeteria and sanitation management. These always be necessity facility for life quality of construction labor in Thailand. However, there are the inadequate of designing for space building including facility usage that takes the bad condition of facility usage safety and hygiene. This paper aims to design and show properness of spaces and building in camp site. By questionnaires for 300 sample labors from 3 property construction project in Chonburi. Data were composed as daily activities and need of facilities and analyzed by zone of space. The result showed that proper space and building of camp site were provided as 15 m^2 / 1 labor. These space were separated as the space of accommodation for 0.85 m^2, sanitation for 1.50 m^2, emergency for 1.25 m^2, travelling for 1 m^2, recreation and retail for 1.25 m^2 and open space for 5.40 m^2. All content about spaces of camp site were designed as layout of space and building concretely by program sketch up version 8.0. While discussing with various studies and provision about building and facilities for living, it found that there were both agreed and opposed.

Keywords: Construction labor, Outside welfare, Temporary accommodation, Lay out of camp site

1. Introduction

Due to economic grown extremely at macro level of Thailand by The National Economic and Social Development Plan, the important businesses and activities for country's economic development are constructions these are the beginning point of the businesses considered as their basic factors such as various buildings infrastructure for implementation of businesses and activities, an important part of country's economic development, such as household, factories and commerce buildings for implementing the businesses.

Additionally, the mentioned construction industry does not depend on resources, materials, and technology only. There is also important "construction labor" that takes duty in building construction by skill ability and workforce to build various buildings for usability. These construction labors are not only even human resource taking part for country's economic development, they are also the consumer taking purchasing power for the economic system of country. Therefore, there are legislation of legal and occupational measurement for safety condition in working, for instance ministerial regulations standard of administration in occupational health for promoting life quality and hygienist of construction labors in making their working task as potential human resources.

Nevertheless, apart from occupational and life quality of construction labor management, there is also facility for basic living human have to do in daily life. These are composed as bedding toilet shower cafeteria construction workers need to use and supported. Those facility for basic living in accommodation need to be designed for proper condition in space ergonomic and hygienic as well as good sanitation management. By mentioned matter, this researcher is interested in basic life quality promoting for construction labors.

2. Materials and Methods

Research was implemented by collecting data by questionnaire from 300 labors of 3 property construction projects in Chonburi. These data were composed as daily routine, facilities needs to analyzed and concluded that Ngow (2015) by duration of day and Rojvirasingh (2011) by percentage of needs. Analyzing daily routine activities data in camp site and compiling facilities need data of sample labor to provide size of space usage Sthapitanont (1991) explained for providing space of accommodation facilities for life quality supporting including hygiene in camp site welfare for effective of co-operative apace usage. To select 4 items of basic needs facilities to design pattern of building and area by Sketch up program version 8.0.

3. Results and Discussions

1. To compile data of facilities need by using a questionnaire for interviewing labor samples of 3 property construction projects jointed research. To explain data of facilities need by Rojvirasingh (2011) studied, the details regarding this are shown in Table 1.

Table 1. Shows the result of compiling facilities need of construction labors.

Facilities	Need of labor samples (%)
Accommodation building	100.00
Shower and toilet building	100.00
Kitchen and cafeteria building	75.00
Trash and waste water management	86.67
Emergency usage space	81.00
Route of vehicle traveling area	65.67
Parking area	68.33
Area for exercising	84.00
Area for grocery store welfare	94.33

2. To provide temporary accommodation space, according to the analyzed and concluded data and concerning factors for supporting living convenience and comfort in camp site that provided criteria for space or building per labor by minimum requirement for proper and hygienic living in both short and long term. Regarding this, it showed that 1 labor needed not lower than 15 m^2 of space for temporary building camp site and in space of camp site / 1 labor could be separated as sub-areas like accommodation building area, sanitation usage space, emergency usage space, traveling and recreation and grocery welfare space. Thus, the space size provided and implemented as temporary camp site for 1 construction labor would be of 9.60 m^2 per 1 person concluded as in Table 2 and Figure 1.

Table 2. Conclude size of space used in camp site welfare.

Space for camp site welfare	Space for 1 labor (m^2)	%
Living welfare space		
Accommodation building	3.00	20.00
Shower and toilet building	1.00	6.67
Kitchen and cafeteria building	1.00	6.67
Total	5.00	33.33
Sanitation usage space		
Building or space for garbage gathering	0.10	0.67
Building or space for trash storage	0.25	1.67
Building or space for waste water treatment	0.50	3.33
Total	0.85	5.67
Emergency usage space		
Assembly point space	0.25	1.67
First aid point space	1.00	6.67
Emergency situation management space	0.25	1.67
Total	1.50	10.00
Travelling space		
Route of vehicle traveling space	0.50	3.33
Parking space	0.50	3.33
Total	1.00	6.67
Recreation and retail welfare space		
Space for exercising	1.00	6.67
Space for grocery store welfare	0.25	1.67
Total	1.25	8.33
All total space usage	9.60	64.00
Open space	5.40	36.00

3. To design layout of building and area by data and information in the Table 4 by sketch up program version 8.0 by information as follows.

3.1 Accommodation building by condition that provided not lower than 3 m^2/ 1 person. This could be designed for room to sleep as 6 m^2 / 2 person (2 X 3 m.) high as 2.50 m. This room space is proper to sleep by a study Rojvirasingh (2011) explained that sleeping behavior includes sleeping in a horizontal position related equipment including bed or mattress for only one person sleeping and a little more space to twist or stretch. The width should be 0.79 m. (Measured from the width of the shoulders at the widest part of the body plus the area for twisting or stretching) The average size of males 0.82 m. and female 0.76 m. Long side are 1.70 m. (Combined with the mean pillow distance from males 1.77 m. and females 1.64 m.). Besides, there must be 1 window in size as 20 % of room space opposite door for ventilation (Figure 3). To store

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personal stuff such as clothing, toothbrushes, soap, shampoo, etc., mainly using the area above the sleeper's head. It could be a small box or cabinet. The distance between box or cabinet and the wall as about 40-50 centimeters, by Ngow (2015) provided. These could be as figure 1 However labors with families and young children (1-3 years) also can use the space to live and use for other activities in living as well by layout as shown in Figure 1, 2 and 3.

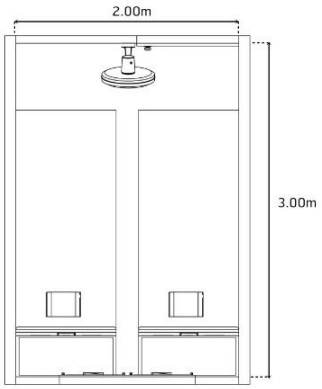

Figure 1. Layout in above view shows 2 single labors sleeping room.

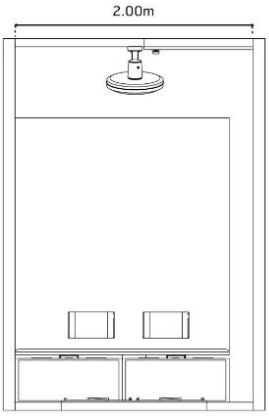

Figure 2. Layout in above view shows family labors sleeping room.

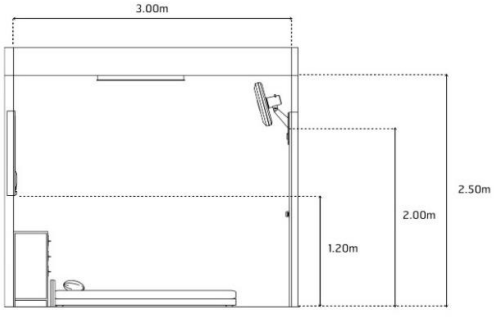

Figure 3. Layout in side view shows labors sleeping room.

3.2 Shower and toilet building by condition that provided not lower than 1 m^2/ 1 person including washing area too. This can be designed as 2 model of shower room. One is single shower room and one is a public bath. For public bath room, there must be a space to construct a room for the labors' bath separated as males and females. This public bath room required a room as 2 x 5 meters, equal to 10 square meters, separate male / female. The height is not less than 2.50 m. Providing tank or reservoir for using of a bowl to scoop the bath in the center or attached to either side of public bath room in size as 1 x 3 m. not higher than 1.20 m. and need size of vent for ventilation and humidity in bath room at least 10% of bath room that must be arranged sufficiently concealed. All mentioned shown as Figure 4 and Figure 5.

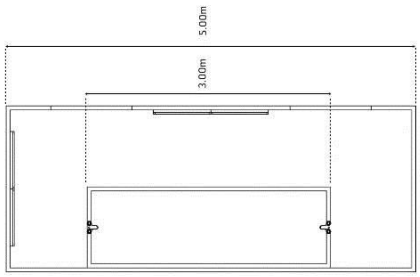

Figure 4. Layout in above view shows public bath room and size of reservoir.

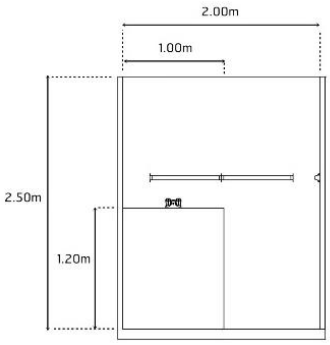

Figure 5. Layout in side view shows public bath room.

For shower room may have wide sides ranging from 0.69 m. (measured from the widest shoulder width of the body, combined with the leg placement and the reach of the hand to the soap stand. Average from males 0.72 m. and female 0.66 m.) horizontal distances from 0.76 m. and standing in the shower for reaching a little more average male 0.78 m. and female 0.73 m.), as well as

related equipment such as shower, soap dispenser and handling area. The distance to hold the shower, bend and stand in the shower. Besides, it should be at least 2 meters and must have a vent to ventilate the humidity in shower room at least 10% of the single shower room space that must be arranged sufficiently concealed. All mentioned shown as layout of Figure 6 and Figure 7.

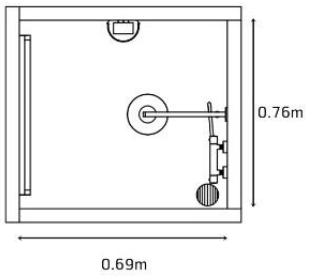

Figure 6. Layout in above view shows shower room.

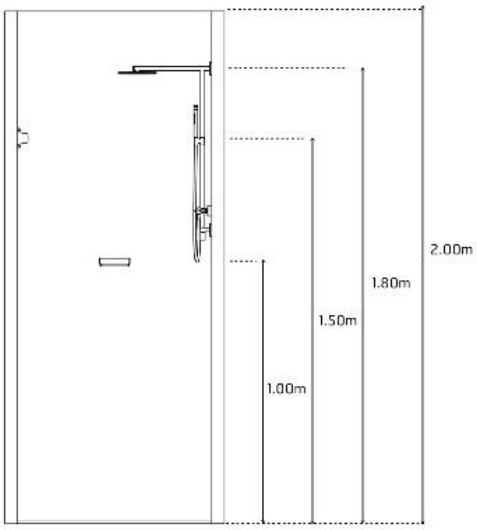

Figure 7. Layout in side view shows shower room

Washing area layout by criteria of space not lower than 1 m^2/ 1 person. Toilets and washing areas are classified as a private area for private activities, but it is an open space for easy entry and exit to engage in activities. Both taking clothes and equipment to wash and taking out to dry after washing finished and also supporting to drain moisture from wet areas as well. In this study provided minimum of 16 m^2 of washing area must be provided for the area in which the sink is established. It was able to set the area with a width of 1.20 m. length 70 cm. the tub size is 70 inches wide x 45 inches long x 56 cm. high. The finished porcelain which are similar in size as specified by installing in the middle of the washing area. Leave empty spaces on the left and right sides of the tub for resting laundry and washed clothes. Installing the faucet in the center of the inner width, which can be designed as layout in Figure 8 - 9.

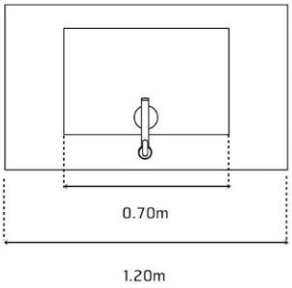

Figure 8. Layout in above view shows sink for washing.

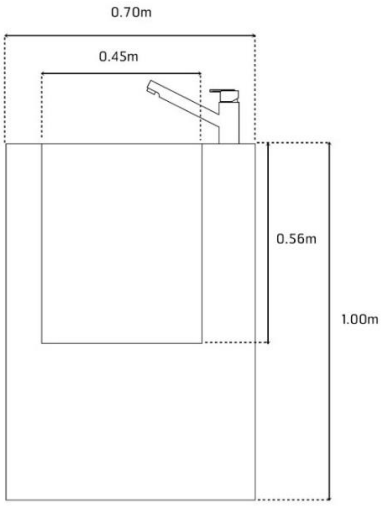

Figure 9. Layout in side view shows sink for washing.

Toilet for excretion, building by criteria of space not lower than 1 m^2/ 1 person, according to Rojvirasingha (2011) explained that toilet usage behavior consists of sitting with related equipment: toilet bowl, bidet sprayer, toilet paper holder. Therefore the width of the toilet should be 0.69 m. (measured from the shoulder distance at it is the widest part of the body, combined with the leg placement and the reach of the hand to the toilet sprayer or toilet paper holder. Average from males 0.72 m. and female 0.66 m.). Long side was 1.05 m. (Measured from the width of the toilet bowl. Combined with a little more leg and reach average

from males 1.11 m. and females 0.99 m.) and the height of the toilets should be at least 2 meters. Details of Toilet for excretion building as layout in Figure 10 - 11.

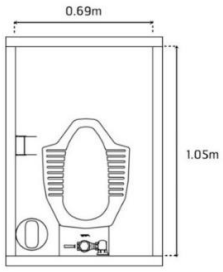

Figure 10. Layout in above view toilet.

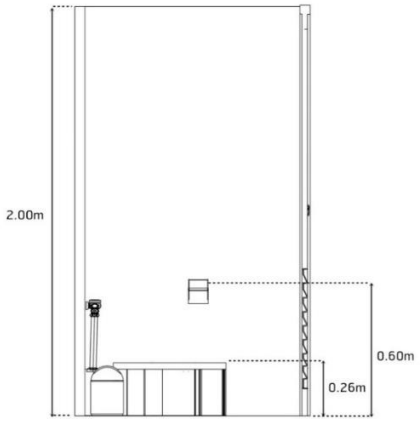

Figure 11. Layout in side view shows toilet room.

3.3 Kitchen room for cooking by criteria of space not lower than 1 m^2/ 1 person, since the kitchen is a both place to do activities with cooperation (to store various raw materials that will be used for hygienic consumption) and engaging in conflicting activities (collecting of dirty and contaminated stuff to be washed for further use) In this study, the kitchen building must covered he kitchen and cafeteria. By the reason of hygienic there must divide the area of the kitchen building for cooking into 3 areas as follows

A. Storage area for cooking ingredients set for 5% of the area of the building, kitchen and cafeteria.

B. Cooking area assigned for 10% of building area, kitchen and cafeteria.

C. Cleaning area kitchen equipment assigned for 5% of area of the building, kitchen and cafeteria.

Details of kitchen room can be designed as layout in Figure 12.

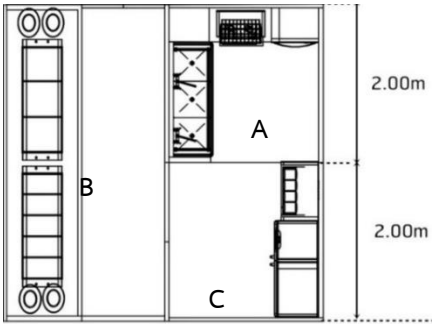

Figure 12. Layout in above view shows kitchen room.

Cafeteria building is a building with an area for construction workers' consuming which may be classified as a benefit during breakfast, lunch or evening, depending on the welfare system of the development project. It is necessary to provide a dining area for construction labors, 80% of the area, where equipment and utensils such as tables and chairs may be provided for dining easily and may set aside a portion of the dish and spoon after eating to be tidy before washing in the next cleaning area. Details of cafeteria building as layout of Figure 13.

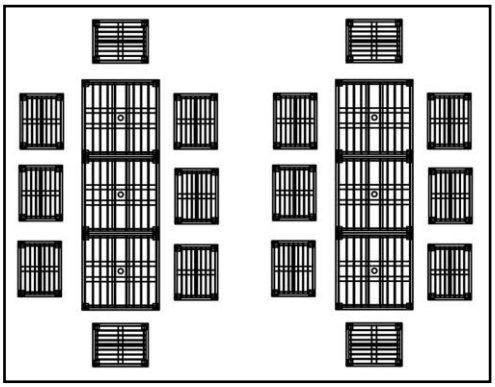

Figure 13. Layout in above view shows table and chair position in cafeteria building.

3.4 Building or space for garbage gathering in this study, area for gathering garbage is 2 x 4 m., Equal to 8 m^2, and may be built into a small tank house to gather garbage from each meal served by the kitchen and dispose of it properly. Sanitation Principles This food waste gathering bin can be used in conjunction with a kitchen building to gather left over raw materials from cooking and may be built as a stall made of wood or other easily demolish materials, not more than 30 cm. in height, to place the garbage bin in Figure 14.

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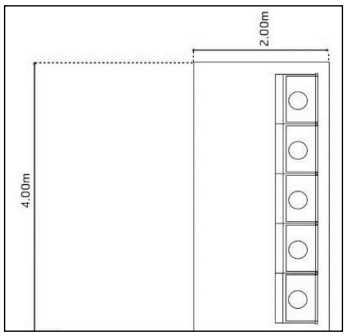

Figure 14. Layout in above view shows Building or space for garbage gathering.

3.5 Building or space for trash storage in this study area for trash storage is 4 X 5 meters equal to 2 0 m^2, that could be built as a small house for collecting various garbage by classified waste. Sorting bin according to the general community waste sorting principle is sorting recycled material. General and hazardous waste should be properly managed and house should be strictly closed for preventing disease-carrier animals that may be used as habitats as in Figure 15.

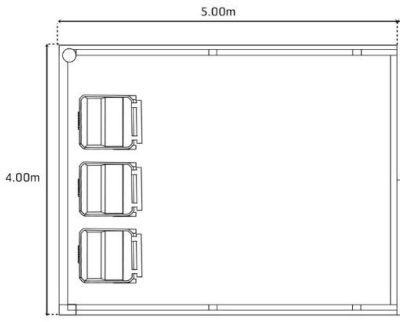

Figure 15. Layout in above view shows Building or space for trash storage.

Building or space for waste water treatment In this study an area for wastewater treatment is 8 X 5 m., equal to 40 m^2 being separated as follow

- Wastewater from sewage arising from excreting should build a septic tank system with a suitable capacity for the number of construction workers at least 30% of the area for septic tanks is required for wastewater treatment.

- Wastewater generated from the shower room and kitchen building a well or a water tank should be built for collecting wastewater before draining to public sewerage to enter the wastewater treatment system of the local organization by case of a camp site in an area of waste water treatment service. For camp site outside service of wastewater treatment system of the local organization, there should be a limited area that does not exceed the criteria. It may be necessary to establish an activated sludge process wastewater treatment system, which can be costly to construct and operate for using in wastewater treatment or used as a stabilized pond wastewater treatment system, constructed wetland wastewater treatment system, oxidation ditch in case of having enough area. For content of waste water treatment is able to be concluded by Figure 16.

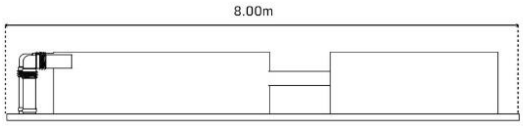

Figure 16. Layout in above view shows waste water treatment.

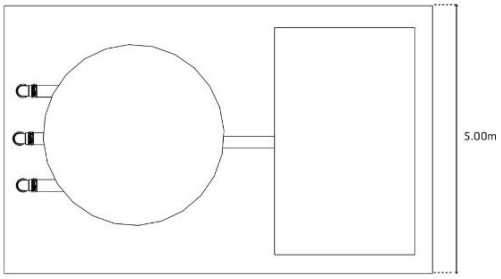

Figure 17. Layout in side view shows waste water treatment.

3.6 Size and form of emergency usage space, in this study space to manage emergencies size 1 2 0 m^2, for use of space divided by implementation to support emergency situations as follows

- Assemble point area in this case The area for the gathering point is 5 X 4 m. equal to 20 m^2, that is an open space on the boundaries of an area There may be a label to indicate the area location.

- First aid area, in this case the space for the gathering point is 5 X 16 m. equal to 80 m^2, which is an open area and may clearly outline the boundaries. And there are signs to clearly indicate the area.

- The area of emergency management, in this case the area of the emergency management is 5 X 4 meters, equal to 20 m^2 being classified as an open area. For details on the Emergency usage space can be designed as layout in Figure 18 - 19.

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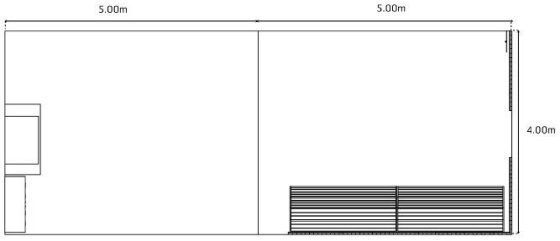

Figure 18. Layout in side view shows assemble point and emergency management.

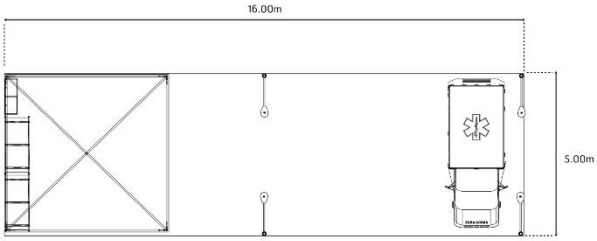

Figure 19. Layout in above view shows first aid point in emergency situation.

3.7 The size and pattern of the traffic route from the assumption, the route has an area of 80 square meters, which can be divided into 2 functional areas as follows

- Vehicle traffic routes, the vehicle traffic route from the doorway is width of 2.50 m^2 and a length of 16 m. that may be made of reinforced concrete or tilde brick paving in the event of long-term use of about 1 year or more in the case of concrete floor or tilde brick laying May also draw lines dividing traffic lanes

- Vehicle parking area from the case of the vehicle parking area is 4 X 5 meters, the vehicle parking area may be set up as an open house and tighten the vehicle parking position.

For details on managing traffic routes can be summarized as shown in figure 20

3.8 Size and pattern of recreation and retail welfare space, from the case of recreation and welfare areas, shops and restaurants are 100 m^2, and the format of recreation areas can be defined as follows:

- Space for exercising and recreational activities from this case, the space for exercise and recreational activities is 6.40 X 12.50 m. that may be ground or grassy, not high and not too overgrown to facilitate sports and exercise for construction workers as well.

- Space for grocery store welfare from this case, the space of shop is 4 x 5 meters, equal to 20 square meters, which may be constructed as a temporary shop house with open air for ventilation and product sales. Conveniently By separating the area for a store that can open and close is an area of 4 square meters in the corner of the area other areas may provide a space for tables and chairs for comfortable dining and can be socialized in small groups.

Details of space arrangements for recreation and retail welfare space can be designed as layout in the Figure 20 - 22.

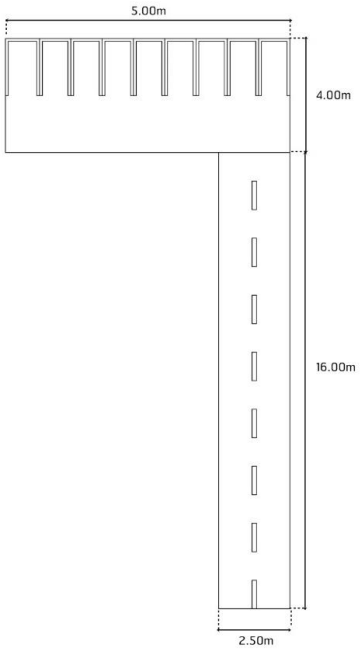

Figure 20. Layout in above view shows traffic route and vehicle parking area.

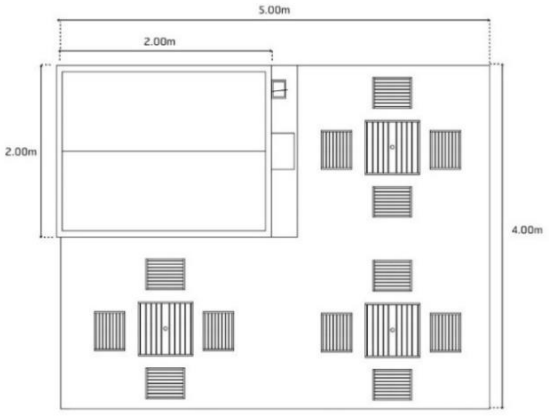

Figure 21. Layout in above view shows grocery store welfare.

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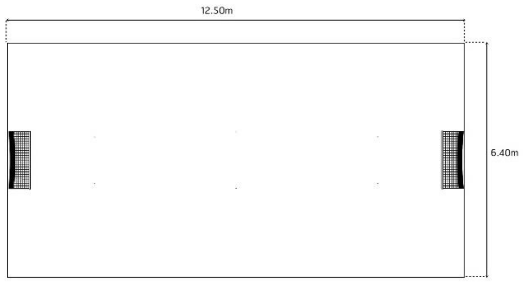

Figure 22. Layout in above view shows Space for exercising and recreational activities (might be the same space of assemble point in emergency)

4. Compare with the result of Khantiwong, (2006) it was composed by the space and building usage of living and daily routine. While discussing and comparing with accommodation building layout in this designing, there are some agreeable with each other and not agreeable in details by Table 5.

Table 5. Comparing camp site for construction labors of West Construction Company (2006).

Item	Camp site for construction labor of West construction company (2006)	Temporary camp site welfare in this study
1	Pattern of temporary accommodation 1st floor zinc row houses 1st floor zinc row houses facing back to collide 2nd floor zinc row house 2nd floor zinc row house facing back to collide	Accommodation building provided the criteria as not lower than 3 m^2 for 1 labor.
2	Shower as public bath room with covering roof no sex separated with 0.80 meters high cement tank, size depend on number of labors, water volume calculated by personal usage in basic 20 liter/1 day/1 person.	1 wash room per labor by male and female, 1 toilet per 8 labor by male and female
3	Shower room and toilet near joint bathroom separated by zinc page in size 0.9 X 0.5 meters, 0.40 meters high water pond along the line of squatting toilet that set more when labor added.	Shower and toilet building for taking a shower excreting and washing not lower than 1 m^2 per 1 labor.
4	Washing space co-operate with space of joint bathroom.	Washing space as 20 % of shower and toilet building space in minimum, install washing tub with water tap that might be cement platform with putty tile.
5	Grocery store, set as not more than 2 shops	Space for welfare grocery or food shop, not lower than 0.25 m^2 per 1 labor.
6	Activity space, empty area for sporting that composed by wile enough area.	Space for exercise, not lower than 1 m^2 per 1 labor.

5. Discussing with "Accommodation and labor welfare standards for employees in the category of construction business B.E. 1998", it was able to discuss in content as follow:

In case that an employer provides accommodation for employees that should be in these options as "(1) size of room should be in narrowest as not lower than 2.50 meters, size of total space as not lower than 9 m^2, and the height as not lower than 2.40 m^2. Thus, there must be a space of accommodation as not lower than 3 m^2/1 labor and up to building control law." When comparing with volume of accommodation of welfare for labors providing as not lower than 3 m^2 / 1 labor, it is considered that size and pattern of campsite welfare in this study and in declaration of Labor Welfare Committee are agreeable to each other.

An employer should allow a provision of bathroom and toilet in these options (1) Able to separate or joint in the same room but separate male and female, designed for easy to clean and ventilator as not lower than 10 % of the space or having enough ventilation fan. The distance of vertical between ceiling or lowest partition has to be not lower than 2 meters. In case that bathroom and toilet are separated, the room size must not be lower than 1 m^2. Comparing with size of shower and toilet of welfare for labors, the provision should not lower than 1 m^2 per 1 labor. From this, it is considered that the size and the pattern of bathroom and toilet space of campsite welfare in this study and the declaration of Labor Welfare Committee did not agree with each other.

"An employer should manage solid waste in accordance with law on public health and drainage should be proper and sufficient for not causing nuisance to others, not letting water flow to other space close to it for hygiene purposes." In comparing with accommodation of welfare for labors that provided size of sanitation space composed as garbage gathering space as not lower than 0.10 m^2 per 1 labor for gathering food garbage space after meal to eliminate sanitary, the space for trash storage as not lower than 0.25 m^2 per 1 labor by principle of community trash to eliminate properly and space for waste water treatment as not lower than 0.50 m^2 per 1 labor and treat by proper process that might be activated sludge or constructed wetland. This is considered that size of

sanitation usage space of campsite welfare in this study and declaration of Labor Welfare committee is agreeable to each other.

6. Considering with "Manual of Accommodation for foreign labor standards by Provincial Labour Office Samutsakhon (2012)" it was able to discuss in content as follows:

Regarding the size of room that campsite welfare in this study provided, it is not lower than 3 m^2 per 1 labor, whereas the manual provided as not lower than 2.5 m^2 per 1 labor that might be mentioned for accommodation of welfare for labors providing for better room size. However, the minimum size of room of manual was provided as not lower than 8 m^2 per 1 labor that was higher.

Regarding the size of toilet and shower room that campsite welfare in this study provided, they were separated from accommodation room and did not provide reference no. of toilet and shower per accommodation room. Since temporary building is for easy to demolish, it uses the criteria no. of labor per space of toilet and washing to provide size and no. of toilet and shower. This was not agreeable with the manual that provided size as 0.90 X 0.90 meters.

7. Discussing with the provision "Environmental Health standard by this manual" campsite welfare in this study provided Sanitation usage space composed by garbage gathering 0.10 trash storage 0.25 and waste water treatment 0.50 m^2 per 1 labor. All mentioned agreed with provision about Environmental Health standard by this manual that provided waste water collecting, excreta containing to treat and discharge.

8. Comparing with the "Safety Health and Welfare on Construction Site A Trying Manual" by International Labor office International Labor Office Geneva (1999) that was able to discuss in topic 13, the welfare mentioned wildly about facilities for supporting the happiness and quality of life that an employer must prepare for employees. These were in Sub topic: 13.1 Why welfare facilities, 13.2 Sanitary facilities, 13.3 Washing facilities, 13.4 Facilities for supplying food and drink, and eating meals, 13.8 First aid, 13.9 Fire precautions that there were the same principle of campsite welfare in this study. However, it was able to be applied to care employee's life in various cases.

9. Discussing with content of the Workers' accommodation: processes and standards A guidance note" by IFC and the EBRD (1999) that there were content in PART II: that there were content in part II: standards for and management of workers' accommodation 1. Standards for workers' accommodation, on page 11 - 18., these were composed by details as A. National/local standards, B. General living facilities, C. Room/dormitory facilities, D. Sanitary and toilet facilities, E. Canteen, cooking and laundry facilities, F. Standards for nutrition and food safety, G. Medical facilities and H. Leisure, social and telecommunication facilities that each sub topic mentioned to provide proper condition and area for supporting quality of life of labors like campsite welfare in this study.

10. Discussing the study of 2 accommodations for labor of 2 construction projects comparing Angsuwatcharakorn (2019), it could be discussed in details like campsite welfare in this study. Accommodation of company A provided and separated space for accommodation and facilities by utility as 14 sub-space composed by the space for accommodation building, toilet, shower and watch clothes, dry clothes, cook food, wash dish, grocery, nursery, head office, parking, guardhouse, litter, water tank and septic tank like company B but added 2 sub-areas which were cafeteria and staff office. Almost all mentioned details agreed with campsite welfare in this study in principle of space usage and different in some feature of workers' living such as children care.

4. Conclusion

The providing of campsite welfare in this study for construction industry labors used the criteria of volume of space per labor to establish accommodation welfare for living mainly by focusing on physical minimum requirement that was enough and proper space for activities of living such as to sleep, to excrete, to shower, to wash clothes, to consume food and water. In addition, there are also activities to promote life quality in both physical and psychological. Those are recreation and safety in emergency such as evacuation provided as basic life quality in normal and happy living. These are not provision or rule in other content able to consider to choose properly in both physical economic and logistic area agreeing to provide and manage accommodation welfare such as raw material to build system of lightening drainage electric etc. these are details of implementation.

There should be a sketch or layout demonstrating this designing of temporary camp site welfare for samples and details of design to guide any construction project in the real implementation. This must provide, in details, of contents and plans to explain and show concretely that would be shown and discussed in the next article.

In conclusion, concept and content of temporary accommodation welfare of this research are able to be drafted as space plan in the Figure 2 by

supposed location of composed buildings or space in campsite.

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6. Ethical approval

The study was approved by Burapha University Ethics Review Committee for Human Research Subjects (certified code: Hu 019-2560).

7. References

Angsuwatcharakorn, W. (2019) Construction Workers' Accommodation management by entrepreneur of large project in Central Business District of Bangkok. *Sarasatr*, *3*(3), 352-366.

Engineering Institute of Thailand under H.M. The King's Patronage. (1994). *Standard and construction plan of temporary building for construction labor and preschool nursery* (2nd ed.). Bangkok: Chula Press.

IFC and the EBRD. (1999). *Part II: Standards for and management of workers' accommodation 1. Workers' accommodation: processes and standard: A guidance note* (pp. 11-18). London: Prentice-Hall.

International Labour Office Geneva. (1999). *Safety, health and welfare on construction site: A training manual* (pp. 89-95). Geneva: ILO Publications, International Labour Office.

Khantiwong, J. (2006). *Developing of temporary accommodation for construction labor case study: Temporary camp site of construction of worker of West construction company Ltd*. (Master's thesis). Chulalongkorn University, Thailand.

Labor Welfare Committee. (1998). *Declaration of Labor Welfare Committee: Standard of labor accommodation welfare for employee in the construction business B.E. 1998*. Retrieved from http://welfare.labour.go.th/ 2018/ attachments/article/193/201601211658.pdf

Ngow, A. (2015). *Prefabricated residence area project for worker in building site* (Bachelor's thesis). Silpakorn University, Thailand.

Protection Engineer Academy. (n.d.). *Assembly point measurement of preparing area around project.* Retrieved from https://www.facebook.com/Fireprotectionacademy/posts/posts/1063464100393013/

Provincial Labour Office Samutsakhon. (2012). *Manual of accommodation for foreign labor standards*. n.p.

Rojvirasingh, S. (2011). *Guide for an extra small housing unit design for Thai people behavior* (Master's thesis). Thammasat University, Thailand.

Sthapitanont, L. (1991). *Basic architect design*. Bangkok: Art & Architecture Publishing.