

## Evaluation of the Size of a Flat Apartment unit with Anthropometry in Cengkareng Jakarta

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**Abstract:** Housing for low-income citizens is one of the problems in Jakarta, Indonesia, for which the Indonesian Government has built flats. Some flats were built and rented by considering the adequacy of motion and comfort. Facilities and infrastructure including the size of the space of each Flat unit also use the minimum level approach needed by the community as a user through meeting the requirements regarding the security and comfort of the movement. The requirements regarding the security and comfort of the movement are one of the four conditions in the Regulation of the Minister of Public Works and Public Housing. The comfort requirements of movement are in accordance with universal design principles and the principle of basic space size, namely equality of space use, easy access without obstacles, easy access to information, use of space for independence, minimum user effort, and space-size ergonomic fitness. Flat Rental users or residents in Jakarta are very heterogeneous in terms of culture, occupation, and income, this also affects the comfort of movement in the daily lives of citizens. This is a descriptive and evaluative study and uses the Post Occupancy Evaluation (POE) method and antropometry approach. The sample is Flat in East Jakarta, managed by the National Settlement Institute (Perumnas), measuring 21 square meters. A 3.5 x 6 square meter apartment unit with cantilevers, placed in front and behind the unit. Cantilever is placed behind the unit that is used as a bathroom, kitchen, and space for hanging clothes, while cantilever on the front is used as a circulation space between units. The conclusion is that there are problems in terms of moving comfort between occupants that affect the safety of citizens.

**Keyword:** Flat, Convenience, Movement, Reliability, Safety.

### INTRODUCTION

Provision of Flat or in Jakarta-Indonesia known as Rental Flats (rusunawa) is one of the answers to the needs of residential areas of the city. Just like other big cities in the world, Jakarta has limited land and large housing needs. Flat or Rusunawa is a simple apartment that is rented to urban communities who have not been able to buy a house or community who want to stay for a while due to the need for a short time such as students, temporary workers and others.

Flat or Rental Flats (Rusunawa) is one of the programs of the DKI Jakarta regional government in particular and the Indonesian government in particular. DKI Jakarta has more than 18 rusunawa with 11,000 units of rental apartments (sarusun) managed by the Regional Government of DKI Jakarta and more than 5 flat apartments with 1000 units of flats or rental flats managed by Perumnas. The large number of rusunawa units makes Jakarta potential to become the city with the largest growth of rusunawa in Indonesia. Flat or Rusunawa is a building with a public function that must

have 4 building reliability requirements, namely safety, health, comfort and convenience for its occupants.

### Flat Rental in Cengkareng

Flat or Rusunawa, including multi-storey apartment buildings that must have the basis of architectural planning as a multi-storey building. The building system which consists of architectural, mechanical, electrical, and plumbing elements is mutually integrated with the scope of building planning. Flat or Rusunawa must meet the conditions of technical development requirements, namely: space, structure, components, and building materials, completeness of flats, apartment units, shared and shared objects, density and layout of buildings, environmental infrastructure, environmental facilities [1].

One of the rusunawa managed by Perumnas is Rusunawa Cengkareng, West Jakarta. Just like other Perumnas flat towers (Kemayoran, Pulo Gebang, Pasar Jumat, and Sindang Koja), the flat conditions include a middle rise building with an area of 21 m<sup>2</sup> each consisting of 3 spaces namely a common room, kitchen,

bathroom. This flat was built in 1995-2000 on a 6 Ha land owned by Perum Perumnas, located in BCI Area, Jalan Kamal Raya Cengkareng, West Jakarta

The form of the building is in the form of 16 blocks each in the form of 5-story buildings with 1531 residential units with 21 m<sup>2</sup> / unit of flats, 266 business units, and 123 units of facilities. Each unit of apartment consists of a common room, a bathroom, a kitchen, and

a sunroom. This rental apartment unit is connected with a corridor with a single loaded corridor system. All Rental Flat Units (Sarusun) of Cengkareng are still used as residences and all facilities are still used well. The inter-transit connecting corridor is functioned as a terrace for each station. The structural system used is a cantilevered multilevel portal in the back and front of the stream.



**Fig-1: Location map**

[https://upload.wikimedia.org/wikipedia/id/2/28/Peta\\_Jakarta.gif](https://upload.wikimedia.org/wikipedia/id/2/28/Peta_Jakarta.gif)  
dan <http://jakartaplaces.com/peta-jakarta-barat/>

### Safety and Ease Requirements

The application of convenience requirements has the principle of using adequate basic space measurements and the application of universal design. The use of basic dimensions of space by approaching the space requirements of building users and visitors to buildings, equipment dimensions, and circulation [2]. Some universal design principles include equality of space use, easy access without obstacles, safety for all, efficiency of user efforts, ease of access to information, ergonomic suitability of size and space, and independence of use of space.

The principle of universal design as meeting the ease of building requirements has a design for both buildings and the environment can be used by every user by minimizing hazards and adverse consequences for all people, having unimpeded access and easy access to communicative information for all and paying

attention to the various capabilities of the users so that can be used independently, efficiently, comfortably, and according to body position, size, user's posture. The percentage of ease requirements is determined based on the activities of the occupants or users by measuring the user's space requirements, the size or dimensions of the equipment used, and the space and shape of the occupants of the flat building, at least 30% of all occupants.

On occupant safety requirements in buildings, it is necessary to review the building systems used including the fire hazard. This flat provides a ladder as a transportation tool when fires stick to the walls of buildings and are located at the end of the corridor. This ladder is an emergency ladder with a slope of 90 degrees and a stair width of 50 centimeters and made of iron.



**Fig-2: Flat conditions**

Source: personal and <http://rusunawa.perumnas.co.id/listing/rusunawa-cengkareng/>

Provision of facilities for elderly people needs to be reevaluated, moreover these flats can be used by the public, so that ease of achievement or accessibility - vertical transportation becomes very important. The ground floor is used as a business facility, while the first floor to the 5th floor is used as a residence. Stairs as vertical transportation is the only access for residents including the elderly. The ladder is also a vertical means of transportation when the occupants will move things either large or small. For residents on floors 3,4 and 5, moving goods from or to the ground floor must be manually up and down stairs. This becomes more difficult if the items being moved are large items.

Before discussing space as a collection of spaces that have an inter-space organization which has the purpose of accommodating activities so that it can increase the productivity of living in flatbed residents, the residents or users of the flat are discussed first. Occupants as human beings who carry out activities - the system of division of labor, cooperation activities, and communication in the lives of human groups are not instinct because humans have reason. The variety of human behavior is indeed not due to racial characteristics, but because groups where these people interact and interact in large groups (countries). In smaller groups (regions), more specialized human units differ from one another, due to ethnic customs and language, sometimes also because of religion or a combination of the two [3].

### Activity

Basic activities as a family that has the norm of a happy and prosperous small family in accordance with the values of religious and social values that are entrenched in personal, family and community, are oriented to the welfare life with the ideal number of children to realize birth welfare and inner happiness [4]. The concept of a flat family is a flat apartment occupant activity in a flat unit (sarusun) with a population of 1 person or 2 people (husband and wife) as a quality family with basic and routine activities in the family.

The first thing that must be considered in social planning is space, as a forum for the activities of its residents who have expressions of 3-dimensional

quality. The shape and enclosure of each space in a building will determine or be determined by the shape of the surrounding spaces [5]. The existence of spaces in one flat rental unit is limited by fields both horizontally and vertically either permanently or not permanently. Space has at least horizontal and vertical base fields. The horizontal field can be lifted, lowered and can even float. The power of spatial formation with field games, is important in spatial planning within this flat unit. Space is also formed by vertical elements, both vertical and linear elements, fields (1-4 fields). Space as a container of activity, does not need space limited by 4 fields. The right of users of space to move should also be considered including the rental flat. It should also be remembered that there is another side that must be considered, namely privacy, with limited area and costs that do not eliminate the right of residents to have personal space. Privacy is the ability of one or a group of individuals to sustain life and its affairs from or to control the flow of information about themselves [6].

### Space

Reviewing architecture starts with talking about space. As is known, space is a container or place of one or several activities of space users. Activity or movement of space users can consist of one activity or several series of activities that are interconnected, so that users can move from one room to another. User flexibility towards space, resulting in space can be limited by imaginary and physical boundaries. The smallest part of the building is the space used in just one activity, while the personal space is the space around individuals who have personal / private / private values. Despite the broad limitations on rental flats, personal space for flat users must also be considered. At least the nature of personal space can be distinguished based on interpersonal distance, namely intimate distance, personal distance, social distance, and public distance. In general, personal space is needed by each individual to move with the nature of space that has a personal distance. The distance of personal space is influenced by gender, age, personality, psychological disorders, conditions of disability, attraction, security / fear, competition / cooperation, power and status, physical environment influence [6].

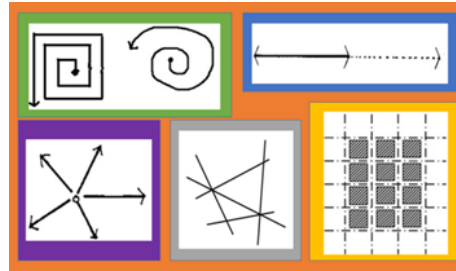


Fig-3: Circulation in one space

Circulation or movement of residents in activities in the flat is a matter that must be considered. Circulation is one aspect that is very strong in shaping the environmental structure of a building. Circulation requires a circulation space where as an important element of space that connects between activities. Movement or movement of users from one activity to another can be said to be a movement or movement from one imaginary space to another imaginary space. It can be said that there are 5 circulation patterns, namely:

- linear pattern
- radial pattern
- spiral pattern

- grid pattern
- network patterns

Flat rental managed by Perum Perumnas in Jakarta still has to pay attention to the tropical aspect, because tropical is the core of buildings in Indonesia. The requirements of tropical buildings on rental flats must also be a concern for designers. The sleeping space is sought to get fresh air and the morning sun, the window can be opened wide, so that fresh air can enter freely. Likewise for sun beds, air and wind can enter so that wet clothes can dry without getting damp. This all leads to healthy and quality families.

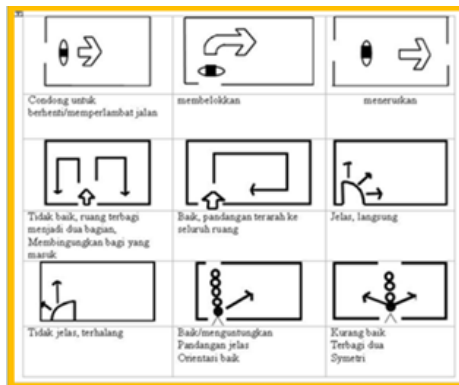


Fig-4: Form of circulation in space

The design of work equipment and ape stations must be adjusted to the needs of workers so that it can improve performance. Agat achieved this hope, it is necessary to design equipment and workstations in accordance with ergonomic rules [7]. This also happens in the design of the room, which is a rental apartment unit. the aim is to provide a comfortable value of motion in space. anthropometry is a study that is closely related to certain physical dimensions and characteristics of the human body such as weight, volume, center of gravity, inertial characteristics of body segments, and strength of muscle groups [8].

**METHOD**

The research method used is descriptive explorative, with the Post Occupancy Evaluation (POE) approach, an evaluation of building performance, which consists of performance criteria, setting / places, user / occupants. In performance criteria there are evaluations: technical, functional, behavioral. The settings / places consist of evaluating settings, rooms, building, facilities. While for users / occupants consisting of individuals, groups, organizations.



Gambar-5: Elements of Building Performance

Evaluation is limited to performance criteria-functional and technical, place-space as a place of activity, user-groups (residents of flat rental in Cengkareng). Evaluation of the technical scope is the safety and ease of occupants of building buildings in activities within buildings and this relates to the reliability of buildings as a comfort requirement,

functional scope starting from the ease requirements in the form of study of motion in space, ease of use in using building facilities occupant safety in using facilities in the building. POE process at the stage of indication, investigation and diagnosis. Data collection uses space observation techniques.

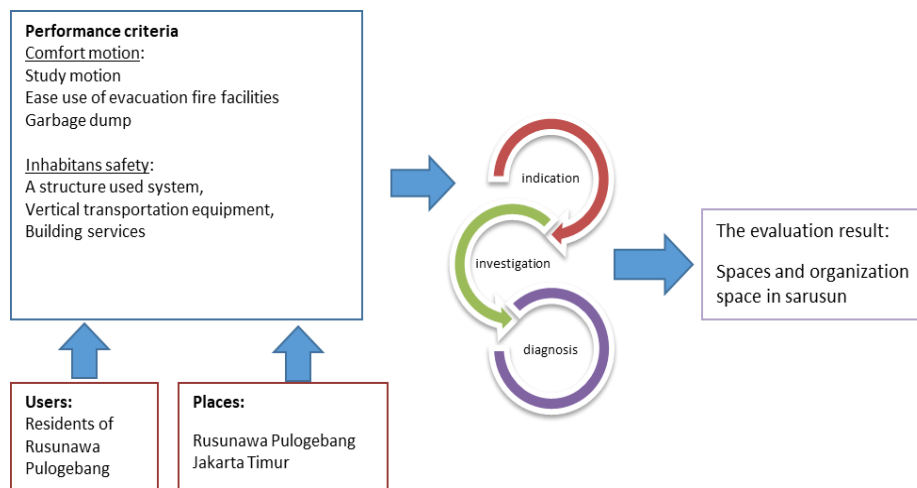


Fig-6: Schematic thinking

The comfort of the occupants or users of apartment units is very dependent on the body dimensions and activities of the residents. These body dimension measurements use anthropometric calculation methods. some of the members of the body are measured and their percentiles are sought to obtain body dimensions using motion analysis, so that the space needed is broad. some of the body members measured are standing height (sh), body sitting position (sp), body part length (bl), body part circle (cb), body skin fold thickness (st). measurements of standing height are composed of free standing stature, stature against the wall, recumbent length, stature stretch. Measurement of body sitting position consists of the length of the body sitting upright, long position sitting upright to the eye, shoulder length of the body sitting

upright, elbow length of the body sitting upright, long popliteal body sitting upright, long politeal buttocks the body sits upright, long buttock-knee body sitting upright , the length of the sitting position up to the knee, the length of the shoulder of the body sitting upright [9].

The percentile function in processing this data is to change the raw data (raw score) to the standard value (standart score) of the body dimensions of the residents of the rental apartment in Cengkareng. In certain populations, human body dimension data will be distributed like a bell-shaped graph where data that has a certain value or at least the same will be collected in the middle of the graph while data that has extreme deviation values will be at the ends of the graph [10].



Anthropometry data is presented in the form of percentiles. Percentile or size measure is a value that divides data distribution into one hundred equal parts. To obtain measurement data for residents of rental apartments in Cekareng, data percentiles are based on anthropometry. The researcher took a sample of 100 adult residents to be measured anthropometrically, then searched for the details. The occupant's body size percentile is a measure used to analyze the size of the existing space.

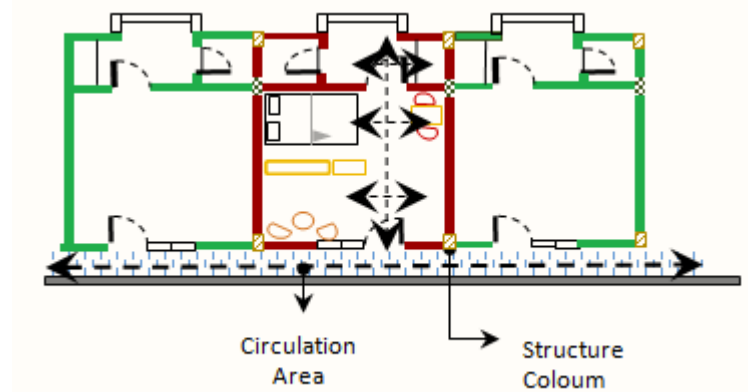
**RESULTS AND DISCUSSION**

Findings from the field are 1. found several rental apartment units inhabited by more than 2 adults, 2. there are items related to hobbies placed in the front hall of rental apartment units, 3. there is a displacement

in the form of objects of large size between floors, 4 difficulties when receiving guests in the apartment unit, 5. movement or limited activity in accordance with the size of the occupant's body which is measured using anthropometry with the existing space area. The results of these findings, it is necessary to discuss some findings using an analysis of occupant activities, namely the circulation and activity in space.

**Circulation of Sarusun**

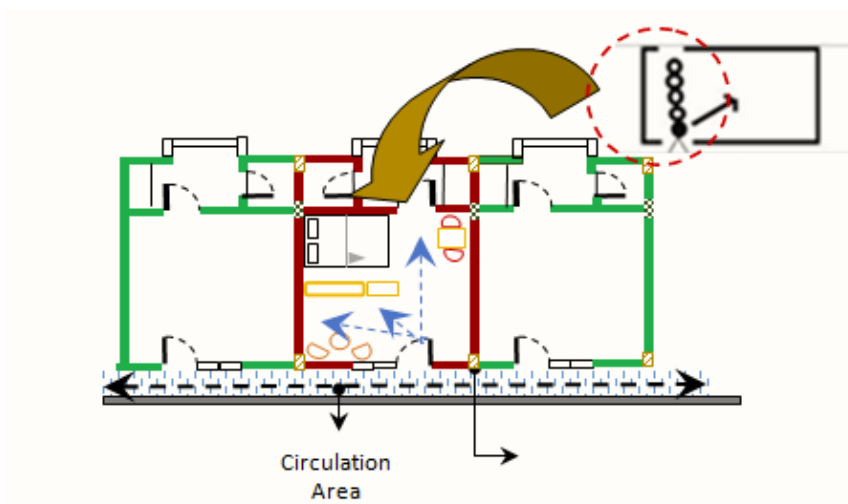
The unit of Flats (Sarusun) for rent or Cengkareng rental unit consists of 3 main rooms, namely a common room, a kitchen, a bathroom and a drying room. Flat rental managed by Perum Perumnas is intended for one occupant to 2 residents from the general public.



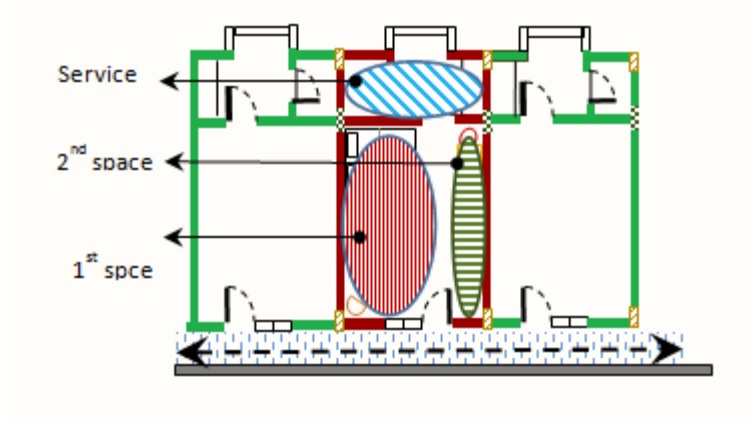
**Fig-7: Circulation in a rental unit**

The form of flat circulation of Cengkareng rental gives a continuous impression from one door to another by passing spaces with imaginary boundaries. Space without walls, but formed by the presence of furniture. The occupants' perception of the formation of

a very dominant space in the interior of this rental flat unit. The shape of the orientation is visible and very clearly felt, creating more space in front of the door compared to the space behind the door.



**Fig-8: Space orientation towards circulation**

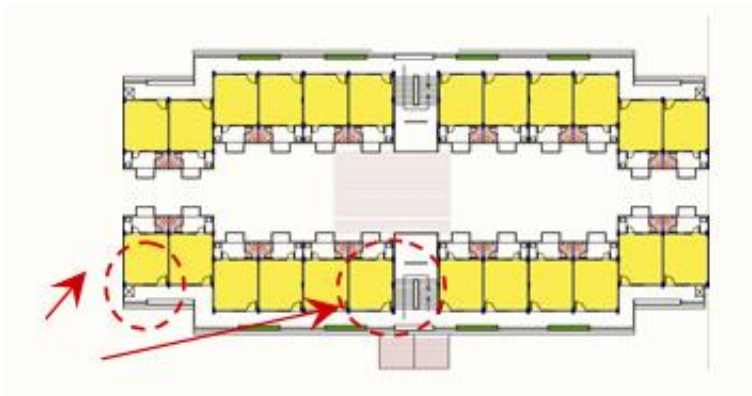


**Fig-9: Spaces are formed from orientation**

**Fire Evacuation**

As part of disaster mitigation, this building has an emergency evacuation path in the building using stairs that are located in the middle of the building and in the corner of the building on each floor. The

condition of the emergency stairs is a ladder with a slope of 90 degrees and attached to the wall. This ladder is more suitable for use as a service ladder. The distance of the emergency stairs and fire stairs from the furthest runway is 11.5 meters.



**Fig-10: Location of stairs in flat rental in Cengkareng**

This flat rental circulation system uses a single loaded system so that one side of this corridor is open air. The fire evacuation corridor is quite good. Likewise

for evacuation stairs has sufficient width. It's just that the ease of occupants of wheelchair users and pregnant women is not good, because there is no ramp.

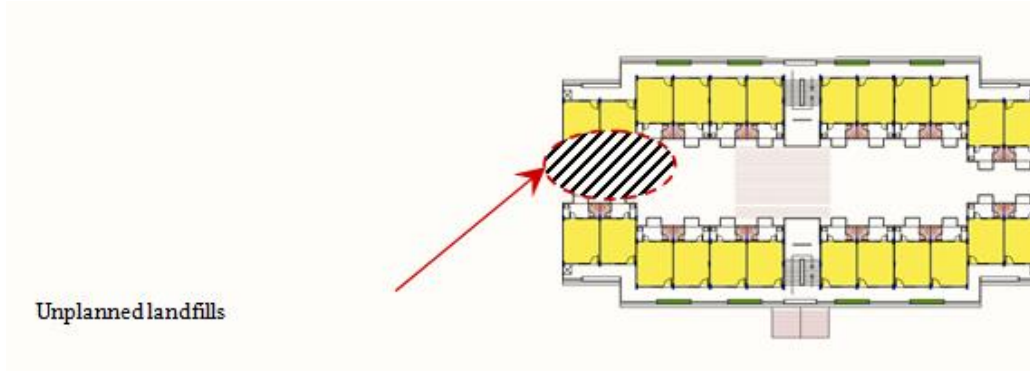


**Fig-11: Position of service ladder**

**Waste Disposal**

This flat rental does not have a good waste disposal line. Residents from the top floor must reduce the garbage that has been put in a plastic bag to be put

in a garbage collection container from the ground floor using a ladder. This condition is not a problem if the waste that is disposed is waste that is easy to carry, but becomes difficult if the waste is large enough items.



**Fig-12: Location of garbage disposal in a rental flat in Cengkareng**

Residents' activities towards quality families are accommodated by personal spaces ranging from intimate personal to social personal. In 2 dimensions, occupant activities become the main line in floor plan or spatial planning, but it must also be remembered in 3-dimensional planning, namely the height of space. In 2 dimensions, it can be seen from the activities of the occupants divided into activities that require private zones, service zones, semi-public zones, and public zones. The public zone, namely the living room, the pseudo public zone, namely the family room, the

service zone consists of a kitchen room, laundry room and drying room, a private zone consisting of a bedroom and a bathroom. Each zone has a different type of personal space. The private room has the concept of intimate distance compared to the living room in the public zone. Similarly, laundry and drying rooms and kitchens in the service zone have personal distances. The division of zones against the theory of personal space must still be considered in the planning of the social system. Likewise the hierarchy of the zone cannot be eliminated or eliminated.

**Table-1: Function dan wide space**

Space type	Space existing AreaM <sup>2</sup>	Activity	Wide space minimalM <sup>2</sup>	Space wide was recommendedM <sup>2</sup>
Master bedroom	7,5	Sleep Dress up	10,2	12
Children sleeping room		Sleep Studying Dress up	6,5	9
Bathroom	2,25	Took a bath	2,25	2,25
Dining & Living room	7,5	Dining	11,5	12
Living room		Watching TV Doing hobby	6,5	9
Kitchen	1,5	Cooking	6	6
Laundry room	2,25	Washing & Drying cloth	4	4
	21,00			54,25

The area of space analyzed using the approach of body dimension measurement (anthropometry) to residents or users of rental apartments in Cengkareng. The difference is quite far, the existing area is 21 square meters, while the results of the analysis of rental apartment units are at least 54.25 square meters.

To get the convenience of motion in this rental apartment unit, you must pay attention to the function

of space, the number of users, the dimensions of furniture and location, and accessibility to buildings, of course not separated from the safety and security of residents or building users. As well as to get the convenience of motion in several related spaces. the imaginary boundary of space is important to note considering that the apartment units are so limited. Access to fire evacuation in rental apartment units in Cengkareng is quite good, because it is easy to reach the



main corridor to the fire evacuation stairs. but this ease and safety will change if the rental apartment units are filled with furniture. Place furniture as a barrier to smaller spaces in a shared space. this condition can ultimately affect the comfort of the occupants or users for evacuation of fires. means of escape to save themselves must be maintained continuously and must be free from obstacles and obstacles. All furniture must not be placed on fire evacuation routes. likewise the mirror is not placed in a position that confuses residents or users and even fire officers in the event of a fire disaster [11]

Users of spaces in the social system create a certain pattern of behavior. An overview of user behavior in the socialization system is important to consider, without the study and analysis of behavioral factors, the results of the design cannot be enjoyed by users of social networks. The spaces in the stream include the sociopetal space where the sociopetal space tends to unite individuals to create social interaction. This space also occurs in family rooms where people really expect intimate relationships with other family members [12].

## CONCLUSION

Residents of rental flats in Cengkareng still have to move, with limited space not reducing the function of spaces in the zone. In terms of quantity, the area of space is a measure of the flexibility of the occupants but in quality, space must meet the comfort of the user's movement and the amount of furniture used. Some spaces can be made into 1 with different functions, but different functions based on time of use. There needs to be cohesiveness between family members to use this space function at the same time. The ease of supply and price of furniture affects the choice of furniture. Compact and integrated furniture is ideal for small spaces, procurement also requires its own thinking so that the room remains comfortable to use with appropriate furniture. But this condition still has a standard of comfort to a certain extent. If it violates the occupant's comfort standard, then the flat unit is deemed inappropriate. Occupational comfort standards according to body size, activity, occupant behavior.

The storage space for goods does not count as space requirements for this rental flat. Another skill needed by these residents is the management of storing goods, such as shoes, bicycles, and items that are still needed for daily activities. The convenience of motion in space according to the dimensions of space for furniture used and the shape of space, and patterns of circulation in space. If these items can no longer be stored in a rental flat unit, then the items are forced to be placed in the front hall of the rental flat unit. Of course this will affect the safety of residents during disaster evacuation and the comfort of residents using the lobby.

Provision of fire evacuation facilities and their ease of use need to be improved to be friendly to users. The same is true for the use of garbage disposal facilities. The structural system used is good, so is the shape of the corridor as an evacuation route and daily circulation. The movement of residents or users in a rental apartment unit is quite limited to private property. the nature of public or semi-public spaces cannot be contained at all in this rental apartment unit. This type of activity that is public in nature can be carried out in the hallway in front of the rental apartment unit.

Seeing so many space limitations that affect the comfort of the occupants or users, the results of this study are recommendations for reviewing the size of rental apartment units for a family. The results of the study can be quantitative, namely adding space or qualitative nature by designing compact rental apartment units. This means that rental apartment units can accommodate all occupant activities safely and comfortably, with the design of space functions, restrictions on the number of occupants, the shape, location, and size of furniture.

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