

Renovation for Architectural Design for all People: A Case Study of Phranakhon Rajabhat University

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Abstract

In order to build credibility and present the competency of the university in stepping into the design standards for all people and in responding to the equality in usage so as to continue in developing other buildings. This research on the prototype in the renovation of building for architectural design for all people in a case study of Phranakhon Rajabhat University contains the following objectives 1) to study the current situation for the problems of the buildings inside Phranakhon Rajabhat University that are not yet considered to be the utilization of buildings for the design for all people 2) to design architecture for all people of the building inside Phranakhon Rajabhat University 3) to create a prototype for the actual construction in the development of the building to universal design for all people. According to data analysis results, the researchers opt the pilot building of Piyamaharaj Building (Building 20), to create a construction prototype for the building development to be architectural design for all people. The design of the building is conducted in 9 areas as follows; signs displaying facilities, ramps and elevators, parking ladder, building entrances, corridors and inter-buildings walkways, toilet doors, the tactile surfaces and the auditorium, as well as the estimated construction cost of these operations in order to create a building prototype that can be improved substantially and can be proposed this prototype to both public and private agencies for considering to support the funding to develop other buildings in the future.

Keywords: Architectural design for all, Accessibility, Facilities in the University

การปรับปรุงอาคารเพื่อเข้าสู่การออกแบบสถาปัตยกรรมเพื่อคนทั้งมวล กรณีศึกษา มหาวิทยาลัยราชภัฏพระนคร

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บทคัดย่อ

เพื่อสร้างความน่าเชื่อถือและแสดงศักยภาพของมหาวิทยาลัยในการก้าวเข้าสู่มาตรฐานของการออกแบบเพื่อคนทั้งมวล และตอบสนองต่อการใช้งานอย่างเท่าเทียม เพื่อให้เกิดผลต่อเนื่องในการพัฒนาอาคารอื่นๆ งานวิจัยเรื่องต้นแบบการพัฒนาปรับปรุงอาคารเพื่อเข้าสู่การออกแบบสถาปัตยกรรมเพื่อคนทั้งมวล กรณีศึกษา มหาวิทยาลัยราชภัฏพระนครมีวัตถุประสงค์ในการวิจัยได้แก่ 1) เพื่อศึกษาสภาพปัญหาปัจจุบันอาคารภายในมหาวิทยาลัยราชภัฏพระนครที่ยังไม่เข้าข่ายการใช้ประโยชน์ของอาคารจากการออกแบบเพื่อคนทั้งมวล 2) เพื่อออกแบบสถาปัตยกรรมเพื่อคนทั้งมวลของอาคารภายในมหาวิทยาลัยราชภัฏพระนคร 3) เพื่อจัดทำต้นแบบในการก่อสร้างจริงที่เป็นรูปธรรมในการพัฒนาปรับปรุงอาคารเพื่อเข้าสู่การออกแบบสถาปัตยกรรมเพื่อคนทั้งมวล ผลจากการวิเคราะห์ข้อมูล คณะผู้วิจัยได้คัดเลือกอาคารนาร่องคืออาคารปทุมหาราช (อาคาร 20) เพื่อจัดทำต้นแบบในการก่อสร้างจริงที่เป็นรูปธรรมในการพัฒนาปรับปรุงอาคารเพื่อเข้าสู่การออกแบบสถาปัตยกรรมเพื่อคนทั้งมวล โดยได้พัฒนาการออกแบบอาคารในพื้นที่ 9 ส่วนด้วยกัน ได้แก่ ป้ายแสดงสิ่งอำนวยความสะดวก ทางลาดและลิฟต์ บันได ที่จอดรถ ทางเข้าอาคาร ทางเดินระหว่างอาคาร และทางเชื่อมระหว่างอาคาร ประตู ห้องส้วม พื้นผิวต่างสัมผัส และหอประชุม ตลอดจนประมาณราคาก่อสร้างในการดำเนินงานดังกล่าว ทั้งนี้เพื่อให้เกิดเป็นต้นแบบอาคารที่สามารถปรับปรุงอย่างเป็นรูปธรรมและทำเป็นรูปแบบเสนอไปยังหน่วยงานทั้งภาครัฐและเอกชนพิจารณาเพื่อที่จะสามารถของรับเงินทุนเพื่อสนับสนุนในการพัฒนาอาคารอื่นต่อไป

คำสำคัญ: การออกแบบอาคารเพื่อคนทั้งมวล, การเข้าถึงพื้นที่, สิ่งอำนวยความสะดวกภายในมหาวิทยาลัย

Introduction

Since the university which is an educational institute that a lot of people deploy, both internal and external university personnel, the design of the building in response to all of these people is very necessary. This research in the prototype of building development into the architectural design for all people from a case study of Phranakhon Rajabhat University is, therefore, to create a prototype of the building development in response to the use of space equally and it is an important aspect of designing the right environment for both internal and external departments. It is the design for use by all groups of people in the society or the design for all people (Universal Design) (STD, 2014). It is the design of the environment, places and things including groups of working people, elderly, the disabled and the underprivileged people who have restrictions in using or in accessing to the environment, places, and general things in the society to use equally for all human in society so that everyone in the society can make use of these fully and with equality. (The Matter, 2017)

Research Objectives

- 1) to study the current situation for the problems of the buildings inside Phranakhon Rajabhat University territory that are not yet considered to be the utilization of buildings for the design for all people
- 2) to design architecture for all people of the building inside Phranakhon Rajabhat University
- 3) to create a prototype for the actual construction in the development of the building to architectural design for all people.

Research Methodology

The research project of the prototype in renovation for the architectural design for all people: a case study of Phranakhon Rajabhat University is conducted by analyzing the data in 4 following phases as follows;

- 1) Synthesize the basic information of the project
- 2) The development of the architectural design for all people
- 3) Prototyping for construction, construction of the facilities for all people
- 4) Estimation of construction costs, construction of facilities for all people

Each phase of the research corresponds to the objectives as follows;

Table 1 Summary of the Operations that are in Accordance with the Research Objectives.

No.	Objectives	Operating procedures
1.	To study the current situation for the problems of the buildings inside Phranakhon Rajabhat University territory that are not yet considered to be the utilization of buildings for the design for all people	Step 1. Synthesize basic information of the project
2.	To design architecture for all people of the building inside Phranakhon Rajabhat University	Step 2. Apply the results from questionnaires and organize the meeting to develop architectural designs for all people.
3.	To create a prototype for the actual construction In the development of the building to architectural design for all people.	Step 3. Prototyping for actual construction, construction of facilities for all people Step 4. Estimate of the cost of construction, construction of facilities for all people

Research Result

1) Location and characteristics of Phranakhon Rajabhat University

Location: Located at No. 9, Chaeng Watthana Road, Anusawari Sub-district, Bang Khen District, Bangkok 10220, with a total area of 162 rai containing 63 buildings. The group of buildings can be divided into 2 groups based on the age of building.

1. Buildings prior to the enforcement of Ministerial Regulations B.E. 2548 determining building facilities for the disabled or disabled and the elderly. (Ministerial Regulations B.E. 2548. (2005)).

2. Buildings after the Ministerial Regulations become completely effective.

In selecting a prototype building that is not considered as the utilization of building for all people so as to study the current situation of problem, it will be implemented by considering the size and type of buildings, year of that the building is built before and after the year 2005, the number of users and the constructions for all people. And it is found that Piyamaharat

Building (Building 20) is the most suitable building used for the design for all people.

2) Summary of the questionnaire

From the data collected using questionnaire about the understanding of architecture design for all people (Universal Design) for Piyamaharat Building (Building 20) from group of 205 samples who respond the question about additional needs of architectural design for all people that consists of faculty, students, staff and workers while there are approximately 800 users of Building 20, the questionnaire is used with simple random sampling using sample sizes based on Yamane's sample table to create a questionnaire from the following formula. (Yamane, 1967)

$$n = \frac{N}{1+nc^2}$$

n = Sample size

N = Population size

c² = Acceptable tolerance (0.0025)

Result of sampling using the calculation provides the sample size of 267 sets

Results from a questionnaire about the understanding of Universal Design for Piyamaharat Building (Building 20) suggest that ; 68.00 percent of sample population have heard of architectural design for all (Universal Design) while 47.00 % provide comment that currently, Piyamaharat Building is not suitable for use for general people, whether children, the elderly, the disabled or the disabled equally. And about 50.24% of them see that in term of utilization in many forms for the area is the issue that should be applied for the development of Piyamaharat Building more effectively while 86.00% agree with the renovation of Piyamaharat Building (Building 20) to support the utilization for all people. The most part required to be used most is the ramps and elevators for wheelchair-disabled people accounting for 47.32%.

Furthermore, not only questionnaires bur also focus group discussion has been gave the opinions to the point of improvement in term of universal design as follows:

1) It is possible to get the funding to support the budget from the Department of Social Development and Human Security by proposing not only the prototype of the Piyamaharat Building (Building 20) is the whole building of the university but also should be improved in terms of architecture for all people, by proposing the construction drawings for the university. In terms of design in research In terms of ramps and staircases, there should be sunscreen that blends in with the traditional style of the building. Because the feelings of the disabled need the same equality as the general public.

2) To propose the use of elevators for wheelchairs in the meeting room at the entrance stairs. Instead of using ramps which are currently inexpensive And in the matter of the entrance gate category with the symbol of the disabled Should go to the automated entrance, which may use a student card or university worker In and out to know the frequency of use and safety instead of the usual sensors. In terms of color, the textures should be adjusted to match the scenery of the building. It is not necessary to use the original yellow color seen on the road. Case studies from other universities that the administrators have a policy regarding education for all people.

From the analysis of data derived from the survey, questionnaires and focus group discussion made with building users in which research team will use to the architectural design for all people by referring to the Ministerial Regulations prescribing building facilities for the disabled or disabled and the elderly B.E. 2548, divided into 9 categories of facility as follows:

- 1) Facility signage
- 2) Ramps and elevators
- 3) Stairway
- 4) Car parking lots
- 5) Building entrance, corridor, and building walkways
- 6) Doors
- 7) Toilets
- 8) Tactile surfaces and
- 9) Theaters, auditoriums, and hotels.

The results reveal that;

1. Facility signage

There are 2 types of facility sign designs, including signs displaying the direction to facilities and signs showing the types of facilities in various locations of the building. The signs contain blue background color and text in white or white background with blue text installed in the position that can be clearly seen. As for such

designs in this study, there are 6 types of signs including sign of ramp entrance, sign for parking entrance, sign indicating the corridor, sign of elevator entrance, sign displaying the accessibility and bathroom sign the detail of signage as following;

1) Sign of ramp entrance for wheelchair users having the dimension of 0.30x0.40 m., 1.50 m. height above the floor

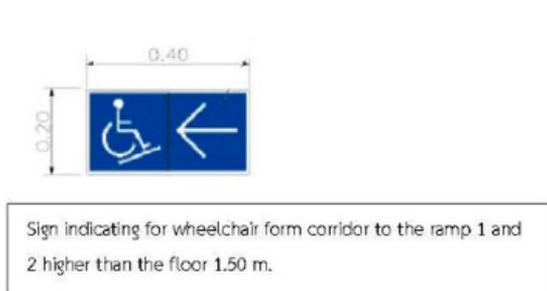
2) Sign for parking entrance for wheelchair users having the dimension of 0.30x0.40 m., 2.00 m. height above the floor.

3) A sign indicating the corridor to the ramp 1 and 2 for the wheelchair user with the dimension of 0.20x0.40 m., 1.50 m. height above the floor.

4) Sign of elevator entrance for wheelchair users with the dimension of 0.20x0.20 m., Height 1.50 m. above the floor.

5) Sign displaying the accessibility for wheelchair users with the dimension of 0.20x0.20 m., 1.50 m height above from the floor

6) Bathroom sign for those visually impaired, with the dimension of size 0.10x0.20 m., 1.50 m. height above from the floor.



Picture 1 Show a Sign of Ramp Entrance

2. Ramps and Elevators

Ramp above the floor level outside the building leading to the floor level inside the building having different levels of 0.70 m will be provided. This consists of 1 ramp to the south, 2 ramps to the east, 3 ramps behind the building to the north and 4 ramps to the north of the building, totally 4 locations, with the following details.

1) Ramp at 1 position in the south leading to the elevator with the length of 8.40 meters (not including a terrace), the inner width of 1.50 m, starting from the walkway level +0.12 m heading to the resting hall below the building +0.82 m, with the height of 0.70 m.

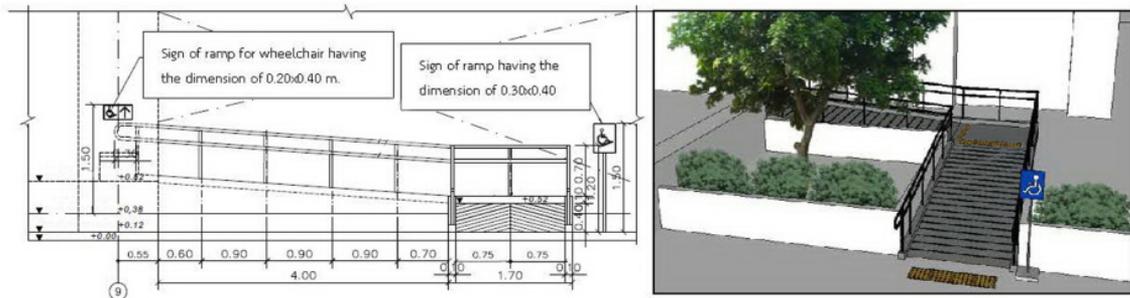
2) Ramp at 2 position in the east connecting the parking for the disabled parking with the length of 8.40 meters (excluding terrace), inner width of 1.50 m, starting from the walkway

level +0.12 m, to the resting hall below the building + 0.82 m, with the different height of 0.70 m.

3) Ramp at 3 position in the rear of the north connected from the ramp No. 4 from the central canteen building, with the length of 4.00 meters (excluding terrace), inner width of 1.50 m, starting from the walkway level +0.38 m to the

resting hall below the building +0.82 m. with the difference of height of 0.44 m.

4) Ramp at 4 positions in the north of the building connected from the walkway from the central canteen building with the of length 3.20 meters, the inner width of 1.50 m, starting from walkway level +0.12 m, walkway +0.38 m, with the difference of height of 0.26 m.

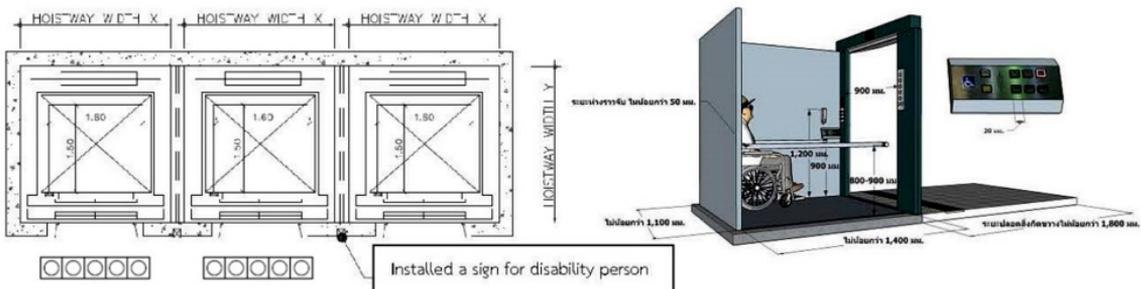


Picture 2 Show a Sample of Ramp in East Position of the Building

3. Elevator

Since there are no facilities for the disabled available in the existing 3 elevators and they are also aged many years. For the convenience for the disabled in using the elevators, a passenger lift should be installed to replace the existing one. The most suitable position is of the middle elevator because it is the location that is closed to the entrance and

easy to use for the disabled. The dimension of the original passenger elevator is measured from the inside with the dimension of 1.60x1.50x2.30 m. And this can be replaced by the elevator for the disabled instantly. Furthermore, according to the survey, elevator for the disability person should including voice output and braille for the blind as well.

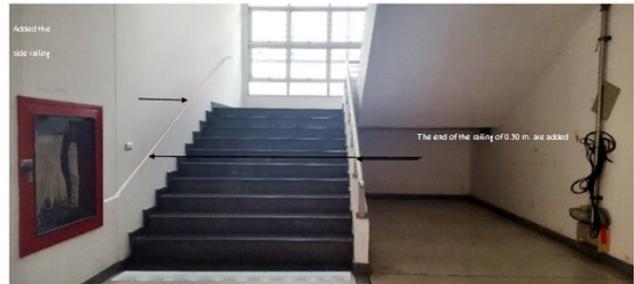
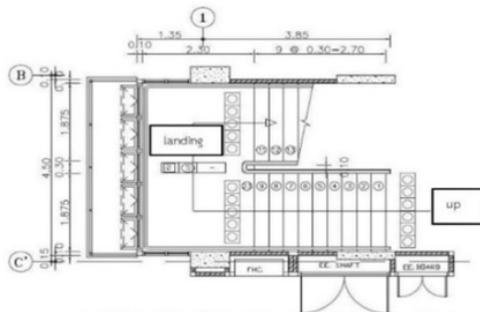


Picture 3 The facility of the elevator for the disability person

4. Stairs

Since the main stairs of the building located in front of the building in the south, the front stair in the east and the main stairway inside near the passenger lift, most of these are compliant with the qualifications according to the Ministerial Regulations prescribing building facilities for the disabled or the impaired and

the elderly B.E 2548. Therefore the additional improvement for ladders is made to the following 3 parts consist of The embossed tactile surfaces in front of the entrance to the terrace and the end of the stairs, The side railing on the 3rd-floor stairway and the protrusion from the end of the railing of 0.30 m. are added and Floor Number-labels.



Picture 4 The Detail to Develop the Stair for Universal Design

5. Parking Lot

Formerly, the Piyamaharaj Building (Building 20) has no parking lot. The parking lot is located in the position away from the building. In this design, consider to create particularly handicap parking beside the building, there are 2 parking lots for the disabled will be constructed which will not be parallel with the roadway located in the front area to the south of the building with the dimension of 2.50x6.00 meters and 1.00 meters of space will be provided on both sides of the parking lot for parking the cart before getting on or off the vehicle which is formerly a green area and can be connected to a ramp for easy access to the building having signage for the disabled person

attached on the floor with the size of 0.90x0.90 m. including the ramp from the street level +0.00 to the sidewalk +0.12 m. with a width of 0.90 m. and with a slope not exceeding 1:12. As for the entrance of the building, the walkway between the building and walkway connected to the building, the Ministerial Regulation stipulates that the walkway must be a flat surface, not slippery, without obstacles. In case the floors have different levels, there must be a ramp provided for easy access. The area where the intersection or the turn locates, the surfaces must be tactile surfaces. All mentioned above, they have been already shown in details of improvements in the ramp and surface sections.



Picture 5 The Detail to Renovate Parking Area for Disable People

6. Door

The doors of the building should be easy to open and close. The height of door sill must be higher than 0.02 m, with a net width of the door not less than 0.90 m, etc. The areas that should be improved include the replacement of the bathroom door knobs from the conventional round knob type to the lever type. And the main entrance of the building 1st-floor area where the doors are with frequently used frequency, the automatic door system with the sensor should be used instead of the original one so as for the convenience of users including the installation of accessibility signage by 0.20x0.20 m. with a height of 1.50 m. above the floor.

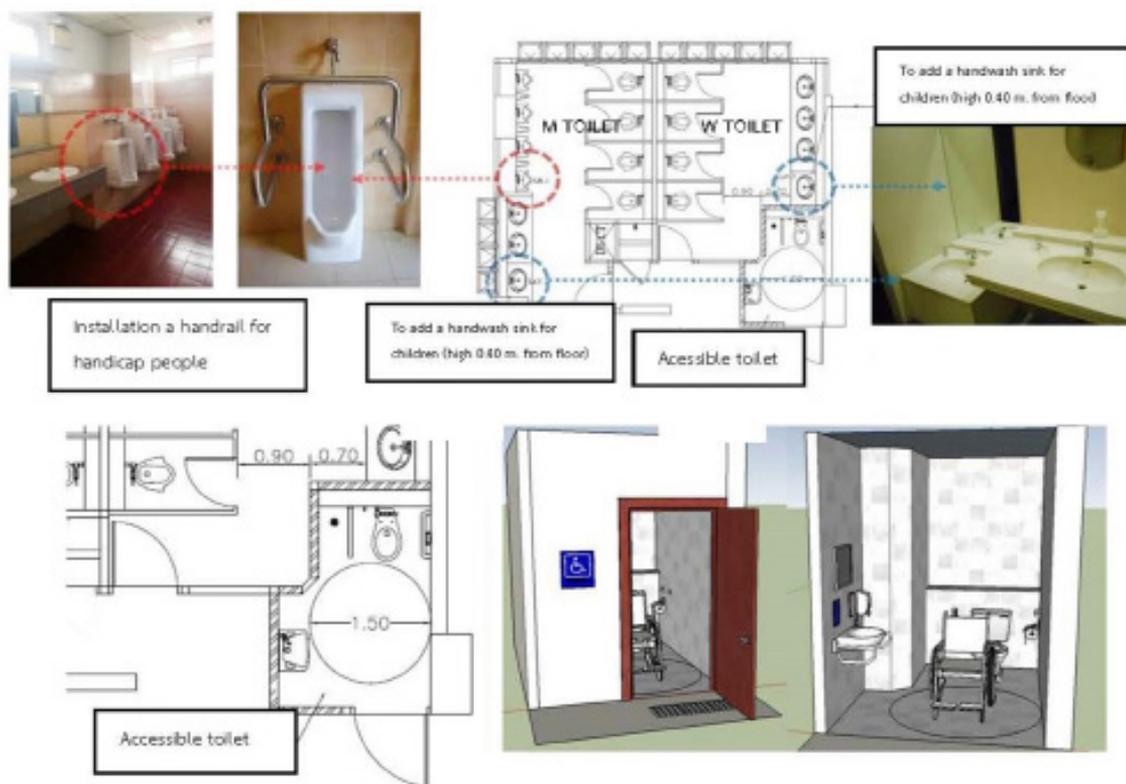
7. Toilet

Piyamaharat Building (Building 20) provides restrooms for the general public and toilets for people with disabilities or handicapped on the floor 2, 4, 6 and 8 of the building in a

location near the stairs and elevators, which can be easily accessed. Toilets for the disabled or handicapped persons mostly contain facilities that are already supported for the disabled, such as the doors that can be open from to the outside and its opening position can be opened for above 90 degrees. The interior floor level is always at the same level as the external floor level with handrails to help support the users etc. What needs to be improved is the size of the interior space of the toilet. For the improvement, the space for the disabled toilets is extended to the direction of general public toilets in order to obtain space of about 1.50 m. which will allow wheelchair users to easily turn back due to the space is wide enough for the standard wheel chair. And additional installation of light and sound signaling systems in the event of an emergency is also installed in the toilet equipped with push-button or a touch button to send signals installed in a position that is easily

accessible for the disabled or handicapped with adding embossed surface texture to the door including the signboards of the disabled wheelchair users and adjustment for the mirror to be in tilt position. In the general public toilet, in the male toilet, the urinal stall is changed from the conventional type to on-floor type for one unit located in the position closed to the entrance for children and the elderly to use easily. In addition, the original hand wash sink 0.80 m above the floor is changed to be the sink for children use 0.40 m above the floor. The same change is also applied for the ladies' toilet where hand sink for children is changed

in the same manner. However, the number of toilet sanitary ware is reduced from 5 to 4 rooms in order to increase the space of the toilet for the disabled. In toilets for the general public, signage in Braille tactile is added on the wall at door bolt side 1.50 m. above the floor. The interior and exterior levels that are different for 0.10 m. is adjusted to be the ramp and the tactile surface in front of the door is added as well. On the other hand, the floor should be flat through the door entrance it can add the drainage grating between the interior and exterior levels.



Picture 6 The Detail to Renovate the Toilet for People with Disability

8. Tactile Surface

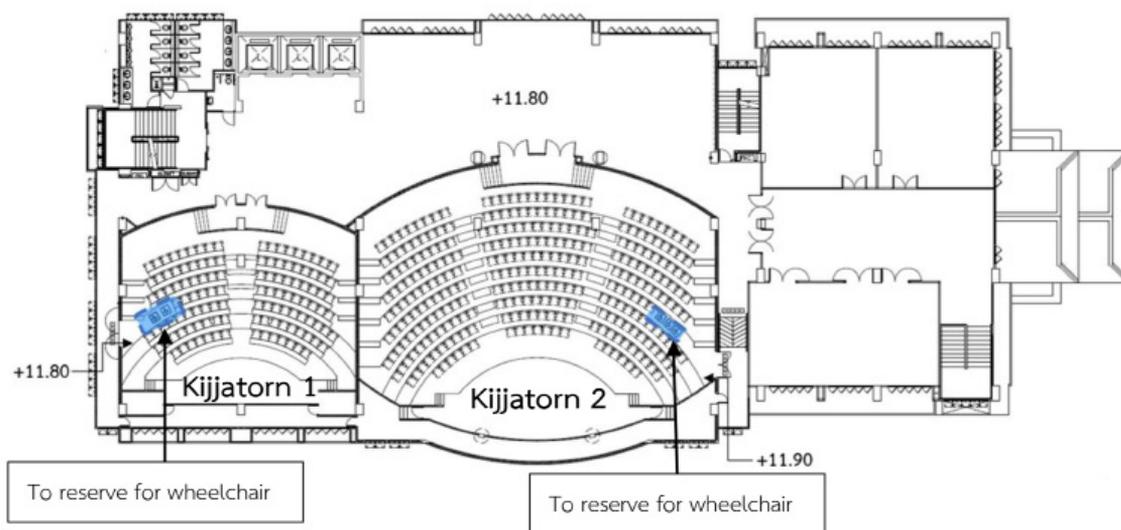
Two different types of rubber tactile surfaces with the size of 0.30x0.30 m. are

provided namely; 1. Embossed button type, generally used as a warning symbol for obstacles, dangerous spots, different levels of the area

and a warning sign to change the direction of traffic, installed directly in front of the up-down entrance, stairs, ramps or different level area exceeding 0.20 m in front of the door or in the turning point or the intersection. The installation is made 0.30-0.35 m away from the warning point in a perpendicular direction to the width of the traveling channel and 2. Embossed line type, generally used as a symbol for directions of traffic from the stair or ramps to the entrance or passenger elevator.

9. The Auditorium

Piyamaharaj Building (Building 20) has 2 meeting rooms located on the 4th floor of the building, namely Kijjatorn 1 Meeting Room (124 seats) where 4 seats are turned to be parking lot for 2 wheelchairs. And in the Kijjatorn 2 Meeting Room (300 seats), 6 ordinary seats are turned to be a parking lot for 3 wheelchairs integrated with the normal seating area. The position of reserve area for wheelchair near the exit door.



Picture 7 The Detail to Reserve for Wheelchair near the Exit Door

Conclusion

From the analysis of problems arise in the Building 20 from above topics in both 9 categories to meet the standards of the design for all people and to respond to the equality of use, the research team has created a solid prototype for the construction of basic facilities for all people by making a construction plan consisting of the floor modification plan and various elements of the building. From the construction drawing plan that has been

improved. The research team prepares the construction cost estimation in order to know the preliminary budget for renovating the building, to be used as a prototype building for the construction of basic facilities for all people. The total budget for the renovation is estimated to be 2,589,485.30 baht. In order to make the building design become tangible, it is suggested to provide operational guidelines, both as policy suggestions and for further research, as follows:

1) The building development should be included to the improvement for architecture design for all people in the agenda and policy of the university development systematically and continuously which may be implemented by selecting the newly-built building for first and gradually consider the existing buildings for the further development

2) The budget should be allocated for continuous improvement either the improvement of the building's internal environment and the environment related to the building such as parking lots, stairs and the ramp connected to the building and on sidewalks, etc.

3) The promotion and publication for the awareness of the importance of design standards for all people should be implemented

in order to create mutual consciousness in the development and improvement of buildings as well as an environment that can be used and accessed equally by all people.

However, this is because the building design for people of all ages to use it is necessary for public buildings. Currently, in Thai society entering the aging society, therefore, awareness of design for easy access to everyday people will have tangible benefits and can be used as a guideline in every building in educational institutions as well as other public buildings.

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