

BAB 7. DESIGN FOUNDATION

The foundation of the design is the conclusion of student attitudes towards the points that are the basis of the design, such as:

7.1 Building Layout Design Foundation

For spatial planning using a combination of linear organization and grid circulation elements

7.1.1 Linear Organizations

With the linear method, this method is the most possible method to avoid physical contact between building users directly because when we walk along the lane, we are only faced with 1 select route, which is forward.

This linear configuration of roads in one or two directions whose patterns can be said to be very simple. In addition, the achievement is also easy and static with respect to distance. This path can be in the form of curvilinear or cut into pieces and intersects with other lines, or branching.

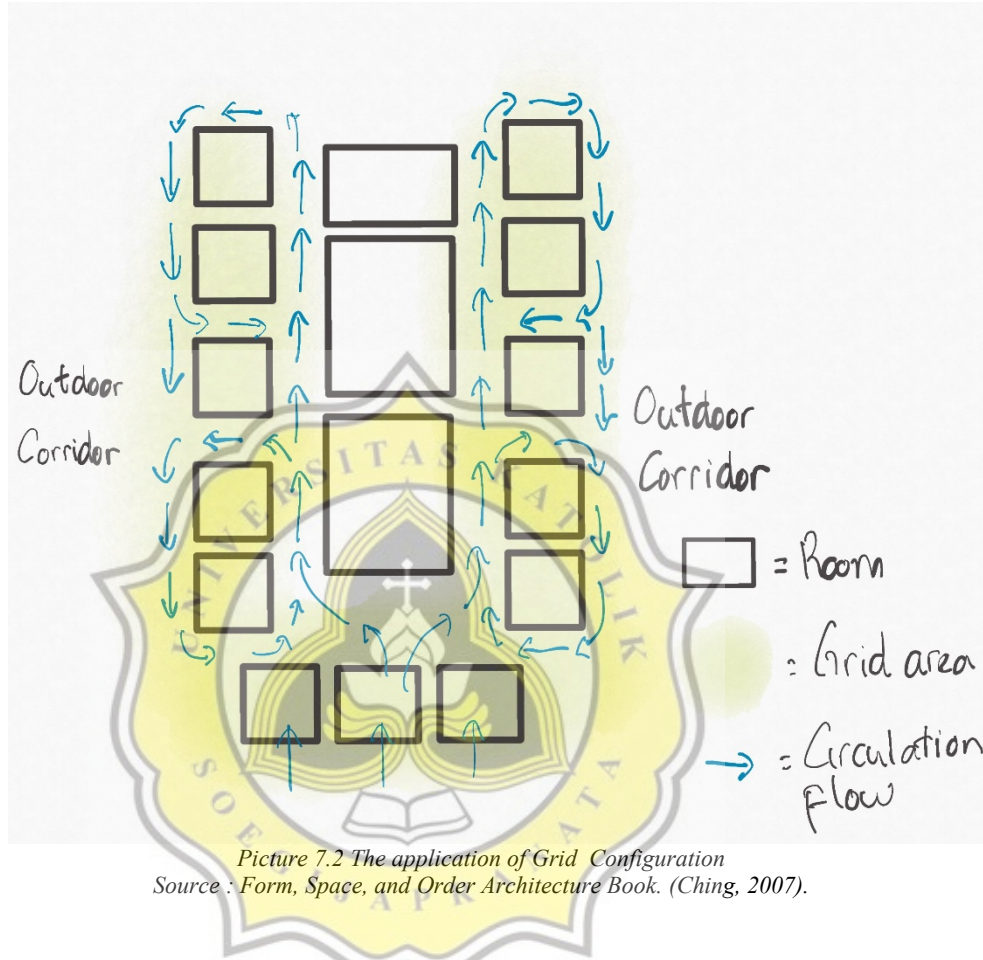


Picture 7.1 Linear Configuration
Source : *Form, Space, and Order Architecture Book*. (Ching, 2007).

Linear organization consists of several spaces. These spaces are related to each other or connected through separate and distinct linear spaces. Linear organization usually consists of repetitions that are the same in size, shape, and function. It can also consist of a single linear space arranged along a series of spaces that differ in size, shape, or function. Each existing space has their respective functions and forms. In addition, the layout in this building is also a combination of linear organization with grid organization.

7.1.2 Grid Organizations

Grid organization is used as a combination in this building to facilitate the circulation of people who have to go out into the outer corridor to reach rooms or places that have been missed.

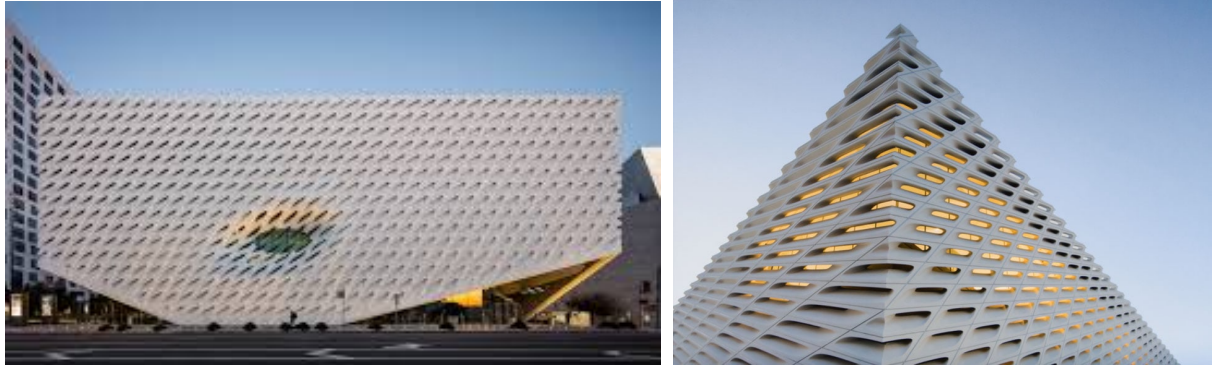


The colored part is the implementation of a grid organization where every 2 rooms there is an access where all basketball academy building users can exit to go to the outer corridor to reach rooms that have been overlooked or are located behind them. With a circulation system like this (one-way circulation) it is possible to reduce physical contact between users.

7.2 Basis of The Building Form Design

For the building design concept, the basketball academy building at BSB will take the basic principles of biomorphic form and pattern according to chapter 6.2.1. By taking the biomorphic concept, the shape of the building can be improvised with many openings in the roof to bring out bright skies and natural sunlight at certain hours. with a box shape,

every room that requires natural lighting will get the same light intensity or direction because the plane at the top is flat. then for processing the facade using a biomorphic pattern.



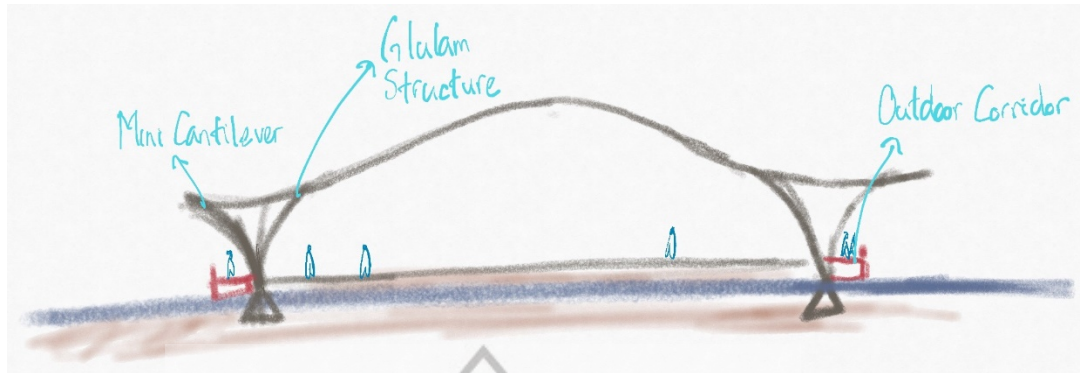
Picture 7.3 The Example of the application of the biomorphic facade
Source : <https://www.thebroad.org/>

According to chapter 2.2, we know that sunlight is the important thing for all of users of this building. For the roof shape in the basketball academy building, there are openings as shown in the picture to get the bright sky and sunlight intensity so that it can help regulate humidity in the building and save electricity.



Picture 7.4 The vibes of Application of natural lighting
Source : <https://www.uclabasketballfacility.com/>

There are 2 main columns in each part of the building to support it as the main structure. For basketball academy this building has a very dominant glulam structure. In addition, there is an outside corridor to access the circulation of people inside the building so that they can access the room that has been passed.



Picture 7.5 Overview of the building shape.
Source : Personal Analysis

7.3 Building Structure Design Foundation

7.3.1 Building Structure

The basketball academy building consists of 2 buildings that have their own functions, namely a training facility building and a mess building for athletes to rest.

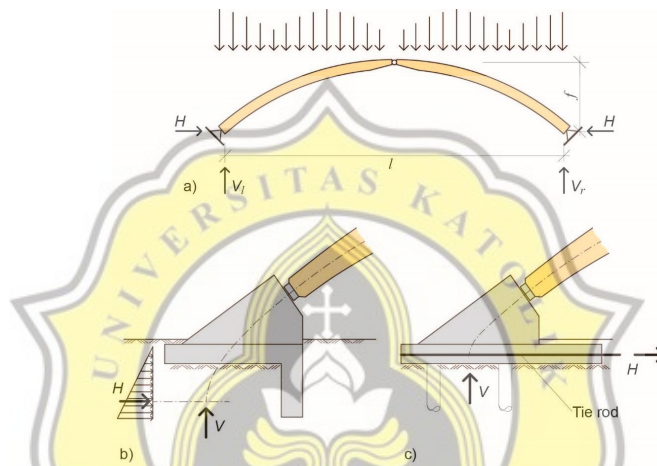
1. Training Building

Glulam structures can be used for buildings that have a wide span even up to a span of 60-70 meters. the most important thing in the glulam structure is the hinge system. Rigid hinges and joints should be positioned as in picture below. Two-way arches have the inconvenience of not being statically determined, meaning they are sensitive to eg. support settlement or / and humidity changes. Arches without hinges in practice are never used for load-bearing wooden structures.



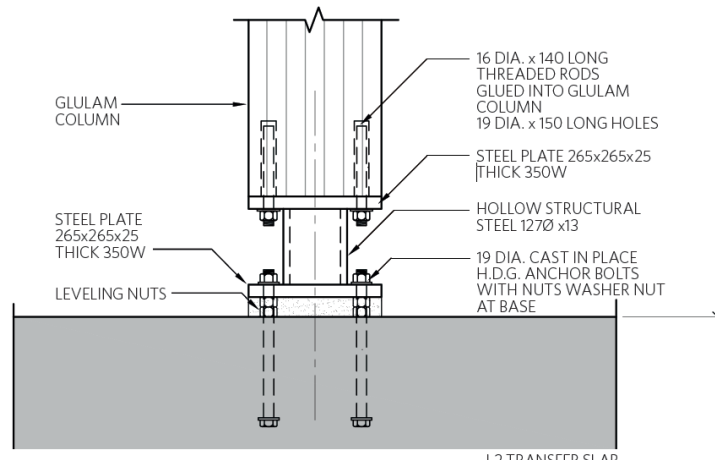
Picture 7.6 Suitable placing of joints in arch structures
Source : Large-Span Timber Structure

The shape of the arch relates to the bending moment because they are both related. The curved geometric lines must match the loading combination. the curved structure rests directly on the ground floor concrete slab as shown below. with this arrangement, horizontal forces can be taken by the foundation if soil conditions allow. besides that using a long pole is also possible as shown below. To limit the size of the horizontal reaction, the curve increment must be equal to or greater than 0.14 to 0.15 of the range. For a parabola or circle this corresponds to a spring angle of about 30 °. In practice, arches are usually designed with an up-to-span ratio of $0.14 \leq f / l \leq 0.30$.



Picture 7.7 Application of natural lighting during training (main field scene)
Source : Large-Span Timber Structure

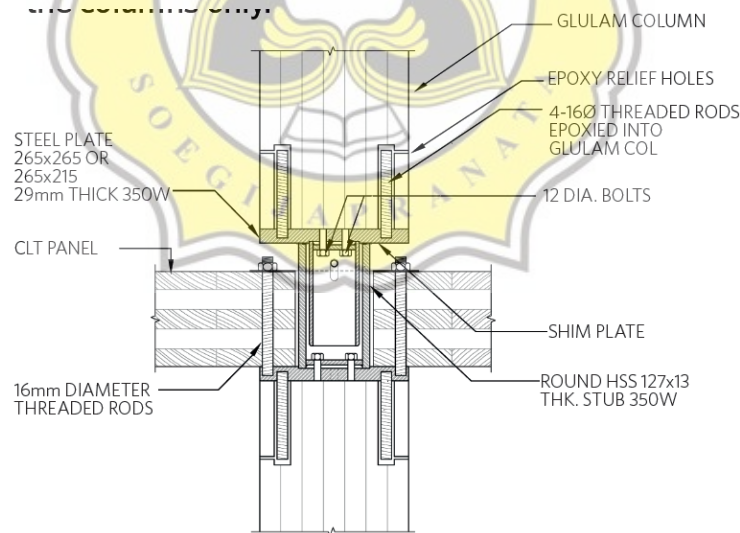
The structure applied in this building is a combination of glulam beams and glulam columns. The structure applied in this building is a combination of glulam beams and glulam columns. The connection of the concrete slab to the column is bolted to the concrete transfer plate. for column size can adjust the glulam beam and span.



Picture 7.8 The detail of steel plate and glulam column meeting
 Source : Brock Commons UBC Tall Wood Building

2. Mess Building

The mess building consists of 3-4 floors using a glulam structure consisting of columns made of glulam wood and beams made of glulam wood. To adjust the size of the column to the stretch or distance between columns. Adjusting the space requirements chapter, the choice of module spacing between columns is a multiple of 4 or 5 (4,5,8,10, etc) because most space uses multiples of that size. for details on the glulam structure can be seen in the following picture.



Picture 7.9 The detail of connection between CLT Panel with Glulam Column
 Source : Brock Commons UBC Tall Wood Building

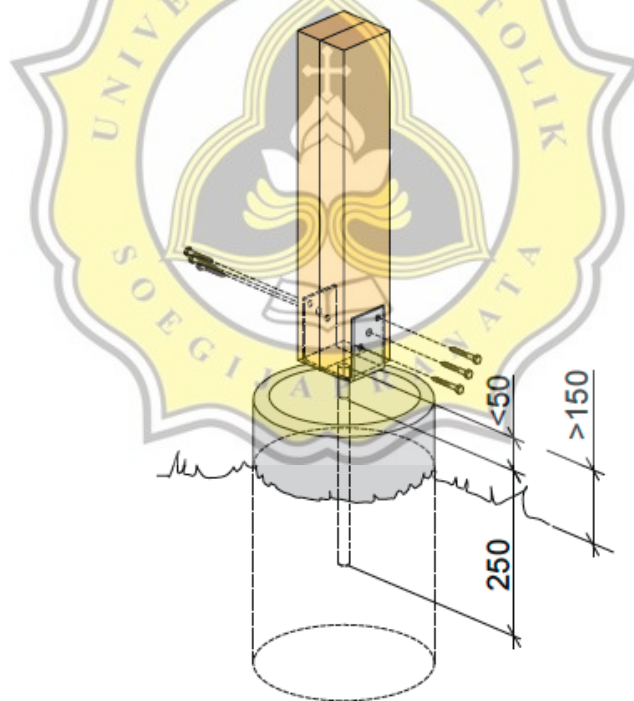
Column-to-column panel joints consist of a circular steel hollow structure (HSS) section bonded by steel plates connected at the top and bottom of each column using threaded rods that are epoxyed into the column. The smaller HSS at the base of the column matches the larger one at the top of the column below. The CLT panel is supported

over the bottom of the column, and bolted to the steel plate by four threaded bars. The connection transfers the vertical load directly to the column only.

7.3.2 Building Foundation

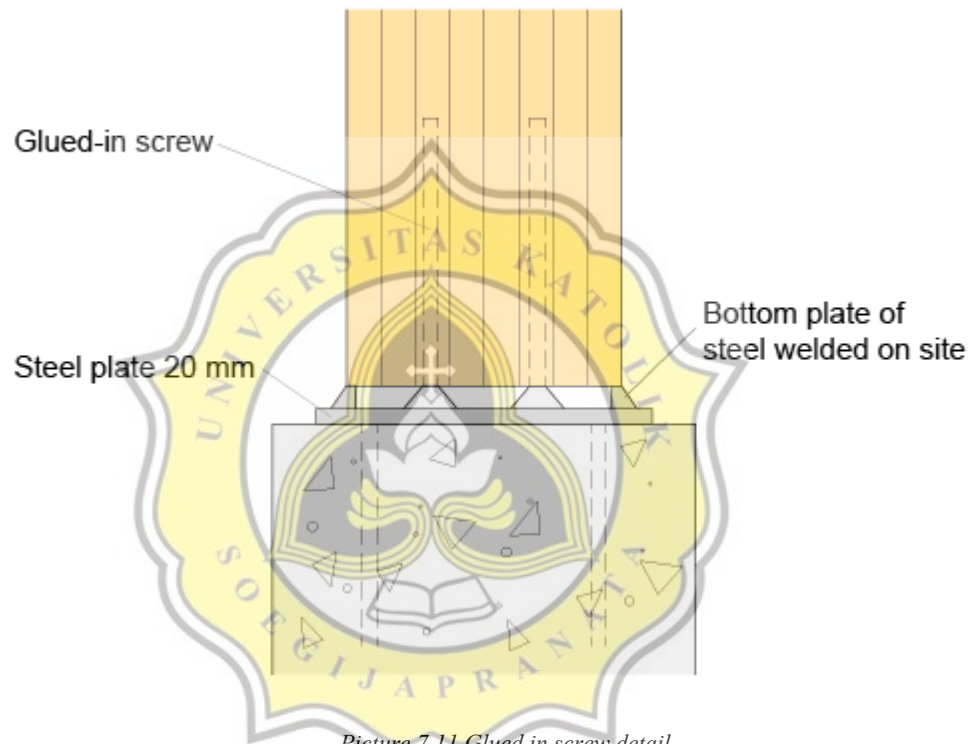
The basketball academy building consists of 2 floors, which on the second floor is a mezanine for the manager room. So the use of a pile foundation is the best choice that is placed on a site that has soft soil quality.

The foundation used for the underground remains using concrete. so the more it goes down, the combination of glulam and concrete is found. For the foundation it is also important to keep moisture away from the column feet outdoors. It is important with a moisture protection membrane or airing between the concrete surface and the glulam column. The top is a foundation fixing with the possibility to handle the tip grains to prevent moisture absorption. The bottom is a sheet metal and moisture protection membrane between glulam and concrete.



Picture 7.10 The detail of keeping moisture condition in glulam foundation
Source : Glulam Handbook volume 1

With the application of "glued in screw" the attachment is completely hidden. Concealed mount provides approved fire protection. The support remains only suitable for relatively small moments. Mounted screws cannot be used in structures that accommodate dynamic loads such as vehicles. The connection to the ground structure is in the form of a post with a sheet metal tip on the end face of the column. The sheet metal ends are threaded on the screws which are glued together and welded to the fastener sheet metal embedded in the structure of the foundation.



Picture 7.11 Glued in screw detail
Source : Glulam Handbook volume 1

7.4 Foundation for Building Materials

There are several materials used in the Basketball Academy building, which are:

1. Glulam wood

For the use of wood structures, glulam is often found in structures. The glulam wood structure used is an exposed system so that the structure can be seen directly by users in the building, besides that, the presence of glulam wood can also stimulate and have an impact in the health sector for all users in this basketball academy building. This

glulam material is very often found in this building, you could say that the glulam wood material is very dominant in this building.

2. Tempered glass

Tempered glass is a type of safety glass that is processed by controlled thermal or chemical treatments. for strength is far more resistant when compared to ordinary glass. tempered glass puts the outer surface into compression and the inner becomes tense. Such pressure causes glass, when shattered, to shatter into tiny grain pieces, instead of breaking into jagged shards like plate glass does. Small grain pieces are less likely to cause injury. Tempered or toughened glass is also as much as 6 times stronger than untreated glass as well as being resistant to impacts. The safety glass credentials come in when tempered/toughened glass is broken into smaller, rounder edged pieces.

3. Green walls and interior landscaping

Whereas loose growth medium systems have the soil packed into a shelf or a bag (which are then placed onto a wall), mat media are, as the name implies, mat systems, usually made of thin coir fiber or felt. The plants root themselves directly onto the mat and require no loose media (such as soil). Sheet media are compatible with mat systems, but consist of patterned inorganic polyurethane sheets more endurant than coir fiber or felt. Structural media combine the loose and mat systems by forming a block that can be made in different shapes and sizes. For example: the greenery can be planted into loose media, placed into pots and laden onto a wall structure with a built-in irrigation.

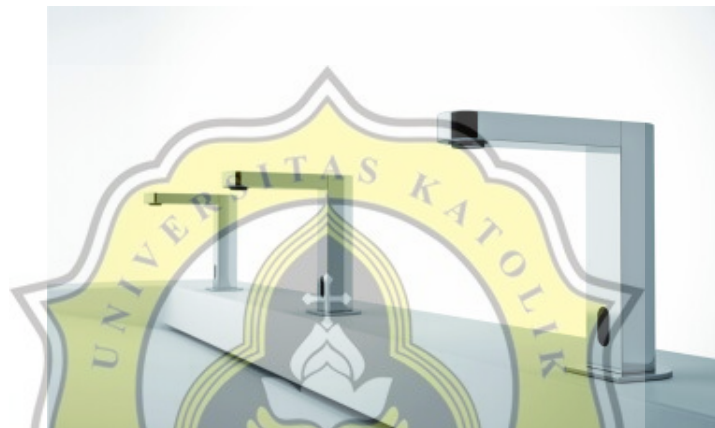
7.5 Site layout design foundation

The spatial arrangement within the site will be arranged by focusing on zoning division based on the activities discussed in chapter 3.2. for zoning the mess building and the main field are located close together and for connecting access the two buildings are a green area which can be used as an area for physical training of athletes.

7.6 Mechanical Electrical Systems In Buildings.

7.6.1 Sanitary Use

In this basketball academy building, all the sanitation contained therein are "sanitary no touch". With all the use of bathroom equipment (toilets, wastewater, urinal) it can minimize the spread of the virus because apart from sticking to the body, covid-19 can also stick to certain objects. Apart from avoiding physical contact with fellow humans, avoiding physical contact by coming into direct contact with objects is also a solution in this new normal. Considering the importance of washing hands, every 15 meters a sink will be found aimed at minimizing the spread of covid.



Picture 7.12 The example of sensoric wastefel
Source : <https://archello.com/product/sensor>



Picture 7.13 The example of sensoric Toilet
Source : <https://archello.com/product/sensor>

7.6.2 Water Distribution System

Water distribution system is divided into 3, which are:

1. Clean Water

Clean water is flowed from the PDAM to the ground tank, and pumped to the reservoir, which is then distributed to all rooms that need clean water. Clean water from the PDAM is used for washing hands and washing dishes.

2. Grey Water

Gray water, such as water from rain, is filtered and collected for reuse for flushing toilets. Some of the collected rainwater is also put into the gray water reservoir

3. Rainwater

Rainwater is collected through gutters and stored in separate tanks for flushing toilets, fire extinguishers, or flushing the garden.

