

Final Architectural Design Studio

BT BUILDING
PERFORMANCE &
TECHNOLOGY
LABORATORY

DESIGN OF CHILDREN LIBRARY FOCUSING ON SAFETY ASPECTS



RA!
Children Library
In Klaten, Central Java

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ID student : 185121

Supervisor : Prof. Ar. Noor Cholis Idham, S.T., M.Arch, Ph.D., IAI



UNIVERSITAS
ISLAM
INDONESIA

INTERNATIONAL UNDERGRADUATE PROGRAM IN ARCHITECTURE



DEPARTMENT of
ARCHITECTURE



한국건축학교육인증원
Korea Architectural Accrediting Board



CANBERRA
ACCORD

FINAL ARCHITECTURAL DESIGN STUDIO

DESIGN OF CHILDREN LIBRARY

FOCUSING ON SAFETY ASPECTS IN KLATEN, CENTRAL JAVA



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**DEPARTMENT OF ARCHITECTURE
FACULTY OF CIVIL ENGINEERING AND PLANNING
ISLAMIC UNIVERSITY OF INDONESIA
2022**

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PERANCANGAN PERPUSTAKAAN ANAK-ANAK

BERFOKUS PADA ASPEK KEAMANAN DI KLATEN, JAWA TENGAH



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PREFACE

Acknowledgments

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- Thankyou! May Allah love and guide us whenever wherever we are.

Yogyakarta, 2022



(Aulia Zulfa Isvandy)

STATEMENT OF AUTHENTICITY

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Tittle : Design of Children's Library Focusing on Safety Aspect, in Klaten, Central Java

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Yogyakarta, December 7th, 2022



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Abstract

Designing a library for children is a good innovation as a place to build a reading culture since childhood. Since children's way of learning is different from the adult, the children's library has different design characteristics from the public library. One of the function that need to be considered is safety space. This aspect is accomodating children that love fun learning and mostly respond and move actively while learning. The quality of safety in the design will be part of the success factor of the children's library. The challenge of this design is to meet the needs of children through design in aspects of safety and comfort based on the general behaviors of children aged 6-12 years, such as activeness, high curiosity, and concern in socializing.

Keyword : Children's library, children's learning space, spatial safety design, formal safety design

Children's library, children's learning activities, safety of building function, fire protection system

01

INTRODUCTION

1.1 Study Background

1.1.1 Library for Children

The library is a facility that bridges the needs of the community in consuming knowledge. But based on the function, the library for public is different from library for children. The children's library is having exclusively planned design to support children's learning effectively (Nolan Lushington, 2008) It's not only considering the basic building standard, but there is the guidelines to design children's space that we will find the guidelines in previous researches. This children library will not only be a place that serve book, but also encourage children to explore the world through reading, learning, and playing [Chandramathi, K., 2017]. It's connecting between children's world and library, between imagination and literacy, also between playing and learning.

Since we can not find good example of children libraries in Indonesia, so we need to refer to children's library abroad. The example is Jackie and Harold Spielman Children's Library (see picture 1). It can be a good inspiration for designing children's library which is combining learning with playing to create fun learning, it will be explained more in precedent study. But, importantly, for realizing this kind of great idea, we need concept and design process. Here, architect has a role to find interesting idea for creating exciting learning space.

1.1.2 Children learning's Space

Children are generally active in thinking and moving. They love to ask a lot, observe, learn, and express their feelings and thoughts (Nafi'ah, Adinda, Wibowo, Ilham, & Dianto, 2018). In scientific papers (Rahmi & Hijriti, 2021), their birth age up to 6 years, they experienced development in terms of physical, language, social cognitive, and motor. The early reading stage of children starts from the age of 5-6 years, in this age they were ready to be guided to build reading habit.



And still explained in (Rahmi & Hijriti, 2021), in childhood aged 6-12, they experienced social interest and start loving to play in groups. In this age they have begun to be able to reason and think concretely. The social interaction held in library can be a good way for them to learn communicating and share their thoughts. By this, library is like open class for them to learn, socialize, and explore the world.

Children love to play, and playing is an essential strategy to learn (UNICEF, 2018). In playing time, what they know is that they have space, opportunities, and freedom. They love to be allowed doing whatever they want rather being told what to do. Has been delivered in the (Huang.R, 2013) that this concept is commonly practiced in western by creating space for children to explore their own world. That research told that the natural things children will do are observing, asking question, discussing with others to know how things work and ideas.

Basically children are active learners of their environment, they learn to solve problems through the experiences they feel. To support children's learning activity, Children library serve safe space and flexibility for children to learn and experience new thing. The quality of library design for children will affect the comfort of children and the success of the library as a medium to develop a culture of literacy in children.

Designing a communicative room is needed to support children's learning. Children also need a place to relax and play, so that the learning room is made continuous with play activities. The room must be designed to be friendly, warm, and integrated to be able to support children to dare to start in terms of socializing, learning, and playing with their friends independently. The most importance purpose of children's library is to make children love books. Also a safe room so that children feel comfortable to move freely and learn optimally. And in this study, children's libraries will be discussed in depth in terms of safety.

1.1.3 Safety Space for children's activity

In designing a building, especially a public building, there are standards for safety aspects that must be met. The system is designed across the board from macro to micro design, from the tread design to the building structure, where each part of the design has its own standards. In this library building, where the users are children, a more detailed safety system is needed, both in terms of function safety, and building systems. And in this study, safety testing will be focused on the design of fire protection systems.

Conclusion

The children's library has an important role in providing facilities and support to children, it is not just a room filled with bookshelves, but it can provide a space for children to learn to explore and imagine the world outside their own world. This library becomes a place for children to interact with other children, and learn to build a community of book lovers. The value of children's libraries goes far beyond simply teaching children's literacy skills. Here we will focus on safety aspect of building design and fire protection.

1.2 Architectural Design Problem

1.2.1 Architectural Problem

Designing library for children that considering the children's safety and comfort. The focus of this design is designing the concept of room organization and building design element to facilitating children's activity.

1.2.2 Design Problem Statement

How to design a library according to the needs of children that focuses on safety aspects?

1.2.3 Aims

Designing library for children that focus on children's comfort and building safety to support their optimal learning activities.

To support the process of learning to read and provide children with access to all media. They empower children and advocate for their freedom and safety. They encourage children to be confident and competent people.

1.2.4 Design Challenge

Designing space based on children's behavior (activeness, curiosity, exploration, playing, imaginative, unable to reason and think well)

Problem Scheme

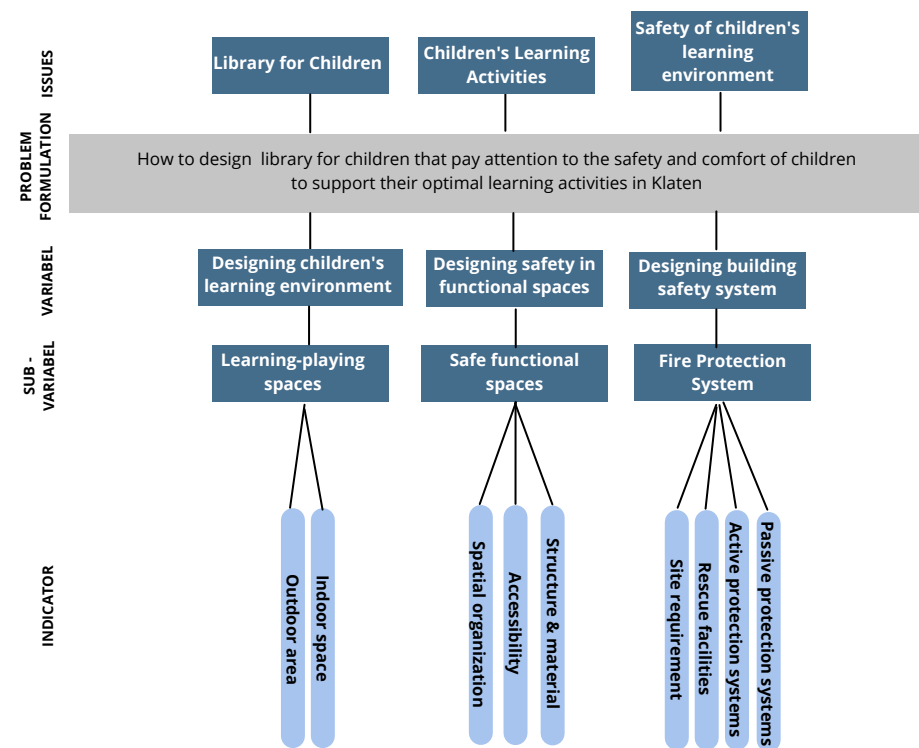


Figure 1. Problem Scheme

1.3 Design Method

The typology of this building is a library building of a public nature, so the authority is the local government. The library building is intended for children, so the design adapts to the needs of children, especially in the process of learning. In designing the design of this children's library, we refer to Kumar's theory of design methods, where the design stages are divided into 5, namely the "explore" stage, where researchers collect data to understand the project to be carried out through literature studies. The second stage is "understanding", where researchers collect field data and typology for analysis. The third stage is the "plan" which is the space program. The fourth is in the form of "create", which is to create ideas and design concepts. And finally "evaluate", which is the stage of looking for shortcomings in the design that can still be improved, so as to create a better design.

1. **Explore.** This stage is about exploring the problem and design aim. It consists of abstracts, study backgrounds, architectural design issues, design methods, library reviews, and references. The variables we have are Children's library, children's learning space, spatial safety design, and formal safety design.

2. **Understanding.** This stage is about understanding the factual data, and literature study. It consists of field data, regional regulations, context analysis, and in-depth analysis of the literatures that talking about library for children, learning and playing concept, children's learning and playing space, safety children's space, and fire protection system. Then drawing the conclusions as the key success of creating libraries for children that focus on safety aspect.

3. **Plan.** This stage is talking about design process and alternatives design. It contains design concepts of effective children's learning and playing space, safe functional space, and fire protection system that have been studied in chapter 2. The design in this chapter is served in a schematic design that offer some alternatives.

It contains design process such as landscape design, bubble diagram, room programming, building mass, and anthropometric.

4. **Create.** This stage is the core of the proposal, it consists of chosen alternatives from chapter 3 and developed with detail system, here we focus on fire protection system. Here we explain the design about what, why, and how it is designed with plan and section drawing in order from macro to micro design, included site planning, building form, room and space, envelope, and construction.

5. **Evaluate.** This is the last stage that talking about design testing to prove the achievement of building performance in solving the problems of safety aspect of children's library, and lastly added with design evaluation that taken from input and criticism of the examining lecturer. In this research, we only focus on testing fire protection system.

1.5 State of The Art

Title	Year	Writer	Source	Summary
Design a space for children in public library in developing country: a case study in Indonesia public library	2009	Nove Hartanto	Research	This research discusses the case study of children's libraries by emphasizing the location of children's libraries, namely in Indonesia, as a developing country that is still rarely found children's libraries there.
Libraries designed for kids	2004	Nolan Lushington	Book	This book is talking about method in designing children's library according to children's age and room required. It also telling about the common mistakes in children's library design.
Perancangan Interior Perpustakaan Anak di Surabaya	2016	Novia Andriani Wijaya and Lintu Tulistyantoro	Research	This research focuses on designing the interior design of children's libraries with contrasting concepts themed "garden" to create a cheerful atmosphere that appeals to children.
Perpustakaan Anak dengan Pendekatan Desain Perilaku Anak	2015	Anggita Triastari and Nur Endah Nuffida	Research	The study designed a children's library with a child behavior approach in an effort to create an interesting and fun place for children to visit, learn, and play.
PERANCANGAN PERPUSTAKAAN ANAK DI BANTARAN SUNGAI WINONGO NOTOPRAJAN, YOGYAKARTA	2020	Ahmad Husein Pasaribu	Research	This research has specific and interesting location characteristics, namely the Winiogo river area. The author seeks problems in irregular river areas by building innovations in the form of children's libraries as an exciting learning and playing medium.

Of the previous research that the authors found, which discussed the design of children's libraries, all of them have the goal to build interest in reading and good literacy skills in the community. In general, it can be found some discuss interior design, some discuss architectural design, and the rest is research on case studies. Specific differences between these studies can be seen from the scope of the discussion, approach and location. Finally, the research that the author made here is the design of children's libraries, just like the studies above, but has a different discussion focus from all the above research, namely designing children's libraries in terms of building performance that supports creativity, comfort, and security of children in the learning process in children's libraries.

1.4 Precedent Study

1.6.1 Precedent of Children's Library

Rimba Raya Library



Figure 3. Rimba Raya Library, source : internet

This library is designed more specifically for children's needs because it is designed for the interests of children's growth and development. There are toys such as puzzles, finger puppets, and cute costumes that can be used for your little one's exploration. The Rimba Baca library also provides an art room which is usually used for drawing and coloring activities. The works that have been made will be displayed on the walls of the art room like an exhibition.

Lesson learned :

- Design must pay attention to the needs of the child's growth and development
- Provide interactive toys and furniture that is light and easy to move, because children love moving objects
- Provide ample space in the middle of the room, because children like to move actively.

Jackie and Harold Spielman Children's Library



Figure 4. Jackie and Harold Spielman Children's Library, source : internet

The library has an interesting concept themed "Tree of Knowledge" with a brightly colored wayfinding system that leads to various spaces that help children to find their room independently. The end of this path is a leaf, and each leaf displays a proper inspirational word that represents the theme of the area: "Play" (Early Childhood Area), "Imagine" (Story Angle for reading and presentation), "Think" (Quiet Study), "Create" (Maker Room / Workshop Room), "Connect" (Commons Learning Media Area). Retrieved from <https://iands.design/articles/32831/how-bring-childrens-library-design-21st-century>, "We wanted to create an environment where, when you walk in, you're transported to another place," Skolnick says. "That's why we used a highly graphic and three-dimensional approach."

Lesson learned :

- Pathway can be a fun way to communicate with the children through design
- Using bright color help children to pay attention and processing information around them
- Create different room according to the children's need based on their age
- Put clear visual boundaries to avoid accidents, collisions, and injuries

02

DATA, ANALYSIS &
LITERATURE REVIEW

2.1 Data

2.1.1 Data on the number of children in Klaten (5-14 years old)

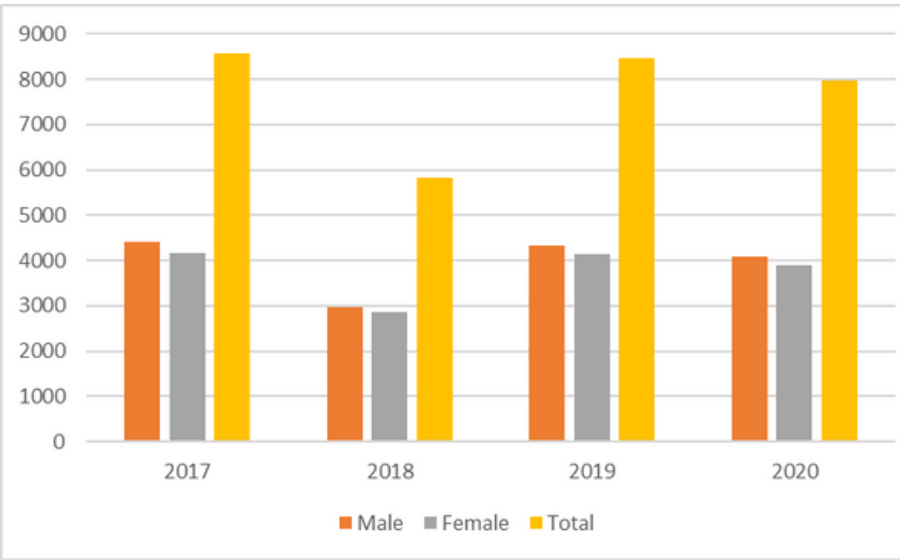


Figure 5. Data of number of children in Klaten City Center

This data shows the total of children in Klaten City Center each year, it's important to know the need of visitor capacity in the building. The design result will show what percentage of this building can reach the target and meet the needs of the owner. The area that will be the location of the construction of this project is Klaten Tengah.

Data 2020 (age 0-14) : 7984, male 4089, female 3895
Data 2019 (age 5-14) : 8465, male 4334, female 4131
Data 2018 (age 5-14) : 5824, male 2959, female 2865
Data 2017 (age 0-14) : 8562, male 4403, female 4159

The written data is not specific and simultaneously shows the age of 5-12, due to differences in writing style and the content of each statistical data book in the middle class every year. There are 2 sources of books used, namely "Klaten In Numbers" and "Middle Klaten In Numbers", because some data is not found in the Middle Klaten version of the book. Likewise, data on the number of children in Central Klaten in 2021 does not exist because the book "Middle Klaten In Numbers" which discusses data on the number of children in the 2022 edition of Central Klaten has not been published.

2.1.2 Children Library in Klaten City Center

There are only general library, school library, reading park, and mobile library in Klaten. All of them have a common function as reading media and do not have a focus on design needs for the children's learning process.



mobile library



general library



reading park



school library

Figure 6. Libraries in Klaten City Center, source : internet

The effort made by the government in 2019 in the reading community movement program is the procurement of a digital library in the form of an application called iKlaten (Focusklaten, 2019). This is useful for people to access remote reading books simply, but not suitable for children. That way, the children's library is an innovative design proposal in support of this reading community movement program.

2.1.3 Data of regional regulations

TOR from SNI 7495:2009 about city library

SNI 7495:2009

12 Gedung

Perpustakaan menempati gedung sendiri dan menyediakan ruang untuk koleksi, staf dan penggunaanya dengan luas sekurang-kurangnya 600 M² (ruang koleksi dan baca anak-anak, remaja, dewasa, ruang kepala, ruang administrasi, ruang pengolahan, ruang serba guna, ruang teknologi informasi dan komunikasi serta multi media, ruang perpustakaan keliling). Lokasi gedung berada di pusat kegiatan masyarakat, dan mudah dijangkau. Perpustakaan memperhatikan aspek kenyamanan, keindahan, pencahayaan, ketenangan, keamanan, dan sirkulasi udara.

12.1 Ruang koleksi dan layanan

Area koleksi seluas 45% yang terdiri dari ruang koleksi dan baca anak-anak, dewasa, koleksi buku, non buku, ruang majalah, ruang koleksi muatan lokal.

12.2 Ruang khusus

Ruang khusus seluas 30% yang terdiri dari ruang teknologi informasi dan komunikasi serta multi media, ruang manajemen perpustakaan keliling, dan ruang serba guna.

12.3 Ruang staf

Ruang staf perpustakaan seluas 25% terdiri dari ruang kepala, ruang administrasi, ruang pengadaan dan pengorganisasian materi perpustakaan.

The library space will divided into 3 part, 45% for collection and services space, 30% for special space, and 25% for staff space.

It also should be opened min. 53 hours in a week. Library opening hours of at least 35 hours per week. Which means min. 6 hours in Monday until Saturday. Sunday is free day. The open hour will affected the shading design concept.

4. Sarana dan Prasarana

a. Lokasi/lahan

1) Lokasi perpustakaan berada di lokasi yang strategis dan mudah dijangkau masyarakat; dan

2) Lahan perpustakaan di bawah kepemilikan dan/atau kekuasaan Pemerintah Daerah Kabupaten/Kota dengan status hukum yang jelas.

b. Gedung

1) Luas bangunan gedung perpustakaan paling sedikit 0,008 m² per kapita dan bersifat permanen yang memungkinkan pengembangan fisik secara berkelanjutan.

d. Keanggotaan perpustakaan

Jumlah anggota perpustakaan paling sedikit 2% dari jumlah penduduk kabupaten/kota.

Contoh Perhitungan Jumlah anggota:

No.	Jumlah Penduduk (jiwa)	Jumlah Anggota	Keterangan
1	< 200.000	4.000	
2	200.000 - 300.000	6.000	
3	300.000 - 400.000	8.000	
4	dst. (kelipatan 100.000)		Penambahan 2.000 anggota

e. Kunjungan Perpustakaan

Jumlah kunjungan ke perpustakaan paling sedikit 0.10 per kapita per tahun.

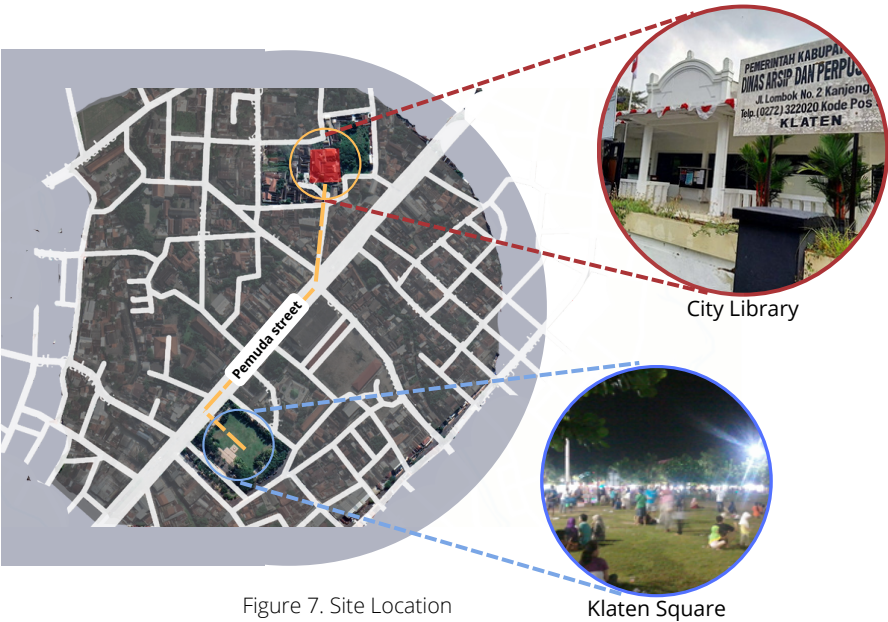
Contoh Perhitungan Jumlah pengunjung:

No.	Jumlah Penduduk (jiwa)	Jumlah pengunjung	Keterangan
1	< 200.000	2.000	
2	200.000 - 300.000	3.000	
3	300.000 - 400.000	4.000	
4	dst. (kelipatan 100.000)		Penambahan 1.000 pengunjung

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2.2 Site Analysis

2.2.1 Site Location



This research presents design proposals in the future so that the location used is a location that is still actively used. This is the location of klaten's old library which is located in Lombok street, No.2, Kanjengan, Central Klaten, Klaten. This location is chosen based on consideration of the closest distance to the author, so that the author can make observations of the site directly.

This site is near to City Park of Klaten/ Klaten square. As educational place, it could be the option for people to bring their children to library rather than square/city park. This site is located in local road which is safe for children, and it has quite wide space and condusive enough for learning activities. It has 1,009.97 m² area, and distance about 450 m from the Klaten City Park & Klaten Square.



Figure 8. Distance of site to city entertainment venues

Address

Lombok street, No.2, Kanjengan, Central Klaten, Klaten

Coordinate

-7.70104041723218,
110.60307502588937

Site Selection Consideration

- In the City Center
- Near to residentials
- Near to public entertainment venues
- Non-green area
- Road type

2.2.2 Land Use & Building Code

Boundary Line

The boundary line is the outer boundary where a building is built. This is stated in the building regulations, but sometimes the information is not indicated in general and the size is not written in detail. In general, the border line of the building against the road is equal to half the width of the road, to be safer plus 1m. In this project, the site is at the end of the road and the width of the road is 6m, so the Building Boundary Line is 3m. If it is added 1m, then it becomes 4m.

Building Coverage

60%

$$60/100 \times 3000 = 1800 \text{ sqm}$$

Floor Area Rasio

2,0

$$2 \times 3000 = 6000 \text{ sqm}$$

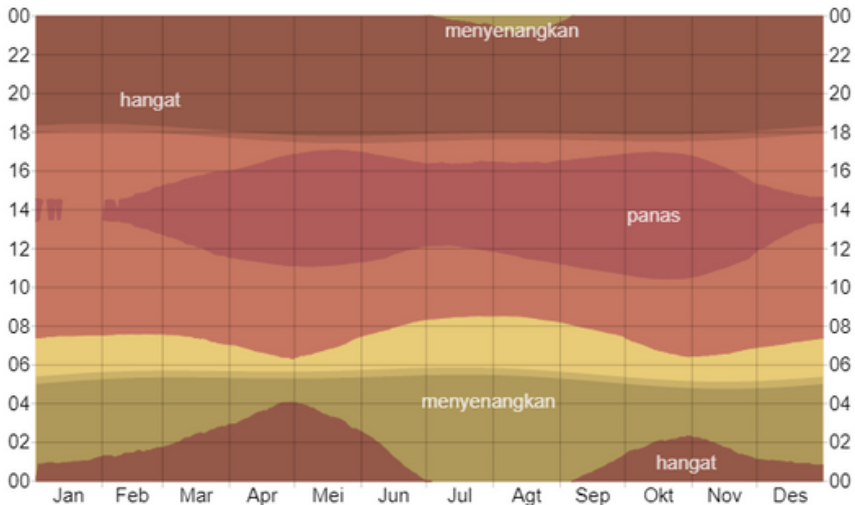
Green Space Rasio

15%

$$15/100 \times 3000 = 450 \text{ sqm}$$

2.2.3 Climate Data

Klaten Regency's climatic conditions include tropical climates with rainy and dry seasons changing throughout the year. The average air temperatures are 28–30 degrees Celsius and rarely below 20°C or above 35°C with an average wind speed of about 153 millimeters per month with the highest rainfall in January (350 mm) and the lowest rainfall in July (8 mm).



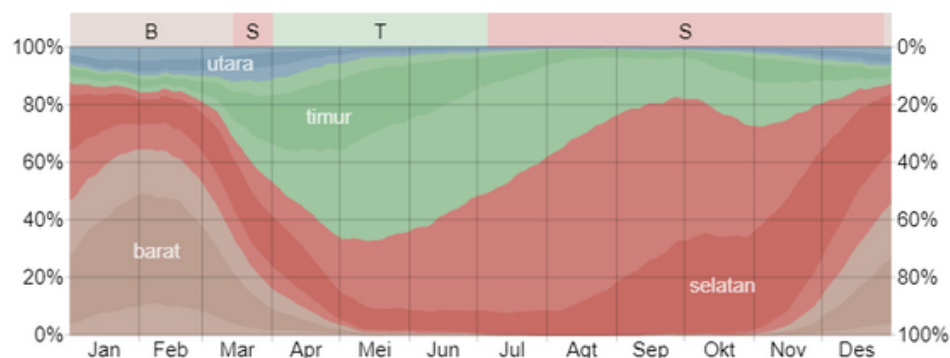


Figure 10. Data of Wind direction in a year in Klaten

August 28 is the windiest day of the year, the speed and wind direction vary depending on local topography and other factors. But in Klaten, most of the winds come from the southwest and the average daily wind speed is 13.8 kilometers per hour. On April 2, the quietest day of the year, the average daily wind speed was 7.4 kilometers per hour.

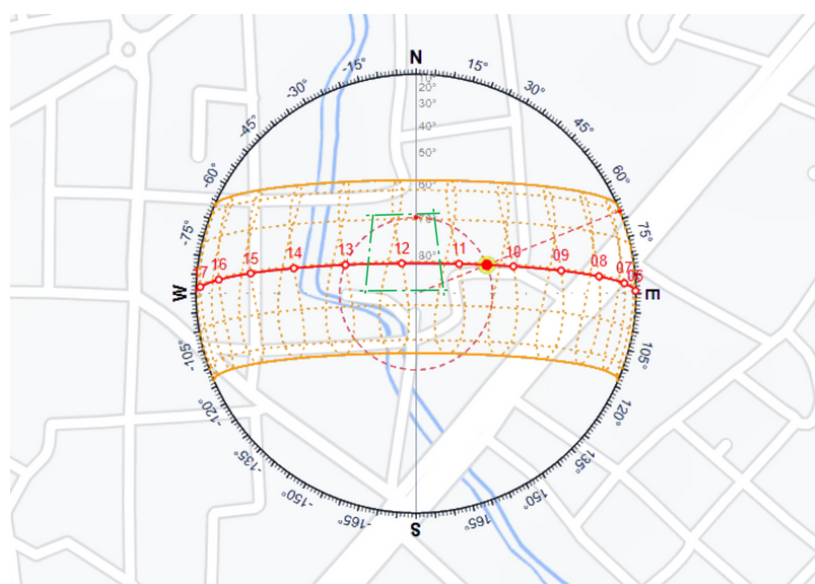


Figure 11. Data of Sunpath in the site

2.2.4 Site Analysis

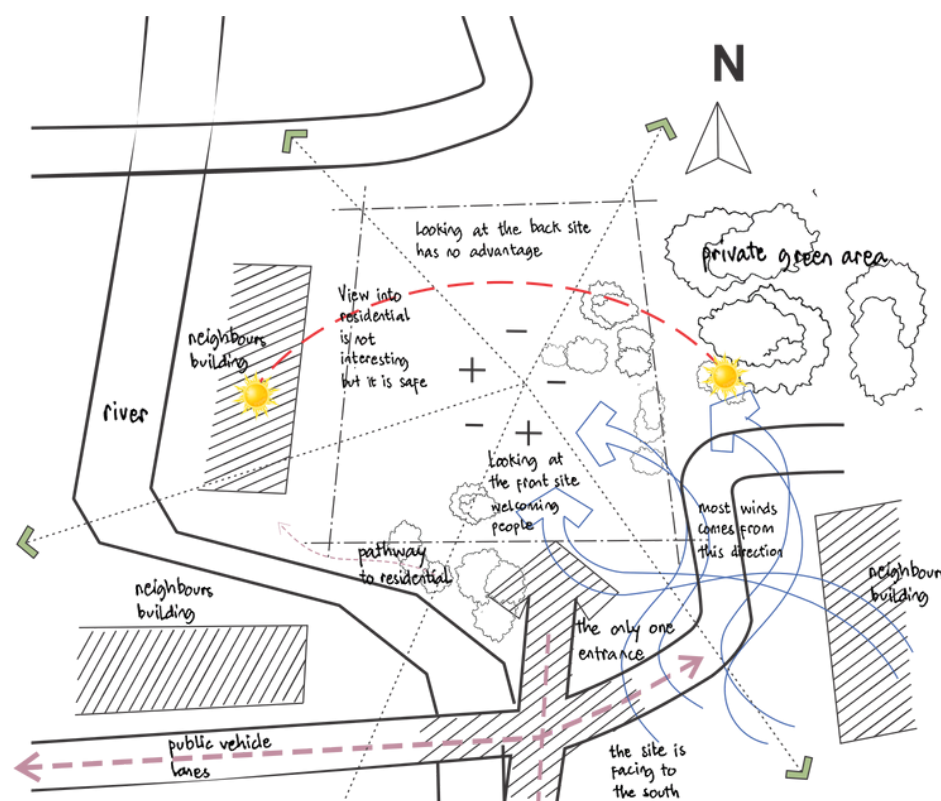


Figure 12. Data of Sunpath in the site

About the soil type, this area has regosol and alluvial soils. It is formed from deposits of volcanic material from Mount Merapi. The distribution of this type of land is in the central part of Klaten Regency and dominates the type of land in Klaten Regency. Both types of land are fertile soil so it is suitable to be used as agricultural land. This is one of the considerations for site selection, which should not be just building on green land or vacant land that has the potential to be used as agricultural land.

2.2.5 Neighborhood Context



Figure 13. Data of Wind direction in a year in Klaten

The site is surrounded by residential in local road. It is near to Pemuda Utara street that surrounded by retails. If we go to the southwest we will find Klaten Park and Klaten Square that was the public entertainment. The buildings around this location have a height of at most 1 floor, and it is very rare to find 3 floors.

The square and the city park have always been a crowded place to visit, there are groups of sellers, from those on the side of the road to the pedestrian area of the square itself. Every Sunday morning is the most beautiful time in the square since the elimination of routine Car Free Day activities every Sunday morning.

2.3 Literature Review

2.3.1 Children's Library

2.3.1.1 Learning through playing

Play is an activity that children love, and being with friends makes children feel more enjoying the game (Collivera & Veraksa, 2019). Learning while playing is a learning method whose purpose is to create a pleasant learning atmosphere. In (Huang, 2013) it is stated that in Asian cultures, Asian parents consider play hours to be limited so that children have more time for academic learning. But in western culture, as in America, American parents actually let them play and encourage children to explore their world more. They see the important role of games and do not worry about children's academics because they think academic achievement is influenced by innate abilities in children's own individuals.

Quoted from jadiguru.id, active learning is learning in which the portion of student interaction with learning resources is more than the interaction between students and teachers. That way, it can be said that good learning is what encourages students to explore their world directly. In terms of this children's library, the library is a place as well as a medium that encourages children to explore directly their learning resources, namely their world and the surrounding environment. Learning while playing becomes a good vehicle to take children towards active learning. The active learning system helps children have the awareness to build good literacy skills, which is the main purpose of this library. Children learn to know their world, the world of literacy, and even the academic world, through an introduction to the library environment, they learn to make friends with books and science, as well as learn to socialize, interact, tell stories, and express ideas of thoughts with their peers.

In a study conducted in China on kindergarten children regarding a concept of learning science through games (Ma, Wang, Fler, & Li, 2021) gave the results that games make children happy so that they affect children's activeness in

taking on roles during the learning process. Games involve emotions and active thinking, it gives children the opportunity to think actively and creatively to solve for themselves the problems they find in science (Ma, Wang, Fler, & Li, 2021). In a study (Huang, 2013), it was found that children could not distinguish between play and learning when a lesson was conceptualized in a game. Learning while playing is considered effective because in the learning process, children show interest and enthusiasm during the learning process. In research by (Pyle & Alaca, 2016) is found that more and more educators are using the learning method while playing, it will build up the possibility of perception in children that games will indeed end up leading to academic learning. Some of these studies have shown that games can be a medium to increase the effectiveness of the learning process.

Playing while learning helps children to go through the stages of self-development (Ritonga & Dilena, 2022). A study cited in Huang's research (Nourot, 2007, p. 2) reminds us that play does not interfere with the curriculum system, but rather play is the best way to implement the curriculum, with the addition of notes from the author, as long as the play system has been carefully conceptualized in the learning system. Planning is the key to the success of this method. On the Website of the Australian Children's Education & Care Quality Authority (ACECQA) it is stated the importance of the role of play in the learning process, namely in the aspects of physical development, social-emotional development, cognitive development, to literacy-numeracy development. Even without the help of adults, children actually have the potential to be able to grow on their own through games. So that adults only need to facilitate and supervise the development of children in the learning process (Huang, 2013).

2.3.1.2 Children's learning space design optimization

The library was then designed not only as a building that provides books, but also as a fun community place for children to learn to be active independently to explore new things through their world and social interactions with their peers. So that the library no longer stands only as a space, but also as a place that is in the hearts of children. In a study written by (Turner, 2017), it was explained that, what is meant by place, is an important object to observe as a guide to know and understand the human being. In relation to the design of libraries for children, then what we need to pay attention to is how to design a place for children? In the next quote from (Lippard, 1997, p. 7) in his research (Turner, 2017), place is not just a physical space, but a place that provides experience, good impression, and comfort so that it becomes very familiar and exposed in the minds of its users. A space that has been transformed into a place will be a living space that creates activity and effectiveness in it.

The creation of a space design that combines learning and play activities has proven successful. The libraries include the Vejgaard library and the Aarhus Public Library, designs that are made child-friendly and encourage children to move around and talk a lot. Besides being good for children's development, this design of the combination of learning and play has proven to attract the attention and favor of children. This can be seen from the significant development of the number of children visitors in the library data that has been studied (Hassinger-Das, et al., 2020). Space is designed based on our goal, the example is if we want to create an environment that encourage children to communicate each other, we need to make the group seat more than the individual seat. In this children's library case, we want to encourage children to love learning process, especially developing literacy skills. Then we have to increase children's interest, make an interactive space, for outdoor and interior design.

In a study conducted by (Hassinger-Das, et al., 2020), they observed statistical data on the attendance of children in 4 libraries, of which 3 libraries are libraries designed with study-and-play rooms and 1 other library is a library without

a study-and-play room design, it was found that there was a significant difference in the number of attendance and length of time spent by children in the library. Libraries with a study-and-play room design experienced an average increase in the number of children's attendance by up to 189%, while libraries without learning-and-playing rooms actually experienced a decrease in children's attendance by up to 304%.

The library is designed to facilitate children's reading, learning and development activities, the learning environment formed in the library will be able to arouse the passion for learning in children and encourage children to observe, explore and adventure in the environment. This will contribute to cognitive development and support the development of creativity, support social skills, as well as hone children's ability to obtain information from the surrounding environment (Pickle, 2014). A good learning environment always offers a wide selection of activities and opportunities for children to learn new things. In terms of design, the library divides the study area into 2, namely outdoor and indoor, and every corner of the library is designed to make it easier for children to find books and read.

The provision of open space is one of the important considerations because outdoor areas are needed to support activities that support children's physical development, exploration power, and observation skills. Children need to be given the opportunity to gain their own learning experience from their learning environment without being guided. Open space becomes a good medium to build independence and responsibility in children. In their observations in the open space, children learn to exercise the sensitivity of their five senses to recognize, and classify the objects that are around them. Seeing mangoes is rated as food, seeing a sandbox as a play tool, a tent or tree shadow as a rest area, and friends to communicate and play (BAKAR, 2007). The author explains that the natural environment is much better at supporting the development of children than the man-made environment. But in general, the children's learning environment has 3 important roles

for children, namely:

- 1. environment as a source of stimulation and feedback
- 2. environment as a source for social play
- 3. environment as a set of affordances

In research (Acar, 2014), it was mentioned, if we want to design an open space, then we must use natural materials such as plants, water, sand, where these materials can be manipulated in shape or played, thus providing direct experience to children. According to observations (BAKAR, 2007), the differences in the play experience offered by both natural and man-made environments to children are as follows:

- 1. Most man-made environments are fixed, there will be no change in their shape, color, and texture because adults have set their shapes and layouts. Children will judge that there are no new experience opportunities and challenges to the game. Unlike natural environments such as rivers or plants that have dynamic elements, brands can experience changes in shape, color, and texture, even smell.
- 2. Playgrounds provide the same opportunities as nature for children to interact with their peers, but offer fewer things to explore, narrower areas, and fewer dynamic elements. While the outdoors offers freedom of play because it is a multipurpose space.
- 3. The outdoors offers more opportunities for social interaction, high exploration opportunities allow children to have different preferences, so an interest in sharing and competing with each other arises.

There are 5 forms of environment exemplified by (Pickle, 2014) :

- 1. Environment with animals, helping children get to know living things and habitats directly
- 2. Water and sand, helping children hone creativity
- 3. Fixed equipment, although the opportunities for creativity offered are very limited and even non-existent, but it is quite contributing in supporting the physical development of children and helping children learn to know their limits.
- 4. Sapces and special equipment (sport), giving children the opportunity to hone their sports skills

5. Outdoor, helps children learn to observe and experience in the outdoors



1. Environment with animal.
Photo by Kai-Chieh Chan:
<https://www.pexels.com/>



2. Playing sand.
Photo by Yan Krukov:
<https://www.pexels.com/photo/a-girl-playing-with-grains-of-salt-8435800/>



Photo by Luna Lovegood:
<https://www.pexels.com/photo/boy-jumping-near-grass-at-daytime-1104014/>



Photo by Allan Mas:
<https://www.pexels.com/photo/a-nonymous-girl-playing-basketball-on-playground-5623064/>



Photo by Caleb Oquendo:
<https://www.pexels.com/photo/kid-climbing-on-ladder-on-playground-7388490/>



Photo by cottonbro:
<https://www.pexels.com/photo/blonde-girl-looking-at-the-binoculars-9293404/>

Referring to the evidence-based playground design research by (Anne Dahl Refshauge, 2013) which divides the game into 4 based on other research sources (Smilansky, 1968), namely: functional, dramatic, constructive, and games. Functional play means playing with muscle movement, such as jumping, running, rolling, spinning, climbing. Dramatic play means playing with a role and using objects as representative of children's imagination. Constructive means children are playing by build something with loose objects, and games mean playing with some rules. Open space is the best play area for kids to play games that involve physical movements such as running. Areas that have loose objects such as sand, water, leaves, wood have the potential to become constructive play areas. And areas that have loose vegetation arrangements or stage-like constructions have the potential to invite dramatic play.

The way to combine the design concept of an outdoor area with indoor is to equate the nature of the elements. In the outdoors, children get the opportunity to manipulate objects such as building sand castles, stacking stones, and making footprints on the ground. So for indoor areas we need to provide elements that children can manipulate as well, for example providing movable objects, shaped bean bags, or special walls for doodling (Biddle, Garcia-Nevarez, Henderson, & Valero-Kerrick, 2013)

In D.K. Ching (2002), interior design is planning the layout of the space in the building. Interior design elements consist of floors, walls, ceilings, windows, doors, stairs, furniture, lights, and decorations. According to Kugler, the elements that can shape interior design are space, variety, hierarchy, personal area, lighting, air conditioning, sound, air temperature, and style. In research (Rook, Choi, & McDonald, 2015) to build social skills in children, children need to be allowed to interact and participate in a group. The way to facilitate it is to design a group seating arrangement that each has different directions of view.

In an article in archdaily.com (Cutieru, 2021), the authors studied research from the University of Salford (2015) and found factors that affect children's physical comfort in the classroom, including temperature, light, air quality, its relationship to nature, and sound. While color is just a stimulus. In this study, it was found that the physical comfort built from the relationship between nature and the learning space supports children's ability to thrive. Also the comfort formed by getting the opportunity to have a sense of ownership, such as having his own room, training the child to have a sense of responsibility. Comfort can be formed by creating spaces with different flavors, such as making corners with slides and rope swings may be active and loud, while corners with parks and benches may inspire quieter reflection. Many playgrounds try to make the most of the space by placing additional elements such as chairs or blackboards under platforms and climbing structures. Separating space based on energy levels creates space for different types of activities. Different kind of atmosphere in the site will give children option to do what they want, either playing, talk and laugh with their friends, or secretly daydream.

Even though we already know what make children feel comfort, as we have told before, we don't focus on comfort, but safety. Safe environment will encourage children to explore and learn more from the environment. Then this library will be discussed focusing on safety aspects, starting from the security of functions in the learning environment and followed by discussing security in building systems, especially fire protection systems. This is to support children's freedom to explore without having to let them or parents feel worried so as to interfere with the existing learning process.

2.3.1.3 Safe learning and playing space

Here we divide the safety into 2, safety in public space and building safety. In terms of safety in public space, we pay attention to things that are not safe in the design of the space and can harm children. And building safety is the safety of systems in buildings such as electrical, machinery, and fire hazard protection. By observing accidents that usually occur in children, (Senda, 2015) writes there are 3 plots of how accidents in children can occur:

- 1. Because of the child's own behavior, such as haste or dangling children's clothes. This can be addressed with increased user security.
- 2. The structure of the play equipment that makes the fabric easily stuck or the boundaries are too low so that children are easily dropped if exposed to pushes. This can be addressed with increased spatial security.
- 3. The environment, such as the absence of adult supervision, or the surface texture of materials such as paving. This can be addressed by increased environmental safety.

Here we only focus on the saefety of building element, which are number 2 about safety of equipment (form), and 3 about safety of environment (space).

2.3.1.3.1 Outdoor Safety

In outdoor areas, we will focus on architectural issues, namely environmental safety, and refer to the U.S. Consumer Product Safety Commission (2015). General playground consideration related to architectural design are playground layout and surfacing.

a. Playground Layout

It consist of :

- Accessibility
- Age separation
- Conflicting activities
- Sight lines
- Signage or labelling
- Supervision

Accessibility means that the playground can be accessed easily by children with dissabilities. Age separation means the division of play zones because younger children (preschool age) have a slower ability to move than older children (school age). Conflicting activities means we need to separate between active area and passive area. Active area mostly in the form of open space, where children have opportunities to run or jump. Passive areas mostly are areas with manipulatable objects such as sand, soil, wood, and water. Sight lines means playground needs to be designed with a visual limiter with a low altitude, so as not to hinder adult supervision of children.

b. Surfacing

Protective surfacing is important as part of environmental safety. There are two options for surfacing, namely: unitary and loose-fill materials. The difference is, whose form of unity cannot be separated2 and manipulated its laying. While the loose-fill ones can be placed according to the existing container or can be spread out only. In general, the unity materials commonly used are rubber mats and tiles, but it can also be with a combination of other materials that can absorb the child's shock energy when falling on it. For the loose-fill material, ngineered wood fiber (EWF) is a wood product specifically designed to be used as a playground security surface, both under and around playground equipment.



In this book, the CPSC team recommends not creating playgrounds on surfaces that have been hardened, such as asphalt, concrete, or hard packed earth. If we still want to create a playground in the area, we must make several layers of protection with shock absorbing materials to avoid injuries when falling. Below is indicated the minimum depth of stuffing of loose material required according to the type of material and the tolerable height of the fall. However, maintenance needs to be done periodically to replace loose fillings that have been compressed because they are often used and have undergone weathering so that the effectiveness of shock suppression remains good.

Table 2. Minimum compressed loose-fill surfacing depths				
Inches	Of	(Loose-Fill Material)	Protects to	Fall Height (feet)
6*		Shredded/recycled rubber		10
9		Sand		4
9		Pea Gravel		5
9		Wood mulch (non-CCA)		7
9		Wood chips		10
* Shredded/recycled rubber loose-fill surfacing does not compress in the same manner as other loose-fill materials. However, care should be taken to maintain a constant depth as displacement may still occur.				

Here is some equipment can be installed refer to the U.S. Consumer Product Safety Commission (2015) based on children's age and capability

TABLE 1. EXAMPLES OF AGE APPROPRIATE EQUIPMENT		
		
Toddler — Ages 6-23 months <ul style="list-style-type: none">• Climbing equipment under 32" high• Ramps• Single file step ladders• Slides*• Spiral slides less than 360°• Spring rockers• Stairways• Swings with full bucket seats	Preschool — Ages 2-5 years <ul style="list-style-type: none">• Certain climbers**• Horizontal ladders less than or equal to 60" high for ages 4 and 5• Merry-go-rounds• Ramps• Rung ladders• Single file step ladders• Slides*• Spiral slides up to 360°• Spring rockers• Stairways• Swings – belt, full bucket seats (2-4 years) & rotating tire	Grade School — Ages 5-12 years <ul style="list-style-type: none">• Arch climbers• Chain or cable walks• Free standing climbing events with flexible parts• Fulcrum seesaws• Ladders – Horizontal, Rung, & Step• Overhead rings***• Merry-go-rounds• Ramps• Ring treks• Slides*• Spiral slides more than one 360° turn• Stairways• Swings – belt & rotating tire• Track rides• Vertical sliding poles
* See §5.3.6	** See §5.3.2	*** See §5.3.2.5

2.3.1.4 Risk assesment

Children are in the growth phase and do not yet have a mature thinking logic, this causes children to easily get involved in events and get caught up in circumstances that endanger themselves. In anticipating the potential dangers and risks of injury to children, risk management is needed, namely taking into account the risks that may occur and managing the way they are handled and handled. For this reason, we adopt the risk severity matrix from AS 4685.0 for assessing potential risks in children library. Some things in the table are removed according to architectural needs. The following is a table to guide the calculation of the risk scale. and its grading table can be seen in point 3.2.2.1.

Risk severity matrix adapted from AS 4685.0

Likelihood	5	L	M	H	H	U
	4	L	M	M	H	H
	3	L	L	M	M	H
	2	L	L	L	M	M
	1	L	L	L	L	L
		1	2	3	4	5
Consequence						

Risk Score

Legend		Score
L	Low Risk	1 to <8
M	Medium Risk	8 to <13
H	High Risk	13 to 20
U	Unacceptable	>20

The risk score is calculated by multiplying the likelihood rating with the potential consequence rating to quantify the risk event according to risk rating

Likelihood of an injury is rated as:		Potential consequences of an injury is rated as:	
1	Rare (highly unlikely event)	1	Little or no injury
2	Unlikely (conceivable event)	2	Minor injury requiring first aid
3	Possible (could occur event)	3	Moderate injury causing absence from school
4	Likely (almost certain event)	4	Serious injury with long term consequences
5	Almost certain (will occur event)	5	Death or major disability

2.3.2 Building Safety

2.3.2.1 Fire Protection

Refers to SNI (Indonesian National Standard), Fire protection systems in buildings and the environment are systems consisting of equipment, completeness and facilities, both installed and built in buildings that are used both for the purpose of active protection systems, passive protection systems and management methods in order to protect the building and its environment against fire hazards.

As for designing this fire protection system, we will use 4 parameters, namely Site Equipment, Rescue Facilities, Active Protection Systems, and Passive Protection Systems, which refers to the Fire Table assessment from Prof. Ar. Noor Cholis Idham, S.T., M.Arch, Ph.D., IAI where this assessment refers to:

- SNI 03-1735-2000, Procedures for planning building access and environmental access for the prevention of fire hazards in house and building buildings
- SNI 03-1746-2000, Procedures for planning and installing exit facilities for rescue against fire hazards in buildings
- SNI 03-6464-2000, Emergency management procedures for buildings
- SNI 03-6652-2002, Procedures for planning the protection of buildings and equipment against lightning strikes
- SNI 03-7012-2004, Smoke management system inside malls, atriums, and large volume rooms

No.	KSKB Parameters	KSKB Value (%)	Total Value
1	Site Equipment	25	
2	Rescue Facilities	25	
3	Active Protection Systems	24	
4	Passive Protection Systems	26	
		100	0

Refers to regulation of the minister of public works, number: 26/prt/m/2008, december 30, 2008 on technical requirements of fire protection systems in building and environment :

1. Site planning is a plan that regulates the building site, including the layout and orientation of the building, the distance between buildings, the placement of yard hydrants, the provision of open spaces and so on in order to prevent and minimize fire hazards. And the completeness of the site referred to above is the need for a tread scale that is included in the series of fire protection such as Water sources, Environmental Road, Distance Between Buildings, and Yard Hydrant.
2. Rescue facilities are facilities that are prepared to be used by residents and firefighters in an effort to save human lives and property in the event of a fire in a building and the environment.
3. An active fire protection system is a complete fire protection system consisting of a manual or automatic fire detection system, water-based fire extinguishing systems such as sprinklers, standpipes and fire hoses, as well as chemical-based fire extinguishing systems, such as fire extinguishers and special extinguishers.
4. Passive fire protection system is a fire protection system that is formed or built through regulation of the use of building structural materials and components, compartmentalization or separation of buildings based on the level of resistance to fire, as well as protection against openings.

According to research (Pitri, 2019) in the journal Library Science, he mentioned several factors for the occurrence of fires in the library environment:

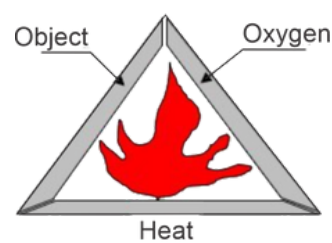
1. Electrical short circuit in a building
2. Lightning strikes that hit flammable materials
3. Earthquakes can be the initial cause of the occurrence of blaze (less likely)
4. The carelessness of people, both library users and

librarian

- 5. Because of someone's bad intentions
- 6. Due to the presence of a stove, gas cylinder or electronic device that explodes

Based on the fire service article (2020), there are three elements that form a fire (can be seen in the picture):

- There are flammable materials either in the form of liquid solid materials or gas (wood, paper, textil, gasoline, oil, acetelin etc.)
- There are high temperatures caused by heat sources such as sunlight, electricity (cortsluiting, mechanical energy heat (friction), chemical reactions, air compression
- There is Oxygen (O₂) which is sufficiently contained. The greater the oxygen content in the air, the greater the fire will be. At an oxygen content of less than 12% there will be no fire. Under normal circumstances the oxygen content in the air is 21%, it is quite effective for the occurrence of fires



Based on the elements that cause the fire, there are 3 ways that can be done to extinguish the fire, namely:

- a. By lowering its temperature below the fire temperature,
- b. Removes acidic substances
- c. Keep flammable items away

Quoted from the fire service article (2020), the National Fire Protection Association (NFPA) established 5 classes of classification of types of fires, namely:

- 1. Class A: Sourced from fire objects such as wood, paper, and cloth
- 2. Class B: Sourced from fire objects such as motor vehicle fuel, paint, and solvents

- 3. Class C: Sourced from electrical short circuit, electronics, and machinery
- 4. Class D: Sourced from fires of metal objects, such as magnesium, lithium, calcium, sodium, etc.
- 5. Class K: Sourced from cooking utensils and ingredients, such as vegetable oils and animal fats

A		Ordinary Combustibles	Wood, Paper, Cloth, Etc.
B		Flammable Liquids	Grease, Oil, Paint, Solvents
C		Live Electrical Equipment	Electrical Panel, Motor, Wiring, Etc.
D		Combustible Metal	Magnesium, Aluminum, Etc.
K		Commercial Cooking Equipment	Cooking Oils, Animal Fats, Vegetable Oils

Parameters related to project's problem

Here is the contents of fire table assesment that is related to IQRA' children's library and the problem solving will be discussed

A. Site components		The compatibility with IQRA' children's library
1	Water source	V
2	Environmental street	V
3	Distance between building	V
4	Yard hydrant	V

B. Rescue facilities		The compatibility with IQRA' children's library
1	Exit	V
2	Exit Construction	V
3	Helicopter pad	X

C. Active protection systems		The compatibility with IQRA' children's library
1	Detector and Alarm	V
2	Siamese Connection	V
3	Light fire extinguisher	V
4	Building hydrant	V
5	Sprinkler	V
6	Overflow Extinguishing System	X
7	Smoke Control	V
8	Smoke detector	V
9	Smoke removal	V
10	Fire lift	X
11	Emergency light and Directions	V
12	Emergency electricity	V
13	Operation control room	X

D. Passive protection systems		The compatibility with IQRA' children's library
1	Fire Resistance in Building Structure	V
2	Space Compartmentization	V
3	Aperture Protection	V

2.3.2.1.1 SITE EQUIPMENT

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point Value	Weight	Component Values	Sum of Values
1	2	3	4	5	6	7
I. Site Equipment						
1	Water Source		FALSE	27	0	25
2	Neighborhood Street		FALSE	25	0	
3	Distance Between Buildings		FALSE	23	0	
4	Yard Hydrant		FALSE	25	0	
						0

1. Water Source

It is water supply for hydrant. There are 3 kinds: underground, on the ground, and on top of building. Generally, water sources come from PDAMs, but can also be combined or replaced with other water sources, such as rivers or dams. For water sources such as rivers, lakes, or dams, we need to use special hydrants called Suction Fire Hydrants.

Water tanks for this fire must be separated from water tanks for building users (toilets), because they are emergency. The contents of the fire tank must always be full. For example, a tank uses 1/3 for emergency water, and 2/3 nys for daily use. So every day the tank must be filled with water more than 1/3, so as not to take emergency water rations.

Then how to calculate the need for water from a water source for a fire? This depends on the potential hazard to the building. In this case, the library belongs to a mild danger. To fill the tank, it takes approximately 1 hour (for light hazard). Based on SNI 03-1745-2000, the water supply for building hydrants must be at least 400 liters / minute, and be able to drain water for at least 30 minutes. The need for such water can be calculated using the formula:

V = Q x t

V = Volume of water required by hydrants (liters)

Q = Flow discharge for hydrants (liters/min)

t = Water supply time (minutes)

But we will not calculate the volume of the amount of water needs in the water tank, because to calculate the water needs we need to know the pressure of the water discharge, and this is no longer part of the architecture.

2. Neighborhood Street

Referring to PERMEN PU 26/prt/m/2008, it is stated, "to protect against the spread of fires and facilitate extinguishing operations, in the building environment of the building, there must be an environmental road with pavement so that it can be passed by firefighting vehicles". That road should be available with a minimum width of 6m, given hardening, and the width of the driveway should be at least 4 m.



3. Distance Between Buildings

Referring to PERMEN PU 26/prt/m/2008, "to protect against the spread of fires, an access point for fire trucks must be provided and a distance is determined minimum between buildings".

No	Building height	Minimum distance between buildings
1	s.d. 8	3
2	> 8 s.d. 14	> 3 s.d. 6
3	> 14 s.d. 40	> 6 s.d. 8
4	> 40	> 8

4. Yard Hydrant

Referring to PERGUB, "Yard Hydrant is a facility outside the building equipped with a valve to connect a hose to a water supply system". To determine the number and point of yard hydrants, you can use SNI 03-1735-2000 item 5, as a reference criterion for planning, namely yard hydrants are placed in a fire-safe location with a maximum radius of 50 m or a maximum length distance of 100 m between hydrants. In the installation of the hydrant, there are other important components:

1. Hydrant water source (water tank, river, or pond)
2. Pump. A special room is required for the pommpa room. This room contains a control panel, pump hydrant, various pipes, pressure tanks, and others. The whole component is a driving machine for distributing water media to various functions.
3. Hydrant Pillar. Hydrant pillar is a network that outputs the exit of water media produced from the hydrant system.
4. Hydrant box
This hydrant box is a box where hydrant accessories are stored such as fire hoses, hose racks, nozzles, valves, and siamese connections. These accessories support the work of the hydrant pillar to reach the fire point.

There are 2 types of yard hydrants, namely wet barrel hydrants and dry barrel hydrants. Wet hydrant barrels have a shut-off valve above ground level. While the dry hydrant barrel has a shut-off valve located at the bottom of the ground level. This dry hydrant barrel is usually only used in countries with 4 seasons to avoid freezing in piping channels. So, when finished using it, the water in the hydrant must be drained or pumped to the end so that no water freezes during cold weather.

2.3.2.1.2 RESCUE FACILITIES

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point Value	Weight	Component Values	Sum of Values
1	2	3	4	5	6	7
II. Rescue Facilities						25
1	Exit		FALSE	38	0	
2	Exit Construction		FALSE	35	0	
3	Helicopter Pad		FALSE	27	0	
						0

1. Exit

Exit is part of the rescue facility that discusses the means of exit to the fire escape in the event of a fire. This facility needs to provide an evacuation route consisting of: exit facilities, exit directions, emergency exits, assembly areas. Assembly area is a safe gathering place to protect the users and visitors of the building from the ruins of the building during a fire or earthquake. Its safest distance is 20 meters from the building.

As for the rules for the procurement of means of exit:

- Minimum floor 2 exit doors with an effective height of 2.5 m
- Each exit must be protected from fire hazards.
- Maximum mileage 20 meters from the exit.
- Minimum size 200 Cm
- The distance from an exit is not > 6 m
- The door from the inside does not open directly to the stairs, The use of swinging doors does not interfere with the process of exiting.
- Smoke-free lobby is provided with TKA 60/60/60 there is an exit given positive pressure.
- Exits should not be blocked
- Exit leading to R. Open

2. Exit Construction

As for the rules for the procurement of means of exit:

- Construction lasts a minimum of 2 hours
- Must be barrier-free
- Width of at least 200 cm.
- Canal road protected against fire, Non-combustible material, Ceiling has resistance Fire passage is not < 60 minutes
- At a certain level, building elements can maintain the stability of the structure in the event of a fire
- Can prevent the passage of fire smoke.
- Enough time for the evacuation of residents
- Access to buildings should be provided for the actions of firefighters

Here, we don't talk about helicopter pad because it is not important for children's library.

2.3.2.1.3 ACTIVE PROTECTION SYSTEMS

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point Value	Weight	Component Values	Sum of Values
1	2	3	4	5	6	7
III. Active Protection Systems						
1	Detection and Alarm		FALSE	8	0	24
2	Siamese Connection		FALSE	8	0	
3	Light fire extinguisher		FALSE	8	0	
4	Building hydrants		FALSE	8	0	
5	Sprinkler		FALSE	8	0	
6	Overflow Extinguishing System		FALSE	7	0	
7	Smoke Control		FALSE	8	0	
8	Smoke Detection		FALSE	8	0	
9	Smoke removal		FALSE	7	0	
10	Fire Lift		FALSE	7	0	
11	Emergency light		FALSE	8	0	
12	Emergency electricity		FALSE	8	0	
13	Operational control room		FALSE	7	0	
						24

1. Detection and Alarm

There are 3 types of detection tools:

1. Smoke Detector

Smoke Detector serves to detect smoke arising from fires. Smoke produces more particles as the intensity of the fire increases. If the smoke particle density has reached the threshold, then the system circuit on the smoke detector will be active.

2. Heat Detector

The heat detector functions as a heat detector and gives a signal to the panel, so that the alarm bell will sound and the indicator light will light up. The system will work if the room temperature increases to 68 degrees Celsius due to the flame.

3. Fire Detector

Flame Detector is a fire detection device that is sensitive to ultraviolet (UV) radiation that arises from the flame. However, this detector does not react to room lamps, infrared and other light sources that are not related to fire.

An alarm system can sound in 2 ways:

- 1. By breaking the manual glass call point / break glass
- 2. Sounds automatically after getting a signal from the heat detector

In general, there are 2 notification systems

- a. The first stage of the alarm as a sign of alert to leave the room immediately
- b. Second stage alarm as a sign of caution to evacuate yourself

2. Siamese Connection

Siamese connection is one of the supporting components in the fire hydrant system. Siamese connection serves to support water supply. If the water in the reservoir is no longer sufficient, the siamese connection is in charge of channeling water from the fire truck to the building fire fighting system. So in the process of extinguishing a fire, the water that is first used is the one that comes from the water tank, and if it has run out, then it is the water carried by the fire truck that is used while waiting for the water in the tank to replenish. Usually, siamese connections are located outside the building, easy to see, and easy to access with the appropriate amount based on the needs and area of the building.

3. Light Fire Extinguisher

If the fire extinguisher weighs more than 18.14 kg, then it is placed at a distance of no more than 1.07 meters between the top of the fire extinguisher tube and the ground. Meanwhile, for the bottom of the fire extinguisher, it is recommended to be at least 102 mm away from the ground.

For fire extinguishers that weigh less than 18.14 kg, the placement of fire extinguishers is carried out with a distance of no more than 1.51 meters calculated from the top of the extinguisher with the ground. Meanwhile, the bottom of the fire extinguishing tool should be at least 102 mm away from the ground.

LAYING BY GRADE

CLASS A. Class A fire extinguishers are able to protect areas in which there is a solid flammable material. Class A fires can be caused by materials such as fabric, rubber, paper, and wood. The requirements for the location and placement of apar class A are as follows:

To determine the minimum number of fire extinguishers needed, you do this by dividing the total floor area by the maximum floor to be protected per fire extinguisher. The distance of travel to the location of the placement of the fire extinguisher should not exceed 22.9 meters.

The size and distance requirements for the placement of class A fire extinguishers based on the level of fire hazard are explained more fully in table 6.2.1.1 NFPA 10.

CLASS C. Class C fire extinguishers are used to protect the area around which there is a voltage electrical installation. Class C fires involve a wide variety of electrical appliances. Generally, class C fires are caused by an electrical short circuit or an electrical short circuit.

CLASS K. Class K fire extinguishers are used in locations that have the potential to experience fires involving cooking components. These fires involved materials such as cooking oil used in commercial cooking utensils. This type of fire extinguisher should not be placed more than 9.1 meters from a potential danger.

4. Building Hydrant

Building hydrant is usually called hydrant box. The difference between yard hydrant and building hydrant is the shape of hydrant. In the yard, the hydrant is called hydrant pillar. And in the building (inside hydrant box) is called hydrant valve. Hydrant box consists of : fire hose, nozzle, hose rack, and hydrant valve. Hydrant valve is the output of the water.

5. Sprinkler

Sprinkler is a system that utilize heat to flush water from the water sources. It's shaped like a ball / gas cylinder mounted on the ceiling. In the technical installation, the distance between the wall and the sprinkler head must not exceed 2.3 m in a light fire hazard

4. Detector and alarm

There are 3 types of detector:

1. Smoke Detector

It serves to detect smoke arising from fires.

2. Heat Detector

It serves to detect the heat from fires until 68 celcius degrees

3. Flame Detector

It serves to detect the UV from the flame of fires

In this case, the library building is an educational building which has a low fire risk, so it only requires a smoke detector and does not need heat and flame detectors.

An alarm system can sound in 2 ways:

1. By breaking the glass manually call point / break glass

2. Auto beep after get signal from detector\

if the alarm sounds, visitors must be evacuated from the building immediately.

2.3.2.1.3 ACTIVE PROTECTION SYSTEMS

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point Value	Weight	Component Values	Sum of Values
1	2	3	4	5	6	7
IV. Passive Protection Systems						
1	Fire Resistance of Building Structures		FALSE	36	0	26
2	Space Compartmentization		FALSE	32	0	
3	Aperture Protection		FALSE	32	0	
						0

1. Fire Resistance of Building Structures

There are 3 types of construction of building structure resistance to fire according to SNI 03-1736-2000,

- 1. type A (construction whose forming structural elements are fireproof and able to withstand structurally against building loads),
- 2. type B (construction whose structure elements form the fire retardant compartment capable of preventing the passage of fire to adjoining spaces)
- 3. type C (construction whose structural components of the building are from materials that can burn and are not able to withstand structurally against fire).

2. Space Compartmentization

compartmentization is the restriction of the area to prevent the passage of fire by using fireproof materials on walls, beam columns, ceilings and floors according to the classification of building classes

3. Aperture Protection

Aperture protection means keeping people safe along the exit routes. These openings there are several types of means of protection at openings including fire doors, fire windows, smoke retaining doors and fire shutters. All such openings must be protected and have fire resistance. Each opening in the fire barrier must be protected to limit the spread of fire and the transfer of smoke from one side of the fire barrier to the other.

Description of the final results of the assessment

Reliability conditions	Physical condition of fire safety components
Good (B) (80% NKS KB 100%)	All components of the fire protection system (active protection system, passive protection system, rescue advice, tread) function perfectly, so that the building can be used optimally, where building users can carry out their activities by getting good fire protection.
Enough (C) (60%≤NKS B<80%)	All components of the fire protection system (active protection system, passive protection system, rescue suggestion, tread) are still functioning fine, but there are utility sub-components that function less than perfectly, sometimes causing interference or the capacity is less than that specified in the design / specification, so the comfort and function of the space and/or building becomes impaired.
Less (K) NKS KB 60%	All components of the fire protection system (active protection system, passive protection system, rescue advice, tread) are damaged/malfunctioning, the capacity is far below the value set in the design/specification, so that the comfort and function of the space and/or building becomes very disturbed or cannot be used completely.

2.3 Design criteria and key success

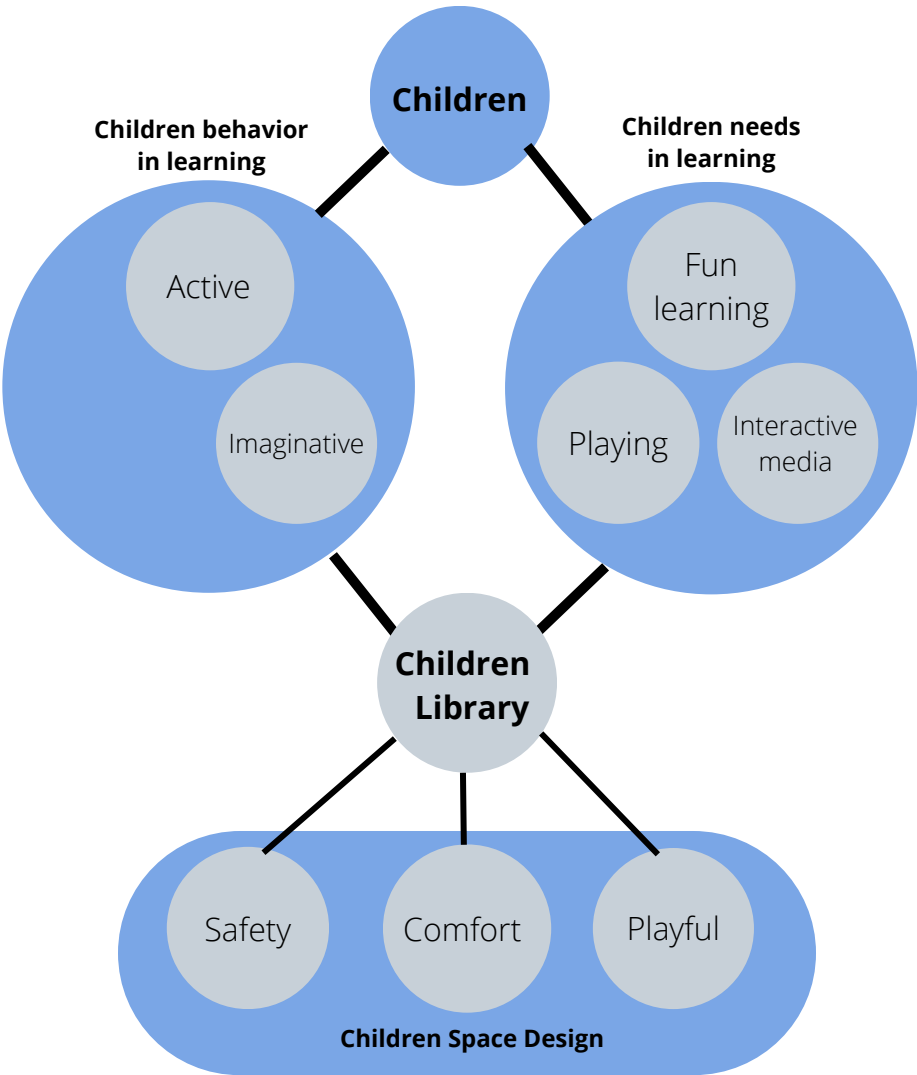


Figure 2. Design Thinking

This research supports the development of literacy culture through efforts to increase reading interest with a design approach in terms of building performance. Discussing the learning process, children have general behaviors that can be distinguished based on their age group. In this case there are 3 general aspects of children's behavior taken, namely liveliness, high curiosity, and imaginativeness. From these behaviors, the needs of children in the learning process are grouped in 3 aspects, namely fun learning, playing while learning, and interactive media. From these conclusions, the design of children's libraries is built in 3 general concepts, namely safety, comfort, and fun.

- Design that accomodate learning through playing
Safe design that supporting children's activities
Optimal design of fire protection system
Design of emergency staircase for children
- Different age group (safety)
 - Different space (safety & function)
 - Loose material (safety & function)
 - Dimension (safety & function)
 - Integrated system

03

DESIGN PROCESS

SUB - VARIABEL

INDICATOR

Learning-playing
spaces

Outdoor area

Indoor space

Safe functional
spaces

Spatial organization

Accessibility

Structure & material

Fire Protection
System

Site requirement

Rescue facilities

Active protection systems

Passive protection systems

The focus of design

As reminder, in this project we will only focus on safety aspects, which are library function safety and fire system safety . Safety can be divided into two phase : prevention and handling. Especially for fire system, it is divided into 2 phase : preventing/ controlling the fire and evacuation.

3.1 Children’s library functions

3.1.1 IQRA children's library

This building is named IQRA', which comes from arabic which means "read it". It is a basic obligation as Muslims to study.

In a hadith it is mentioned:

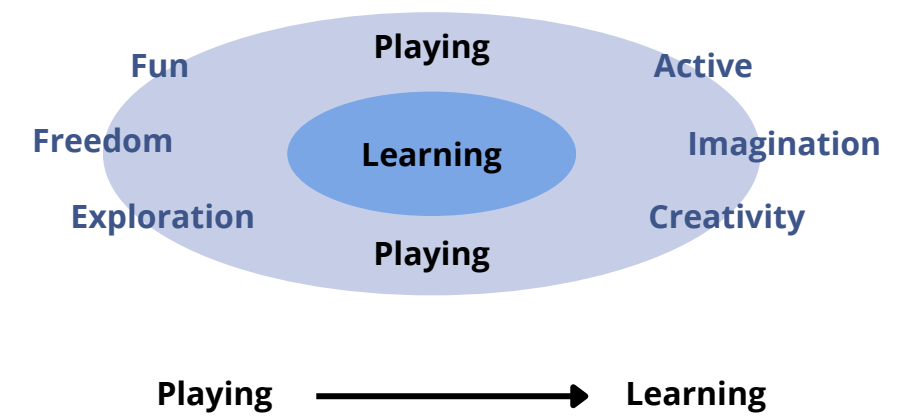
مَنْ أَرَادَ الدُّنْيَا فَعَلَيْهِ بِالْعِلْمِ، وَمَنْ أَرَادَ الْآخِرَةَ فَعَلَيْهِ بِالْعِلْمِ، وَمَنْ أَرَادَهُمَا فَعَلَيْهِ بِالْعِلْمِ

Artinya : ""Whoever wants the world, then he must master the knowledge. Whoever wants the afterlife should he master the knowledge, and whoever wants both (the world and the afterlife) should master the knowledge." (H.R. Ahmad)

This library is expected to be a medium for children to gain knowledge. Through the concept of learning and playing, this children's library is designed to facilitate children to explore their own world and learn things with pleasure. So that the library becomes a place to form a community of children who like to read, a place to refer to play after school or a place for entertainment in their spare time. IQRA' Children Library will be a bridge for children to explore the world of education through the world of play.

3.1.2 Learning and playing space

The library is designed to be a place for children to learn and play by wrapping learning activities with a pleasant playing sensation. See the illustration below.



Play is a fun activity because it gives children the freedom to explore curiosity, build imagination, practice physicality, and develop their creativity. To make this happen, the library provides a wide selection of spaces and activities, and allows children to move and communicate actively. So that the library becomes a place with a good and fun learning environment for children.

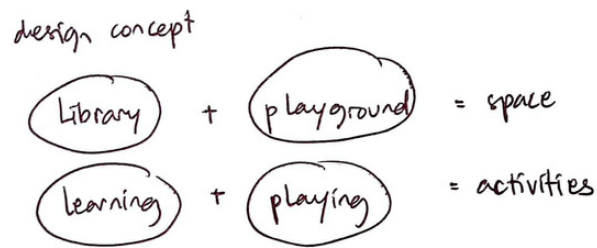
Difference between public library and children's library

Public Library	Children's library
Quiet	Loud
Passive	Active
Monotonous	Playful
Standard	Specific
Non-kid-friendly	Kid-friendly furniture
Serious, boring	Fun
The children's room is part of the library service	The library design is dedicated for children

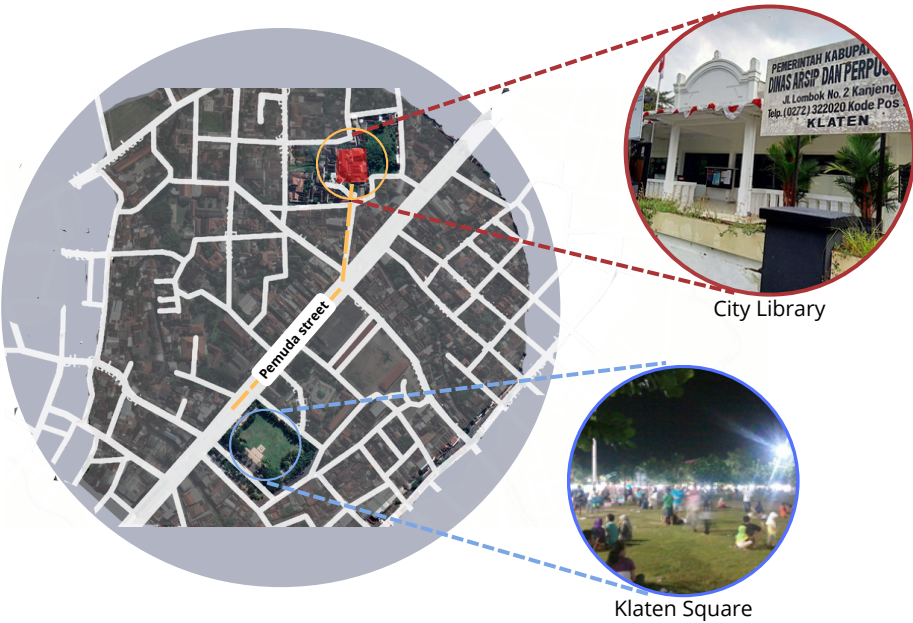
Don't	Do
Typical space design	Variety space design
Monochrom	Colorful
High shelves	Low shelves
Lamp more than daylight	Daylight more than lamp
Public standard furniture	Children's furniture

Parents do not need to worry about the risk of children who are free activities because this library is designed with due regard to the safety of the function of the children's learning area and the safety of the fire protection system in the building which will be described in points 3.2 and 3.3.

This library consists of 2 main spaces : library and playground, as part of efforts to provide alternative learning spaces that children can choose from. The other thing is explained in points 3.1.4 and 3.1.5



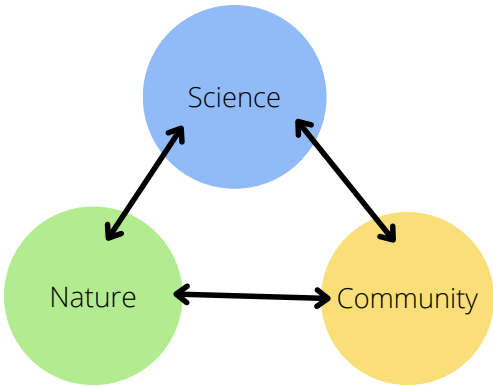
3.1.3 Site consideration



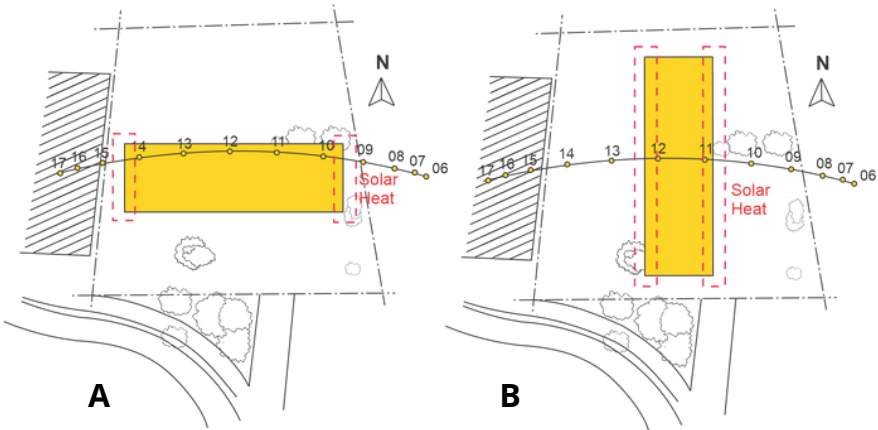
The reason for choosing this location, in addition to its conformity to rules and standards, design goals, and the ease of the author, this location is also intended to direct the focus of the community from spending time to play in the square, to spending time playing in the children's library. Because the main target is children, then the playground becomes an important icon to be the first attraction. That way, the goal of the library to build a culture of reading, improve literacy skills, and educate the community, will be achieved.

3.1.3 Playground

In this project, the playground is conceptualized to be an attraction to bridge the connection to 3 things: nature, science, and community. Playgrounds rely on their landscapes to bring children to know nature more closely. Children's library is connecting community with the science and nature.



Building orientation and it's effect to the site



Consideration of alternative A

- Reduce heat gain by minimizing the east/west facing side of the building
- The transverse building leads to the driveway and the rest of the area on the site consists of the front area and the rear area
- Vehicles are more flexible in accessing the site

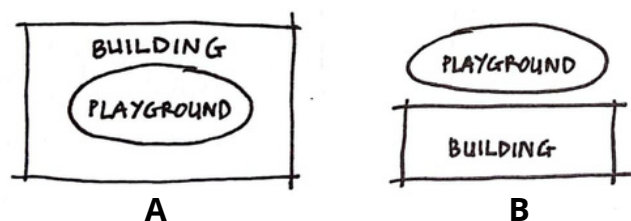
Consideration of alternative B

- The east / west facing side of the building is very spacious so it requires a secondary building skin design
- Uneconomical because it does not apply the passive cooling design concept

- The building is sideways and the rest of the area on the site consists of the right side area and the left side area
- Gives a mysterious impression and limited access to the right of the tread

Alternative A is considered better and more effective in implementing passive cooling design and providing access, and is more suitable to be applied to children's libraries because the orientation of the building gives the impression of welcoming visitors who come.

Location of the playground to the building



Consideration of alternative A (Playground located in the middle of the building)

- Provides a more intense learning atmosphere
- Children get good supervision
- Looked from the playground area, the building is divided into 4 sides
- The back area of the building will get fewer children visitors if the playground has become the center of their attention
- Noise control becomes a big challenge
- To create a large playground area, the size of the building must also be enlarged

Consideration of alternative B (Playground located outside of the building)

- Playground area separate from the building
- Children who want to go to the playground must pass through the library
- The shape of the building is not affected by the size of the playground
- The size of the playground adjusts to the needs of the building coverage area

The playground placed in the back area of the site is more effective and profitable, because the area of this site is only 3000sqm, if you use the playground option in the middle of the building, it will pose new challenges that have actually been resolved by alternative B. In addition, to build curiosity about the contents of the library, and make children feel close to the library, the playground is designed in the back area so that children always enter and exit through the area library. So that playgrounds play a role in attracting children's attention, as explained in point 3.1.2, to bring children closer to the world of learning through the world of play. If we stick to the first option, it's likely that the back area of the building will be rarely visited by children unless the area can offer something eye-catching.

Children's activity in playground

The playground in this children's library is an outdoor space filled with grass, plants, and natural materials. The natural environment is better than a human-made room, as it offers a variety of exploration opportunities with natural elements of a dynamic nature. In addition, it is also important to support physical development. Activities that can be done in the playground include running, jumping, playing tools, paying attention to nature, playing sand and water, chatting with peers, playing with friends, playing imagination.

3.1.4 Library

The disadvantage of laying the playground area outside the building is the potential for inter-space disconnection. Thus, to combine the composition between indoor and outdoor spaces, we equated the use of elemental properties in both. The properties of that element are loose material or compilable material. The use of this element in outdoor areas can be in the form of natural materials such as water, sand, wooden branches, grass, which are dynamic and playable. And in indoor spaces, the elements can be either movable furnfutures, or doodling walls, to give the child an experience in imagining and developing his creativity.

3.1.4.1 Room programming based on library's requirement

Based on the regulations of the National Library of Indonesia (2011), library rooms are at least divided based on a predetermined proportion of space, namely 45% for collection and service rooms, 30% for special rooms, and 25% for staff rooms. In this children's library, these spaces consist of:

40% Collection and service space – library reception, service, service activities

Types of Activities	Space Requirements	Large area @ people	Sources of information	Capacity	Area + flow 20%
Reading, learning, chitchatting	Common room	2.32m2	AD	50	150m2
Reading, learning	Private room	2.32m2	AD	20	55.68m2
Reading, learning, chitchatting	Reading house	2.32m2	AD	4	1.856m2
Drawing, coloring, playing	Creative space	2.32m2	AD	20	55.68m2
Biological needs	Lavatory	2.32m2	Calculation	10	27m2

35% Dedicated space – support activities

Types of Activities	Space Requirements	Large area @ people	Sources of information	Capacity	Area + flow 20%
Parking vehicle	Parking Lot	3.58 x 5.12 = 18.33 m2	LR	16	351.936m2
Smoking	Smoking area	1m2	Calculation	12	14.4m2
Reporting a loss	Security Post	1m2	Calculation	2	3m2
Praying	Mushola	0.98m2	Calculation	50	58.8m2
Workshop	Hall	2m2	Calculation	40	96m2
Eating, snacking, drinking	Canteen	2m2	Calculation	40	96m2

25% Staff room – management activities

Types of Activities	Space Requirements	Large area @ people	Sources of information	Capacity	Area + flow 20%
Asking information	Information desk	2m2	Calculation	2	4.8m2
Writing, observing the running of the library system	Directur's office	12m2	Calculation	1	14.4m2
Meeting	Meeting room	2m2	Calculation	20	44m2
Place for mechanical equipment	Mechanical equipment	25m2	LR	2	60m2
Place for tools, stationery	Warehouse	12m2	Calculation	1	36m2
Biological needs	Lavatory	2.25	Calculation	10	27m2

Legend :

LR = Literature Review

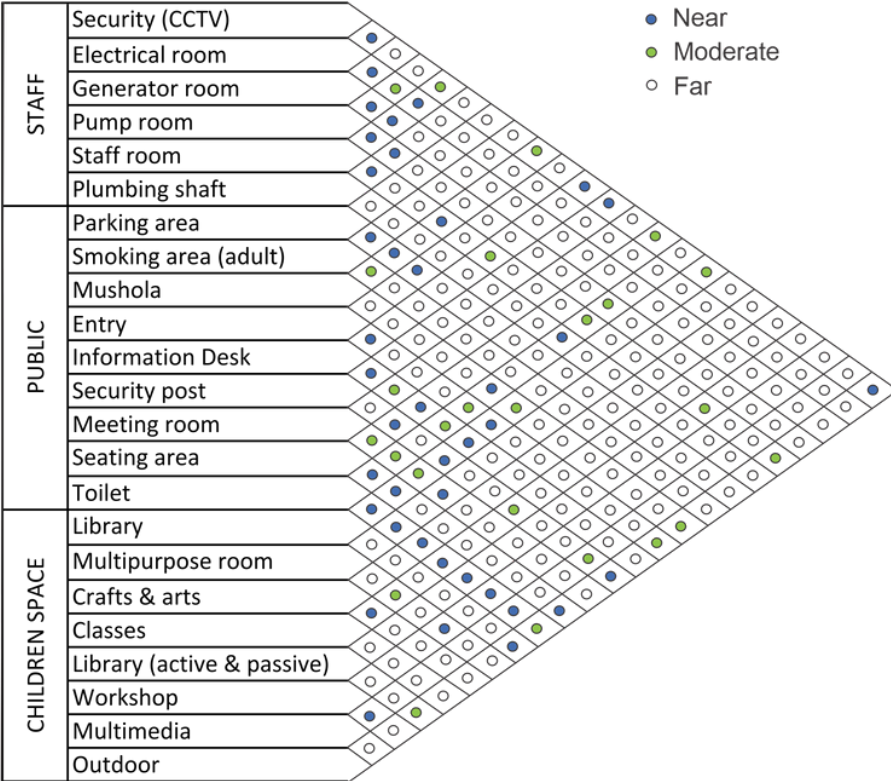
AD = Architect's Data-Ernst Neufert

3.1.4.2 Room programming with classification

No	Room	Room/ space name	Activities	Property
1	Public	Parking lot	Parking	Parking area
2		Smoking area	Sitting, smoking	Seating area
3		Mushola	Take ablution, Praying	Toilet, Place for take ablution, pray room
4	Collection and service space	Front park	Sitting, talking, snacking	Seating area, grass area
5		Playground	Running, walking, sitting, socializing	Seating area, play area, moveable property
6		Reading house	Reading, talking, socializing, imagining, telling story	Books, moveable property, book shelf, shoes rack
7		Security Post	Report something	Table and chair, fire extinguisher, fire alarm
		Information Desk	Asking information	Table and chair, note books
8		Toilet	Toilet	Toilet

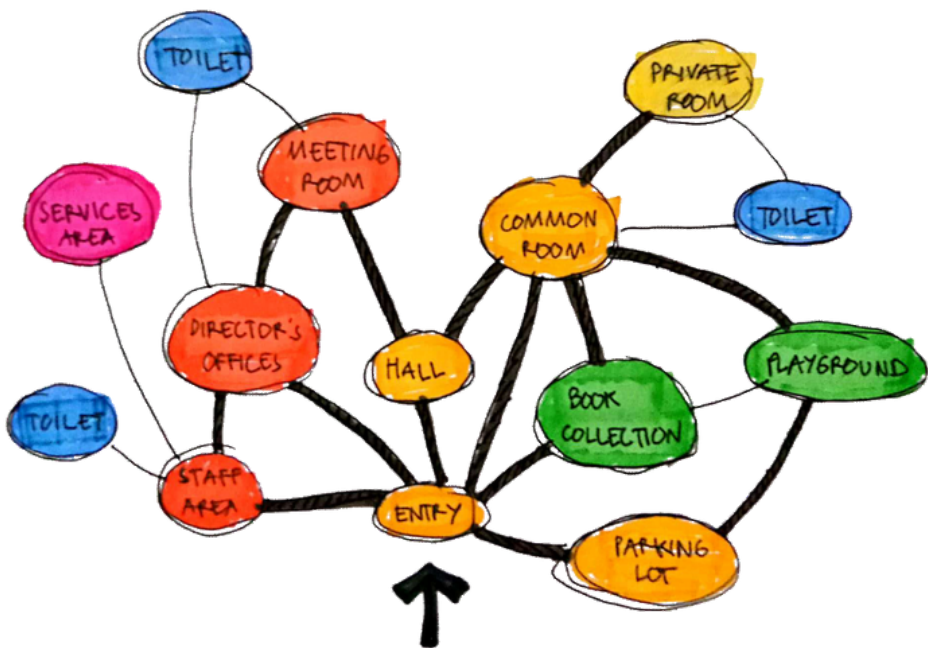
9	Special space	Hall	Workshop, waiting room	Bean bag, carpet, mini stage
10		Active room	Reading book, socializing, learning, writing	Lockers, book shelves, bean bag, table and chair
11		Quiet room	Reading book, socializing, learning, writing	Lockers, book shelves, bean bag, table and chair
12		Creative space	Drawing, playing, solving problem, coloring	Stationary shelf, carpet, moveable chair
		Canteen	Eating, drinking, talking	Table and chair, order and payment area
13		Meeting room	Meeting & discussion with parents, staff, or education personnel	Table and chair, LCD Projector, cabinet, stationary
14	Staff space	Storage	Saving luggage	Stationary, chairs, carpets, etc.
15		Director's office	supervising the work, plan public events, make long-term plans for the library	Table and chair, cabinet, stationary
16		Services/ mechanical equipment	Place for mechanical and electricity equipment	Mechanical and electricity equipment
17		Toilet	Toilet	Toilet

3.1.4.3 Spatial relation and spatial zoning



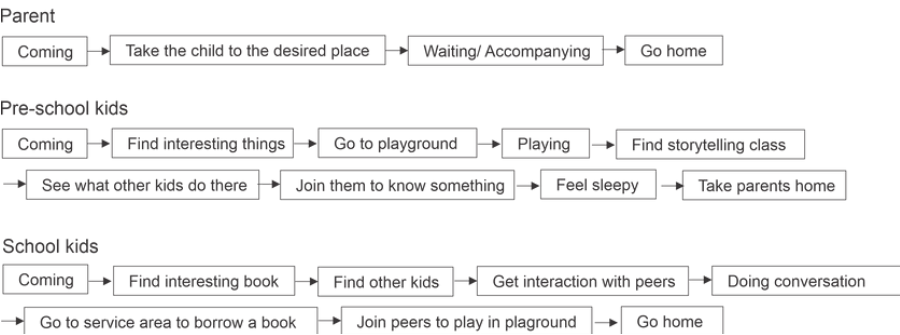
3.1.4.4 Bubble diagram

Using bubble diagrams, the order between spaces arranged based on the relationship of proximity between spaces begins to be seen.



3.1.4.5 User activity analysis (visitor circulation flow)

By analyzing the flow of circulation of visitors and library users, the order between spaces begins to be seen more clearly



3.1.4.6 Book collections & activity programs

Then we tried to make a list of books that would be in the collection of this children's library, and also a program of activities that could be carried out in this children's library.

Books List Classification

Genre	Books
Fiction	Contemporary fiction
	Mystery
	Historical fiction
	Fairy tale
	Fable
	Fantasy
	Science fiction
	Horror
	Poem
Non fiction	Biography/ autobiography
	History
	Biology
	Science
	Self-help
	Encyclopedia
	Crafts/ Arts

Activity Program
Character games
Film Screenings
Workshop
Story Telling
Crafts
Public Speaking

3.1.4.7 Room zoning



Consideration of alternative A

- There is a playground area in the front area of the left tread
- The parking area is divided into 2 with different areas, on the left for 2-wheeled vehicles, and the right for 4-wheeled vehicles.
- Children's toilet room is close to corridor access
- The library director's room is in the middle of the staff zone

Consideration of alternative B

- The parking lot and playground are made elongated, so they have a clear boundary between the two.
- Have a larger children's reading area
- Has an easy-to-find service area in the corridor access
- The library director's room is adjacent to the playground area

The above spatial arrangement is compiled on the basis of the site analysis in point 2.2.4 and the design exploration in point 3.1.3. These two alternatives have something in common in providing direct access to the playground, which is an important consideration so that children can easily find a way in and out of the building. However, alternative B is considered better at providing effective circulation and not wasteful of space, so that the children's reading area is wider. Simple circulation will provide information that is easy for children to understand, so that children can quickly find the room they want to go to.

3.1.4 Library

1. zonasi ruang
2. penggunaan elemen bergerak mengikuti sifat outdoor
3. Pengelompokan buku
4. Desain interior
5. Macam2 ruangan perpustakaan, fasilitas, jam buka
6. Kegiatan dalam perpustakaan
7. layout furnitur

3.2 Safe functional space

3.2.1 Regulation of Property Size

3.2.1.1 Building Coverage, Floor Area Rasio, Green Space Rasio

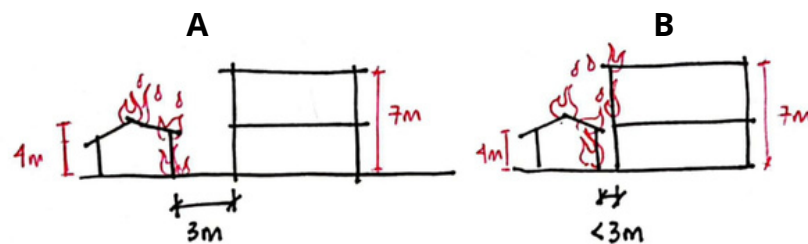
Based on spatial regulations, the basic building coefficient of this area is 60%, so the maximum area of the **Building Coverage** is $60/100 \times 3000 = 1800 \text{ sqm}$

The **Floor Area Rasio** is $2.0 \times 3000 = 6000 \text{ sqm}$

And for **Green Space Rasio**, it is required to have 15% of the site area so it must have a minimum of $15/100 \times 3000 = 450 \text{ sqm}$

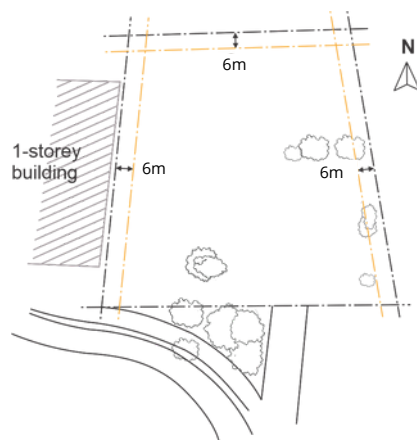
3.2.1.2 Boundary Line

A boundary line is the boundary line where a building is allowed to be erected. In the context of this project site, the building has 3 types of boundary lines, namely building boundary line, river boundary line, and street boundary line. The function of the Building Boundary Line in relation to the building security system is to avoid the risk of spreading fire from one building to another.

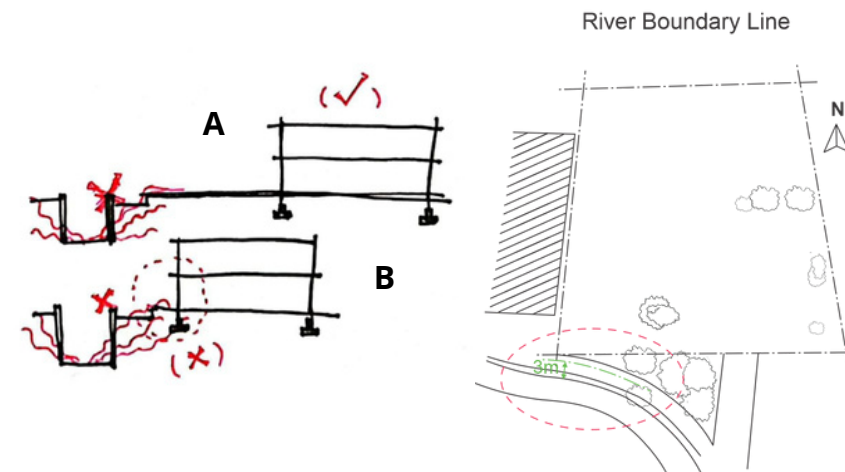


The regulations on the distance between buildings that are allowed have been stated in government regulations. Because the building plan to be erected has 3 floors and a height of more than 8m, and there are buildings next to the site which mostly are 1-storey house, the distance taken from the building will be 6m.

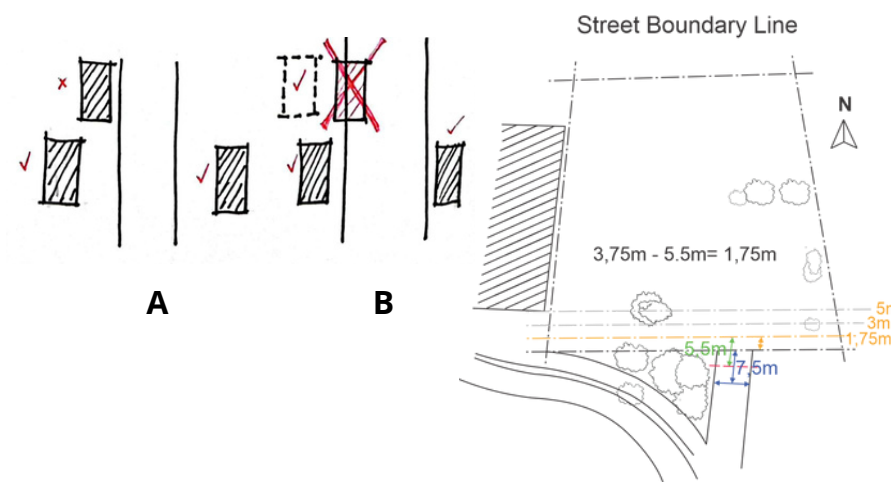
No	Building height	Minimum distance between buildings
1	s.d. 8	3
2	> 8 s.d. 14	> 3 s.d. 6
3	> 14 s.d. 40	> 6 s.d. 8
4	> 40	> 8



Next up is the River Boundary Line, in relation to building safety is about the strength and density of the footing ground. In the case of this project, the site is in the area of the city and the nearest river has an embankment. The regulation regarding the distance between buildings and the rivers in urban areas is 3m.



Last but not least is the Street Boundary Line, the majority of buildings are required to follow Street Boundary Line rules which are based on the width of the street and the context of the site. Its function is for the sustainability of the building in case in the next few years a widening of the road is carried out. In this case, the site is connected to the primary collector's road which is the provision of the Street Boundary Line for 5.5m taken from the middle of the width of the road.



3.2.2 Risk Measurement

We potential risks happen for such activities by multiply the likelihood rating with the potential consequence rating or just by following the risk severity matrix (we can see it in point 2.3.1.4) to determine the design criteria.

3.2.2.1 Risk Measurement in Playground

Activity : Running

Benefits of activity :
Character building - confidence through challenge
Coordination and strength - lower body activity
Learning limitation - how fast you run
Problem solving - menghindari halangan dan orang
Social interaction - kejar-kejaran
Connection with nature - belajar tentang lingkungan sekitar, batu, kayu, rumput

Risk	Hazard	Likelihood Rating Assumtion	Consequence Rating Assumtion	Risk Rating	Design Criteria
Potential accidents	Sudden stop	5	1	L	-
Unintentional Mistakes	Bumping into people	2	1	L	-
Structure	-	-	-	-	-
Fall Height	Fall from a standing positionall down	3	2	L	No hardened surface
Slippery/ Hard Material	Stumbled, slipped	3	3	M	Open space no obstacles

Activity : Jumping

Benefits of activity :
Coordination and strength - balance and leg muscle strength
Learning limitation - how high you can jump
Healthy - strengthen muscles and bones

Risk	Hazard	Likelihood Rating Assumtion	Consequence Rating Assumtion	Risk Rating	Design Criteria
Potential accidents	Sprained leg	3	3	M	The jumping area is an area that can absorb shocks
Unintentional Mistakes	Step on things, or a friend's feet	2	2	L	The jumping area requires an open and object-free area
Structure	The footing is fragile or weak	1	1	L	Jump in areas with strong, shock-resistant steps
Fall Height	Fall from a standing positionall down	2	1	L	-
Slippery/ Hard Material	Slipped	3	1	L	Non-slip surface

Activity : Playing with playground equipment

- Benefits of activity :**
- Character building - courages through challenge
 - Coordination and strength -visual, upper and lower body activity
 - Learning limitation - how high I can climb, how can I use the equipment
 - Social interaction - competition, sharing idea, discussion

Risk	Hazard	Likelihood Rating Assumption	Consequence Rating Assumption	Risk Rating	Design Criteria
Potential accidents	Getting slipped and stuck	3	2	L	Safe and comfortable equipment for children
Unintentional Mistakes	Clothes snagged	3	1	L	-
Structure	Collapse	1	3	L	Safe and strong equipment
Fall Height	About 2-3m	2	3	L	Safety on equipment
Slippery/ Hard Material	Slipped	3	3	M	Use of materials according to function

Activity : Wheelchair users playing in playgrounds

- Benefits of activity :**
- Character building - courages, confidence, independent
 - Coordination and strength -visual and upper body activity
 - Learning limitation - where you want to go, how you interact with peers
 - Social interaction - sharing idea, discussion

Risk	Hazard	Likelihood Rating Assumption	Consequence Rating Assumption	Risk Rating	Design Criteria
Potential accidents	Getting stuck	3	1	L	Safe and comfortable pathway for wheelchair user
Unintentional Mistakes	-	-	-	-	-
Structure	-	-	-	-	-
Fall Height	From wheelchair	2	2	L	Standard ramp
Road surface material	Find it difficult to move	4	1	L	Provision of special roads for wheelchair users
Possible problems after the activity	-	-	-	-	-

Activity : Wheelchair users playing in playgrounds

Benefits of activity : Character building - courages, confidence, independent
Coordination and strength -visual and upper body activity
Learning limitation - where you want to go, how you interact with peers
Social interaction - sharing idea, discussion

Risk	Hazard	Likelihood Rating Assumption	Consequence Rating Assumption	Risk Rating	Design Criteria
Potential accidents	Getting stuck	3	1	L	Safe and comfortable pathway for wheelchair user
Unintentional Mistakes	-	-	-	-	-
Structure	-	-	-	-	-
Fall Height	From wheelchair	2	2	L	Standard ramp
Road surface material	Find it difficult to move	4	1	L	Provision of special roads for wheelchair users
Possible problems after the activity	-	-	-	-	-

3.2.2.1 Risk Measurement in Library

Risk assesment in library

Activity : Running

Benefits of activity : Coordination and strength - visual and lower body activity
Learning limitation - how fast you run & how shrewdly you avoid obstructions
Problem solving - avoiding obstructions and people
Social interaction - Chasing with peers

Risk	Hazard	Likelihood Rating Assumption	Consequence Rating Assumption	Risk Rating	Design Criteria
Potential accidents	Bumping into furniture	5	2	M	Free circulation
Unintentional Mistakes	Bumped	4	1	L	-
Structure	-	-	-	-	-
Fall Height	Falling overturned	3	1	L	-
Slippery/ Hard Material	Stumbling, slipping	5	3	M	No running allowed

Activity : Climbing the furniture

Benefits of activity : Character building - confident in performing in public and courage to take risks
Coordination and strength - upper and lower body activity
Learning limitation - how high you climb, how can you take items on high place by yourself
Problem solving - maintaining concentration and balance of the body, taking items

Risk	Hazard	Likelihood Rating Assumption	Consequence Rating Assumption	Risk Rating	Design Criteria
Potential accidents	Slipped and fell	3	3	M	Fixtures that are allowed and safe for children to climb
Unintentional Mistakes	Dropping items	4	1	L	Bookcase with book stand
Structure	Broken furniture	3	1	L	Strong furniture
Fall Height	According to the height of the climbed furniture	4	3	M	Not allowed to climb tables and chairs
Slippery/ Hard Material	Slipped and mired	3	2	L	-

Activity : Taking items in high shelf

Benefits of activity : Character building - believe in his own abilities
Coordination and strength - upper and lower body activity
Learning limitation - how far can you reach
Social interaction - asking help to library staff

Risk	Hazard	Likelihood Rating Assumption	Consequence Rating Assumption	Risk Rating	Design Criteria
Potential accidents	-	-	-	-	-
Unintentional Mistakes	Falling overturned	2	1	L	Low furniture that is easily accessible to children
Structure	-	-	-	-	-
Fall Height	-	-	-	-	-
Slippery/ Hard Material	-	-	-	-	-

3.2.2.2 Design criteria for playground and library

The conclusion of those risk measurement becomes the

Playground Design Criteria and Problem Solving

Variable	Design Criteria	Problem Solving
Spatial organization	Open space no obstacles	Wide open area for run, jump
	Age separation	Separating pre-school-age with school-age children
	Functional zoning	Dividing site for some function
	Safe insect viewing area	Special passive area in the edge or corner of the site
Accessibility	The jumping area requires an open and object-free area	Plotting shrubs layout so it's not blocking the circulation
	Standard ramp	Easy and safe access with ratio 1:7
	Safe and comfortable pathway for wheelchair user	Use of flat surface material
	Provision of special roads for wheelchair users	Providing paths leads to any function area
Structure & material	No hardened surface	Providing grassy area with no hard material that is safe for falling down
	Safe and strong equipment	Use of strong structure and material
	Use of materials according to function	Providing soft and hard material surface according to function
	Non-slip surface	Providing safe area for running
	The jumping area is an area that can absorb shocks	Use of loose fill material (wood, rubber)

3.2.2.2 Design Story

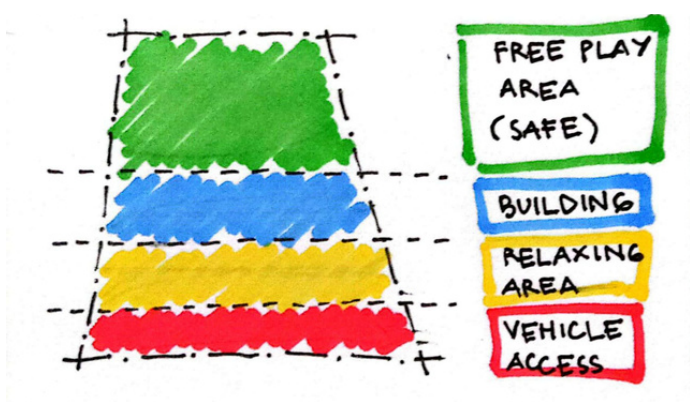
How people will come into site, enjoy, learn, access, etc.

What is the potentially risks they'll find it there?

3.2.3 Spatial Organization

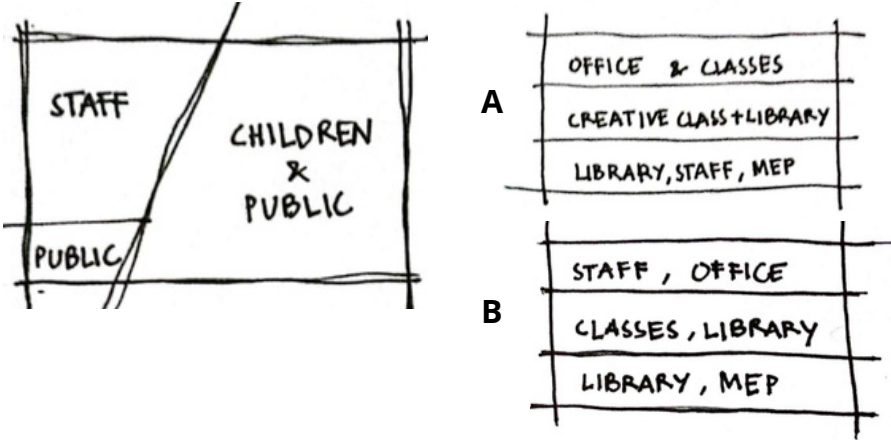
3.2.3.1 Site Zoning

The division of zones on the site relates to the position of the mass laying of the building. The function of zone division related to building security, in particular buildings intended for children users is the safety of children when playing and exploring their environment. In an effort to separate between vehicular traffic areas and child-friendly areas, between community areas and educational areas, to establish a more effective monitoring system for children's activities, and to create an intensive educational environment, an alternative division of zones on the site was created as follows.



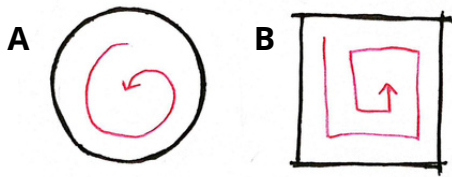
3.2.2.3 Building Exploration

Exploration of the mass of buildings is determined by various factors and considerations. In the case of children's libraries, exploration will be focused on the safety of building functions and the safety of fire protection systems. But before determining the shape of the building, it is necessary to pay attention to the division of zones on the building. The division of zones is aimed at the security system of the building and the security of its building functions. Staff and children's areas must be separated so that children do not explore risky and dangerous areas such as generator rooms and electricity. And in terms of function, the division of zones will create a more directed circulation and facilitate activities for users and visitors. The zones are divided from the visible floor plan and divided per-floor. Alternative zone divisions on the floor plan and zone divisions per floor can be seen as follows.

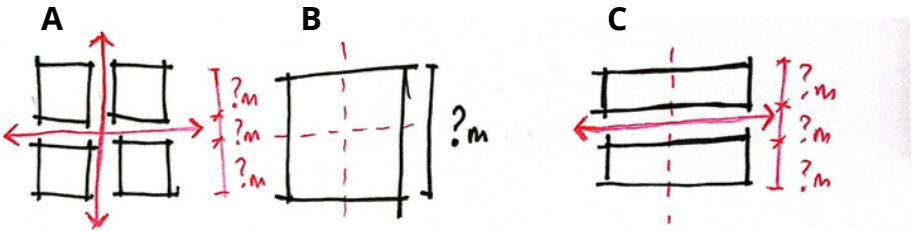


3.2.2.4 Circulation routes

Based on the literacy sources in chapter 2, the best form of mass for the safety of building functions intended for children users is a circle. The illustration of its function is as follows.



The circulation created by the shape of the circle building will be centered and all the activities contained in it are easier to supervise, while in the shape of the box, there are 4 corners, so that the circulation can lead to 4 sides. In terms of supervision, the circle shape is better to apply to children's library projects, especially for children who still need adult guidance and supervision. In addition, alternative designs can be designed based on the safety factor of the building system against fire hazards, as follows.

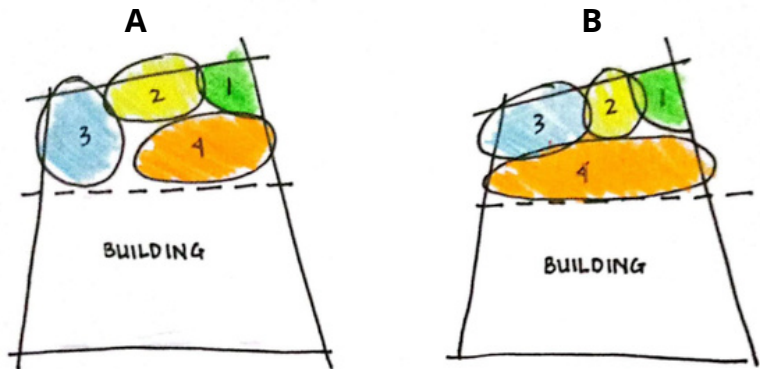


The size of the building, the division of the mass of the building, and the distance between the masses will affect the ease of access of firefighters and the ease of extinguishing fires in the event of a fire. This is also a preventive measure for the spread of fire, namely by grouping the function zones of buildings.

3.2.3 Accessibility

3.2.3.1 Age separation

Division area between pre-school age children and school-age children

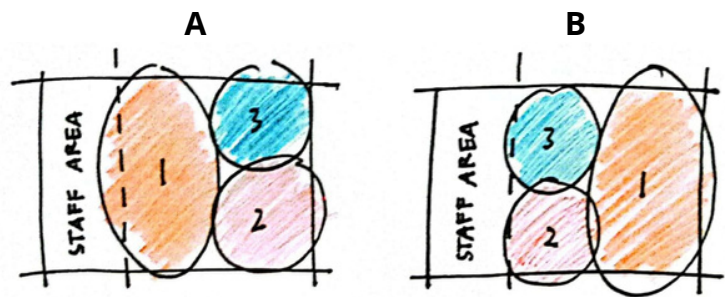


- 1 = Assembly point
- 2 = Playground playing tool
- 3 = Passive area
- 4 = Active area

Alternative A and B has similar zoning, this is because the assembly point area is the furthest from the building which is the safest area, it's suitable for keeping people safe while disaster is occurred. The second is playing tool, both of alternatives has same place for playground playing tool, this is because it was the easiest area for adults to monitor their children. This is also neutral position so it can be used either young children or older children.

The difference of both are the ratio of area and the zone. The alternative A has passive area for young children (pre-school-age) which had slower movement than older children (school-age) in the left part of the playground. The playground play tool in alternative A has wider area rather than in alternative B. And in alternative B, we had passive area in the corner of the playground and the active area tend to be longer which means playground is potentially more noisy rather than if the active area is in alternative A condition. This is because children will feel more free to run, and shout out by having wide area. So, here, we can conclude that the alternative A is better than alternative B.

3.2.3.2 Age separation in library

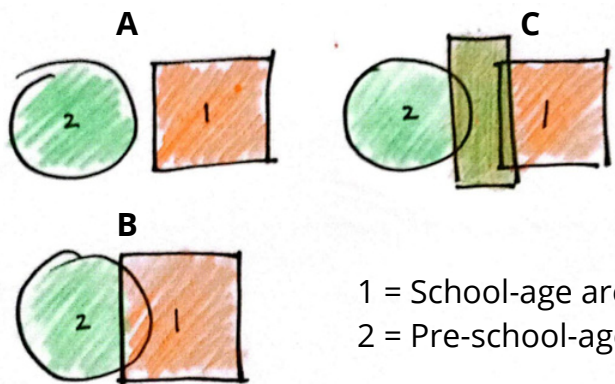


- 1 = School-age area
- 2 = Pre-school-age area
- 3 = Toilet

School-age-children has dynamic movement and pre-school-age-children has slower movement. Division area is needed to avoid unwanted accidents. Alternative A has school-age-area in left part of building, and vice versa. The toilet is stay the same in the back part of building because it's private space and has no need to be put in front. Alternative B is better than alternative A because the hierarchy of movement speedity will create harmony. The staff area tend to have calm movement, the pre-school children will have moderate speedity of movement, and the school-age-children have dynamic movement.

3.2.3.3 Spatial organization related to accessibility

There are several ways to connect between library rooms, if it is connected with the needs of the space function in the security aspect, it can be reviewed as follows:



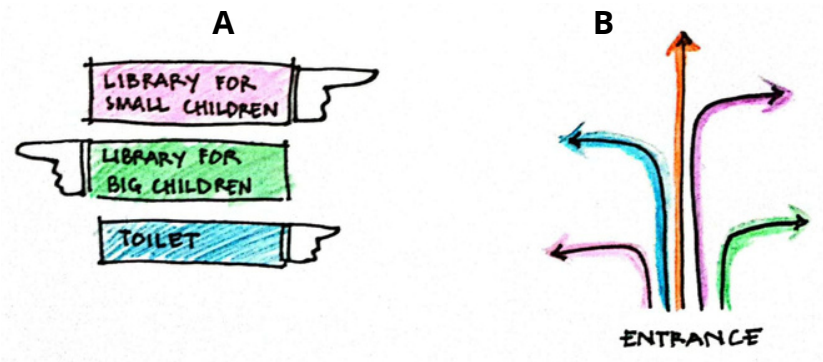
- 1 = School-age area
- 2 = Pre-school-age area

- A = Adjacent spaces
- B = Interlocking spaces
- C = Space linked by a common space

Alternative C is the best option because we have outdoor space behind the building. The direct access that is created will give ease for children accessibility and avoid confusion, loss of direction, or even accident.

3.2.3.4 Signage in library

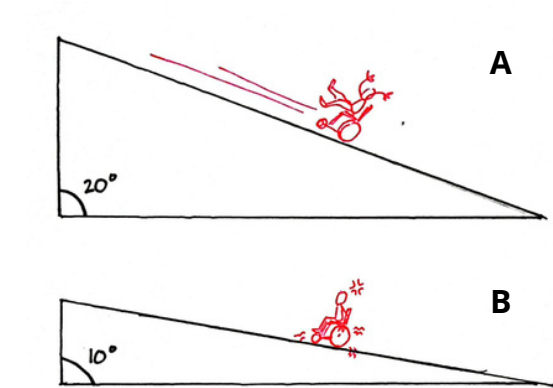
Children need convenience in getting to know their environment and accessing the room they want to go to. A simple directional guide will help children a lot in finding their purpose.



Alternative A show the direction by providing signage on the wall. Those directional guide use writing and color. And the alternative B use pathway on the floor and rely on color to indicate direction. Here, alternative B is better because easier to be seen and understood, especially by pre-school age who can't read yet. It is also the way more fun than find the writing on the wall, especially considering the low viewing level of children.

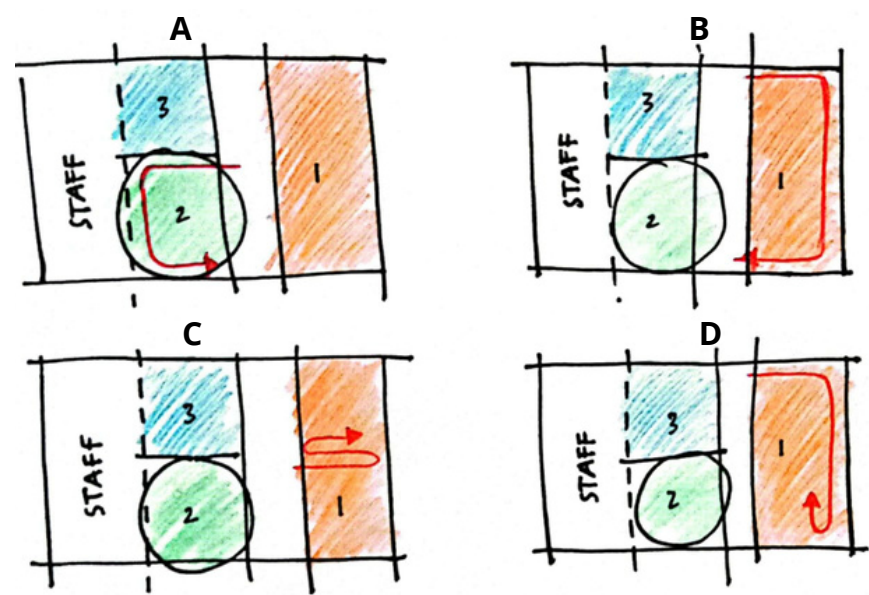
3.2.3.5 Wheel chair user needs

Vertical access, akses dalam site (masuk-keluar bangunan dan playground), kamar mandi



These alternatives show the illustration of how the wheelchair user are accessing the ramp with different slope ratios. The alternative C with 7' slope is the best ramp. It is easy to access and safe for the wheelchair user.

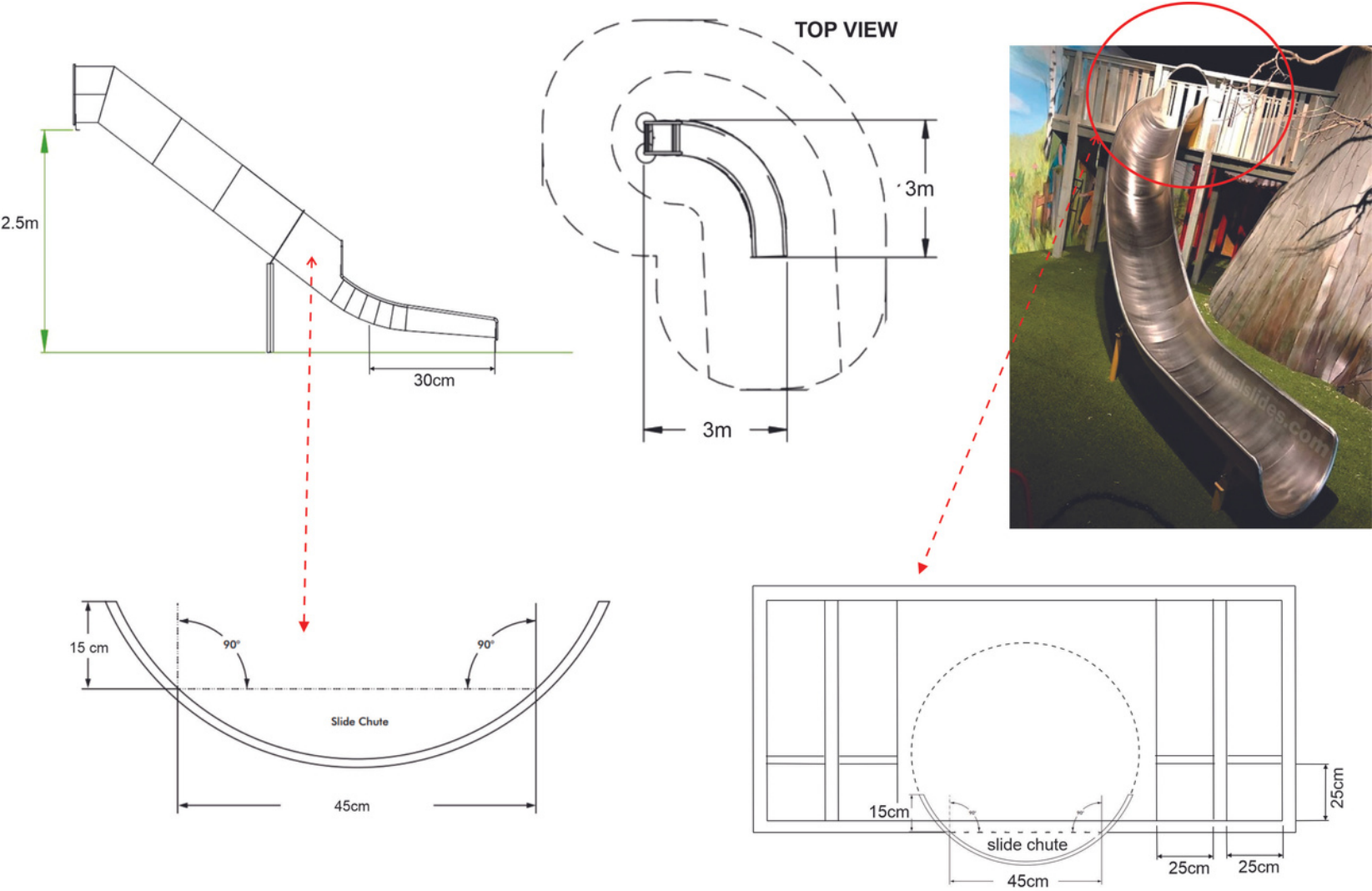
3.2.3.6 Ramp position in building



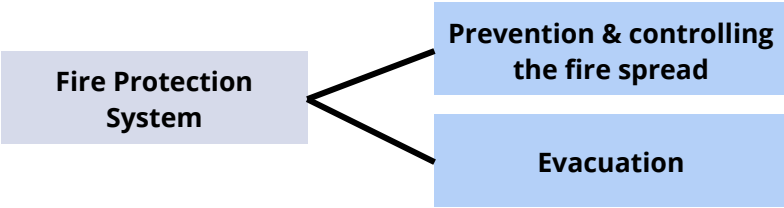
The height of each floor is 3m, the slope of the ramp will be used is 7' slope. So, it will have 21m length of the ramp inside the building. From those alternatives, the alternative B,C,D is the logically can be made in building. Aternative B, and D has special experience which can see the children's activities in building whil accessing the ramp. Here, the alternative D is the best because get experience and not blocking light from the front building.

3.2.4 Structure & material

3.2.4.1 Structure and dimension of slide



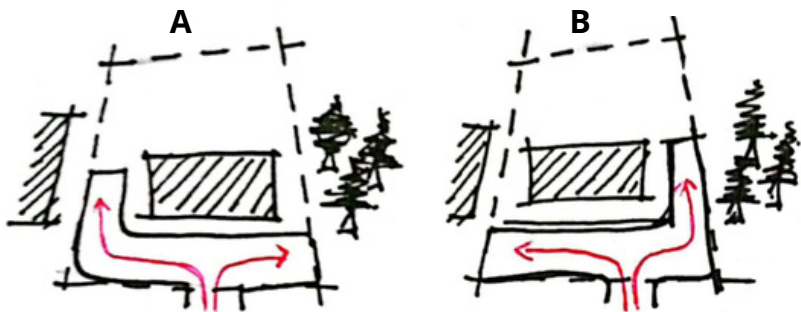
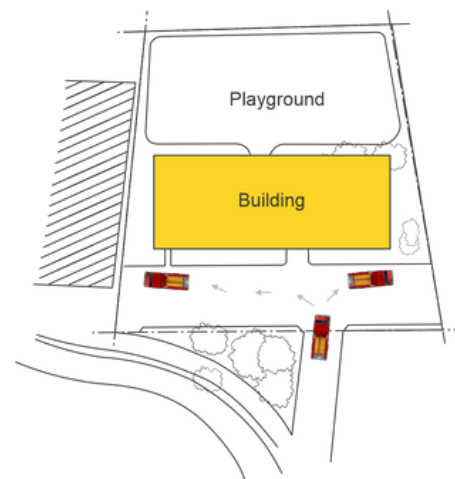
3.3 Fire Protection System



3.3.1 Site equipment

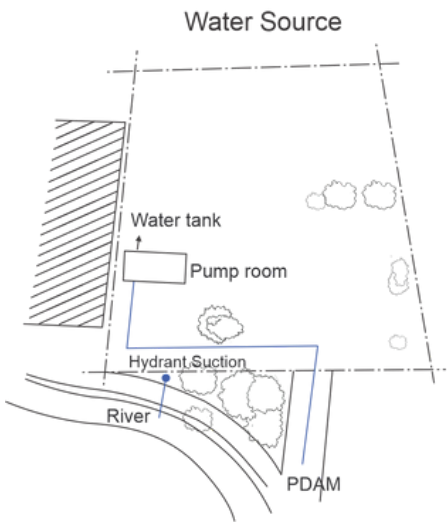
Fire truck access

Since the considerations for designing the mass of buildings there are many, let's for now consider that the building of children's libraries in general is boxy. We will discuss the mass of the building again later after the design consideration of space requirements. And now we will discuss the path of fire trucks on the site. This line needs to be prepared according to existing regulations and the maneuvering needs of the car. As per existing regulations, the path of the fire truck must be made 4m wide with a minimum distance from the building is 2m.



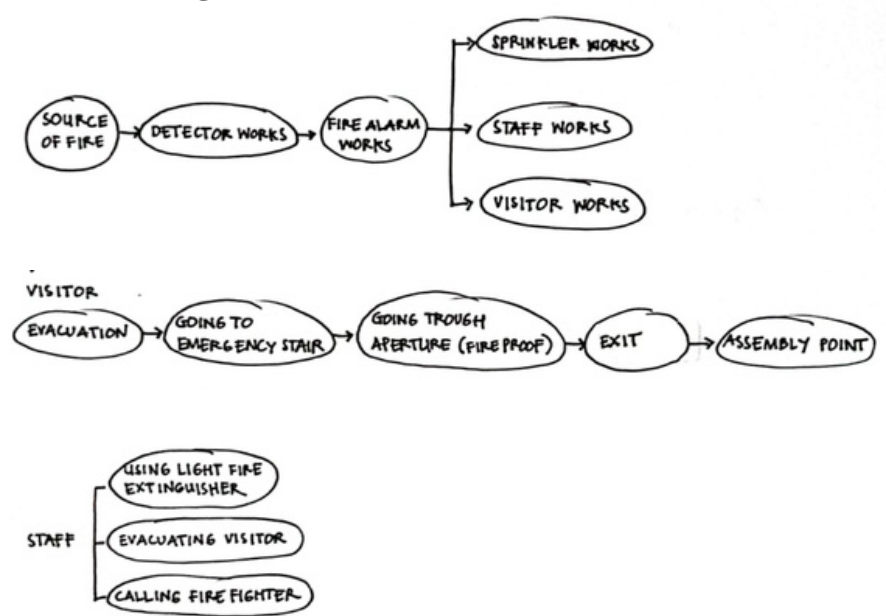
Water source

The water source is usually in the form of a water tank that is placed underground, above the ground, or in a building bag. It can also come directly from the river, but the building needs to have its own supplies to avoid obstacles when it wants to use water from the river, whether it is the constraint of suction hydrants, water pumps, or drying rivers.

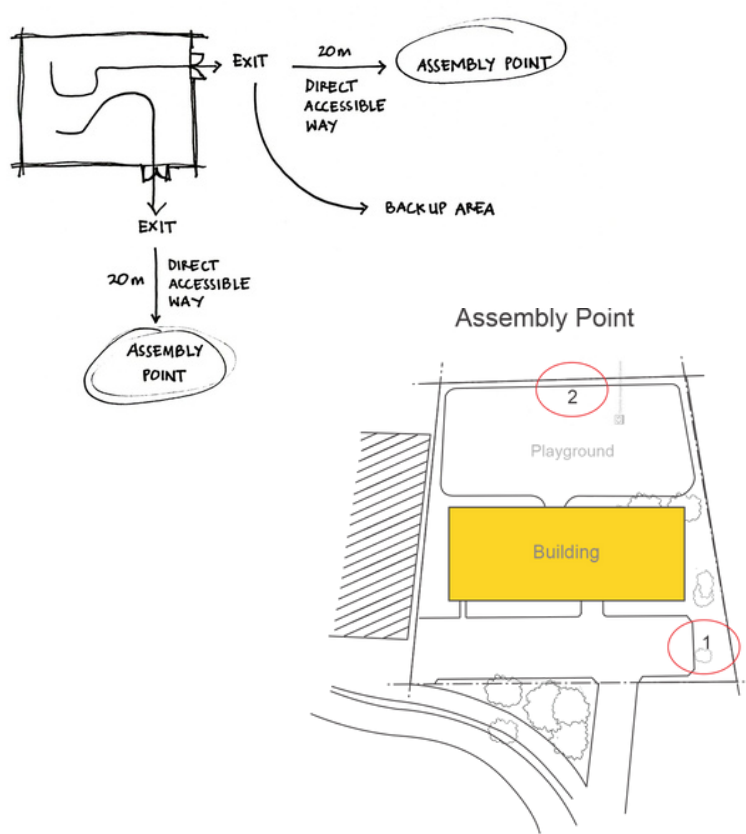


3.3.2 Rescue Facilities

Fire Handling Scheme



Assembly consideration



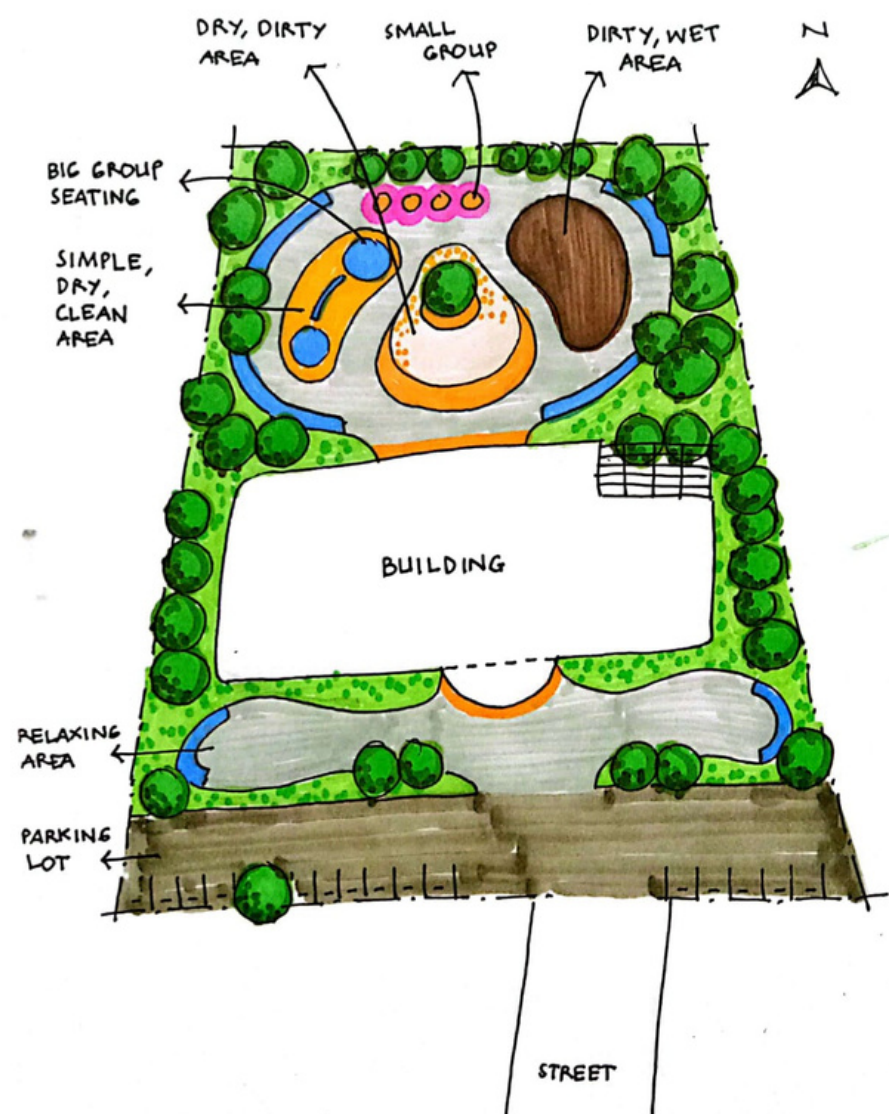
3.4 Initial Design

Landscape design

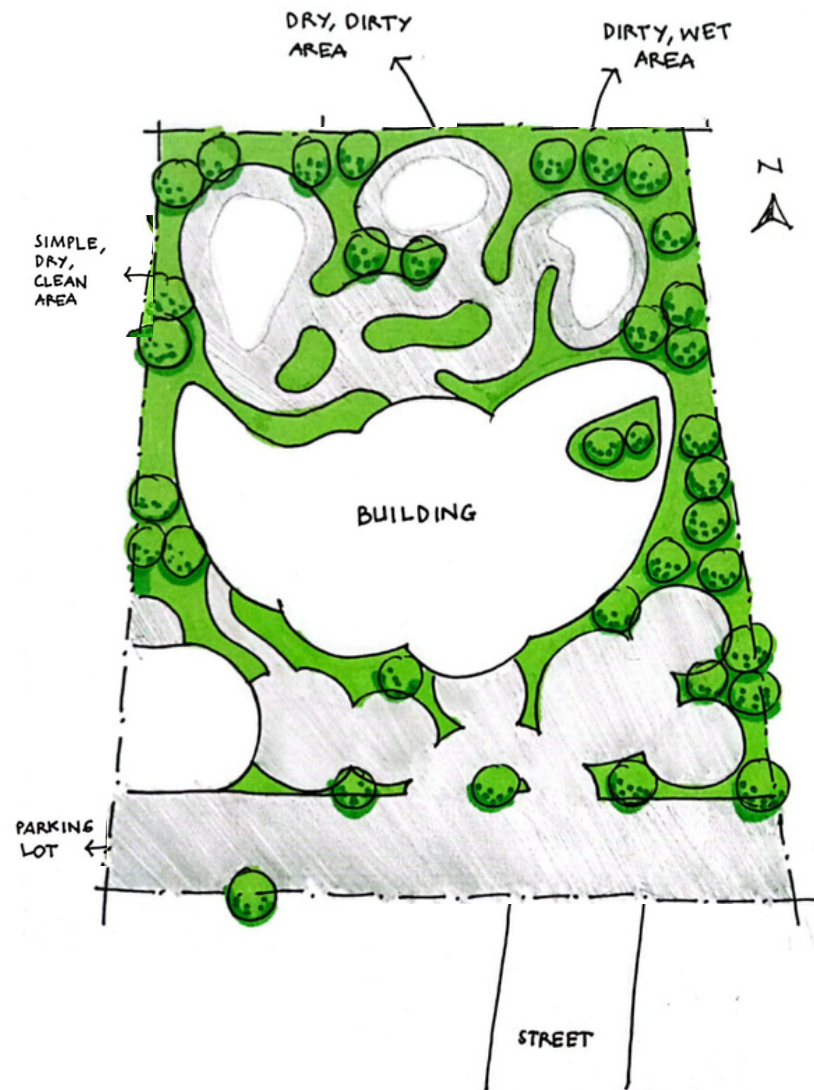
The design of this building is made to lead to the entrance of the site and has striking doors so that it is easy to recognize. The bright and warm color makes the children excited and feel loved. That way, they will not worry about wasting their time here. Children can choose their own place, here we serve variative design for any children, we also consider for the disable to feel experiences, one of the experience can be seen below.

This second alternative is similar with the first, but it has more circular shape and different plan shape. The playground also has different pattern either with the old or the front park, it is used to optimize its experiences and help to enhance creative thinking.

Alternative A



Alternative B

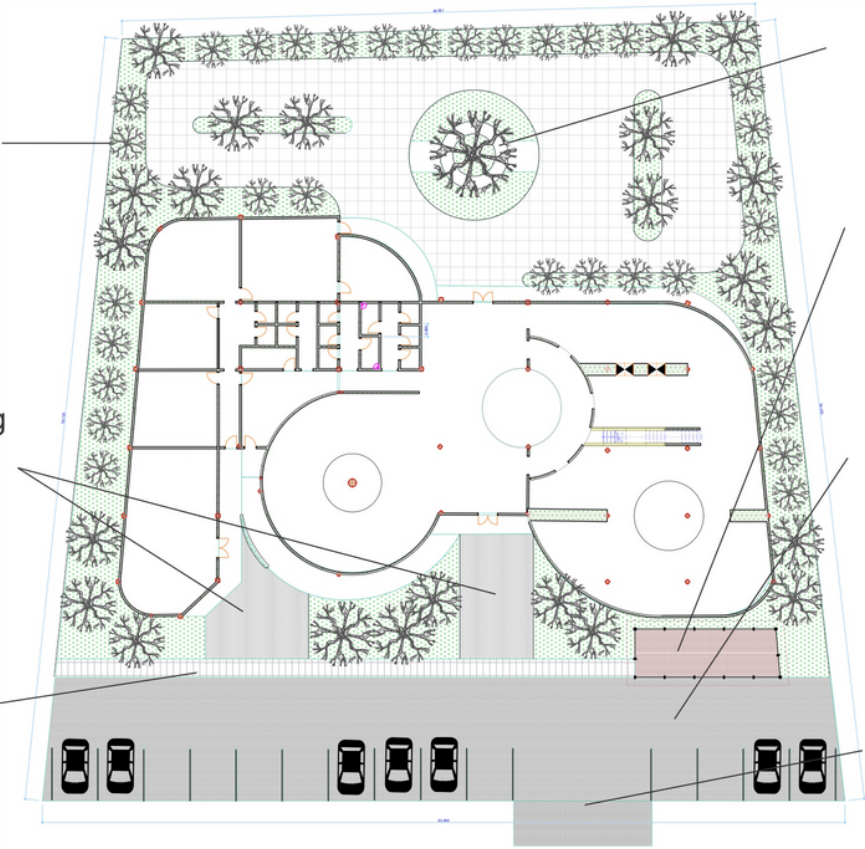


Alternative C

Massive wall as the site boundary to restrict entry to the site

The road to the building is made wide so that it is convenient for visitors to pass by.

Pedestrian made straight to give a clear boundaries to separate vehicled area and pedestrian only for safety



Seating facility in the middle of the circular facing outwards for easy adult care of children

Make room for adults who need to smoke outside the study area and away from children

The parking area is in the front area of the site with placement that is not adjacent to the sidewalk in order to provide a large and uninterrupted space for pedestrians

The entrance to the site has a width of more than 4m and the parking area has a width of 8m. This size is enough for fire truck access in anticipation of a fire.

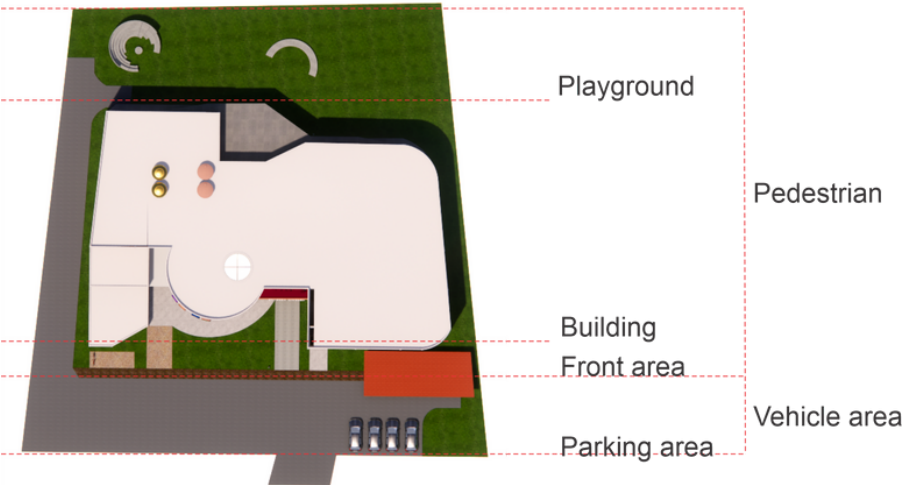
04

DESIGN DEVELOPMENT

4.1 Site Plan

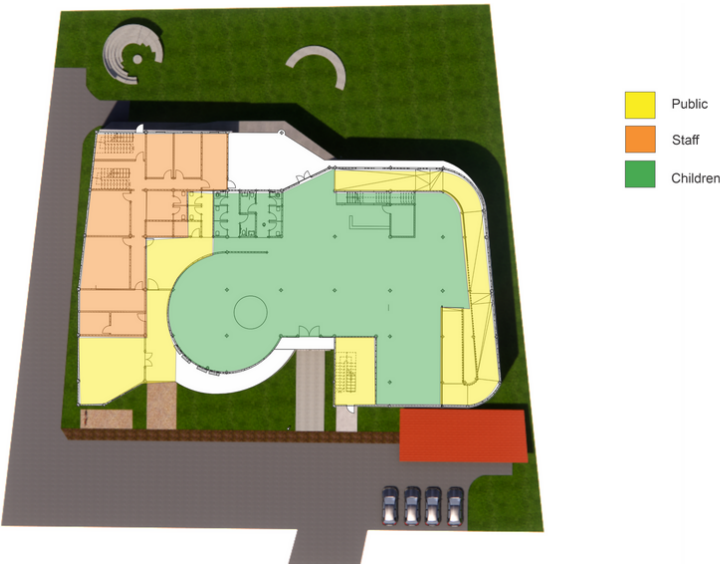
4.1.1 Site Zoning

In general, the site is divided into 2 parts, namely a pedestrian area that is safe for children, and a vehicle area, which is a parking area, where vehicles are free to pass by and children need to be supervised when walking in the parking area. These 2 areas are separated by sidewalks and railed along the edges, to signal that children need to stop running if they start leading to the parking area.



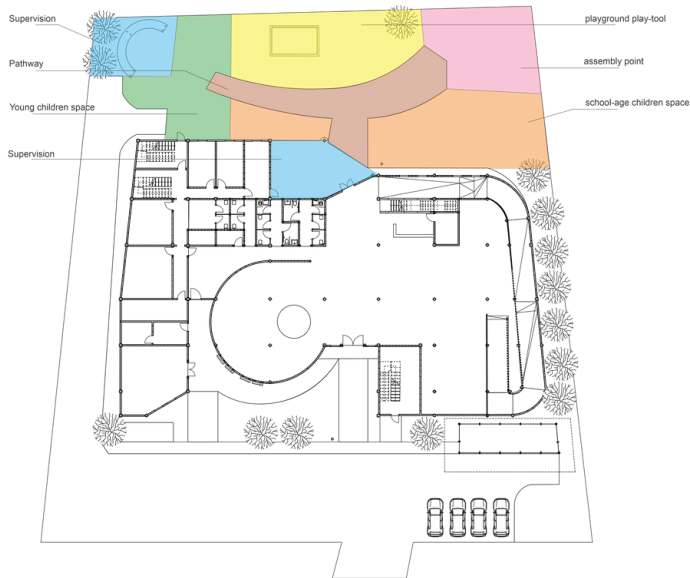
4.1.2 Building Zoning

The use of space in the library is divided into 3 types of users, namely children as the main user, adults as general users, and staff members. This zone division is intended to give children the freedom to explore and recognize every corner of the library, while keeping children away from potential hazard areas.



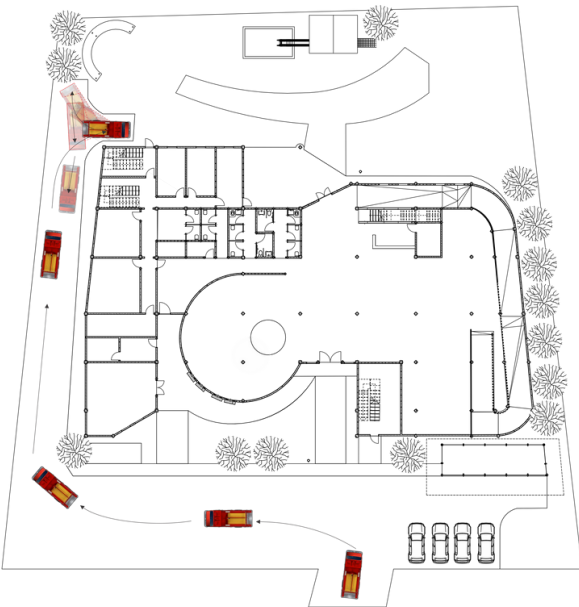
4.1.3 Playground Zoning

The use of space in the library is divided into 3 types of users, namely children as the main user, adults as general users, and staff members. This zone division is intended to give children the freedom to explore and recognize every corner of the library, while keeping children away from potential hazard areas.



4.1.4 Fire truck access

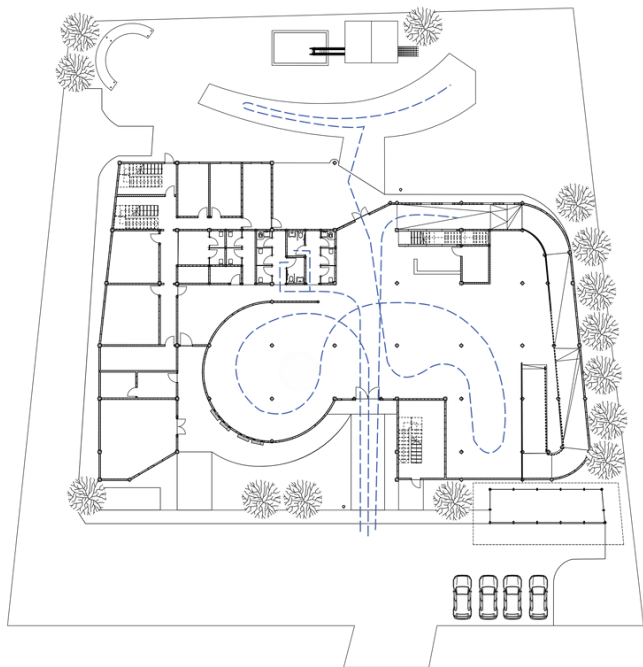
The reason for creating a fire truck access road on the left side of the tread so that in addition to access fire trucks, it also saves the use of areas on the site because it utilizes boundary lines and meets the minimum distance requirements between buildings.



4.2 Plan

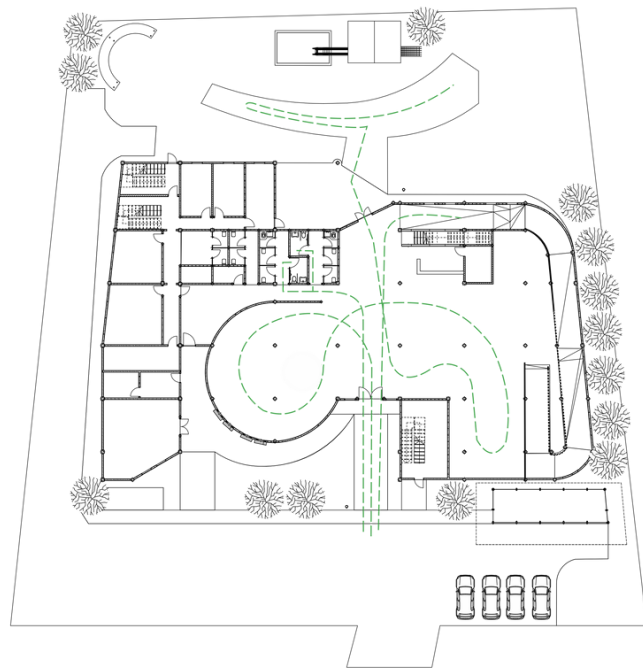
4.2.1 Children routes

Children's freedom in exploring the children's zone in the library can be seen from the following circulation route.



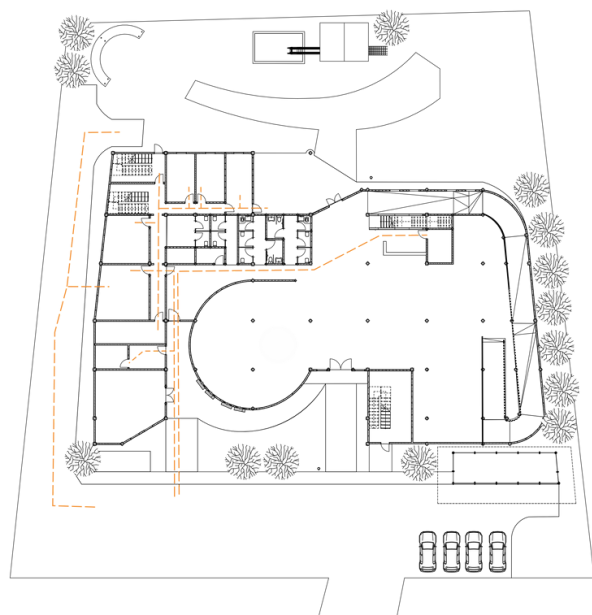
4.2.2 Disabled routes

This child-friendly designed area allows children with disabilities to experience the same as their peers, they can also go upstairs easily, safely, and freely through a ramp installed extending to the edge of the wall inside the library.



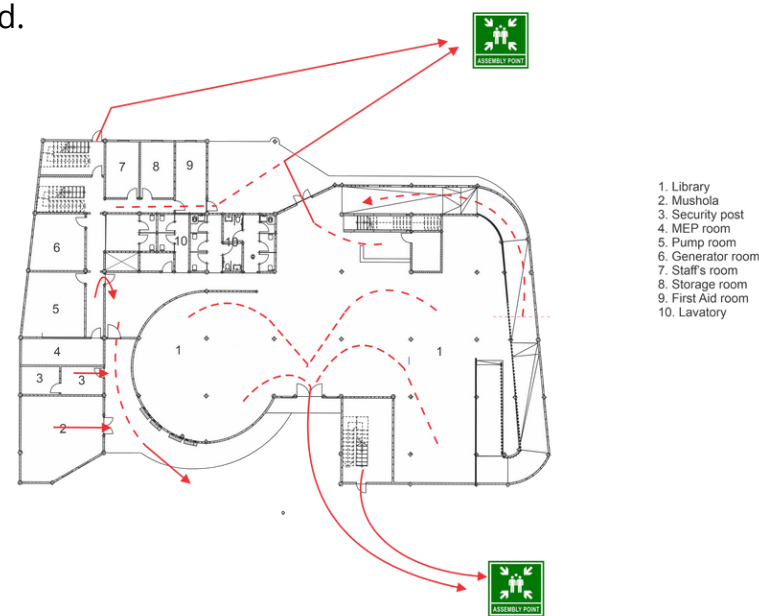
4.2.3 Staff's routes

The staff circulation route is distinguished from the children's circulation route. This zone division is important to avoid accidents when children are running around and staff are at work.



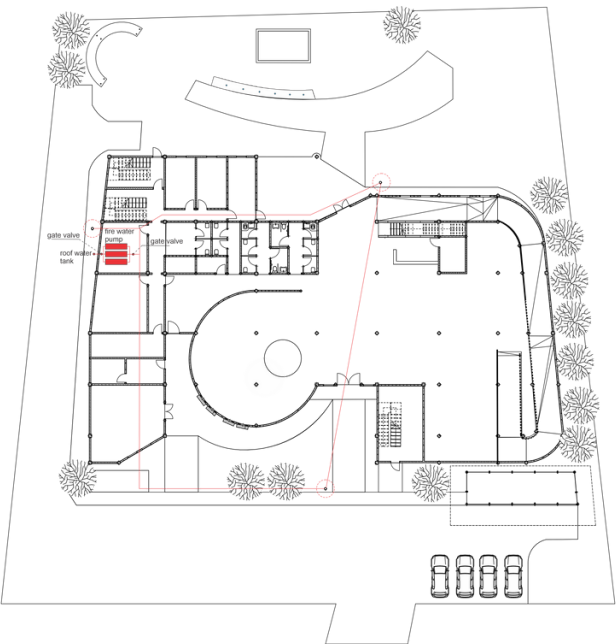
4.2.4 Evacuation routes

The evacuation route is the most important route that must be introduced to children. The provision of training can be carried out in the workshop room and children can be trained directly on the spot to provide an understanding of what children should do in the event of a fire or earthquake hazard.

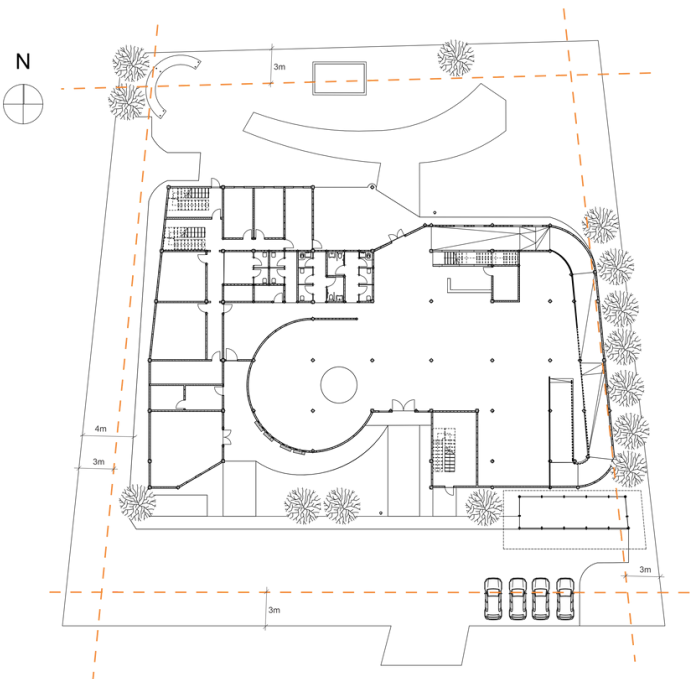


4.2.5 Hydrant System

The pump in the pump chamber serves to supply water to the hydrant. The pipes between hydrants meet each other to avoid potential bottlenecks in water distribution. The pump room is placed in the side room of the building, adjacent to the fire truck access road, in order to facilitate the maintenance of the pump room. There are 3 hydrants according to the needs of the library building which is classified as an educational building with a light fire risk.

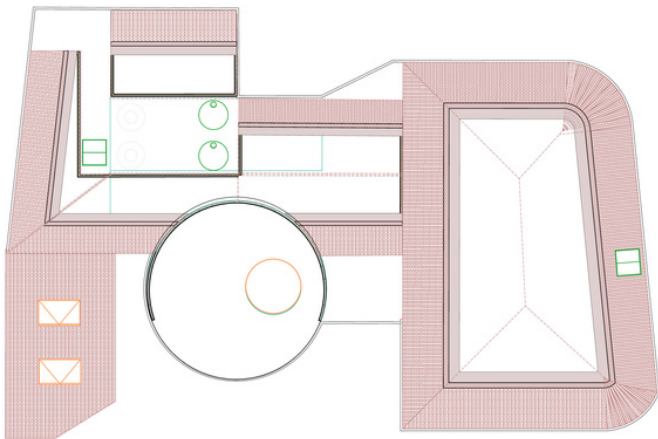


4.2.6 Property Size



4.2.6 Roof plan

The gable roof is added on the reinforced concrete construction. And the edge of the roof is added by 1m height of barrier.

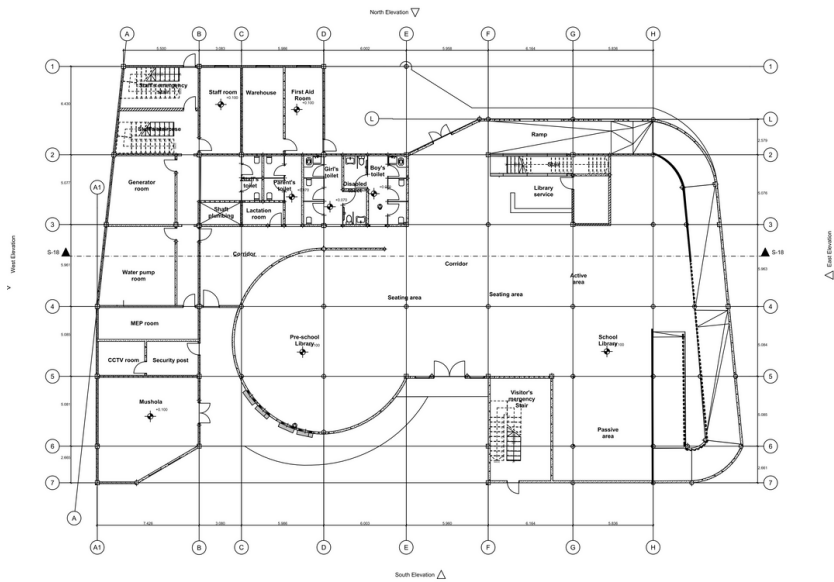
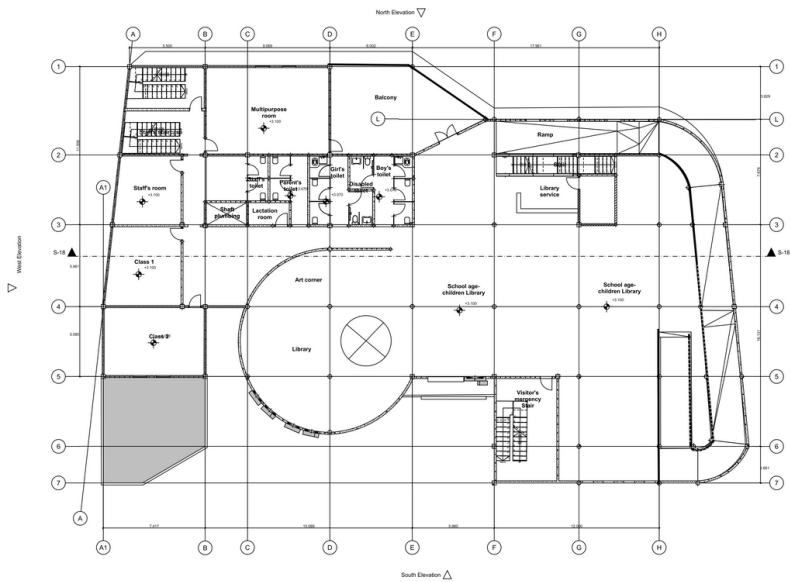


4.2.6 Furniture plan

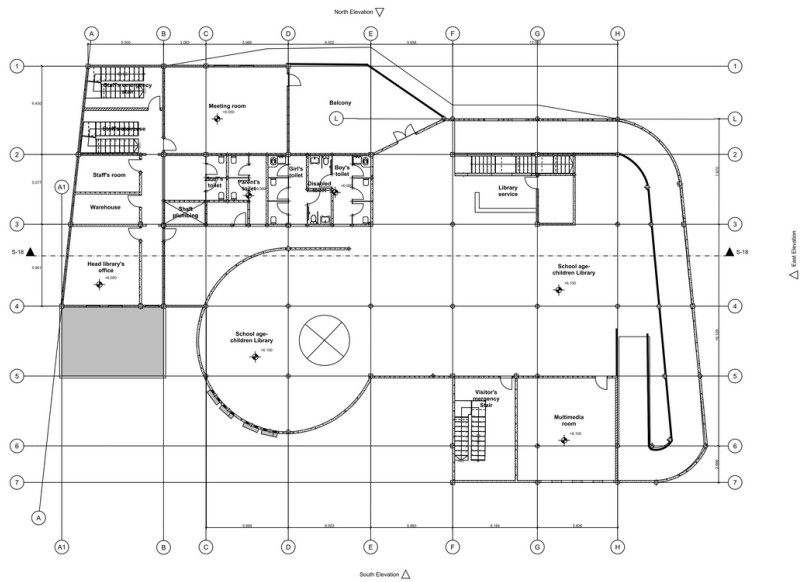


4.2.7 Floor Plan

Floor level	User	Room list
Floor 1	Public	Parking area
	Public	Smoking area
	Public	Mushola
	Public	Entry
	Public	Security Post
	Public	Lobby
	Public	Toilet
	Children	Library (active & passive)
	Children	Receptionist/ information desk
	Staff	Staff room
	Staff	Plumbing
	Staff	Mechanical electrical
	Staff	Genset

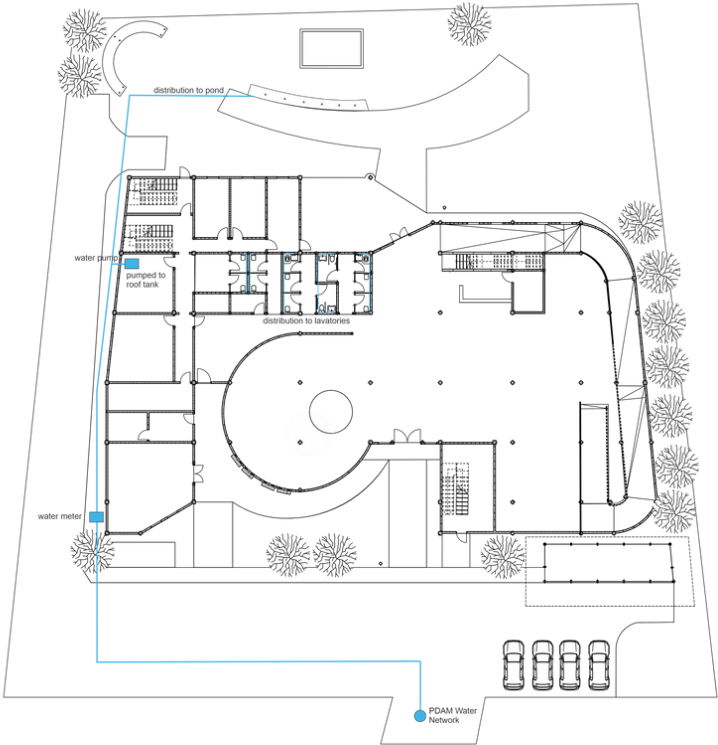


Floor level	User	Room list
Floor 2	Public	Caregiver post
	Public	Toilet
	Public	Meeting room
	Children	Library
	Children	Workshop
	Children	Multipurpose room
	Children	Multimedia

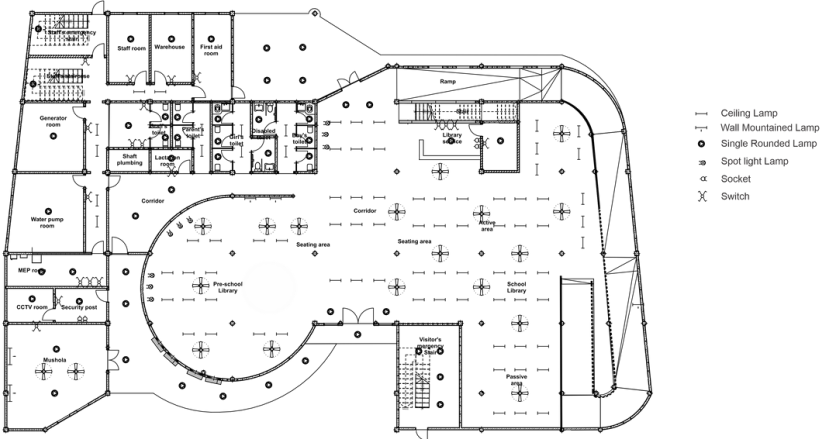


Floor level	User	Room list
Floor 3	Public	Caregiver post
	Public	Toilet
	Children	Multipurpose room
	Children	Crafts & arts
	Children	Classes

4.2.8 Clean Water Plan

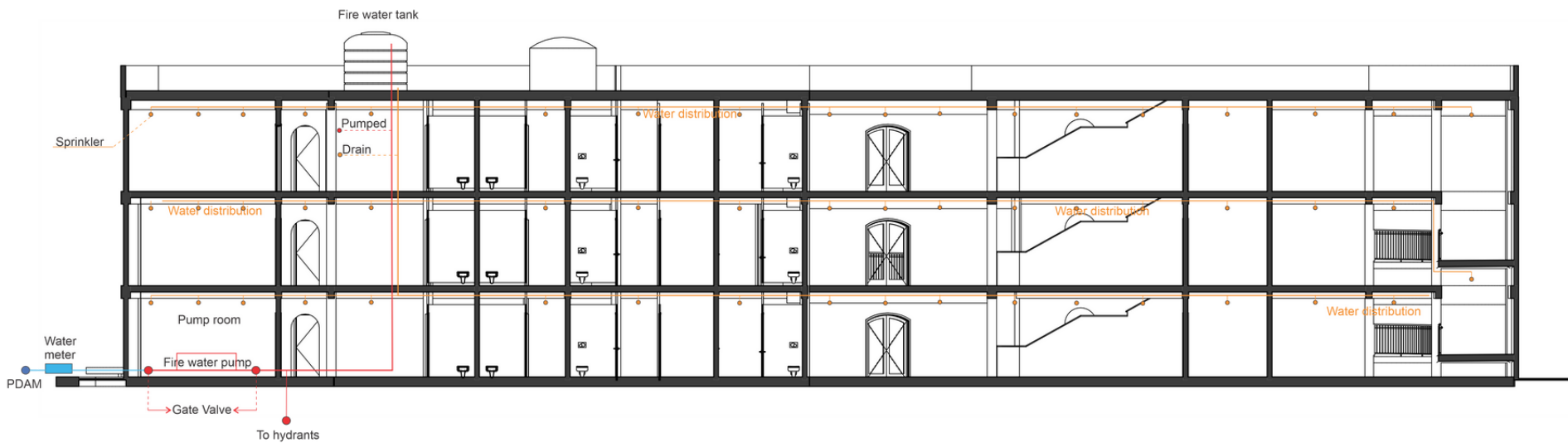


4.2.9 Lighting Plan

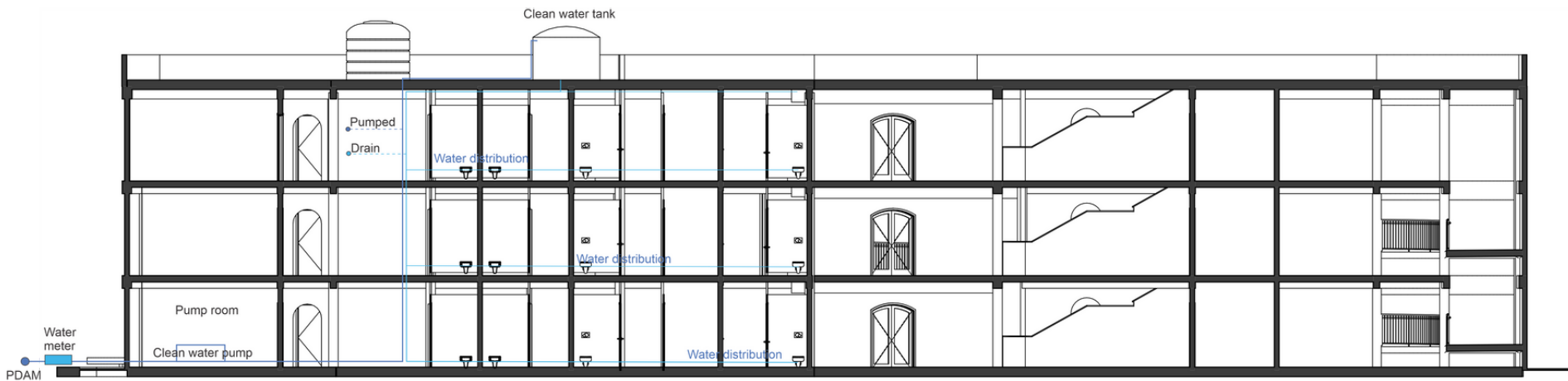


4.3 Section

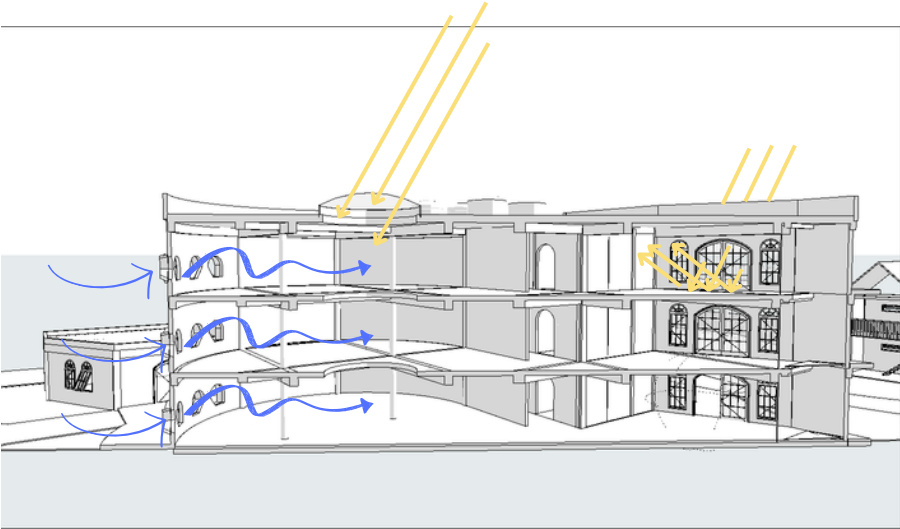
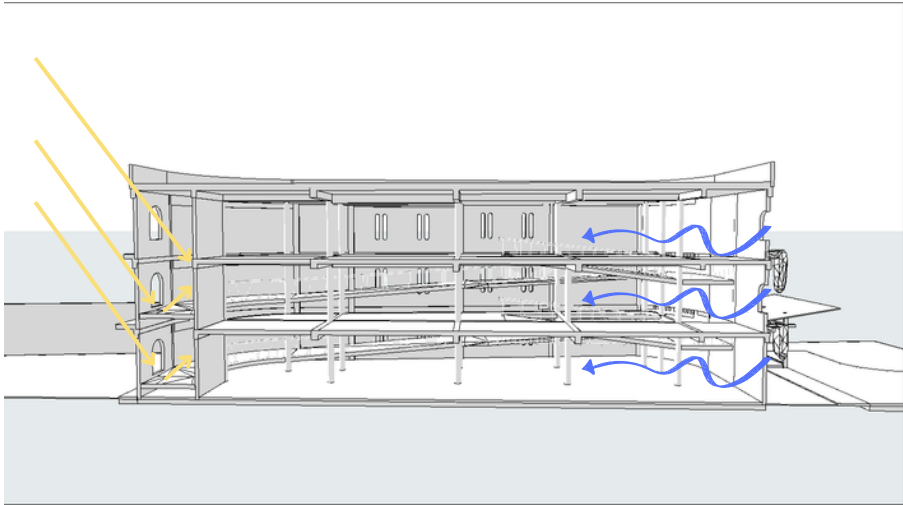
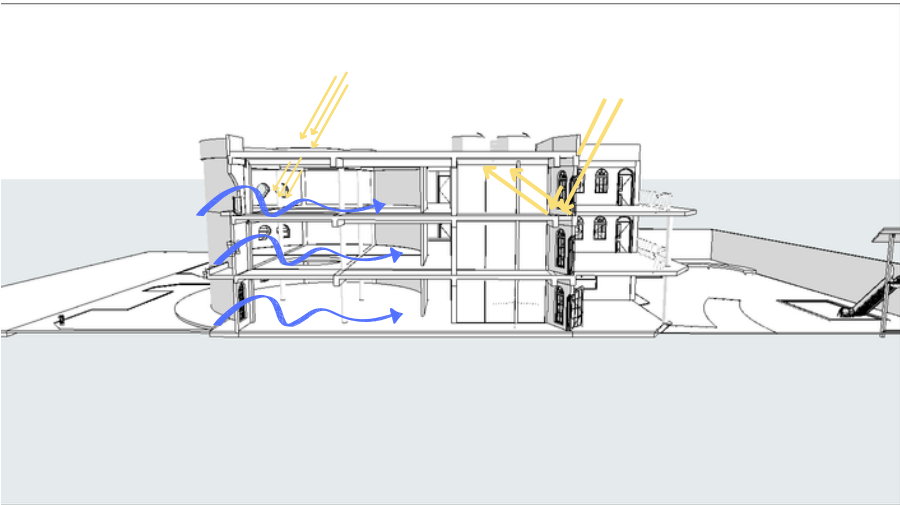
Fire Water Distribution



Clean Water Distribution



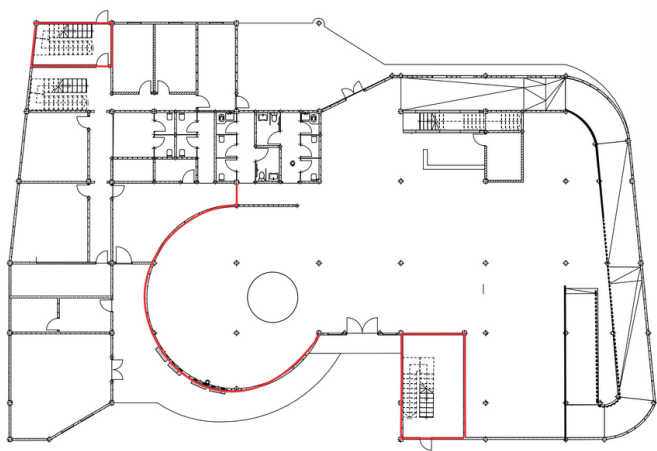
Thermal control



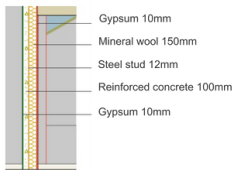
Wind
Sun light

4.4 Structure & material

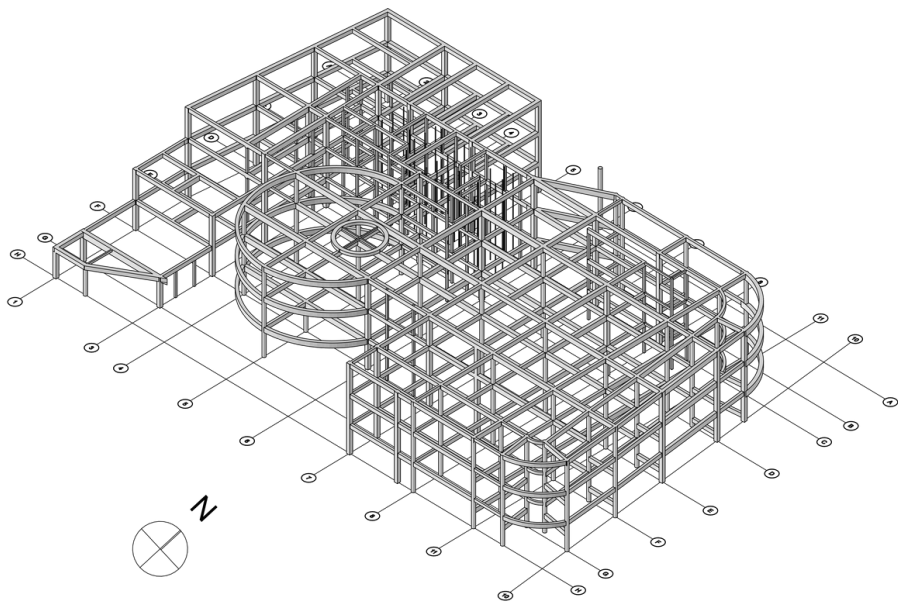
Compartmentization



Fireproof Wall Material



3D Structural Building



05

DESIGN PROOF

5.1 Children's Library Problem Solved

No	Problem	Parameter	Concept	Design
1	Children Library	Playing and Learning concept	3.1.2	4.1.3
		Outdoor area	3.1.3	4.1.3
		Indoor space	3.1.4	4.2.7
2	Safe functional Space	Property Size	3.2.1	4.2.6
		Spatial organization	3.2.3,	4.1.1, 4.1.2
		Circulation routes	3.1.4.7, 3.2.2.4	4.2.1, 4.2.2, 4.2.3
		Accessibility	3.2.3	4.1.2, 4.1.3
		Furniture Layouting	3.2.3	-
		Structure and material	3.2.4	4.4
3	Fire Protection System	Site requirement	3.3.1	4.1.4
		Rescue facilities	3.3.2	4.2.4
		Active protection systems	3.3.3	4.2.5
		Passive protection systems	3.3.4	4.4

5.2 Fire table assesment

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point value	Assessment weight	Component values	Number of values
1	2	3	4	5	6	7
A. Site components						
1	Water source	B	100	27	6.75	25
2	Environmental street	B	100	25	6.25	
3	Distance between building	B	100	23	5.75	
4	Yard hydrant	B	100	25	6.25	
						25

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point value	Assessment weight	Component values	Number of values
1	2	3	4	5	6	7
B. Rescue facilities						
1	Exit	B	100	38	9.5	25
2	Exit Construction	C	80	35	7	
3	Helicopter pad **	B	100	27	6.75	
						23.25

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point value	Assessment weight	Component values	Number of values
1	2	3	4	5	6	7
C. Active protection systems						
1	Detector and Alarm	B	100	8	1.92	24
2	Siamese Connection	B	100	8	1.92	
3	Light fire extinguisher	B	100	8	1.92	
4	Building hydrant	B	100	8	1.92	
5	Sprinkler	B	100	8	1.92	
6	Overflow Extinguishing System**	B	100	7	1.68	
7	Smoke Control	B	100	8	1.92	
8	Smoke detector	B	100	8	1.92	
9	Smoke removal	C	80	7	1.344	
10	Fire lift**	B	100	7	1.68	
11	Emergency light and Directions	B	100	8	1.92	
12	Emergency electricity	B	100	8	1.92	
13	Operation control room**	B	100	7	1.68	
						24

No.	KSKB / SUB KSKB	Valuation* B / C / K	Point value	Assessment weight	Component values	Number of values
1	2	3	4	5	6	7
D. Passive protection systems						
1	Fire Resistance in Building Structures	B	100	36	9.36	26
2	Space Compartmentization**	B	100	32	8.32	
3	Aperture Protection	B	100	32	8.32	
						26

* Isilah hanya dengan:
B Baik
C Cukup
K Kurang

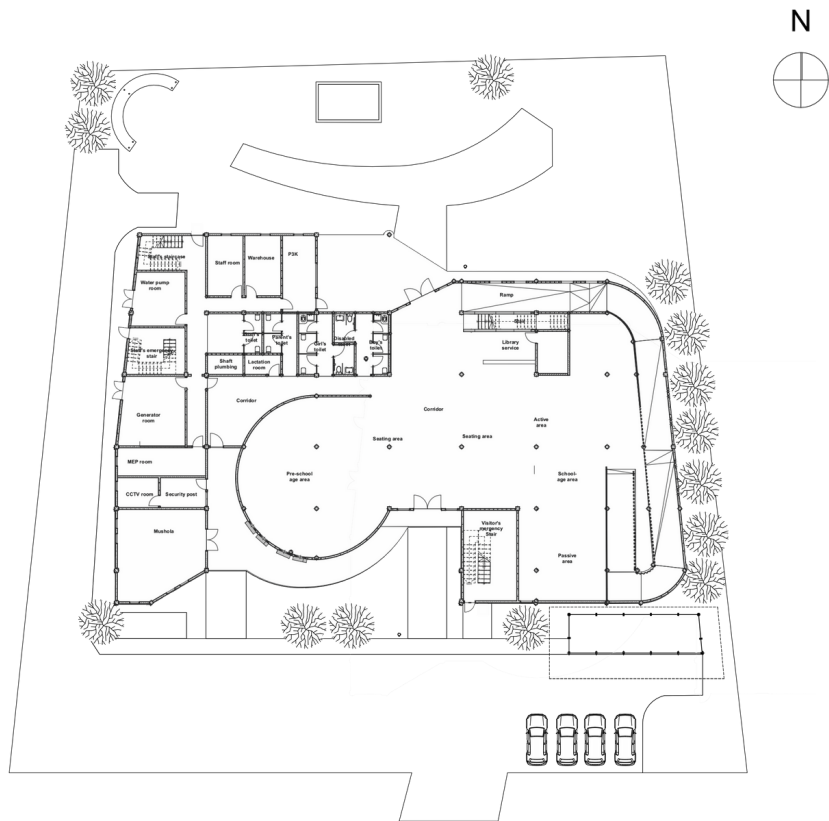
No.	KSKB Parameters	KSKB Assessment weight (%)	Value
1	Site Components	25	25
2	Rescue Facilities	25	23.25
3	Active Protection Systems	24	24
4	Passive Protection Systems	26	26
Percentage		100	98.25

5.3 Safe functional space

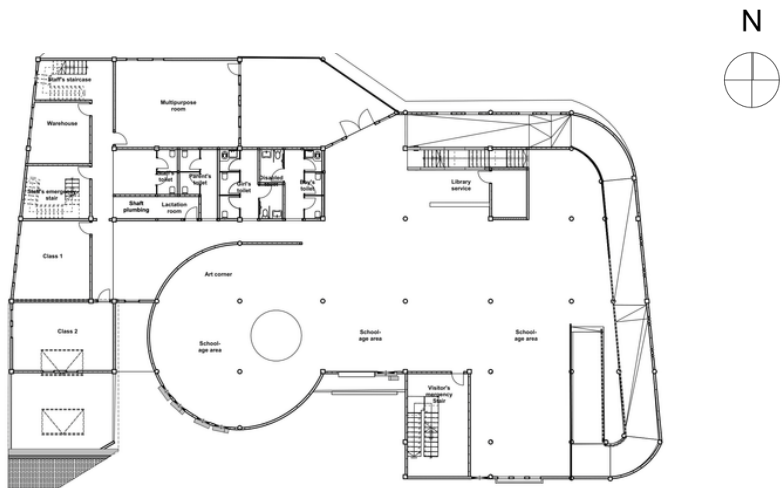
Playground Design Criteria and Problem Solving		
Variable	Design Criteria	Problem Solving
Spatial organization	Open space no obstacles	Wide open area for run, jump
	Age separation	Separating pre-school-age with school-age children
	Functional zoning	Dividing site for some function
	Safe insect viewing area	Special passive area in the edge or corner of the site
Accessibility	The jumping area requires an open and object-free area	Plotting shrubs layout so it's not blocking the circulation
	Standard ramp	Easy and safe access with rasio 1:7
	Safe and comfortable pathway for wheelchair user	Use of flat surface material
	Provision of special roads for wheelchair users	Providing paths leads to any function area
Structure & material	No hardened surface	Providing grassy area with no hard material that is safe for falling down
	Safe and strong equipment	Use of strong structure and material
	Use of materials according to function	Providing soft and hard material surface according to function
	Non-slip surface	Providing safe area for running
	The jumping area is an area that can absorb shocks	Use of loose fill material (wood, rubber)

DESIGN DRAWING

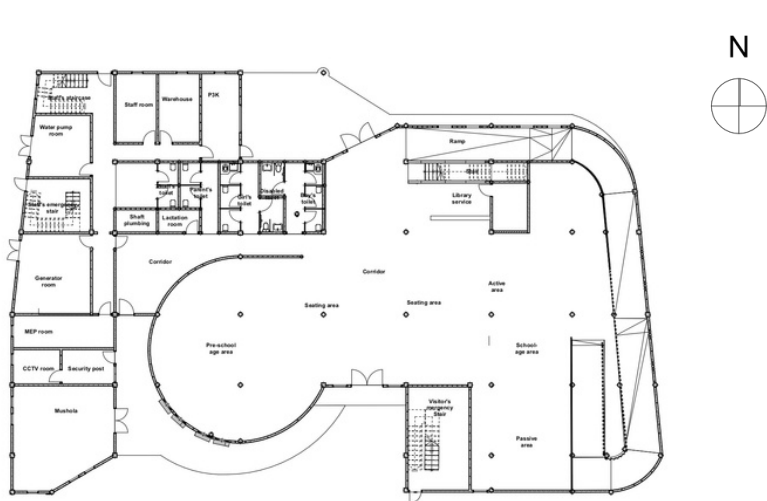
Site plan



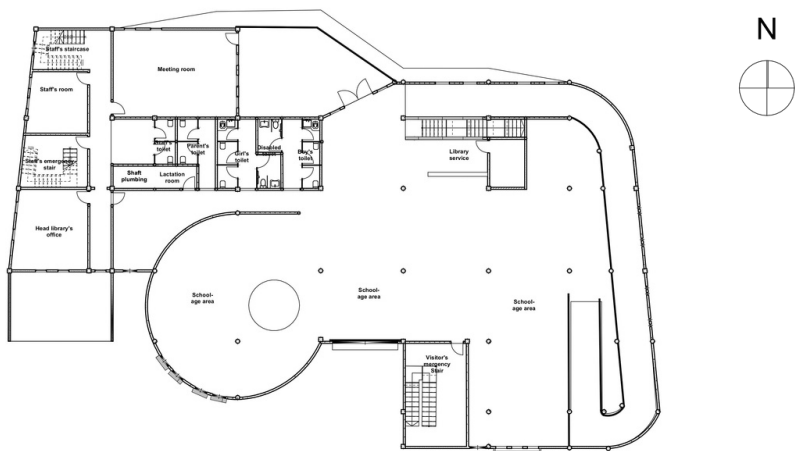
Floor plan 1



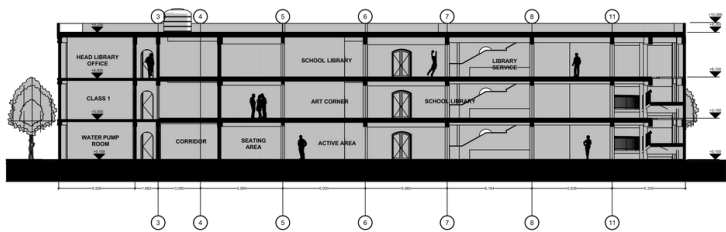
Ground Floor plan



Floor plan 2

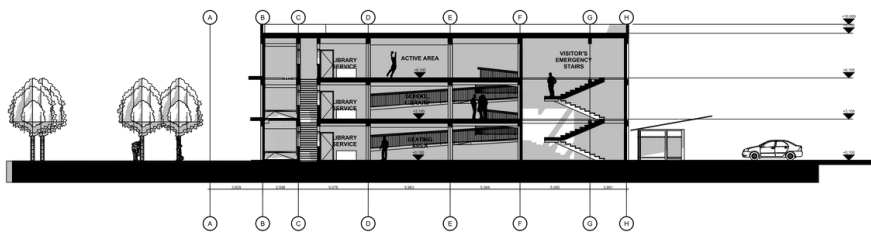


Section A



Building sec A Building Section 1:200

Section B



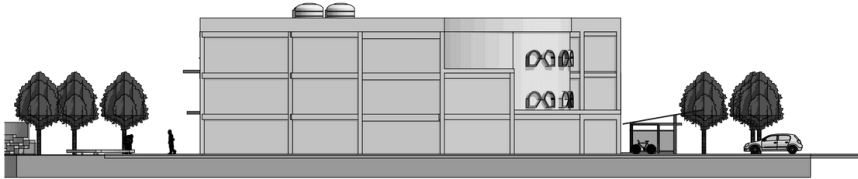
Building Sec B Building Section 1:200

Elevation South



South Elevation 1:200

Elevation West



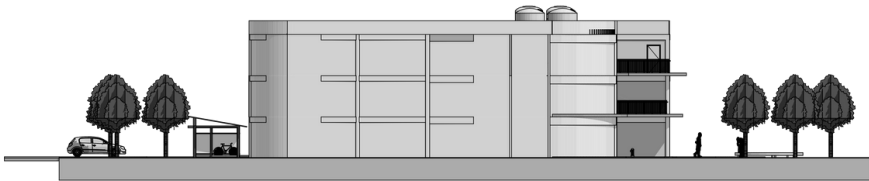
West Elevation 1:200

Elevation North



North Elevation 1:200

Elevation East



East Elevation 1:200



Interior



Exterior



EVALUATION

Defense Evaluation

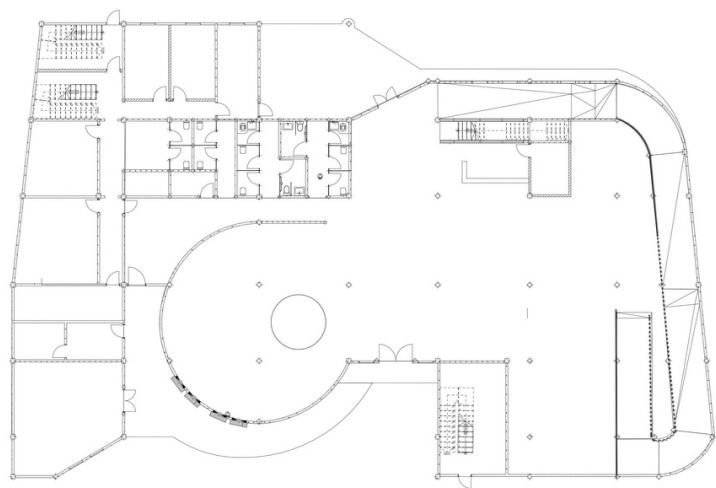
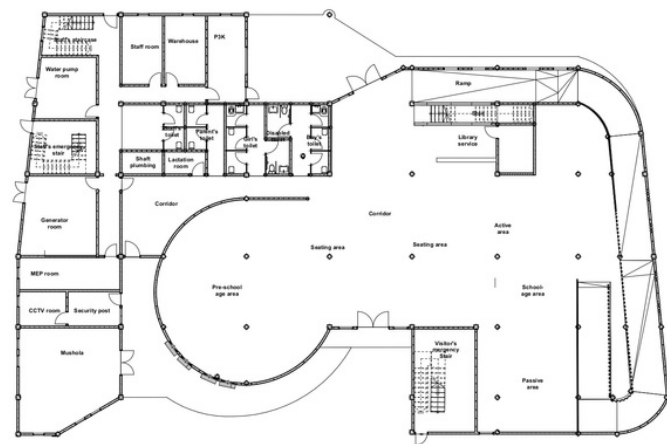
1. Haven't shown detailed furniture layout details yet and design process of how the room is arranged
2. Has not completed the explanation of the design concept
3. Design criteria have not directly demonstrated problem solving and design processes
4. The placement of fire escapes adjacent to ordinary stairs is less effective
5. The concept has not been integrated and well structured
6. In terms of quantity, the content of the book is still lacking, and in quality there are concepts that are missed to be discussed
7. The use of flat roofs in tropical climates can pose risks

Design Completion

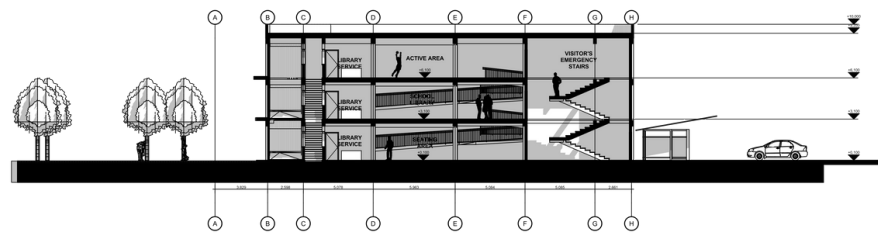
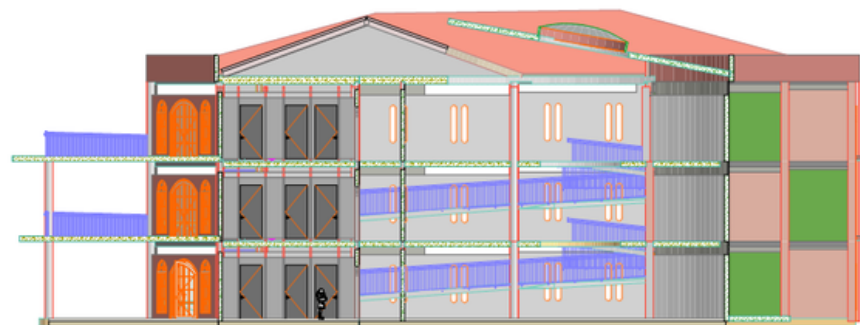
1. Added the design process of the spatial organization of the space in point 3.2.3 and the drawing of the furniture layout plan in point 4.2.6
2. An explanation of the design concept has been added
3. The design process has been added and the design criteria table has been created specific
4. Revise the layout of stairs in buildings can be seen in the design drawing sub-chapter
5. Checking and rearranging the contents of the book so that it is in order
6. Double-checking and adding missed concepts
7. A gable roof on top of the reinforced concrete construction has been added

Design Revision

Stair problem



Roof problem



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Design of children’s library, focusing on safety aspects, in Klaten, Central Java

IQRA CHILDREN LIBRARY

Smart way of having fun, bridging children from their playing world come into literacy world

Design Brief

IQRA Children Library is a city public library for children that accommodates children's development. This children library exists to create educational community and bridging children from their world (playing) to literacy world (reading-learning). Children are given the freedom to choose the activities they want and learn anything from the surrounding environment. Children's learning activities are supported by the library by designing learning areas according to design criteria, playground design guidelines, and library design guidelines. Which then takes the security aspect as the focus of the discussion of the design concept. The safety includes the safety of the building function and safety of the building system.

Study Background

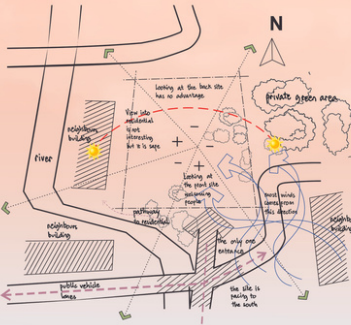
The library for public is different from library for children. The children's library is having exclusively planned design to support children's learning effectively (Nolan Lushington, 2008) In this case, the library is a community space with the aim of facilitating self-development and the development of children's literacy skills. This children library will not only be a place that serve book, but also encourage children to explore the world through reading, learning, and playing [Chandramathi, K., 2017]. It's connecting between children's world and library, between imagination and literacy, also between playing and learning. Why playing is included here? Because it's their world, children love to play, and playing is an essential strategy to learn (UNICEF, 2018). They love to be allowed doing whatever they want rather being told what to do. Exploration is a good way to learn and this builds self-learning independence in children. But many teachers and parents limit their children's activities because they are worried that harm or an accident will befall the children. Naturally, children, especially pre-school age, have not been able to assess the scale of risk in the activities they undertake, so they have difficulty avoiding potential hazards. Here is the challenge that children's library should be designed safe and children-friendly.

Problem and Limitation

How to design children's library that providing learning environment for supporting children's activity and development, which focusing on safety aspect. This safety aspects is limited by focusing on the spatial organization and fire protection system. Here we will not discuss spatial behavior children, so in terms of function room safety will be focused on space and area performance, such as accessibility arrangements, use of materials, structure, spatial organization, circulation arrangements.

Site Analysis

The site is located in Lombok street, No.2, Kanjengan, Central Klaten, Klaten.



Property Size

Building Coverage $60\% = 60\% \times 3000$ $= 1800\text{sqm}$	Floor Area Rasio $2.0 = 2.0 \times 3000$ $= 6000\text{sqm}$	Green Space Rasio $15\% = 15\% \times 3000$ $= 450\text{sqm}$
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Library Concept



Library Design Focus



Problem Scheme

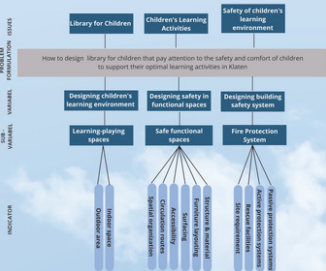


Figure 3: Problem Scheme

Difference between public library and children's library

Public Library	Children's library
Quiet	Loud
Passive	Active
Monotonous	Playful
Standard	Specific
Non-kid-friendly	Kid-friendly furniture
Serious, boring	Fun
The children's room is part of the library service	The library design is dedicated for children

Don't	Do
Typical space design	Variety space design
Monochrom	Colorful
High shelves	Low shelves
Lump more than daylight	Daylight more than lump
Public standard furniture	Children's furniture



Land area : 3000m2
Building coverage : 1100m2
Floor area : 3300m2
Green space area : 582m2

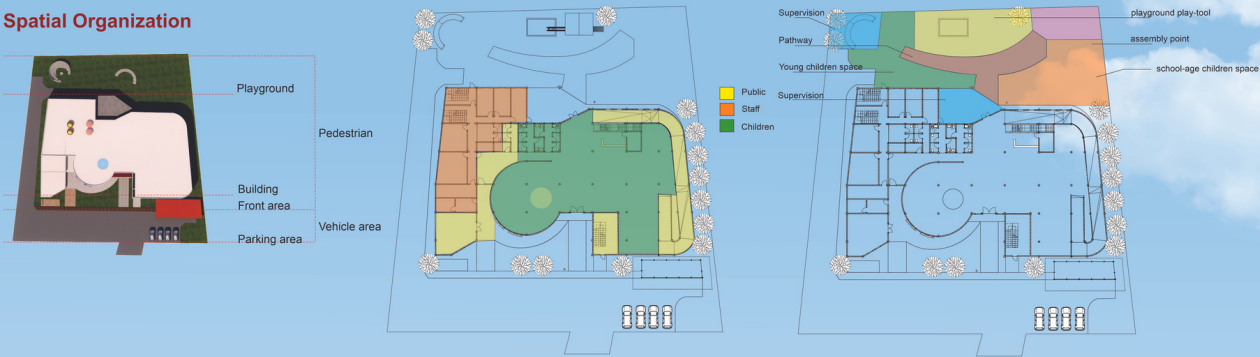
FADS Title : Design of Children's Library
Focusing on Safety Aspects, in Klaten,
Central Java

Name/ ID Student : Aulia Zulfa Isvandy
Supervisor : Prof. Ar. Noor Cholis Idham,
S.T., M.Arch, Ph.D., IAI

Examiner : 1. Yulianto P Prihatmaji, MT., Dr., IAI
2. Putu Ayu P Agustiananda, S.T.M.A.Dr-Ing

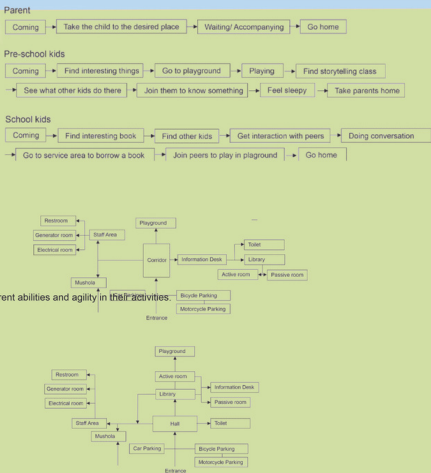
Problem Solving of Safety of Functional Space

Spatial Organization



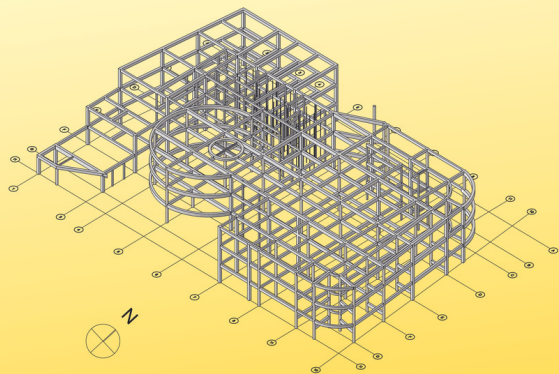
The division of zones is intended to separate the age groups of building users who have different abilities and agility in their activities.

Accessibility



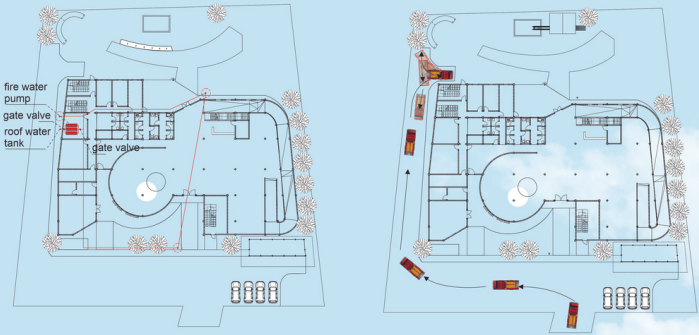
The division of zones is intended to separate the age groups of building users who have different abilities and agility in their activities.

Structure & material

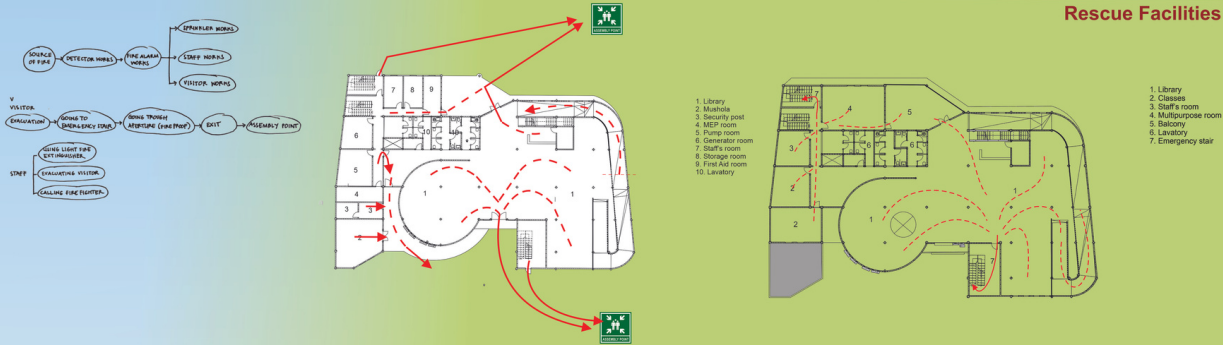


Problem Solving

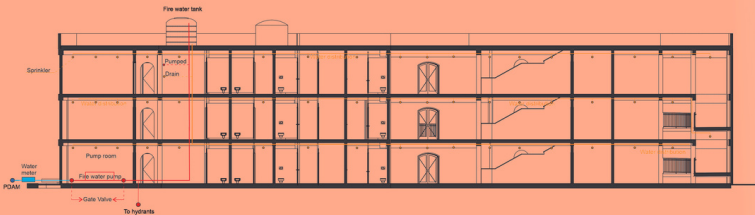
Site Requirement



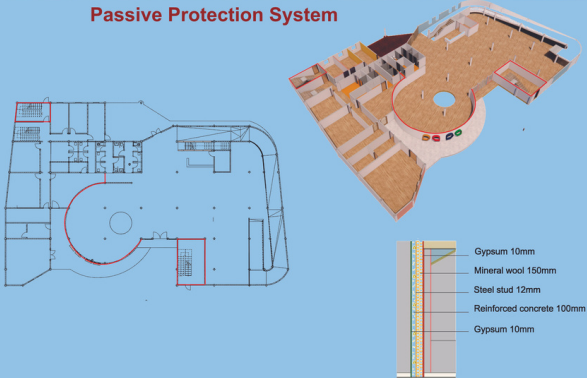
Rescue Facilities



Active Protection System



Passive Protection System



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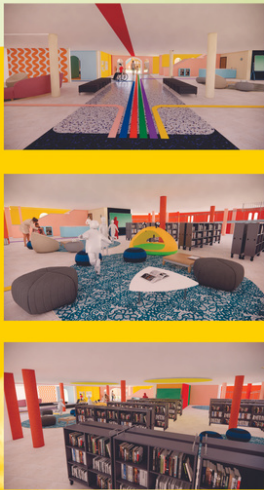
Examiner : 1. Yulianto P Prihatmaji, MT., Dr., IAI
2. Putu Ayu P Agustiananda, S.T,M.A.Dr-Ing

Design perspective

Exterior



Interior



FADS Title : Design of Children's Library
Focusing on Safety Aspects, in Klaten,
Central Java

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SURAT KETERANGAN HASIL CEK PLAGIASI

Nomor: 1931332284/Perpus./10/Dir.Perpus/X/2022

Bismillaahirrahmaanirrahiim

Assalamualaikum Wr. Wb.

Dengan ini, menerangkan Bahwa:

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