Final Architecture Design Studio
Design Of

Difable Athletes Sport Center Architecture

in Palembang with passive design approach to establish high performance facilities



Kirana Zhafirah Maheswari
21512187

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

entra.kita

DEPARTMENT of ARCHITECTURE

ARCHITECTURE UNIVERSITAS ISLAM INDONESIA

UNGGUL

KA AB

한국건축학교육인증원 Korea Architectural Accrediting Board

BOARD OF ARCHITECTS MALAYSIA LEMBAGA ARKITEK MALAYSIA

BUILDING PERFORMANCE & TECHNOLOGY LABORATORY

Studio Akhir Desain Arsitektur
Desain dari

Arsitektur Pusat Olahraga Atlet Difabel

di Palembang dengan Pendekatan Passive Design untuk Mewujudkan Fasilitas Berkinerja Tinggi



Kirana Zhafirah Maheswari
21512187

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

entra.kita

DEPARTMENT of ARCHITECTURE

ARCHITECTURE UNIVERSITAS ISLAM INDONESIA

UNGGUL

KAAB 한국건축학교육인증원 Korea Architectural Accrediting Board

BOARD OF ARCHITECTS MALAYSIA LEMBAGA ARKITEK MALAYSIA

BUILDING PERFORMANCE & TECHNOLOGY LABORATORY

UNIVERSITAS
ISLAM
INDONESIA

PAGE OF APPROVAL

Studio Akhir Desain Arsitektur yang Berjudul :
Final Architectural Design Studio Entitled :

Arsitektur Pusat Olahraga Atlet Difabel di Palembang dengan Pendekatan Passive Design untuk Mewujudkan Fasilitas Berkinerja Tinggi
Difable Athletes Sport Center Architecture in Palembang with Passive Design Approach to Establish High Performance Facilities

Nama Lengkap Mahasiswa : **Kirana Zhafirah Maheswari**
Student's Full Name

Nomor Mahasiswa : **21512187**
Student's Identification Number

Telah Diuji dan Disetujui Pada : **Yogyakarta, 21 Agustus 2025**
Student's Identification Number

Dosen Pembimbing *Supervisor*	**Penguji 01** *Examiner 01*	**Penguji 02** *Examiner 02*
Prof, Noor Cholis Idham, ST., M.Arch., Ph.D., IAI	Johanita Anggia Rini, S.T., M.T., Ph.D	Ir. Hanif Budiman, M.T., Ph.D

Diketahui Oleh:
Acknowledge By:
Ketua Program Studi Sarjana Arsitektur
Head of Undergraduate Program in Architecture

UNIVERSITAS ISLAM INDONESIA
FAKULTAS TEKNIK SIPIL DAN PERENCANAAN
YOGYAKARTA

Ir. Hanif Budiman, M.T., Ph.D

UNIVERSITAS
ISLAM
INDONESIA

SUPERVISOR NOTES

Berikut ini adalah penilaian buku laporan Studio Akhir Desain Arsitektur:

Nama Lengkap Mahasiswa : **Kirana Zhafirah Maheswari**
Student's Full Name

Nomor Mahasiswa : **21512187**
Student's Identification Number

Studio Akhir Desain Arsitektur yang Berjudul :
Final Architectural Design Studio Entitled :

Arsitektur Pusat Olahraga Atlet Difabel di Palembang dengan Pendekatan Passive Design untuk Mewujudkan Fasilitas Berkinerja Tinggi
Difable Athletes Sport Center Architecture in Palembang with Passive Design Approach to Establish High Performance Facilities

Kualitas Pada Buku Laporan Studio Akhir Desain Arsitektur:
~~**Sedang***)~~, ~~**Baik***)~~, **Baik Sekali***) Lingkari Salah Satu

Sehingga,
Direkomendasikan/ ~~**Tidak Direkomendasikan***)~~ Lingkari Salah Satu
Untuk menjadi acuan produk laporan Studio Akhir Desain Arsitektur

Yogyakarta, 21 Augustus 2025
Yogyakarta, 21 August 2025

Dosen Pembimbing
Supervisor

Prof, Noor Cholis Idham, ST., M.Arch., Ph.D., IAI

UNIVERSITAS
ISLAM
INDONESIA

STATEMENT OF AUTHENTICITY

I, the undersigned below:

Name	:	Kirana Zhafirah Maheswari
Student Number	:	21512187
Study Program	:	International Undergraduate Program in Architecture
Faculty	:	Civil Engineering and Planning
Title	:	Difable Athletes Sport Center Architecture in Palembang with Passive Design Approach to Establish High Performance Facilities

I declare the work that contained in this Final Architectural Design Studio Project report is my work, not an existing work of someone else. For any material that has not originated by me, I certify the sources have been properly and fully acknowledged in the text

I sincerely declare that this statement is true and submit it to the Department of Architecture at the Islamic University of Indonesia to be used for educational and publication purposes.

Yogyakarta, 20 Augustus 2025
Yogyakarta, 20 August 2025



Kirana Zhafirah Maheswari

FOREWORD.

Praise and thanks to Allah SWT for the mercy and blessings upon all His people, as well a our greetings and prayers to the Prophet Muhammad SAW who has give syafa'at for his followers. Gratitude to Allah SWT, Prophet Muhammad SAW, family, and close friends who have given the strength for the author to complete the Final Architecture Project with title **"Difable Athletes Sport Center Architecture in Palembang with Passive Design Approach to Establish High Performance Facilities."** Through this opportunity, I sincerely want to express my gratitude to those who generously offered help, support, guidance, and encouragement throughout the entire process for the author to achieve this degree.

1. Allah SWT, for all the grace and blessings that have been given to me in every process of the journey. The one who answers all my prayers to give me health and strength, who makes me able to finish this final project successfully without any regrets
2. My beloved family, Laksi (Father), Midtri (Mother), and Cila (Sister), are the ones who gave the author the biggest strength, courage, and unlimited support in every aspect of the project. They are the reasons that make the author keep walking forward in the journey. And also Uti (Grandma), the one who take care of me with a full heart from the first semester until finishing this final architecture project.
3. Prof. Noor Cholis Idham, S.T., M. Arch., Ph.D., IAI, as the supervisor of the Final Architecture Design Studio (SADA), who always shares his wide knowledge relentlessly and kindly guides the author, enabling the author to finish the project and learn a lot of precious knowledge.
4. Johanita Anggia Rini, S.T., M.T., Ph.D., as the examining lecturer. Who always provides the best constructive advice and criticism in a detailed manner to help the author complete the technical aspect of the final project and become better.
5. Ir. Hanif Budiman, M.T., Ph.D., as the examining lecturer and Chairperson of the Architecture Study Program at Universitas Islam Indonesia. Who always provides the best constructive feedback to enable the author to explore the conceptual aspect of the final project and become better.
6. My beloved university friends, Caca, Zaza, Raisa, Rhafie, Darrel, and Kak Kemal. Those who have been witnesses and comrades-in-arms from the beginning of the semester to the end. Words of gratitude alone are insufficient to express how grateful the author is to have been brought together with friends as wonderful as them, who have been a source of strength, knowledge exchange, reminders, and motivation in every step of the journey.
7. All my other friends and colleagues, as well as the people I met along the way, who cannot be mentioned individually who have helped the author along the journey. The author is really sincerely grateful to them.
8. My beloved partner Wati (car), the one which faithfully accompanied the author wherever she went in pursuing her education.
9. My favorite singers, Stray Kids & Laufey. Their songs accompanied the author while working on his final project.

For all the assistance and dedication that has been provided, hope that these kindnesses will be rewarded many times over by Allah SWT. As the author, I am aware that this project is not perfect. The author hopes that the Final Architecture Project Studio (FADS) can serve as a reflection that we must all continue to learn and improve in future projects. Therefore, the author also hopes that this writing can be beneficial as a learning tool and useful for new innovations to be developed as a design approach in a similar context for the readers.

Yogyakarta, 17 Augustus 2025



Kirana Zhafirah Maheswari

ABSTRACT.

The lack of awareness and limited infrastructure for athletes with disabilities in Palembang, highlighting the need for inclusive sports facilities. The proposed design focuses on developing a Sport Center that embodies inclusive architecture—ensuring accessibility and dignity for all users—while simultaneously achieving high-performance passive design. By integrating natural ventilation and daylighting strategies, the design aims to reduce energy dependency and enhance indoor comfort. Design performance is evaluated through Computational Fluid Dynamics (CFD) simulations to analyze natural airflow and Velux simulations to assess daylight penetration. The final outcome is a Sport Center design that not only supports inclusivity for difabled athletes but also meets environmental and thermal comfort standards through passive strategies.

ABSTRAK.

Kurangnya kesadaran dan terbatasnya infrastruktur untuk atlet penyandang disabilitas di Palembang, menyoroti kebutuhan akan fasilitas olahraga yang inklusif. Desain yang diusulkan berfokus pada pengembangan Sport Center yang mewujudkan arsitektur inklusif-memastikan aksesibilitas dan martabat bagi semua pengguna-sekaligus mencapai desain pasif berkinerja tinggi. Dengan mengintegrasikan strategi ventilasi alami dan pencahayaan alami, desain ini bertujuan untuk mengurangi ketergantungan energi dan meningkatkan kenyamanan dalam ruangan. Kinerja desain dievaluasi melalui simulasi Computational Fluid Dynamics (CFD) untuk menganalisis aliran udara alami dan simulasi Velux untuk menilai penetrasi cahaya matahari. Hasil akhirnya adalah desain Sport Center yang tidak hanya mendukung inklusivitas bagi atlet difabel, namun juga memenuhi standar kenyamanan lingkungan dan termal melalui strategi pasif.

List Of Content

Chapter 01 — Introduction

1.1 Design Premise ---- 16
1.2 Background ---- 16
1.2.1 Disability in Indonesia ---- 16
1.2.2 Disability Sport Category in Indonesia ---- 17
1.2.3 Difable Community in Palembang ---- 17
1.2.4 Disability Sport Category in Palembang ---- 17
1.2.5 Disability Sport in Architecture ---- 18
1.2.6 Passive Design as Design Approach ---- 18
1.2.7 Passive Design Implementation at Sport Center ---- 19
1.2.8 Inclusive Architecture Approach Implementation at Sport Center 20
1.3 Problem Statement and Objective ---- 21
1.4 Design Method ---- 22
1.5 Design Framework ---- 23
1.6 Literature Review, Originality, & Novelty ---- 25

Chapter 02 — Design Study & Site Analysis

2.1 Precedents
2.1.1 Virginia G. Piper Sports and Fitness Center for Persons with Disabilities ---- 27
2.1.2 Hangzhou International Sport Center ---- 28
2.1.3 Sports Center of Jinhua City ---- 29
2.1.4 Singapore Sports Hub ---- 30
2.1.5 Fuyang Yinhu Sports Center/ UAD ---- 31
2.1.6 Hazza Bin Zayed Stadium ---- 32
2.1.7 LightHouse for the Blind and Visually Impaired ---- 33
2.1.8 The Casa Mac House ---- 33
2.1.9 School for Blind and Visually Impaired Children ---- 34
2.1.10 Canoeing Training Base/ PSBA + INOONI ---- 34
2.2 Difable Sport Center Typology
2.2.1 Sport center definition ---- 25
2.2.1 Sport center type ---- 35
2.2.3 Sport classification in general ---- 35
2.2.4 Difable sport classification ---- 35
2.3 Property Size Requirement ---- 36
2.4 Property Existing & Requirement ---- 37
2.5 Room Need ---- 38
2.6 Difable Field Standard Need
2.6.1 Boccia Field ---- 39
2.6.2 Paralympic Powerlifting ---- 40
2.6.3 Wheelchair Basketball ---- 40
2.6.4 Blind Chess ---- 41
2.6.5 Blind Judo ---- 42
2.7 Difable Architecture Element Need
2.7.1 Physical disability architectural integration ---- 43
2.7.2 Visual disability architectural integration ---- 44
2.8 Site Location & Analysis ---- 45

Chapter 03 — Design Concept

Design Concept Focus ---- 48
3.1 Site Development
3.1.1 Site Development According to Site Usage Regulation ---- 49
3.1.2 Site Development User Entrance According to Public Accessibility 49
3.1.3 Site Development Landscape Concept to Respond Climate Data 49
3.2 Property Size Use
3.2.1 Property Size Concept According to Regulation Needs ---- 50
3.2.2 Property Size Concept According to Supporting Function ---- 50
3.2.3 Property Size Concept According to Function Quantity Needs ---- 52
3.2.4 Property Size Concept According to Room Zoning Category ---- 52
3.2.5 Property Size Concept According to Room Zoning Category Implementation at Site ---- 52
3.2.6 Property Size Concept According to Room Zoning Classification Detail 53
3.3 Building Form
3.3.1 Building Form Concept According to Zoning Building Orientation (Orientation + Zoning) 57
3.3.2 Building Form Concept According to Zoning Based & Massing Arrangement on Climate Respond (Climate +Zoning) 58
3.3.3 Building Form Concept According to Massing Arrangement on Climate Respond Simulated Through Formit (Climate + Massing) 59
3.4 Room Layout
3.4.1 Room Layout Concept of Sport Field with Tribune According to Function 60
3.4.2 Room Layout Concept of Sport Field According to Function for Users 62
3.5 Landscaping
3.5.1 Green Space as Landscaping Concept of Green Space According to Climate Data at Open Space 63
3.5.2 Green Space as Landscaping Concept According to Paving Texture as Sensory Element at Open Space 63
3.5.3 Green Space as Landscaping Concept of Difable Parking Accessibility 64
3.6 Building Structure
3.6.1 Building Structure Concept According to Climate Respond to Damp Soil Type for Structure Stability 65

3.6.2 Building Structure Concept According to Climate Respond and room function at Roof Shape 66
3.7 Building Envelope
3.7.1 Building Envelope Concept According to Climate Data & Building Orientation 67
3.7.2 Building Envelope Form Concept According to Rood Structure 67
3.7.3 Building Envelope Type Concept According to Building Mass & Climate 67
3.7.4 Building Envelope Concept According to Cross Ventilation and Venturi Effect for Natural Passive Cooling 68
3.7.5 Building Envelope Concept According to Opening Type Specifically Window 68
3.8 Building Material
3.8.1 Building Material Concept According to Sensory Element 69
3.9 Accessibility
3.9.1 Concept of Pedestrian Pavement According to Public Accessibility 70
3.9.2 Accessibility Concept According to Room Function 70

Chapter 04 — Design Result & Proof
4.1 Final Massing
3.4.1 Final Massing According to All Consideration Aspect & Concept 72
4.1.2 Final Massing Concept CFD Simulation AIr Circulation Result 73
4.1.3 Final Massing Concept Formit Simulation Solar Radiation Result 73
4.2 Master Plan 74
4.3 Site Plan
4.3.1 Entrance Circulation to Main Building 75
4.3.2 Entrance Circulation to Sport Fields 75
4.4 FloorPlan
4.4.1 Inclusive Accessibility Inside the Building 76
4.5 Section
4.5.1 Cross Ventilation From Opening to Roof 77
4.6 Elevation 78
4.7 Schematic Visualisation
4.7.1 Exterior Schematic Visualisation 79
4.7.2 Exterior Schematic Visualisation 79

Chapter 05 — Design Evaluation
5.1 Evaluation Design Notes 81
5.2 Design Improvement
5.2.1 The Changes in The Site Size 82
5.2.2 The Changes in Building Mass Shape & Arrangement 83
5.2.3 The Changes in Building Roof Structure & Shape 84
5.2.4 The Changes in Building Facade 85

5.3 Final Design Development
5.3.1 Situation Plan 87
5.3.2 Site Plan 88
5.3.3 Floor Plan (Active Zone) 89
5.3.4 Floor Plan (Power Zone) 90
5.3.5 Floor Plan (Quiet Zone) 91
5.3.6 Elevation 92
5.3.7 Site Section 93
5.3.8 Section & Tribune Detail 94
5.3.9 Section & VIP Room Accessibility Detail 95
5.3.10 Section & Ramp Accessibility 96
5.3.11 Section & Difable Toilet, Shower Room 97
5.3.12 Facade Design 98
5.3.13 Facade Design CFD Simulation Result 100
5.3.14 Perforated Wall Design 101
5.3.15 Roof & Structure Design 102
5.3.16 Roof Opening Simulation With Velux 104
5.3.17 Inclusive Landscape Design 105
5.3.18 Inclusive Texture Material 106
5.3.19 Passive Design Scheme 107
5.3.20 Foundation Type Distribution 108
5.3.21 Roof Supporting Structure 109
5.3.22 Exterior Visualisation 110
5.3.21 Interior Visualisation 114
References 116

Chapter 06 — Design Evaluation
Design Development Conclusion 118
Space Truss Connection to Diagrid Structure 119
ACP Material Connection to Space Frame 120
PVC Material Connection to Space Frame 121
Parking Area Calculation According to Regulation 122
Color Guide as Inclusive Architecture Ornament Placement 123
Landscape Design Aspect to the Surroundings 124

Chapter 07 — Product Attachment
Plagiarism Check Letter 126
Apreb 127
Maquette 129
Design Document 133

TABLE OF FIGURE

Chapter 01

CODE	CAPTION OF THE FIGURE	PAGES
1.1	Difable running athletes	12
1.2	Difable basketball atlet	13
1.3	Community activities to find athletes in Palembang	13
1.4	Passive design strategy approach	14

Chapter 02

CODE	CAPTION OF THE FIGURE	PAGES
2.1	Building accessibility path	23
2.2	Passive design system	23
2.3	Three Building Mass Composition From Aerial View	24
2.4	Integrated Roof and Facade	24
2.5	Building Mass Composition From Plan	25
2.6	Triangular Building Facade	25
2.7	Building Mass Composition From Aerial View	25
2.8	Passive & active design system at roof	26
2.9	Open roof situation for ventilation	26
2.10	Facade Passive Design Technology	27
2.11	Facade From Exterior at Night	27
2.12	Tensile Facade Building From Elevation	28
2.13	Tensile Facade From Detail	28
2.14	Floor and Wall Contrast Material as Zoning Guide	29
2.15	Floor Pattern Material as Movement Guidance	29
2.16	Wall Pattern Material Texture as Movement Guidance	30
2.17	Color Line Guide	30
2.18	Type B Sports Field Layout	32
2.19	Existing Facility Requirements Location	33
2.20	Boccia Field Dimension	35
2.21	Paralympic Powerlifting Activity Situation	35
2.22	Paralympic Powerlifting Room Situation	35
2.23	Wheelchair Basketball Dimension	36
2.24	Basketball Wheelchair Dimension	36
2.25	Single Row Layout and Dual Row Layout	37
2.26	Differences Between Ordinary Chess With Braille Chess	37
2.27	Judo Field Dimesion	38
2.28	Ramp dimension standard	39
2.29	Difable tribun seating area	39
2.30	Difable fitness room standard	39
2.31	Difable parking space	39
2.32	Difable shower room	39
2.33	Reflective surface for difable guide	40
2.34	Surface material for accessibility	40
2.35	Contrast color accessibility	40
2.36	Braille signage	40
2.37	Sensory landscape	40
2.38	Contrast color surface	40
2.39	Tacticle Tech for Visually Impaired Watching Sport	40
2.40	Public Accessibility to Site location	41
2.41	Existing Bus Stop in Front of The Site	41
2.42	Road & Land Condition at SIte	41
2.43	Site Boundary and Dimension	41
2.44	Sun Path & Wind Rose at SIte	42
2.45	Monthly Precipitation Data at Site	42
2.46	KKOP Height Map at Palembang	42
2.47	Site Boundaries	42

Chapter 03

CODE	CAPTION OF THE FIGURE	PAGES
3.1	Site Context Respond from The Regulation	45
3.2	Pedestrian & Vehicle Access Concept	45
3.3	Retention Pond Concept to Respond Precipitation	45
3.4	Vegetation Placement to Respond Sun & Wind	45
3.5	Vegetation Arrangement to Wind	45
3.6	Zoning Alternative 1	48
3.7	Zoning Alternative 2	48
3.8	Building Orientation Visualisation Based on Zoning	53
3.9	Zoning Alternative 2 Chosen for Development Study	53
3.10	Conclusion of Building Form According to Climate	54
3.11	Zoning Alternative 2 Chosen for Development Study	54
3.12	Field Layout Arrangement	56
3.13	Field Orientation Towards Sunpath	56
3.14	Sport Center Tribune Area Layout Type	57
3.15	Tribune Distribution Layout	57
3.16	Users Distribution Zoning	58
3.17	Active Zone and It's Room Function Typology Programming	59
3.18	Tacticle Texture as Sensory Element Guide at Open Space	59
3.19	Pavement and Green Space Concept for Difable Parking	60
3.20	Foundation Stability Concept Respond to Soil Type	61
3.21	StiltFloor Concept at Sport Fields & Entrance	61
3.22	Triangle Space Truss Roof Structure	62
3.23	Secondary Skin Opening Concept Placement According to Orientation	63
3.24	Secondary Skin Concept Opening Placement According to Orientation of Wind	63
3.25	Secondary Skin Concept Form According To Roof Structure	63
3.26	Double Layer of Secondary Skin Concept According to Wind	63
3.27	Perforated Wall With Venturi Effect Concept From Section	64
3.28	Facade as Ventilation When Paired with Perforated Wall	64
3.29	Facade as Shading When Paired with Glass	64
3.30	Floor & Wall Material Texture at Tribune Area	65
3.31	Interior Wall Texture and Floor Texture	65
3.32	Stilt Concept of Main Access of Pedestrian	66
3.33	Pedestrian Main Access Concept to Building Alternative 1	66
3.34	Pedestrian Main Access Concept to Building Alternative 2	66
3.35	Pedestrian Ramp Access Concept Inside The Building	66

Chapter 04

CODE	CAPTION OF THE FIGURE	PAGES
4.1	Final Massing According to Climate & Concept	68
4.2	Final Building Massing on CFD Simulation	69
4.3	CFD Simulation Result on 3 Meters Height	69
4.4	CFD Simulation Result on 7 Meters Height	69
4.5	Master Plan	70
4.6	Entrance Circulation to Main Building & Sport Zone	71
4.7	Building Floor Plan Inclusive Accessibility	72
4.8	Cross Ventilation at Building Section	73
4.9	Building Elevation	74
4.10	Exterior & Interior Schematic Visualisation	75

Chapter 05

CODE	CAPTION OF THE FIGURE	PAGES
5.1	Site Size Before	78
5.2	Site Size After	78
5.3	Building Mass Before	79
5.4	Building Mass After	79
5.5	Building Roof Shape Before	80
5.6	Building Roof Shape After	80
5.7	Facade Shape Before	81
5.8	Facade Shape After	81
5.9	Situation Plan	83
5.10	Site Plan	84
5.11	Active Zone Floor Plan GF	85
5.12	Active Zone Floor Plan 1st Floor	85
5.13	Power Zone Floor Plan GF	86
5.14	Power Zone Floor Plan 1st Floor	86
5.15	Quiet Zone Floor Plan GF	87
5.16	Quiet Zone Floor Plan 1st Floor	87
5.17	East Elevation	88
5.18	South Elevation	88
5.19	West Elevation	88
5.20	North Elevation	88
5.21	Site Section - A	89
5.22	Site Section - B	89
5.23	Section - A & Tribune Detail	90
5.24	Section - B & VIP Room	91
5.25	Section - C & Ramp Accessibility	92
5.26	Section - D & Toilet Difable, Shower Room Difable	93
5.27	Facade Design at Axonometric View	94
5.28	Facade Design Construction Detail	95
5.29	Facade Design Simulation on CFD Result	96
5.30	Perforated Wall Design Detail	97
5.31	Roof Structure Construction	98
5.32	Roof Structure Exploded & Opening	99
5.33	Roof Opening Simulation With Velux	100
5.34	Landscape as Open Space & Material Detail	101
5.35	Contrasting Material Texture	102
5.36	Passive Design Scheme	103
5.37	Foundation Type	104
3.38	Supporting Structure Detail	105
3.39	Main Entrance Rendering	106
3.40	Building Axonometric Rendering	107
3.41	Landscaping & Entrance Rendering	108
3.42	Landscaping & Vehicle Entrance Rendering	109
3.43	Basketball Field VIP Room, Snack Bar Lounge, & Tribune Rendering	110
3.44	Boccia Field, VIP Room, Ticketing Area & Ramp Access Rendering	111

Chapter 06

CODE	CAPTION OF THE FIGURE	PAGES
6.1	Space Truss Connection Detail	119
6.2	ACP Connection Detail	120
6.3	PVC Connection Detail	121
6.4	Color Guide Placement Detail	123
6.5	Landscape Section Detail	124

Chapter 07

CODE	CAPTION OF THE FIGURE	PAGES
7.1	APREB Pages 1-2	115
7.2	APREB Pages 3-5	116
7.3	Maquette Model	117
7.4	Maquette Model Detail 1	118
7.5	Maquette Model Detail 2	119
7.6	Maquette Model Detail With Lamp	120
7.7	Design Document QR Code	121

TABLE OF DIAGRAM

Chapter 01

CODE	CAPTION OF THE DIAGRAM	PAGES
1.1	Passive design parameters	15
1.2	Inclusive Architecture Strategy	16
1.3	Sport center target users	17
1.4	Design method scheme	18
1.5	Design framework scheme	19
1.6	Design framework scheme 2	20

Chapter 02

CODE	CAPTION OF THE DIAGRAM	PAGES
2.1	Site Existing Facility Requirements	33
2.2	Physical disability & vision disability sport room need	34
2.3	Difable Supporting Room Needs	34
2.4	Regulation Standard & Implementation at Existing	42

Chapter 03

CODE	CAPTION OF THE DIAGRAM	PAGES
3.1	Design Concept Focus	44
3.2	Main Function Zoning According to Sport Ambiance Typology	48
3.3	Zoning Classification According to Type of Space	48
3.4	Zoning Classification According to Four Main Zone	49
3.5	Tribune Area Concept Criteria	57
3.6	Main Structure Material Concept	61
3.7	Main Structure Material Concept 2	62
3.8	Roof Structure Concept Criteria	62

Chapter 06

CODE	CAPTION OF THE TABLE	PAGES
6.1	Diagram of Parking Area in Design	122

TABLE OF TABLE

Chapter 01

CODE	CAPTION OF THE TABLE	PAGES
1.1	Originality and Novelty	21

Chapter 02

CODE	CAPTION OF THE TABLE	PAGES
2.1	Typology and Use of Sports Halls, Sports arena size, and capacity	32
2.2	New Sport Typology Need	33

Chapter 03

CODE	CAPTION OF THE TABLE	PAGES
3.1	Main Function Property Size According to Regulation	46
3.2	Supporting Function Property Size According to Regulation	46
3.3	Main Function Capacity	47
3.4	Main Function & Supporting Function Room Quantity	48
3.5	Active Zone and It’s Room Function Typology Programming	50
3.6	Quiet Zone and It’s Room Function Typology Programming	51
3.7	Power Zone and It’s Room Function Typology Programming	52
3.8	Final Form Formit Simulation Result	55

Chapter 04

CODE	CAPTION OF THE TABLE	PAGES
4.1	Formit Simulation Result of Final Massing	69

Chapter 05

CODE	CAPTION OF THE TABLE	PAGES
5.1	Evaluation Design Notes	77

Chapter 06

CODE	CAPTION OF THE TABLE	PAGES
6.1	Table of Difable Car Parking Need	122
6.2	Table of Car Parking Calculation	122

Chapter 01

Introduction

1.1 DESIGN PREMISE

Raising the topic of sports centers for the difable has the aim of spreading awareness to our friends who have special needs, especially in the field of sports. Specifically in the field of sports because what we know is that currently **many sports competitions specifically for disabilities are starting to be held, but there are not many sports facilities in Indonesia that facilitate this need**. Another problem that often arises in sports center buildings apart from inclusive design is the **poor ventilation and lighting system which makes users uncomfortable.** Therefore it is important to have a sports center architectural design that cares about inclusiveness and high performance sport facilities.

1.2 BACKGROUND

1.2.1 Disability in Indonesia

Disability is a condition of an individual who has an inability to carry out certain activities as normal people, this condition is caused by an impairment resulting from birth or accidental injury (Widinarsih, 2019).

According to UU Number 8 of 2016 concerning Persons with Disabilities, disabilities are classified into 4 categories:

1. **Physical Disabilities**: Impaired movement functions, such as amputations, withered or stiff paralysis, paraplegia, cerebral palsy (CP), due to stroke, due to leprosy, and people with small body posture.
2. **Intellectual Disability**: Impaired thinking function with below average intelligence, including conditions such as slow learning, mental disabilities, and Down syndrome.
3. **Mental Disability**: Disorders of thought, emotion and behavior, which include:

- Psychosocial: Such as schizophrenia, bipolar, depression, anxiety, and personality disorders.
- Development: Affects social interaction abilities, such as autism and hyperactivity.

4. **Sensory Disability**: Disorders in one of the functions of the five senses, including visual disability (vision), hearing disability (hearing), and/or speech disability (speech).

However, awareness of these groups still needs to be improved. According to data from the coordinating ministry for human development and culture (Kemenko PMK RI) the percentage of children with disabilities who can pursue education is only 12% or 269,398 children out of 2,197,833 people (Muhibban, 2023). **Especially people with disabilities who want to take part in the sports field.** However, unfortunately these facilities still lack existence in Indonesia especially in Palembang.



Figure 1.1 Difable running athletes
Source: *infopublik.id*

1.2 BACKGROUND



Figure 1.2 Difable basketball atlet
Source: *Kompas.com*



Figure 1.3 Community activities to find difable athletes in Palembang
Source: *instagram.com/npcisumsel*

1.2.2 Disability Sport Category in Indonesia

There are several disabled sports that are contested in Indonesia, such as those held by the Pekan Paralimpiade Nasional (Peparnas) on 6 - 13 October 2024, including:

1. Athletics: Includes running, jumping, and throwing.
2. Swimming: Various styles and distances.
3. Badminton: Singles and doubles.
4. Table Tennis: Singles and doubles.
5. Chess: Includes blind and blind chess.
6. Weight Lifting: Categories based on body weight.
7. Archery: Using a standard or modified bow.
8. Shooting: Air rifles and pistols.
9. Judo: Including blind judo.
10. Boccia: A strategic sport similar to petanque.
11. Football: Including blind football.
12. Goalball: A special sport for the visually impaired.
13. Sitting Volleyball: Volleyball in a sitting position.
14. Wheelchair Basketball: Basketball using a wheelchair.
15. Wheelchair Tennis: Court tennis in a wheelchair.
16. Wheelchair Fencing: Fencing performed in a wheelchair.
17. Bike Racing: Includes road and track numbers.
18. Taekwondo: Adaptive martial art.
19. Tenpin Bowling: Adaptive bowling.
20. E-Sports: Video game competitions.

1.2.3 Difable Community in Palembang

There is an organization, the National Paralympic Committee Indonesia (NPCI) of South Sumatra Province, which held to search for young difable athletes. The young talent search program titled “Mendobrak Batas” in Palembang was attended by 147 prospective difable athletes.

1.2.4 Disability Sport Category in Palembang

In Palembang, there are several disabled sports that have been competed in Palembang in the 2023 National Student Paralympic Week (Peparpenas) including:

1. Athletics: Running, jumping and throwing for athletes with disabilities.
2. Boccia: A strategy sport similar to petanque, specialized for athletes with severe disabilities.
3. Chess: An adaptive chess match for people with disabilities.
4. Swimming: Adaptive swimming competitions for athletes with disabilities.
5. Table Tennis: Adaptive table tennis competition.
6. Badminton: Adaptive badminton competitions.

1.2 BACKGROUND

1.2.5 Disability Sport in Architecture

An athlete is very dependent on their physical aspects, but athletes with disabilities need special facilities that can support their activity process. However, there are still many athlete facilities, especially in Indonesia, that do not meet the standards and needs of their users. Several special aspects required are:

Facility Accessibility
Many sports facilities are not yet fully friendly for people with disabilities. Physical obstacles such as the lack of adequate ramps, lifts or handrails often make access difficult for wheelchair users. In addition, inappropriate placement of information media and communication signs, such as damaged or out-of-place guiding blocks, hinders the mobility of people with disabilities.

In this aspect, according to Cassi, R. (2023), architecture implementation that can be done to enable users to better understand the spatial configuration, and identify spaces and elements, the architects developed design solutions which refer to:

- contrasting colours and tactile surfaces
- visual and tactile guidelines
- guiding lighting
- focal lighting

Specialized Infrastructure and Equipment
Sports facilities often do not provide equipment that meets the needs of disabled athletes, such as sports-specific wheelchairs or guided running tracks for the visually impaired. Apart from that, several sports for disabled people still lack adequate training places.

In this aspect, one example of implementation is the use of color on the running track. Quoted from kompas.com the special treatment of difable running tracks are the track contains two colors from the usual one-color track. These two colors are very helpful for athletes with disabilities.

Natural Ventilation
lack of natural air circulation, causing stale air and high humidity which poses a risk to the health of athletes, especially disabled people with respiratory problems. Some sports such as weight lifting and wheelchair basketball require optimal ventilation, but are often not supported by a good air change system.

According to Rakhmawati (2016), there are several architectural elements that affect air circulation into buildings. Among them are opening orientation, ratio of inlet/outlet openings, type of openings, stack effect, and building envelope.

Natural Lighting
Uneven lighting and reliance on artificial light can interfere with an athlete's performance, especially in sports such as goalball and boccia. Glare from improperly placed lights can also hinder vision, while high energy consumption increases sports center operational costs.

Menurut Nurhaiza (2016) In distributing natural light into into the building, in general can be through side lighting, top lighting, or a combination of both (top lighting), or a combination of both.

1.2.6 Passive Design as Design Approach

According to Altan 2016, Passive design means the design that maintains a comfortable temperature within the building using the climate and natural elements to get the optimum benefit and to reduce or eliminate the independence on mechanical systems for heating, cooling and lighting.

Meanwhile according to Noor 2022, Passive design system designed is expected to be able to maximize the entry of sunlight and use natural ventilation to ensure this occurs good air exchange and fresh air enter the building.

In addition Building form, passive cooling design strategies and control principles can improve a building's thermal efficiency and reduce cooling loads. These strategies include **the use of shading devices**, such as overhangs and louvers, to block direct sunlight; the use of natural ventilation, such as cross ventilation and stack ventilation, to cool the building; and the use of thermal mass to store heat during the day and release it at night. (Sulistiawan, 2023)

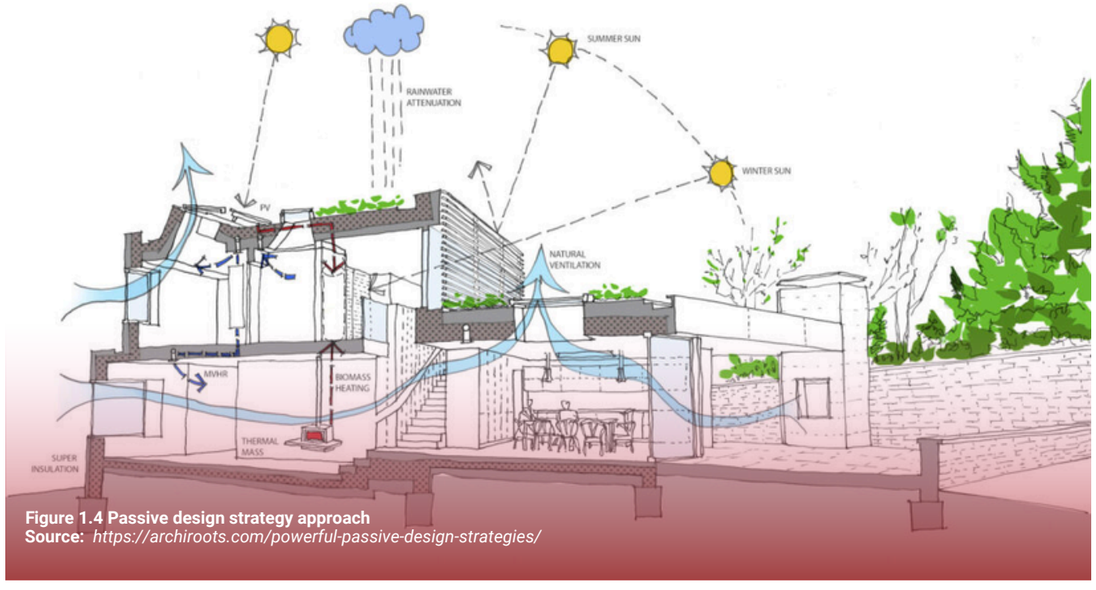


Figure 1.4 Passive design strategy approach
Source: *https://archiroots.com/powerful-passive-design-strategies/*

1.2 BACKGROUND

1.2.7 Passive Design Approach Implementation at Sport Center

According to Leong S (2021) in the research Technical Guidelines for Energy Efficiency and Conservation in Commercial Buildings, there are several architectural aspects that become passive design parameters:

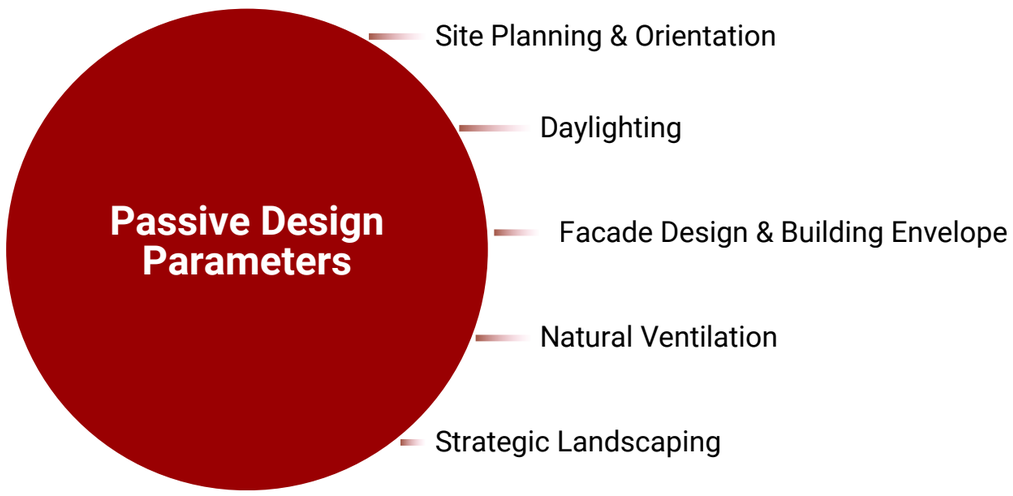


Diagram 1.1 Passive design parameters
Source: *Author, 2025*

Site Planning & Orientation

According to Leong S (2021) Building orientation in equatorial regions should face north-south to minimize exposure to solar radiation from east to west. The long axis of the building with more openings should be aligned with this direction, while the narrow side faces east-west. This approach helps to reduce overheating, improve thermal comfort and create a cooler microclimate around the building.

However, sports buildings are more often found with a circular shape where this shape gives the effect of even light distribution throughout the day, increasing the cooling load of the building, but this shape has a good effect on ventilation because the wind can surround the building well.

Daylighting

According to Emmanuel (2023), some passive design architectural elements that are applied to enhance natural lighting in sports centers include skylights, sun portals, high performance glazing, and light shelves. Of the several application options, skylights are most often found in sports buildings, especially indoor ones such as swimming pool rooms. Where the use of skylights can provide direct sunlight but can still control the intensity of light and protect from weather such as rain.

Facade Design & Building Envelope

The application of secondary skin in sports centers varies depending on the context and response to the site. Variations in facade design response can be based on form and material. Some types of facades are also kinetic where the facade can move so that it is more flexible to respond to different issues.

According to Yaman (2021), there are several types of facades that are used as energy efficient building strategies which also able to be use to enhance passive design, there are including double skin facades, adaptive skin facades, photovoltaic panel facades, vertical green facades, media facades, and structural membrane facades. Therefore, there is no definite type of facade that must be used in sports buildings because the shape and material of the facade is influenced by its function.

Natural Ventilation

This aspect in sports buildings has several strategies that can be used. Quoted from Accili (2016) some strategies include single side ventilation, cross ventilation, and stack ventilation. Supported by research conducted by Syafira (2022) based on some of these strategies, cross ventilation and stack ventilation strategies are efficiently used as natural ventilation for sports buildings which can remove hot air in the room and enter cold air from outside to the inside so that air exchange occurs.

Strategic Landscaping

Landscaping at the sports center is also an important supporting aspect where landscaping not only provides green open space but provides aspects that support building performance in passive design. According to. Menurut (Space23o5, 2024) Integrated landscape design helps regulate indoor thermal conditions by managing external climate factors. Trees and vegetation can minimize heat gain from radiation and provide shade for buildings. Additionally, they can guide natural ventilation into the building's interior. Green roofs also contribute by offering insulation, reducing heat transfer from the roof into the indoor space.

1.2 BACKGROUND

1.2.8 Inclusive Architecture Approach Implementation at Sport Center

Design Approach

There are two approaches to the design of this sports center, which emphasize aspects of inclusive architecture and passive design. Both approaches are needed to meet the needs of special users, such as difable people and the physical building of the sports center itself which is need high-performance building for user comfort.

Inclusive Architecture

According to Kille-Speckter and Nickpour (2022) Inclusive Architecture is a design approach that places human needs at the core of the process. It emphasizes empathy, enhances the ability to conceptualize and design through multiple senses, and promotes a holistic design strategy. This approach ensures dignity, appropriate treatment, and support for persons with disabilities, addressing their specific needs.

According to other sources, inclusive design in architecture includes not only physical accessibility but also sensory and cognitive inclusion, especially for individuals with differences in intelligence. This approach recognizes the diversity of users and aims to create spaces that offer equal opportunities for all individuals Zallio, M., & Clarkson, P. J. (2021).

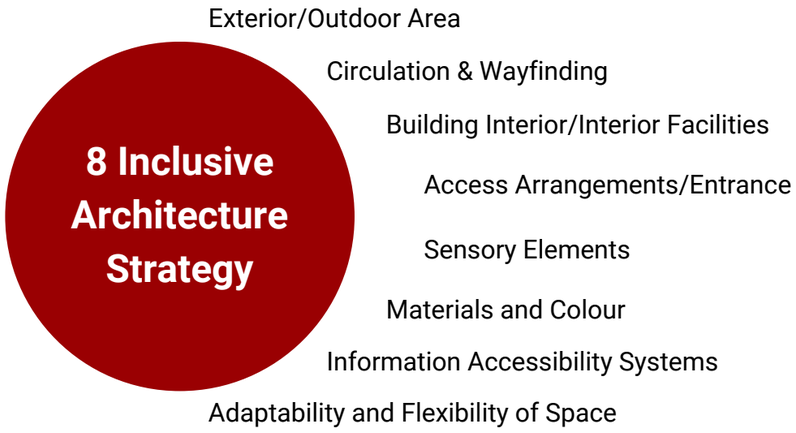


Diagram 1.2 Inclusive Architecture Strategy
Source: *Adewale, B. A., & Odewumi, A. N. (2024)*

Elaborating aspects of inclusive design According to Adewale, B. A., & Odewumi, A. N. (2024)

Exterior/Outdoor Area

Outdoor accessibility is enhanced with clear paths, nearby accessible parking, guiding furniture, handrails, and contrasting walkway edges to support safe navigation for the elderly, visually impaired, and those with limited mobility.

Circulation & Wayfinding

Outdoor accessibility is improved with clear paths, nearby accessible parking, guiding furniture, handrails, and visual contrasts for safe, inclusive navigation.

Building Interior/Interior Facilities

Emphasizes simple and inclusive interior design by minimizing complex partitions and loose furniture. Key features include accessible WC cubicles, unisex bathrooms, wide doors, and well-placed facilities to support ease of use for all building users.

Access Arrangements/Entrance

Ensures entrances are accessible for all by providing features like automatic or clearly marked doors, wide threshold-free access, clear signage, and good lighting—supporting easy entry for people with mobility or visual impairments and elderly users.

Sensory Elements

Sensory elements are spatial features designed to meet diverse sensory needs in public spaces, including noise reduction for the hearing impaired, color-coded navigation for easier wayfinding, and proper lighting to minimize eye strain.

Materials and Colour

Focuses on selecting safe, accessible materials and colors—such as anti-skid, non-reflective flooring, clear color contrasts, and acoustic treatments—to support users with limited mobility, visual impairments, or sensory sensitivities.

Information Accessibility Systems

Use strategies like assistive technology, flashing lights, clear signage, braille, audio, and ground tactiles to ensure information is accessible for people with visual or hearing impairments, promoting an inclusive and understandable environment.

Adaptability and Flexibility of Space

Emphasizes open layouts and adjustable furniture arrangements to accommodate changing needs over time, supporting diverse users and promoting inclusive, long-lasting environments.

1.3 PROBLEM STATEMENT & OBJECTIVE

General Problem

Based on the issues, a sport center architecture design that cares about inclusive design and pays attention to passive design aspects is needed to improve the quality of sports facilities, especially for people with disabilities.

Specific Problem

- Accessibility: How to integrate inclusive design in all areas of the sports center so that areas are easily accessible.
- Natural Lighting: How to maximize sunlight in term of illuminate the entire sports center area but still according to the specified standards.
- Passive Cooling: How natural ventilation is maximally integrated in all spaces to reduce massive energy use of active cooling.

Design Limitation

With many different kind of sports and many classifications of disabilities, there is a limitation where this building will only provide several sports. The limitation of sports is chosen based on the sports that have been competed in Palembang, this is because it has urgency related to facilities that are currently needed as an initial development stage.

Goals

Designing a sports center architecture building with inclusive accessibility by prioritizing passive design aspects that are emphasized on the shape of the building and the building facade technology used.

The Users

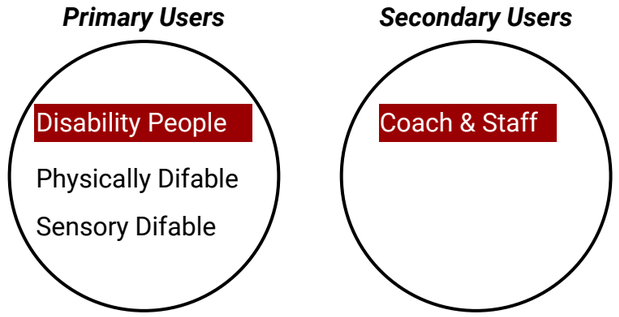


Diagram 1.3 Sport center target users
Source: *Author, 2025*

Objective

Accessibility:
a.Provide ramp and use it as main access throughout the area
b.Use variety of textured materials to help sensory disabilities recognize spaces

Natural Lighting:
a.Design a porous facade that can provide access to natural light.

Passive Cooling:
a.Designing a kinetic building facade that can adapt to the situation of the user's needs.

Specific Facility:
Running track, boccia, chess, swimming pool, table tennis, and badminton court

1.4 DESIGN METHOD

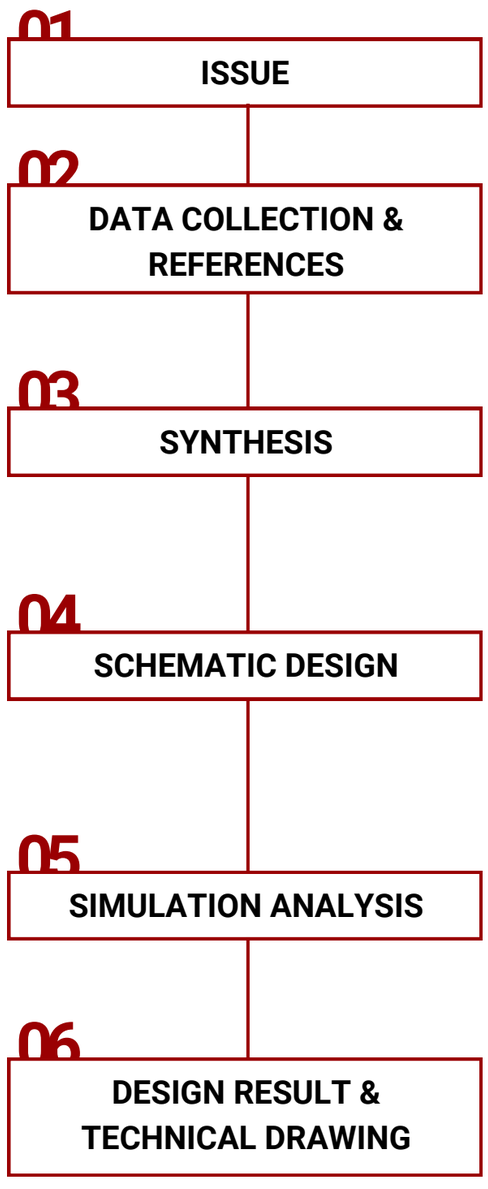


Diagram 1.4 Design method scheme
Source: *Author, 2025*

Issue: Lack of sport center architecture that cares about inclusive design and pays attention to passive design aspects. Which is needed to improve the quality of sports facilities, especially for people with disabilities.

Data Collection & References: Conduct further research related to what is needed to design a sports center for disabled users in architectural aspects. By integrating passive design aspects needed in sports function buildings, namely natural lighting and natural ventilation. In addition, studying the building precedent as an example of implementation in the design.

Synthesis: *T*his stage is the process of combining various information and ideas from several sources is carried out to form a comprehensive concept related to the difable sports center. The information is in the form of inclusive design implementation in sports centers that apply passive design that focuses on mass form, facade technology, and accessibility.

Preliminary Design: The design focuses on aspects of user inclusivity and passive design performance of the building. The inclusivity aspect includes circulation, specific space requirements, guiding aspects such as paving and material texture. While passive design aspects include natural lighting and natural ventilation which are implemented in the shape of the building mass, building orientation, opening, facade, and supporting vegetation.

Simulation Analysis: The simulation using Velux software aims to analyze the performance of natural lighting where the aspects that will be focused on the simulation are the roof and opening design of the building. In addition, CFD software will simulate the wind direction for natural ventilation whose aspects are focused on simulating building orientation and building facades.

Design Result & Technical Drawing: The design that has been tested using simulation and in accordance with the desired parameters is then finalized in the form of more detailed engineering drawings. Among them are site plan, plan, elevation, section, and detail.

1.5 DESIGN FRAMEWORK

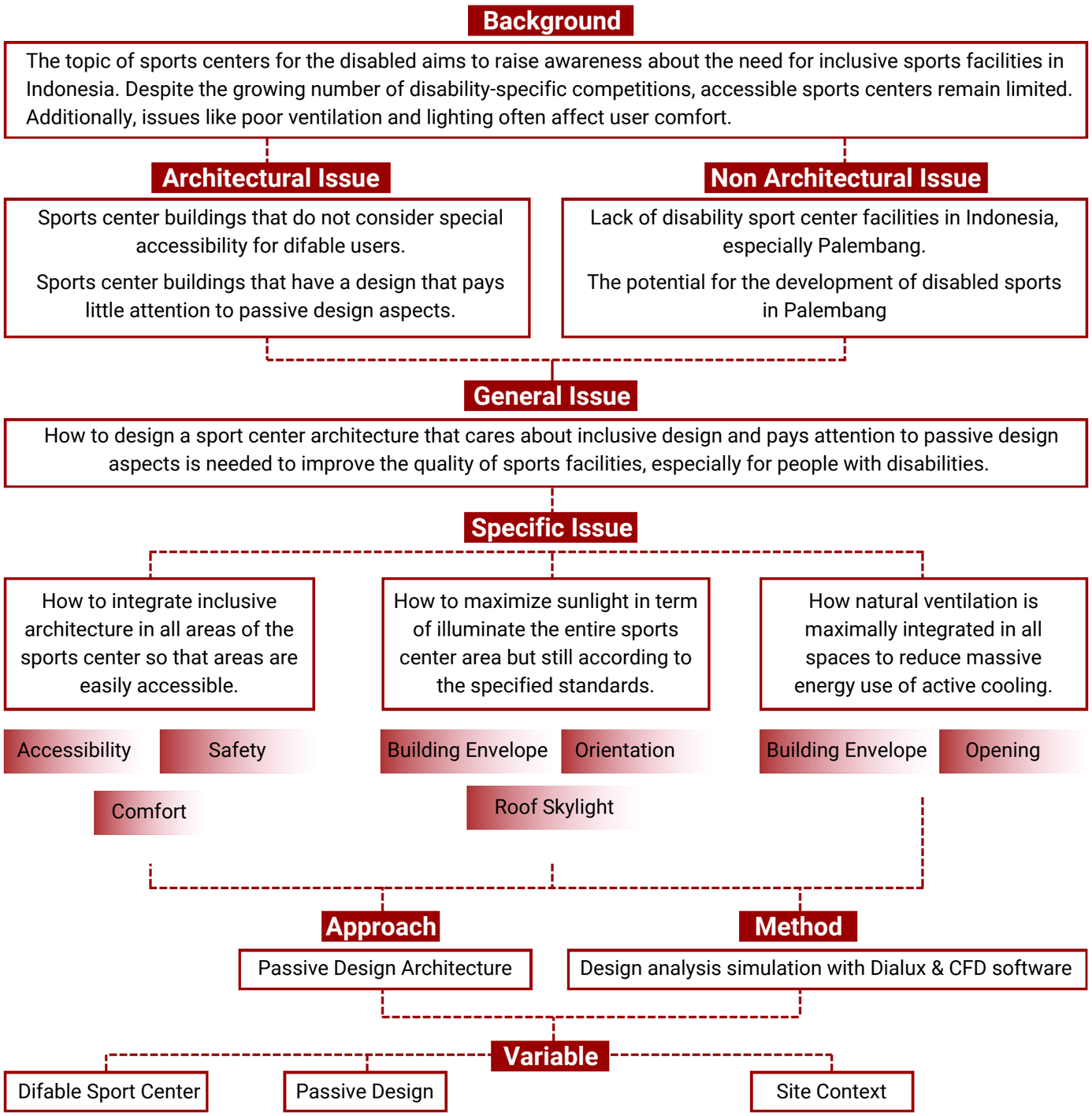


Diagram 1.5 Design framework scheme
Source: *Author, 2025*

1.5 DESIGN FRAMEWORK

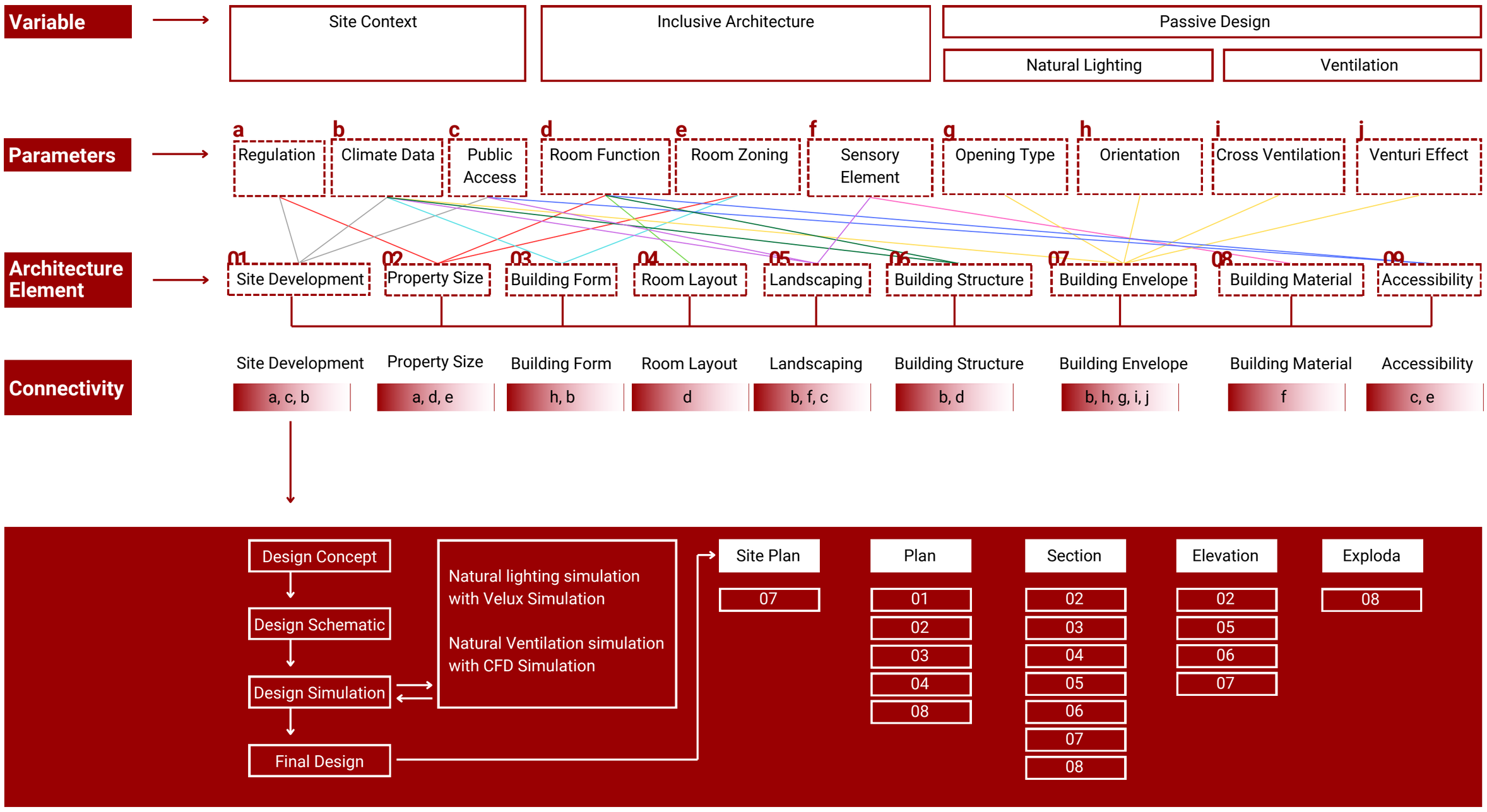


Diagram 1.6 Design framework scheme 2
Source: *Author, 2025*

1.6 LITERATURE REVIEW, ORIGINALITY & NOVELTY

Tara and Zahra (2024) designed a sports center with a universal design approach that aims to create a friendly environment for all users and minimize accessibility barriers. The study used a qualitative method with literature studies and case studies as the basis for design analysis. The results showed that the application of inclusive architectural elements, such as special pathways for disabilities, ramps as vertical access, accessible areas for wheelchair users, clear information systems, and safe and comfortable circulation.

Another study from Ikhsani and Setyowati (2021) designed a sports center that aims to ensure that all people, both disabled and non-disabled, have equal access to exercise and develop their talents. However, the method used is descriptive and field studies to obtain site-specific data. The results of the research not only focus on the inclusive aspect of design but also respond to several issues by considering the mass form, the concept of structural strength, the concept of utilities that use active design such as air conditioners for ventilation.

Another sports building design that emphasizes passive design is one by Fadhilah (n.d). This design utilizes the wind response to the orientation and shape of the building. In its mass form, the building is separated into two so that the wind can pass through the building. An important role in this building is the building envelope, which uses 30% WWR and a building envelope that applies a venturi effect that aims to increase air flow in and out of the building. Therefore the building feels cool by relying on the wind from natural ventilation.

Based on previous research related to difable sports centers and passive design, there is a gap that becomes further research to be developed. That is to design a difable sports center that not only pays attention to users with physical disabilities but also visual disabilities, therefore that the design not only focuses on space standards but also sensory. Supported by emphasizing passive design that focuses on facades that aim for natural lighting and natural ventilation aspects to provide high performance design.

Table 1.1 Originality and Novelty
Source: *Author, 2025*

TITLE	AUTHOR YEAR	APPROACH	LOCATION	SIMMILARITY	DIFFERENTIATE
Perancangan Sport Center Dengan Pendekatan Desain Universal di Labuhanbatu Utara	Adinda Tara & Wahyuni Zahra, 2024	Desain Universal	Sumatera Utara	Designing a sports center for the disabled to create a welcoming and inclusive environment for all users and minimize accessibility barriers.	The use of approaches that only focus on the aspect of user movement space and building function standard.
Penerapan Desain Inklusif Pada Perancangan Sport Center di Kota Tegal	Muhammad Azmy Ikhsani & Marcelina Dwi Setyowati, 2021	Desain Inclusive	Tegal	Designing a sport center for people with disabilities so that people with disabilities have the same rights as people without disabilities to exercise and develop their sports talents.	The use of approaches that only focus on the aspect of user movement space and building function standard. There is implementation of natural ventilation related to facade design but no technology is used on the facade.
Gedung Olahraga Dengan Penerapan Passive Cooling	Fakhry Fajar Fadhilah, n.d	Passive Cooling	Jakarta Barat	Sport center design that uses passive cooling approach which emphasize building orientation and facade technology. It aim of increasing energy efficiency and thermal comfort in the building.	The building is designed for the public and is not specified for disabled users. In addition, this building only emphasizes natural ventilation and does not focus too much on natural lighting.
Difable Athletes Sport Center Architecture with passive design approach to establish high performance facilities in Palembang	Kirana Zhafirah Maheswari, 2025	Passive Design	Palembang	Designing a sports center aimed specifically at disabled users to provide equal access for friends with special needs.	Designing a sports center that applies inclusive design and also emphasizes a passive design approach to establish high performance building facility

Chapter 02

Design Study & Site Analysis

2.1 PRECEDENTS

2.1.1 Virginia G. Piper Sports and Fitness Center for Persons with Disabilities

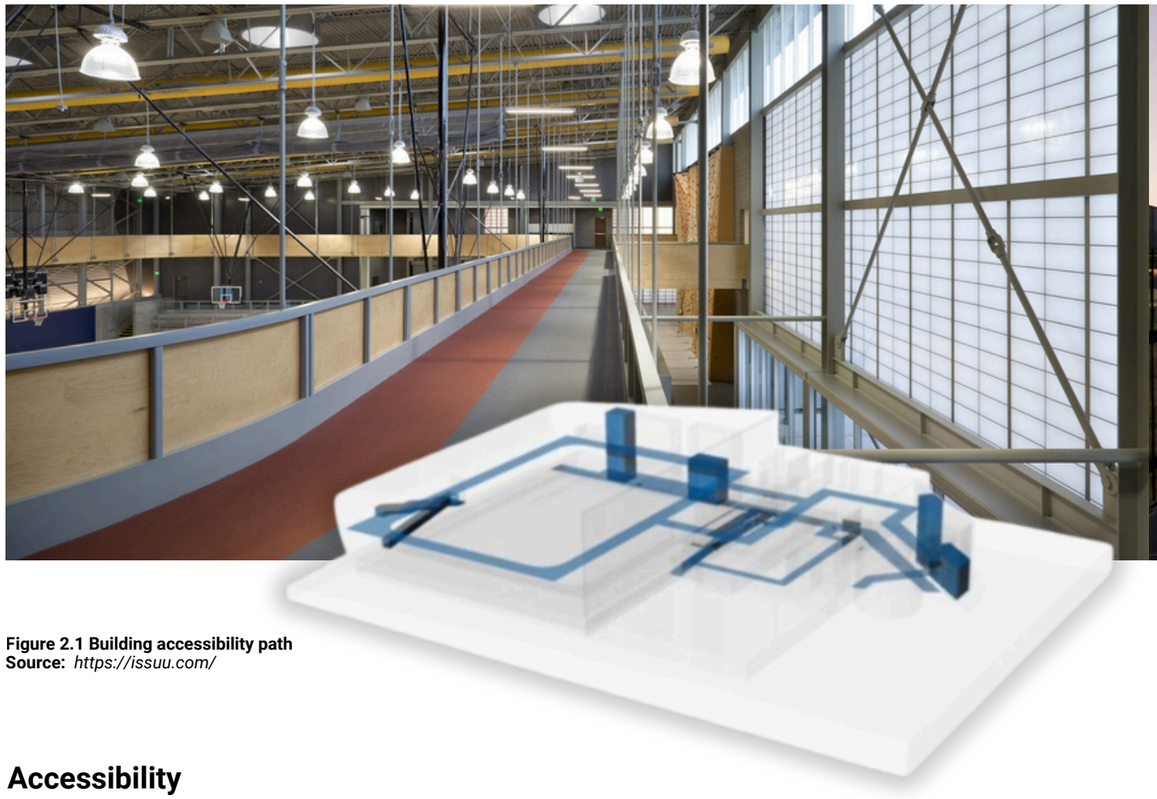


Figure 2.1 Building accessibility path
Source: *https://issuu.com/*

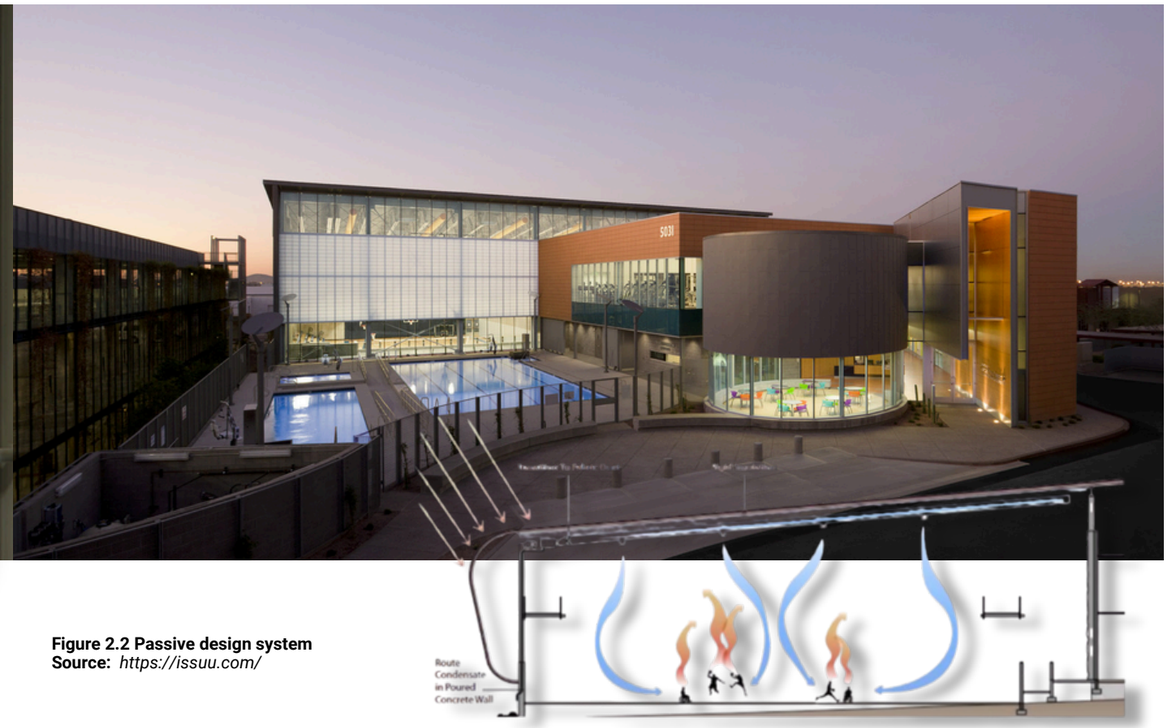


Figure 2.2 Passive design system
Source: *https://issuu.com/*

Accessibility

This building is designed to be easily accessible for wheelchair users and other people with disabilities, with wide pathways, sloping ramps and automatic doors. Swimming pool with special lift and ramp, allowing wheelchair users to get in and out of the water easily. Fitness equipment accessible to wheelchair users, including treadmills, free weights, and modified cardio machines.

The most important aspect for users, disabled athletes who use wheelchairs, is circulation in the building. The building circulation is designed to be spacious and accessible, with the main route to the basketball court using a ramp. A running track hanging from the ceiling adds variety to exercise. Two main vertical circulation cores are located near the lobby and next to the track and basketball court.

Passive Design Strategy

This building uses an HVAC system to maintain comfort and ventilation. The main passive strategies used to maintain thermal comfort are building orientation and appropriate window-to-wall ratios. The south and west facades do not have glass to help keep the building cool, and rigid insulation is used on them to regulate thermal bridging. HVAC systems are forced air systems without hydronic components. Air-conditioned air is distributed through exposed ducts throughout the building

Meanwhile, the building facade construction uses zinc screen walls, where the outer layer protects rigid insulation from the exterior environment. This material is 100% recyclable so it is environmentally friendly. Therefore, this material is used on all walls and even on the roof.



Figure 2.3 Three Building Mass Composition from Aerial View
Source: *https://www.archdaily.com/*

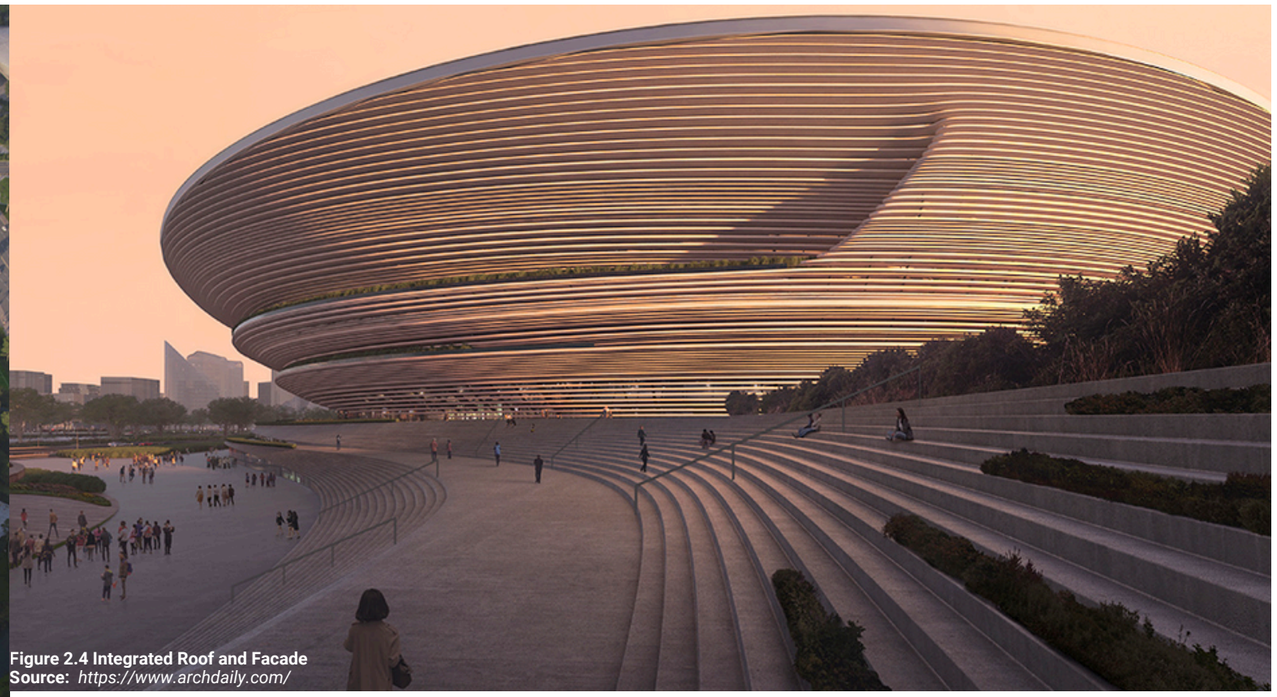


Figure 2.4 Integrated Roof and Facade
Source: *https://www.archdaily.com/*

2.1 PRECEDENTS

2.1.2 Hangzhou International Sport Center

Building Form & Composition

The sports facility design study by Zaha Hadid Architects features an elliptical building shape. There are three building masses of different sizes, with the largest being the main building. The **composition of the building appears to be a single unit despite having different roof expressions**. In this design, **the roof structure also blends into the walls/facade of the building**, creating a visual unity with the surroundings

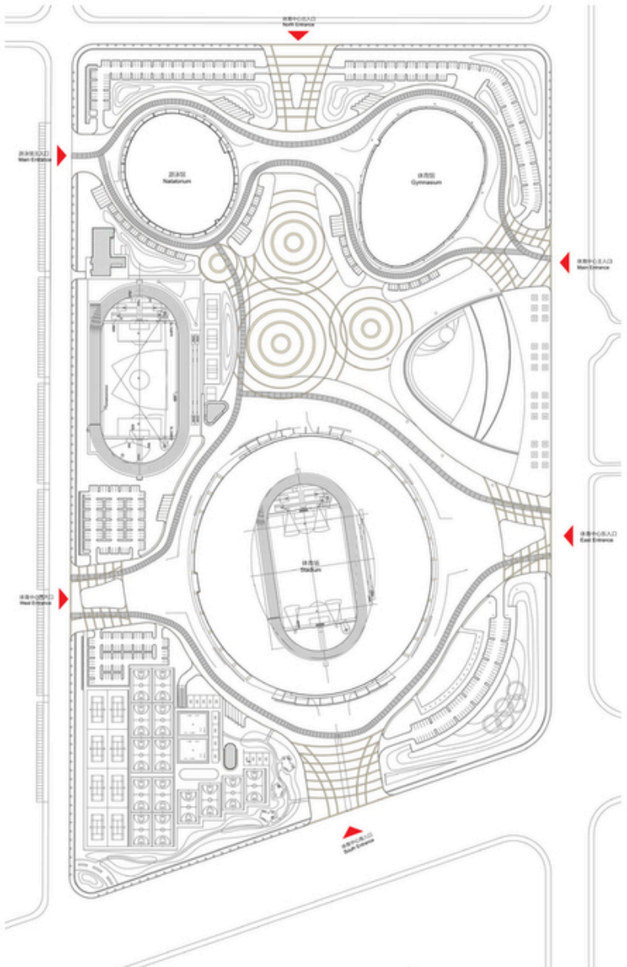


Figure 2.5 Building Mass Composition From Plan
Source: *https://www.archdaily.com/*



Figure 2.6 Triangular Building Facade
Source: *https://www.archdaily.com/*



Figure 2.7 Building Mass Composition From Aerial View
Source: *https://www.archdaily.com/*

2.1 PRECEDENTS

2.1.3 Sports Center of Jinhua City

Building Form & Composition

Similar to Zaha Hadid Architect's sports center, the composition of this building also has a **central area as a public space,** which unites the three building masses. The difference lies in the central area of this building, which has an interesting pattern that supports activities. The open space in this project is also much **more spacious, allowing for better air circulation.** In addition, the use of triangular structures in buildings gives a sturdy impression and adds pattern to the building's facade.

2.1 PRECEDENTS

2.1.4 Singapore Sports Hub

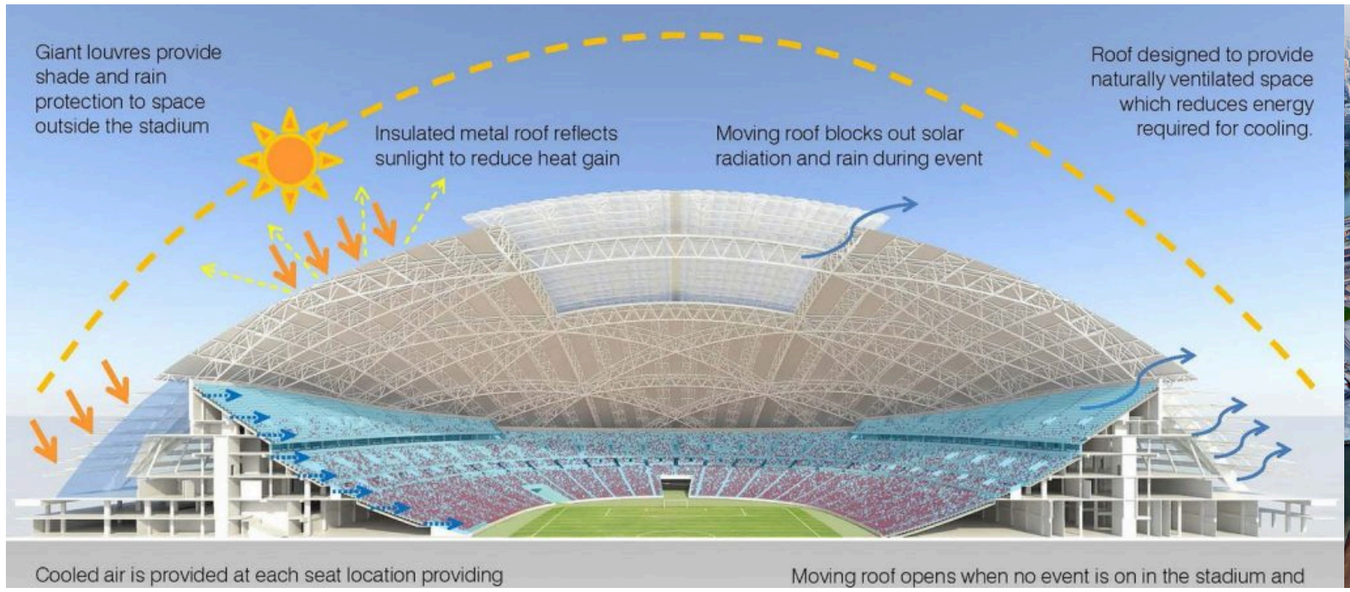


Figure 2.8 Passive & active design system at roof
Source: *https://archdaily.com/*



Figure 2.9 Open roof situation for ventilation
Source: *https://archdaily.com/*

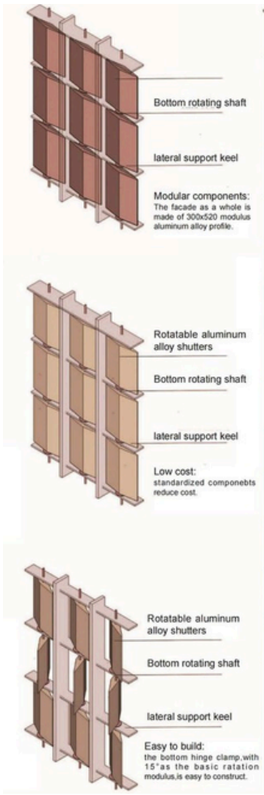
Passive Design Strategy

The Sports Hub employs a passive design strategy that integrates with the landscape and water system to create a natural and sustainable environment. The design prioritizes green accessibility, with waterfront promenades, sky terraces, and vertical greenery that enhance thermal comfort naturally. In addition, the stadium optimizes passive cooling through a bowl cooling system, which reduces energy consumption by 60% compared to conventional stadiums. Energy use in the stadium is also balanced with renewable energy sources, making it a stadium with a 'zero carbon' cooling system.

The main dome roof structure was designed with high efficiency, using one-third of the steel weight per square meter compared to other large-span structures, reducing environmental and material impacts. With this approach, the Sports Hub was awarded the BCA GoldPlus Mark certification, demonstrating outstanding achievements in sustainability and energy efficiency compared to similar sports facilities in the world.

2.1 PRECEDENTS

2.1.5 Fuyang Yinhu Sports Center / UAD



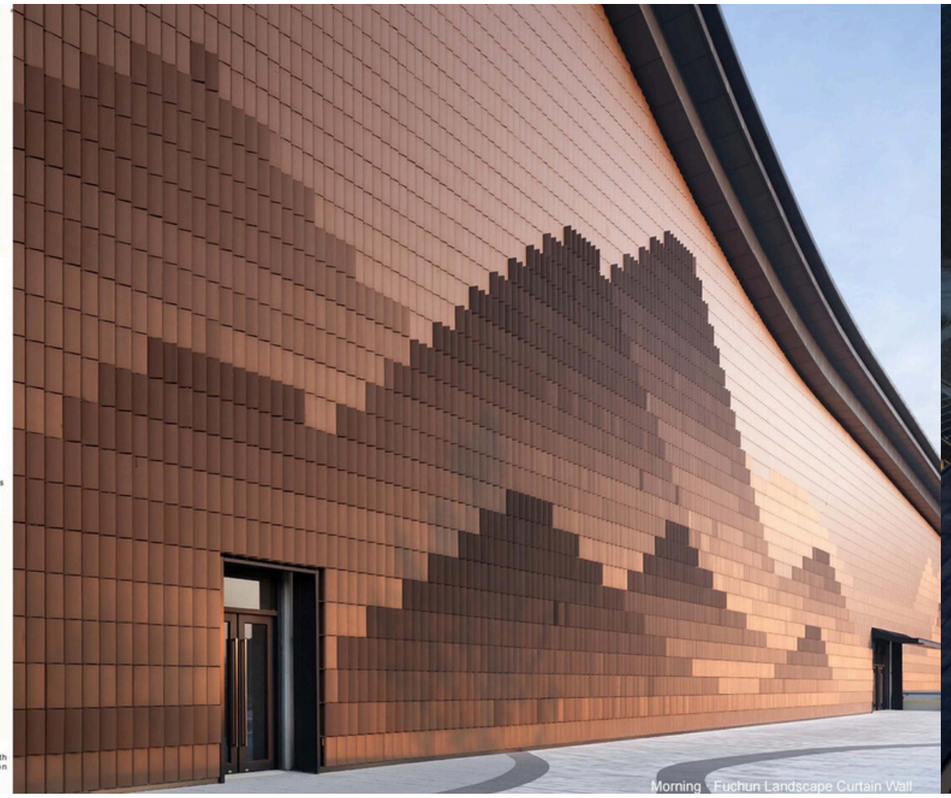


Figure 2.10 Facade passive design technology
Source: *https://archdaily.com/*



Figure 2.1.11 Facade from exterior at night
Source: *https://archdaily.com/*

Passive Design Strategy

The facade of Fuyang Yinhu Sports Center adopts the principle of passive design with a modular, low-tech, and natural light responsive approach. With over 37,000 modular louvers that can rotate at 15 different angles, the facade is able to regulate natural lighting, ventilation, and create dynamic shadow effects, reducing reliance on artificial lighting and air conditioning.

Through a simple rotation system controlled by gears, the design optimizes the interaction between the building and the environment, adjusting the amount of incoming light and creating visual effects that artistically depict the Fuchun River landscape. The sunlight cycle is utilized to create a facade that changes throughout the day, reflecting time and seasons in the architectural elements.

2.1 PRECEDENTS

2.1.6 Hazza Bin Zayed Stadium

Passive Design Strategy

The facade of this building uses tensile material, which is a lightweight material formed into diamond-shaped modules. These modules are installed on a steel frame and can rotate. The primary function of this facade is to reduce sunlight entering through the building's windows. The selection of this material as the building's facade is quite unique and has several advantages. Specifically, this **material does not completely block light but instead diffuses it into a softer glow. As a result, the building remains cool while still receiving adequate sunlight.**



Figure 2.1.12 Tensile Facade Building From Elevation
Source: *https://archdaily.com/*

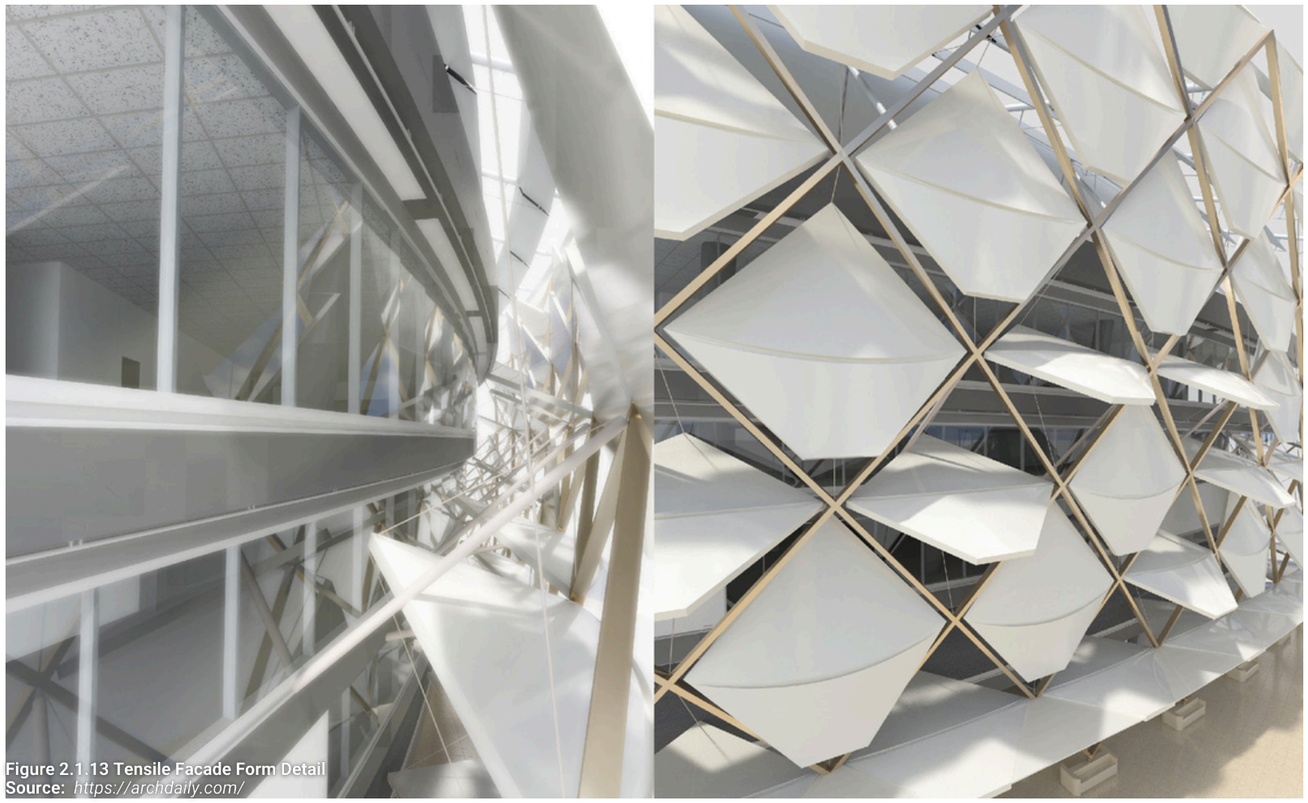


Figure 2.1.13 Tensile Facade Form Detail
Source: *https://archdaily.com/*

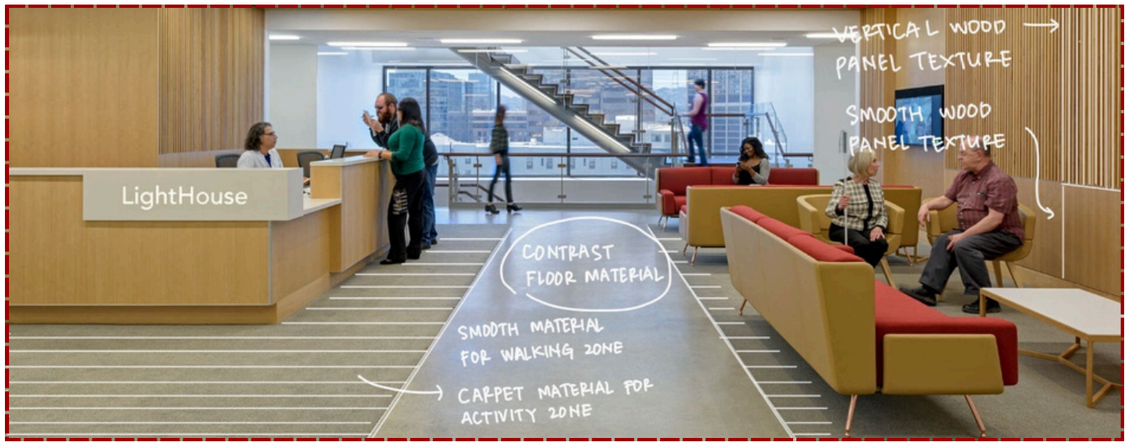


Figure 2.14 Floor and Wall Contrast Material as Zoning Guidance
Source: *https://www.cavagnero.com/*



Figure 2.15 Floor Pattern Material as Movement Guidance
Source: *https://www.re-thinkingthefuture.com/*

2.1 PRECEDENTS (MATERIALS)

2.1.7 LightHouse for the Blind and Visually Impaired

Designed by Mark Cavagnero Associates specifically for visual disability users, the design emphasizes the use of contrasting materials to indicate different zones or functions. Seen in the picture on the floor material there are differences in the materials used, in the zone for walking using concrete material coated with epoxy so that it has a smooth texture. While the sitting zone in the right area and the information center zone use carpet material. With the difference in contrasting materials, it can signify the difference in space functions. The wall material also uses wood panels arranged vertically which gives the effect of embossed texture on the wall. So it is concluded that **the concept of using materials uses contrasting material methods to signify differences in function zones.**

2.1.8 The Casa Mac House

Designed by So & So Studio, the use of materials is emphasized on the texture of the floor to help visually impaired people. The material used is a parakeet floor but there is a specific pattern to indicate the direction of movement of the space. Described in the picture beside as an example if the horizontal floor direction indicates a stop which means it is the boundary of the movement space, otherwise if the vertical floor direction indicates that the direction of the movement space moves straight. So it is concluded that **the concept of the material used emphasizes the use of floor patterns as movement guidance.**



Figure 2.16 Wall Pattern Material Texture as Movement Guidance
Source: *https://www.archdaily.com/*

2.1 PRECEDENTS (MATERIALS)

2.1.9 School for Blind and Visually Impaired Children

Designed by SEAlab, this building design uses 4 different wall textures consisting of vertical, horizontal, semi-circular, and sand faced texture. Texture material using rough plaster provides an embossed texture effect to navigate users to different areas. So it can be concluded **that the use of materials on the walls aims to provide navigation to certain spaces.**

2.1.10 Canoeing Training Base / PSBA + INOONI

The interior of one of these sports buildings uses color lines as a guide to each room in the building. These lines make it easier for athletes with disabilities to find their way to the rooms they want to go to.



Figure 2.17 Color Line Guide
Source: *https://www.archdaily.com/*

2.2 DIFABLE SPORT CENTER TYPOLOGY

2.2.1 Sport center definition

Sport center is a typology of sports building that includes several sports activities in it both indoor and outdoor. Another definition of sport center is an expansion of a certain scale that can be associated with a Sport Hall or expansion of the Sports Center (GOR), the Sport Center also includes a center or place that accommodates various types of sports that provide sports facilities and other sports support facilities, which are useful for the community, as well as for rules and standards referring to building standards or national sports centers (Apipah 2021)

2.2.1 Sport center type

According to Peraturan Menteri Pemuda Dan Olahraga Republik Indonesia Nomor: 0445 Tahun 2014 about Standar Prasarana Olahraga Berupa Bangunan Gedung Olahraga, sport center divide into three category accroding to it's capacity and function.

- ***Type A:***

Usually have a large capacity and are designed to accommodate national or international level sports competitions. Equipped with full facilities, including a main stadium, indoor arena, Olympic-standard swimming pool, tennis courts, media center, VIP rooms, and large parking areas.

- ***Type B***

Designed for regional or provincial level sports competitions, with medium capacity. Provides facilities such as basketball, volleyball, badminton courts, a national standard swimming pool, and training rooms.

- ***Type C***

Intended for local or community level sports activities, with smaller capacity. Typically has multi-purpose courts, gyms and community rooms.

2.2.3 Sport classification in general

- Athletic Sports: Includes basic physical activities such as running, jumping and throwing.
- Ball Game Sports: Involve the use of a ball and are usually played in teams. Examples: soccer, basketball, and volleyball.
- Water Sports (Aquatics): Performed in water or involving water as the main element.
- Martial Sports: Focus on self-defense and attack techniques.
- Recreational and Extreme Sports: Usually done for recreation or extreme challenges.
- Winter Sports: Performed on snow or ice. Examples: skiing, ice skating and ice hockey.
- Electronic Sports (E-Sports): Video game competitions that are recognized as sports.
- Sports Gymnastics: Combines flexibility, strength, and coordination of the body.

2.2.4 Difable sport classification

Quoted from several sources of international and national sports websites such as IPC, (n.d.), NPCI (n.d.), IBSA, (n.d.), Deaflympics, (n.d.), Special Olympics International, (n.d.). There are several classifications of special sports for the difable, including:

1. Physical Disability

Physical disabilities include amputations, spinal cord injuries, cerebral palsy and other conditions that affect mobility or muscle control. Some of the sports available to people with physical disabilities include:

- Wheelchair Athletics
- Wheelchair Basketball
- Wheelchair Tennis
- Boccia
- Paralympic Powerlifting
- Adaptive Archery

2. Vision Disability (Blind or Low Vision)

People who are blind or visually impaired compete in categories tailored to their level of visual impairment. Example sports:

- Goalball
- Blind Judo
- Blind Athletics
- Soccer 5-a-side

3. Intellectual Disability

This category includes athletes with cognitive limitations that affect understanding and strategy in sport. Example sports:

- Athletics
- Adaptive Swimming
- Adaptive Table Tennis
- Adaptive Basketball and Futsal

4. Sensory Disabilities (Deaf and Hard of Hearing)

Athletes with hearing loss compete in special categories, often without hearing aids to create a fair competitive environment.

- Deaf Badminton
- Deaf Football
- Deaf Swimming
- Deaf Chess

2.3 PROPERTY SIZE REQUIREMENT

TYPE B SPORT CENTER

The consideration for the selection of type B is to complete the sports facilities aimed specifically at people with disabilities. Where the sports event “Peparpenas” which has been held in Jakabaring Sport City Palembang is a national disability sport, the type B sports hall is sufficient to accommodate the needs of tournaments and training. The following is a table of requirements for type B sports hall facilities

Table 2.1 Typology and Use of Sports Halls, Sports arena size, and capacity
Source: *PERATURAN MENTERI PEMUDA DAN OLAHRAGA REPUBLIK INDONESIA NOMOR 0445 TAHUN 2014*

Sport Center Type	Sport Type	National & International Competition	Local Competition	Practice
Type B	Badminton	4	4	4
	Volleyball	1	1	2
	Basketball	1	1	1
	Futsal	-	1	1
	Tennis	1	1	1
	Sepaktakraw	4	4	4

Sport Center Type	Length Including Free Zone	Width Including Free Zone	Height Ceiling Area Games	Height Ceiling Area Games
Type B	40 m	25 m	12,5	5,50

Sport Center Type	Capacity	Seating Area Total
Type B	Medium	1.000-3.000

In addition supporting facility such as parking spaces require a minimum area of 1,000 m2 and a distance of 500 m from parking lots and public vehicle stops to the main entrance.

Sport center type b has field standards intended for national competitions, so there are field size recommendations recommended for designing sport center type b. In addition, there are differences in layout between field layouts for competitions and fields for training. The picture below is an example of a type b sport center layout and recommendations.

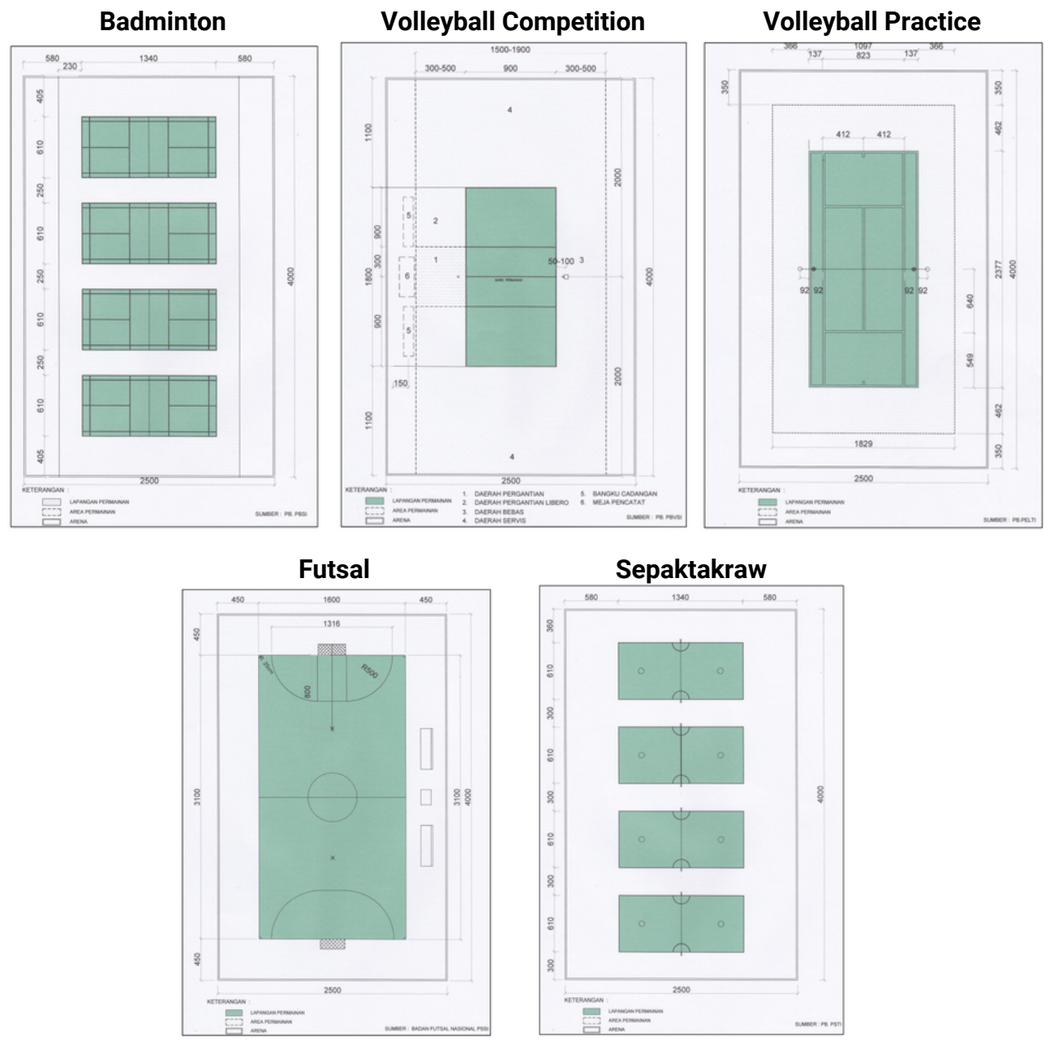


Figure 2.18 type B sports field layout
Source: *PERATURAN MENTERI PEMUDA DAN OLAHRAGA REPUBLIK INDONESIA NOMOR 0445 TAHUN 2014*

EXISTING FACILITY ANALYSIS

Since the design that will be made aims to complement the facilities in the Jakabaring Sport Center area in Palembang, there are already several facilities that are fulfilled Sport Center Type including:

01	**Badminton**	not permanent	Unclassified	Not Fulfill Requirements
02	**Volleyball**	5 field exist	Type A	Fulfill Requirements
03	**Basketball**	non permanent	Unclassified	Not Fulfill Requirements
04	**Futsal**	not permanent	Unclassified	Not Fulfill Requirements
05	**Tennis**	16 field exist	Type A	Fulfill Requirements
06	**Sepaktakraw**	non permanent	Unclassified	Not Fulfill Requirements

Diagram 2.1 Site existing facility requirements
Source: *Author, 2025*

Due to the design that will be made aims to complete the facilities in the Jakabaring Sport Center area in Palembang, there are already several facilities that are fulfilled including: Among the 6 facilities located in Jakabaring 4 of them do not have fixed facilities, so the field is adjusted according to the needs of the competition. Among them are badminton, basketball, futsal, and sepaktakraw which are held in one of the buildings in Jakabaring Sport Center known as GOR Ranau.

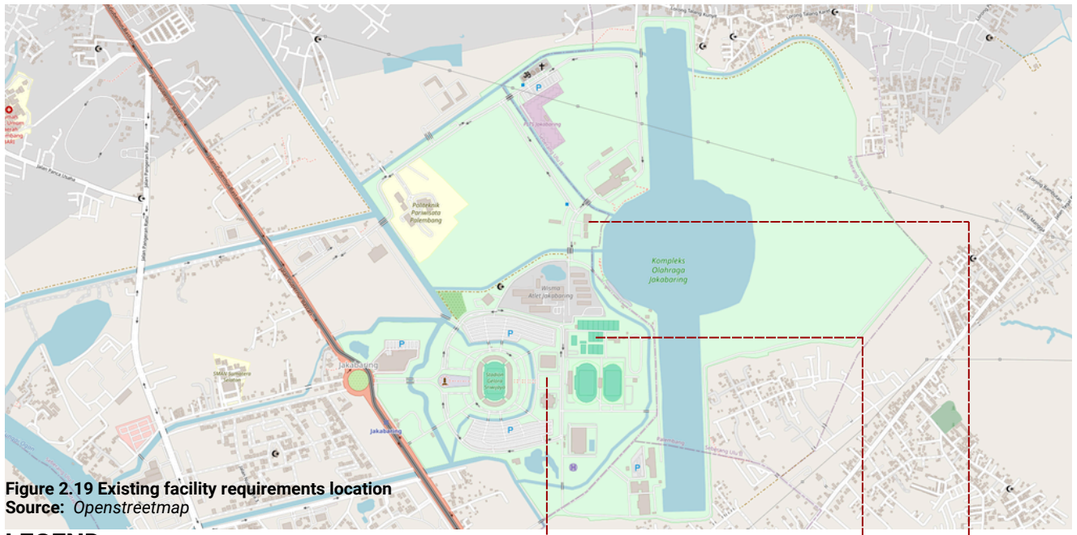


Figure 2.19 Existing facility requirements location
Source: *Openstreetmap*

LEGEND:

01. Badminton
02. Volleyball
03. Basketball
04. Futsal
05. Tennis
06. Sepaktakraw

2.4 PROPERTY EXISTING & REQUIREMENT

However according to government regulations related to sports buildings in Indonesia, **there are no special regulations related to special sports buildings for the difabled**. Therefore that the reference for the number of fields needed is taken from several sources of sports events that have been held in Indonesia.

Boccia was held at Tanjung Priok Youth Arena during the 3rd Asian Para Games in Jakarta, Indonesia in October 2018 with 6 competition courts.

Paralympic powerlifting was held during the 2018 Asian Para Games - Jakarta using 1 competition field. Another reference is the competition held by Paris 2024 Paralympics which also uses 1 competition field.

Wheelchair basketball was held during the ASEAN Para Games 2022, Surakarta, precisely at the Sritex Arena GOR with 1 competition court.

Blind chess does not have many competitions organized in Indonesia and the competition field tends to be closed. One of them is the Senyum Cup #1 competition organized by Yayasan Senyum Kita in Building E Faculty of Teacher Training and Education (FKIP) Universitas Sebelas Maret (UNS) Surakarta. The competition had 46 participants so it was assumed that there were approximately 20 chess tables in the competition.

Blind judo was held at Tirtonadi Convention Hall Surakarta during the 2022 ASEAN Para Games with 3 competition courts.

NEW SPORT FACILITY NEED

So based on several references, the needs of the 5 sports competition field are calculated as follows:

Table 2.2 New Sport Typology Need
Source: *Author, 2025*

Sport Type	Competition	Practice
Boccia	4	2
Paralympic Powerlifting	1	2
Wheelchair Basketball	1	1
Blind Chess	20	4
Blind Judo	3	1

2.5 ROOM NEED

So based on the consideration of space needs based on the sport center type, the function space is divided into two aspects, main function and supporting function. Some aspects of the function below are the initial ideas of what space needs might be a concern for the needs of difable users.

Main Function Need

The difable sports center has a variety of sports, but based on the site context, there are already several sports facilities that can facilitate these activities. Therefore that disabled sports activities that have the potential to be developed and require special space are chosen, these activities include:

Physical Disability	Vision Disability
1. Boccia 2. Paralympic Powerlifting 3. Wheelchair Basketball	1. Blind Chess 2. Blind Judo

Diagram 2.2 Physical disability & vision disability sport room need
Source: *Author, 2025*

Supporting Function Need

In addition to the main function of the sports center for sports activities, there are special facilities that are also needed in the building. This aims to fulfill the needs of user activities indoors. Supporting facilities consist of indoor areas, outdoor areas and accessibility.

Supporting Indoor Function	Accessibility	Supporting Outdoor Function
1. Shower room 2. Changing room 3. Medical room 4. Difable toilet 5. Difable lounge 6. Cafetaria 7. Mushola	1. Ramp 2. Difable lift 3. Difable tribun seating	1. Sensory landscape 2. Difable parking

Diagram 2.3 Difable Supporting Room needs
Source: *Author, 2025*

2.6 DIFABLE FIELDS STANDARD NEED

2.6.1 Boccia Field

Quoted from In-Sport, (n.d.) the following are the standards for boccia field

- Overall field size: 12.5 meters x 6 meters
- The field is divided into six player zones (boxes) with a size of 2.5 meters x 1 meter per zone.
- The boundary lines should be clearly visible, usually white and 5 cm wide.
- The court is generally blue or green in color to provide a good contrast against the Boccia balls (red, blue, and white).

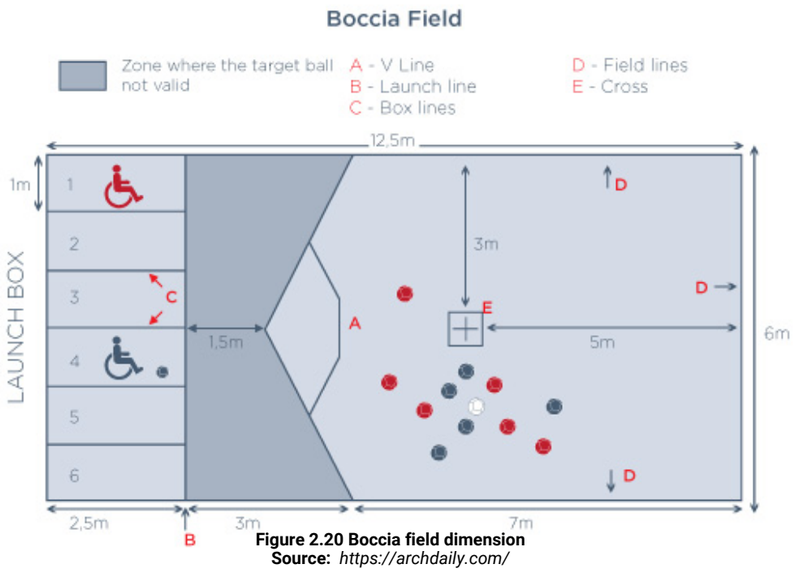


Figure 2.20 Boccia field dimension
Source: *https://archdaily.com/*

Boccia Participant Category

The standards set by BISFed classify Paralympic Boccia into four categories with the code BC, which stands for Boccia followed by a number indicating the athlete's level of functionality (BISFed, 2016):

- BC1 - Athletes with cerebral palsy who can play using their hands or feet (either with or without special shoes) and are accompanied by a sports assistant during the game.
- BC2 - Athlete with cerebral palsy who is able to play independently without the assistance of a sports assistant during the match.
- BC3 - Athletes with cerebral palsy who require the assistance of a sports assistant during competition. They use assistive devices such as ramps/parachutes and, if required, may utilize helmets with pointers, mouth extensions, hands, or other devices. Players who qualify for the BC4 category but use a ramp will fall under the BC3 category.
- BC4 - Athletes with motor impairments other than cerebral palsy. If playing with their feet, they may be accompanied by a support assistant.

2.6.2 Paralympic Powerlifting

Quoted from Move United, (2023) the following are the standards for paralympic powerlifting

- Platform Size: Maximum 4.0 m x 4.0 m.
- Surface: Must be flat, firm, non-slip and level.
- Height: Shall be no more than 10 cm from the surrounding floor or platform.
- Accessibility : If the competition is held on a stage, there must be a ramp with an anti-slip surface for wheelchair access.If possible, provide an additional ramp for descent to save time.
- Alternatives: If a platform is not available, the competition area should be clearly marked on the floor.



Figure 2.21 Paralympic powerlifting activity situation
Source: *https://sportsmatik.com/*

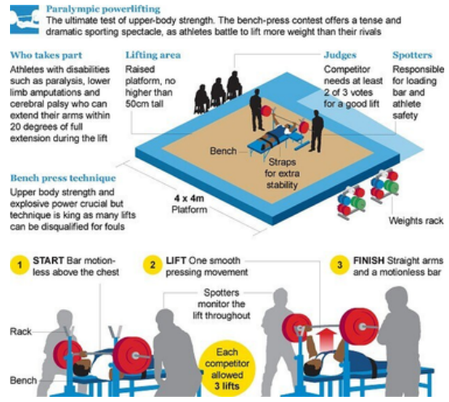


Figure 2.22 Paralympic powerlifting room situation
Source: *https://www.telegraph.co.uk/*

Paralympic Powerlifting Participant Category

Para Powerlifting is open to male and female athletes with physical disabilities. Athletes can compete from the age of 14, while for international competition, they must be 15 years old by January 1 of the competition year.

- Spinal Injuries & Dwarfism: Athletes must maintain a position with the shoulders, buttocks, feet, and soles of the feet fixed on the bench during the force. The use of orthotics or special shoes is allowed with referee approval.
- Cerebral Palsy (CP): The athlete must maintain the same position as the previous category, but may use a wedge (maximum 600 mm) to support the bent leg, with the referee's approval.
- Amputation: The athlete must maintain the position of the shoulders and buttocks on the bench, while the leg, prosthesis, or leg should be extended on the bench as far as possible.
- Use of Prosthesis: Athletes with spinal cord injuries and CP are allowed to use special orthotics and shoes, while athletes with amputations have additional rules regarding weight classes.

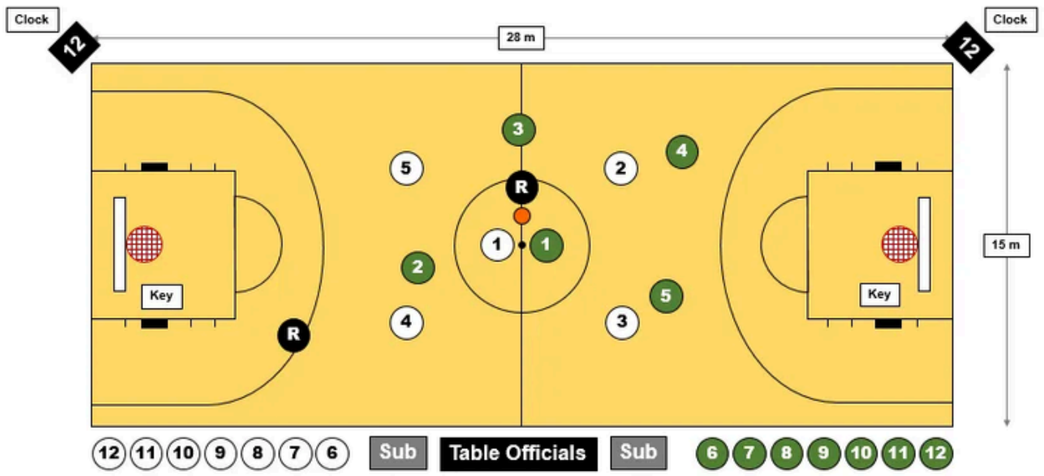


Figure 2.23 Wheelchair basketball dimension
Source: *https://www.policeukdisabilitysportcic.co.uk/*

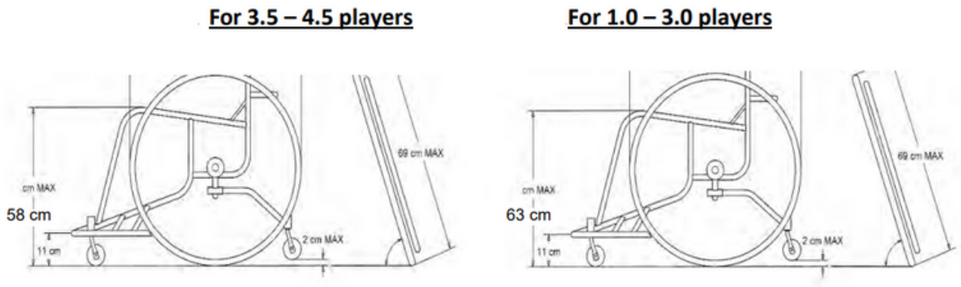


Figure 2.24 Basketball wheelchair dimension
Source: *https://cdn.prod.website-files.com/*

2.6 DIFABLE FIELDS STANDARD NEED

2.6.3 Wheelchair Basketball

Menurut ketentuan paralympic mengacu pada ukuran lapangan basket menurut FIBA

- Length: 28 meters
- Width: 15 meters
- Hoop height: 3.05 meters from the floor (same as regular basketball)
- Three-point line distance: 6.75 meters (FIBA)
- Free-throw line distance: 4.6 meters from the hoop
- All lines shall be of the same colour and drawn in white or other contrasting colour, 5 cm in width and clearly visible.

The floor shall include the court area surrounded by a further boundary lane free from obstructions with a minimum of 2 m Therefore the floor shall have dimensions of a minimum of 32 m in length by a minimum of 19 m in width.

Wheelchair Basketball Participant Category

Each player is assigned a classification based on his/her level of disability (from 1.0 to 4.5 points). Teams must keep the total points of players on the field not exceeding 14 points to ensure the balance of the game.

- Players with more limitations have lower points (1.0 - 2.5 points).
- Players with more bodily functions have higher points (3.0 - 4.5 points).
- The total points of the five players on the field should not exceed 14.0 points, to keep the game balanced.

2.6 DIFABLE FIELDS STANDARD NEED

2.6.4 Blind Chess

There is a difference in space requirements between a chess tournament and a blind chess tournament, which requires an assistant to help run the game.

- Each table should accommodate only one game. If a player requires an assistant, the table should be wider (at least 2 meters) to provide sufficient space for both the player and their assistant, and it should be positioned separately.
- The aisles between table rows must be twice as wide as usual to ensure accessibility for wheelchair users.
- Arbiters should be easily reachable for all participants.
- Additional power outlets should be provided, as some visually impaired players use lamps for their chess boards. These lamps should be positioned carefully to avoid disturbing their opponents.
- Whenever possible, blind chess players should be seated in the same area throughout the tournament, allowing them to quickly familiarize themselves with the route to and from the restrooms. Additionally, they should be assigned the same assistant for the entire event to maintain consistency.

Some definitions and recommendations regarding sizes
(L) Length of the table = 110 cm, tolerances: +20 cm, -10 cm.
(W) Width of the table = 85 cm, tolerances: +5 cm, -5 cm.
(H) Horizontal space between table rows = 3m, tolerances: +1.5 m, -0.5 m.
(R) Vertical space between table rows = 3m, tolerances: +1.5 m, -0.5 m.

There is a difference between chess in general and chess braille where this chess board has a different texture that has a different height between the boxes. In each of the squares there are holes that aim to hold the chess pieces from shifting easily. To distinguish between pieces, the white pieces have small spikes on the top.

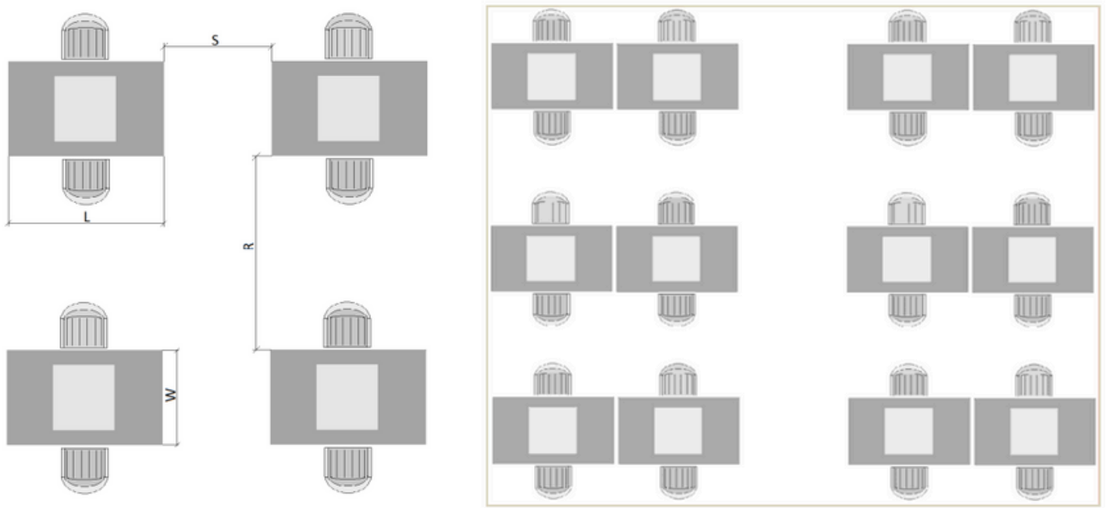


Figure 2.25 Single row layout and dual row layout
Source: *https://www.fide.com/*

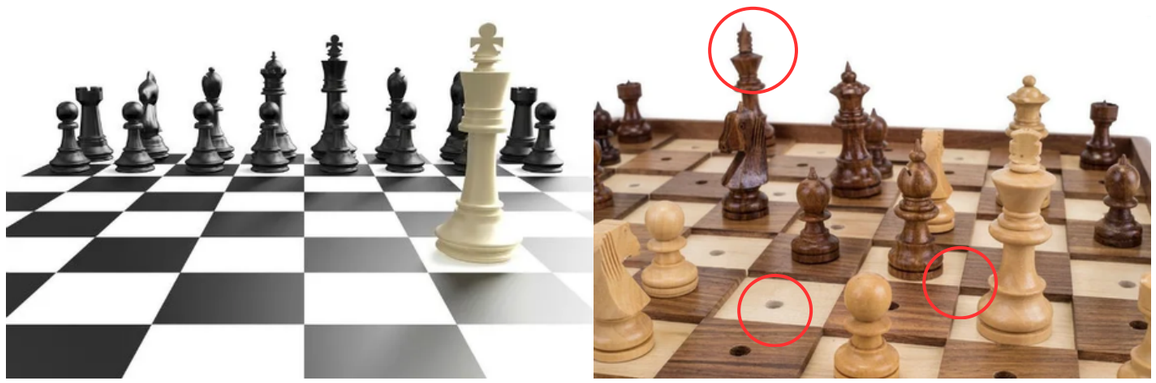


Figure 2.26 Differences between ordinary chess with braille chess
Source: *https://rumahinspirasi.com/ & https://www.etsy.com/*

2.6 DIFABLE FIELDS STANDARD NEED

2.6.5 Blind Judo

There is no difference in the size of the blind judo field, where the size of the field used is the same as the judo field in general.

- Minimum: 8 m x 8 m
- Maximum: 10 m x 10 m
- 3m width on each side of the competition area for safety area
- If there is more than one competition area, the distance between two competition areas is at least 4 m.
- Mat thickness: 4 cm - 6 cm

Blind Judo Participant Category

Blind judo athletes are classified into three categories based on their level of visual impairment:

- B1 (Totally Blind): Has no light perception at all or cannot recognize the shape of a hand at any distance.
- B2 (Severe Visual Impairment): Has light perception and can recognize the shape of a hand within up to 2 meters with a maximum visual acuity of 2/60.
- B3 (Moderate Visual Impairment): Visual acuity between 2/60 to 6/60, or has a field of vision of less than 20 degrees.

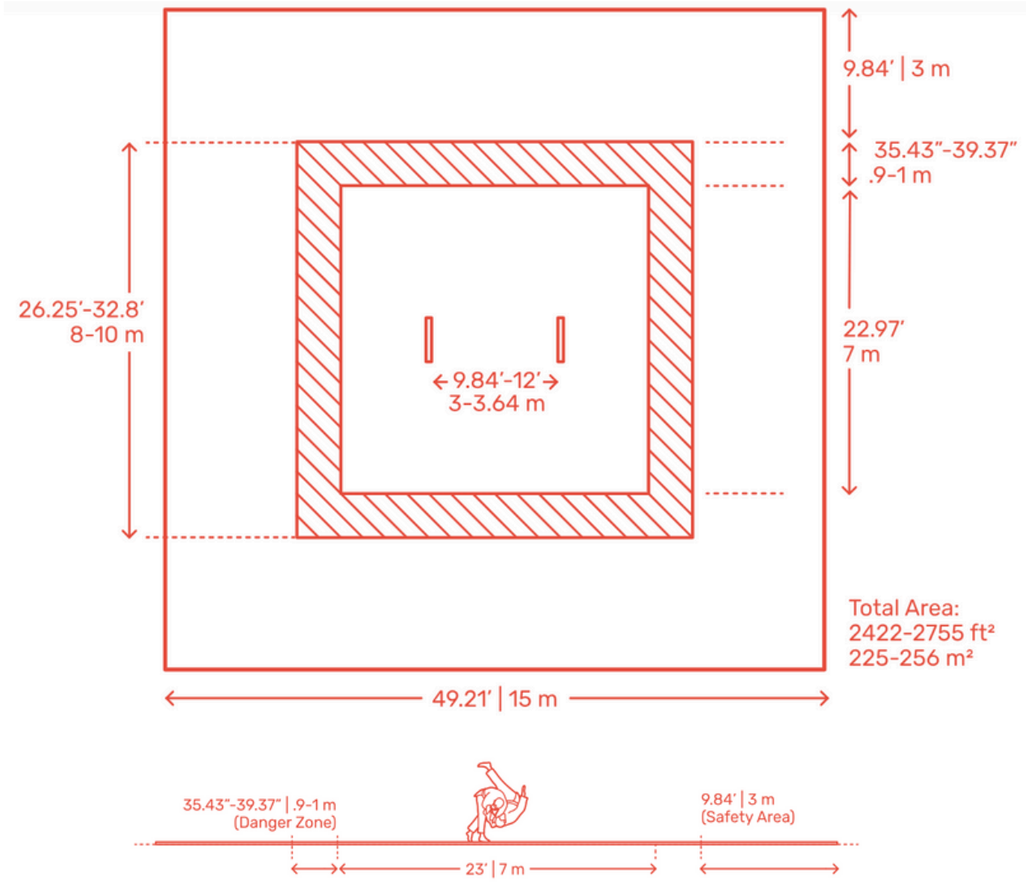


Figure 2.27 Judo field dimension
Source: *https://www.dimensions.com/element/*

2.7 DIFABLE ARCHITECTURE ELEMENT NEED

2.7.1 Physical disability architectural integration

Max height	Max slope
15 cm and less	1:12 or 8%
Between 16 - 50cm	1:14 or 7%
Between 51 - 100cm	1:16 or 6%
More than 100 cm	1:20 or 5%

Accessibility

The main accessibility for disabled users is a ramp, where the ramp has a special width and slope standard. Where the minimum width is 120 cm, the length of the bordes is 150 cm. There is a standard slope that is measured based on height, as shown in the table below.

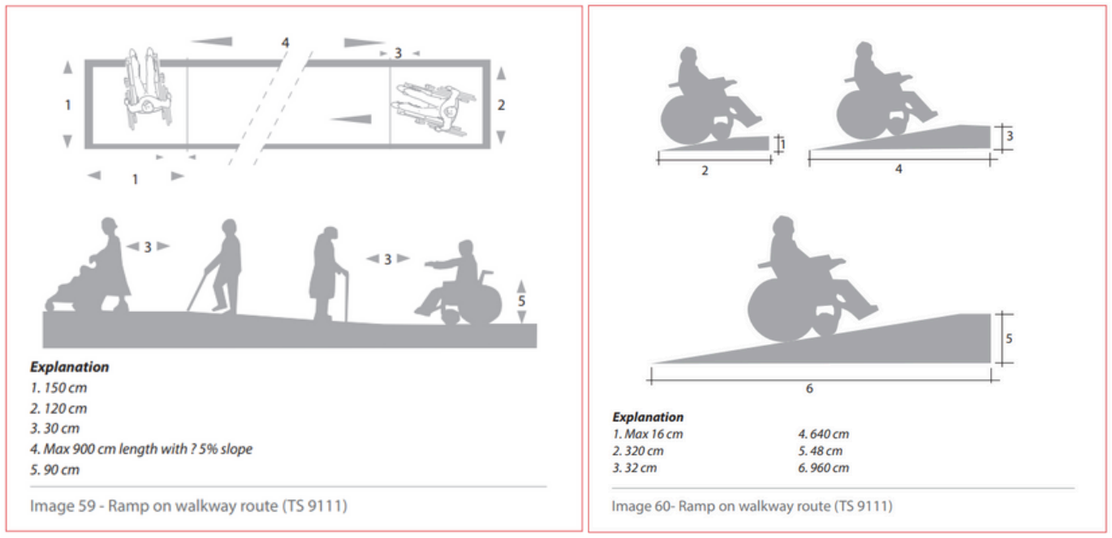


Figure 2.28 Ramp dimension standard
Source: *https://worlddisabilityunion.com/*

Difable Tribun Seating

To provide sufficient space for wheelchair users and their companions, an area of at least 1.4m x 1.4m is required. This space includes a width of 900mm for the wheelchair user and at least 500mm for the companion chair placed next to them.

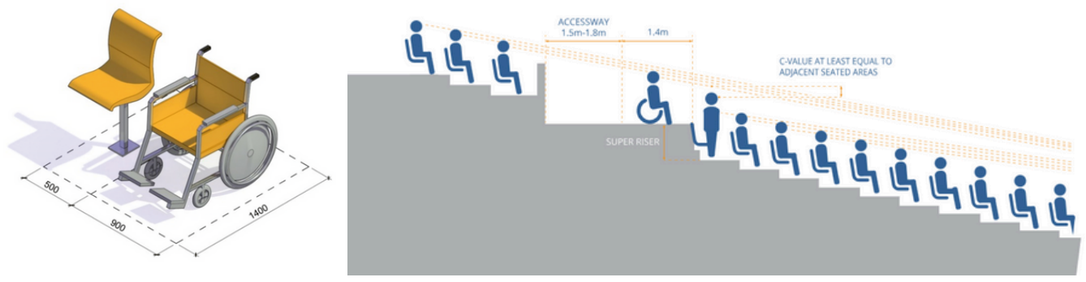


Figure 2.29 Difable tribun seating area
Source: *https://worlddisabilityunion.com/*

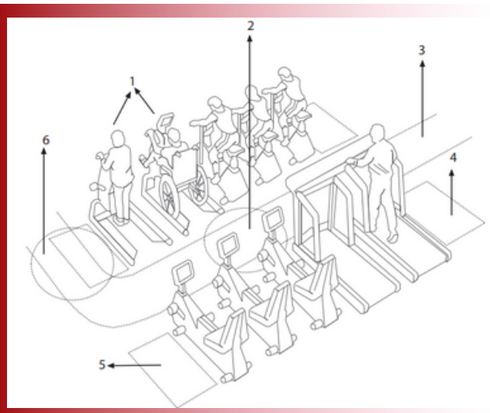


Figure 2.30 Difable fitness room standard
Source: *https://worlddisabilityunion.com/*

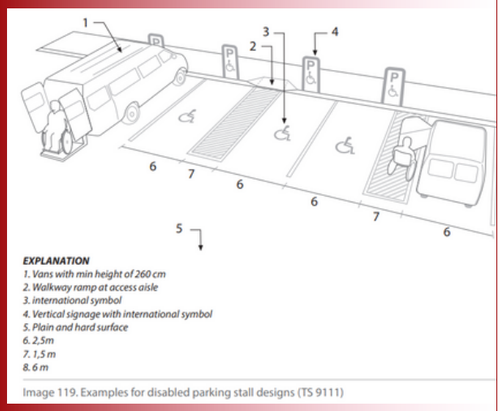


Figure 2.31 Difable parking space
Source: *https://worlddisabilityunion.com/*

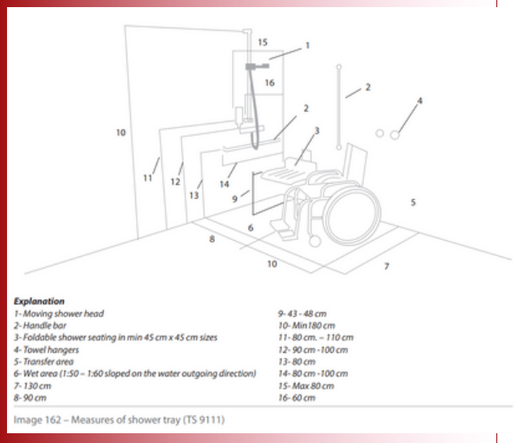


Figure 2.32 Difable shower room
Source: *https://worlddisabilityunion.com/*

Fitness center equipment for difable

The sports center is also equipped with a fitness area that will be intended for the disabled. This space requires a special circulation space for the disabled. As in the picture beside points 4 and 5, there is an empty space as a circulation in and out of wheelchair users with equipment. Point 6 also emphasizes that there is a recommended radius of 150 cm as a circulation space for disabled users.

Difable Parking Space

Parking spaces for difables have different space requirements from parking in general. It is emphasized again on the circulation aspect that difable users need empty space in the parking space to get in and out of the vehicle easily.

Difable Shower Room

Sport center khusus difabel memerlukan ruang shower room dengan ketentuan ukuran yang khusus dimana ruang shower harus dapat diakses oleh pengguna kursi roda. Ruang shower harus didesain dengan dimensi minimum 95 cm x 95 cm atau 76 cm x 150 cm untuk memastikan aksesibilitas. Ruang bukaan yang jelas dengan lebar minimal 90 cm dan panjang 122 cm diperlukan di depan baki pancuran 95 cm x 95 cm untuk pendekatan paralel. Untuk baki shower berukuran 76 cm x 150 cm, area bukaan yang jelas harus memiliki panjang minimal 150 cm dan lebar 90 cm untuk memberikan kemampuan manuver yang memadai. Spesifikasi ini memastikan aksesibilitas dan kemudahan penggunaan, terutama bagi individu dengan gangguan mobilitas.

2.7 DIFABLE ARCHITECTURE ELEMENT NEED

2.5.2 Visual disability architectural integration

For individuals with visual disabilities, sound plays a crucial role in navigation. To facilitate their movement, buildings should incorporate sound-reflective surfaces on floors, walls, and ceilings. Poor acoustics can hinder concentration and spatial awareness, making it essential to balance sound absorption (e.g., carpets) with reflective materials in other elements like walls, ceilings, and furniture. This approach ensures a safer and more navigable environment for visually impaired individuals.

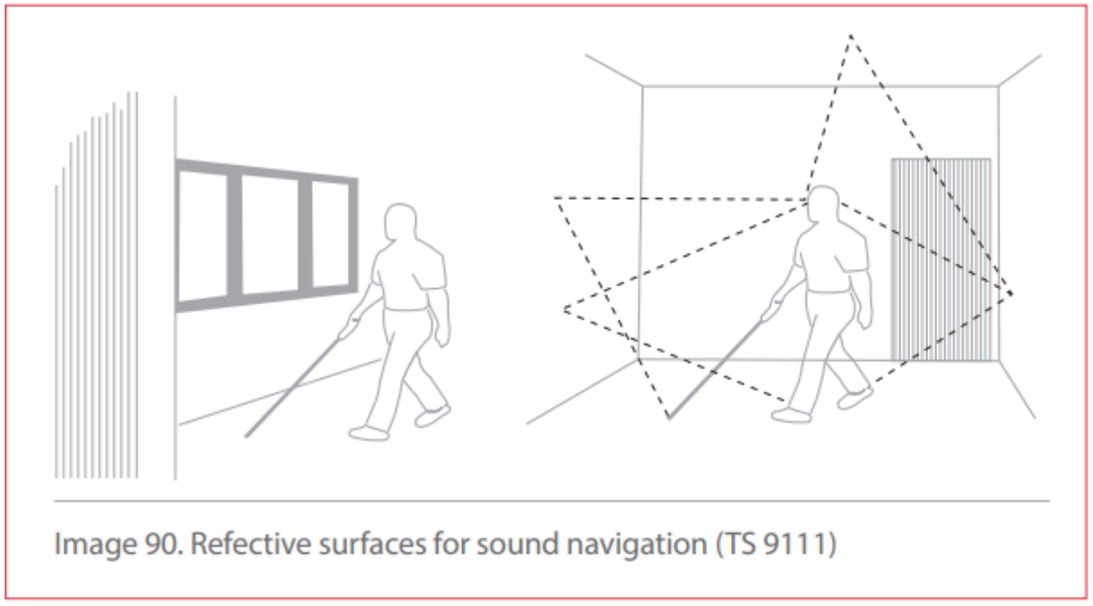


Figure 2.33 Reflective surface for difable guide
Source: *https://worlddisabilityunion.com/*

An accessible route should prioritize safety and ease of travel, especially for individuals using wheelchairs or mobility devices. To ensure a barrier-free path, both indoor and outdoor surfaces must be hard, stable, and slip-resistant, with careful consideration of surface texture to enhance accessibility.

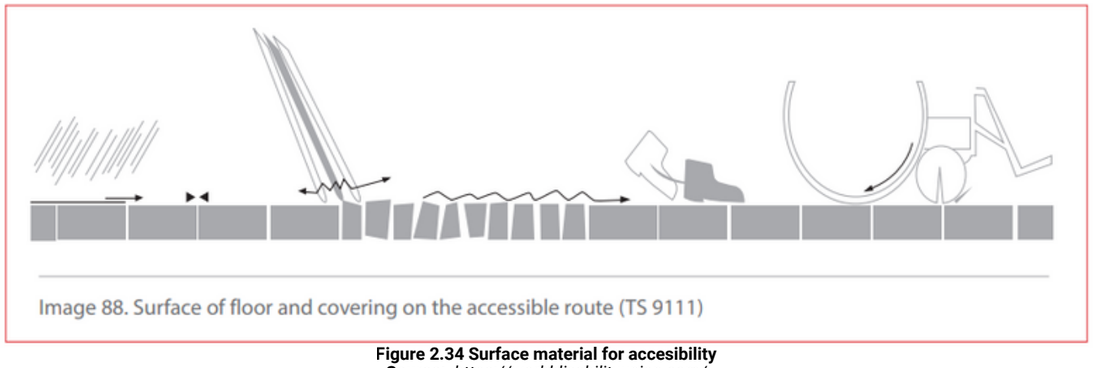


Figure 2.34 Surface material for accesibility
Source: *https://worlddisabilityunion.com/*

There are several aspects of architecture that need to be considered to enhance inclusive design for blind people, including:



Figure 2.35 Contrast color accessibility
Source: *https://www.denios.de/*



Figure 2.36 Braille signage
Source: https://id.made-in-china.com/

High contrast color markings at the edges wherever there are level and Braille plates as information systems to be integrated with elements like handrails in staircase / ramps or grab rails in circulation spaces.



Figure 2.37 Sensory landscape
Source: *https://www.archdaily.com/*



Figure 2.38 Contrast color surface
Source: *https://www.bdonline.co.uk/*

Use of sensory landscapes, micro climate features, soundscapes using water, etc. as features in built environment for ease in navigation and effective colour combinations keeping in mind the needs of the colour blind



Figure 2.39 Tacticle Tech for Visually Impaired Watching Sport
Source: *https://www.fastcompany.com/91317275/inside-one-court-accesible-tech-sports-watching*

Specifically designed for visually impaired spectators, a board-shaped device has been developed to help them follow the sports activity tournaments through vibrations. With this device, spectators can follow the game independently, but they need more space to store their belongings, especially their device, during the game break.

2.8 SITE LOCATION & ANALYSIS

SITE BACKGROUND

Palembang is the capital of South Sumatra Province, known as one of the oldest cities in Indonesia with a long history as a center of trade and culture. The city is located on the banks of the Musi River, which is a major icon and important transportation route. In 2011, Palembang had the honor of hosting the 26th SEA Games, the largest sporting event in Southeast Asia. To support the event, various international-standard sports facilities were built at Jakabaring Sport City (JSC). The complex is the center of sports activities, including stadiums, water arenas, and tennis courts.

ACCESSIBILITY

The most accessible public transportation to this area is the LRT which is located on the main road. So that access from the main entrance of the sports complex to the site leads to the north, where the access road in this complex has two-way lanes. Along the way to the site there are three bus stops that can be used as public access to the site. And the site is right next to the third bus stop.

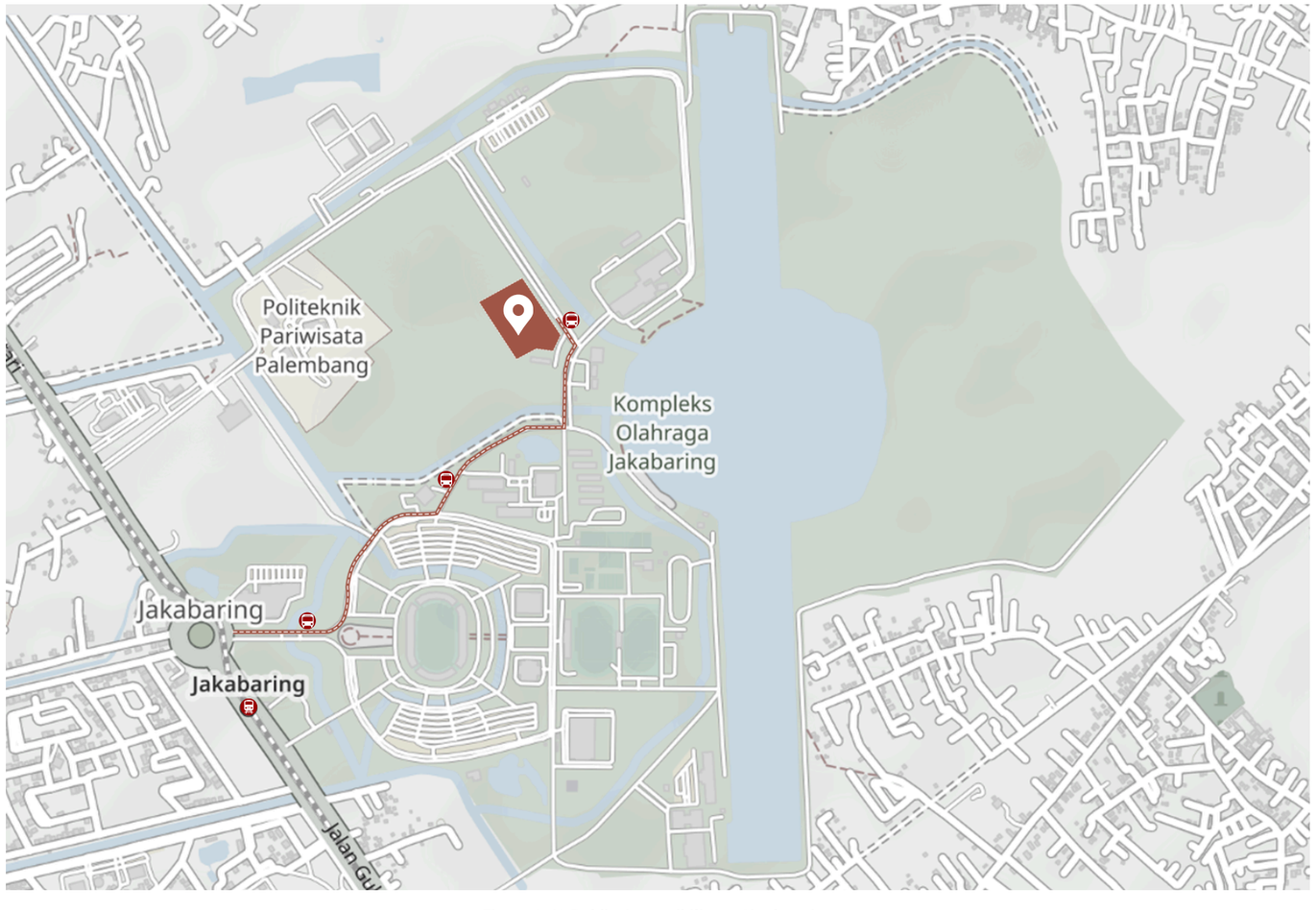


Figure 2.40 Public Accessibility to Site location
Source: *https://www.openstreetmap.org, Modified By Author, 2025*



Figure 2.41 Existing Bus Stop in Front of The Site
Source: *Author, 2025*



Figure 2.42 Road & Land Condition at Site
Source: *Author, 2025*



Figure 2.43 Site Boundary and Dimension
Source: *Google Earth, Modified By Author, 2025*

2.8 SITE LOCATION & ANALYSIS

CLIMATE DATA

The direction of incidence of the sun is not parallel to the orientation with an altitude of 3.72° and average daily radiation level at 4.96 kWh/m2. Site The strongest wind came from the southwest with 2.21m/s at 10 meters height. Stated from the data, the wind pressure came strongest during evening especially during February. With this wind pressure it quiet normal for wind pressure at the outdoor

SUN DATA

WIND DATA

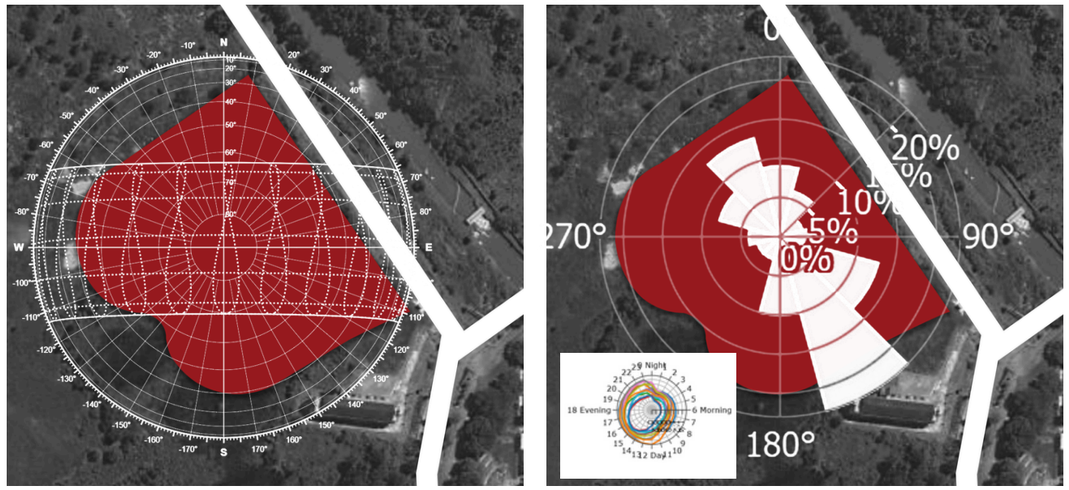


Figure 2.44 Sun Path & Wind Rose at SIte
Source: *Google Earth, Modified By Author, 2025*

PRECIPITATION DATA

Based on the precipitation level data in Palembang, the highest level is in March, November and December in the range of >300mm. While the lowest level is in August and September with <100mm. So it is concluded that rainfall in Palembang is moderate to high.

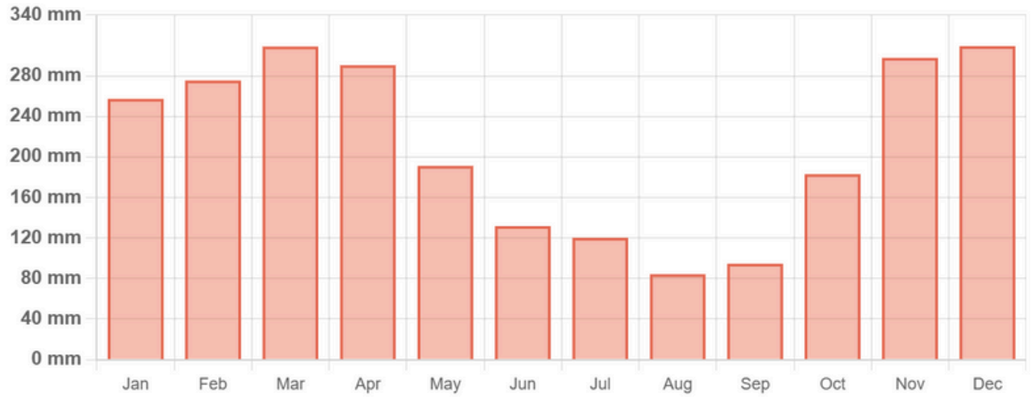


Figure 2.45 Monthly Precipitation Data at Site
Source: *https://weather-and-climate.com/*

REGULATION

According to RTRW Kota Palembang No.5 Year 2024, the site that located in 15 Ulu, Seberang Ulu I, Palembang City, South Sumatra is considered as RTH-5 (Green Open Space-5) and public & social facility typology.

Therefore according to the category the regulation use is from article 66 Paragraph 3C NO.6 related ro general zoning provisions for Public Facilities and Social Facilities Areas

SITE DIMENSION USE 48.100 m2					
KDB *max*	BCR	60%	---->	Site x 60%	28.860 m2
KLB	FAR	4	---->	Site x 4	192.400 m2
KDH	GAR	20%	---->	Site x 20%	9.620 m2
GSB	STBK	20%	---->	Site x 20%	9.620 m2
MAX KKOP HEIGHT					out of KKOP range

Diagram 2.4 Regulation Standard & Implementation at Existing
Source: *Author, 2025*

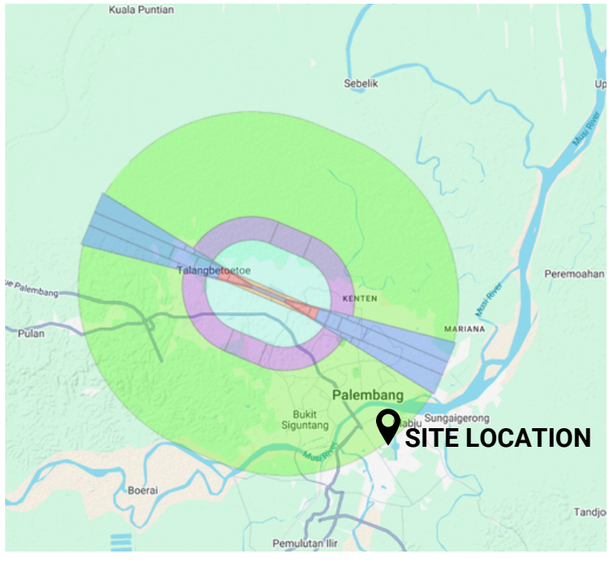


Figure 2.46 KKOP Height Map at Palembang
Source: *kkop.injourneyairports.id/publik/map_index*

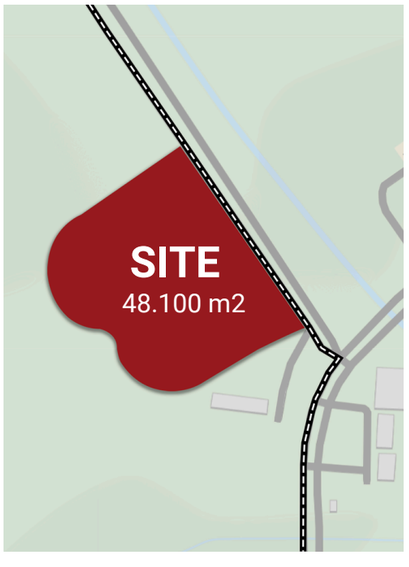


Figure 2.47 Site Boundaries
Source: *Google earth, Modified By Author, 2025*

Chapter 03

Design Concept

DESIGN CONCEPT FOCUS

Inclusive Architecture

Implementation of inclusive architecture approach in the design **to achieve equal accessibility** for all building users. **By applying 8 strategies** that are also use as benchmark for the success of building accessibility. The 8 aspects of the strategy consist of:

- Exterior/ outdoor area
- Circulation & wayfinding
- Building interior/ interior facilities
- Access arrangement/ entrance
- Sensory elements
- Material & colour
- Information accessibility system
- adaptability & flexibility of space

Difable Sport Center

Passive Design

Implementation of a passive design approach **to achieve high-performance buildings** means minimizing the use of active design. **By implementing 5 strategies** that are also used as benchmarks for high-performance buildings. The 5 aspects of the strategy consist of:

- Site planning
- Dayligting
- Facade design & building envelope
- Natural ventilation
- Strategic landscaping

By implementing the two focus approaches, the sports center building design will be a place for disabled athletes to enjoy the comfort of universal accessibility and the comfort of high building performance. So the important aspects that will be addressed are

Physical difabel

Focusing on accessibility standard such as circulation and access

Sensory difabel

Focusing on sensory material and colours

All users

Focusing on natural ventilation on facade and natural lighting from building opening

Diagram 3.1 Design concept focus
Source: *Author, 2025*

3.1 SITE DEVELOPMENT

3.1.1 Site Development According to Site Usage Regulation

Based on the regulation the building will use 50% BCR and 40% GAR for public facilities. The GAR or the green area will located at the southeast since the it has smaller area that suitable for open space. In addition on the southeast area there is another building, **therefore the placement of green area that place at the southeast will create the gap to allow air circulation.** The GAR will **utilized as parking area and green space such as garden.**

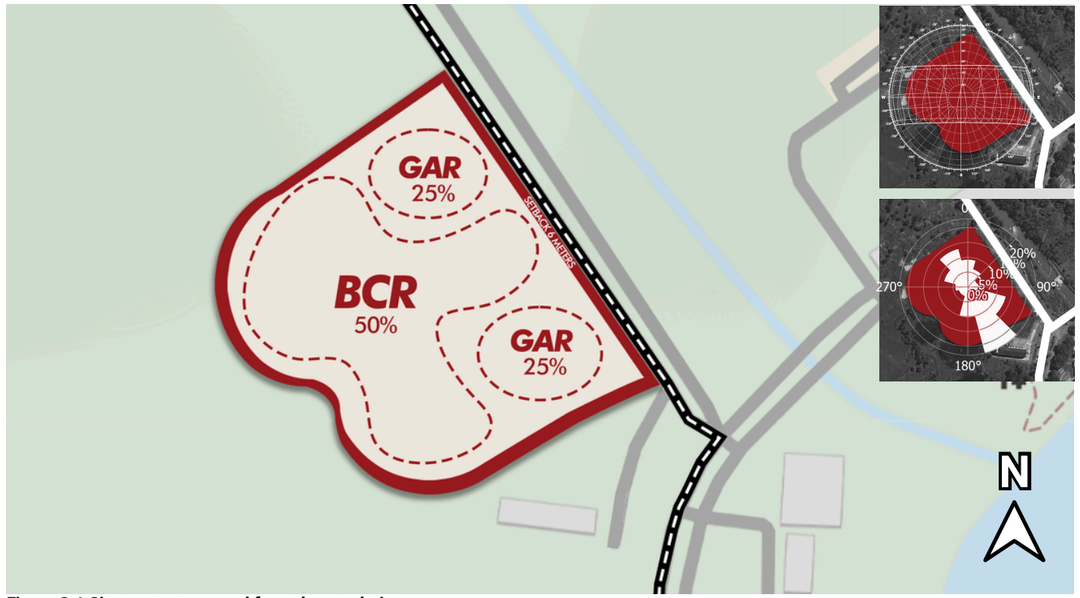


Figure 3.1 Site context respond from the regulation
Source: *Author, 2025*

3.1.2 Site Development User Entrance According to Public Accessibility

The width of the road is 7,8 meters with one way route, then there is a bus stop at the southeast of the road. Since the area is quiet huge there is a public transportation that connect one point to another. Therefore to respond to the site context, **the pedestrian entrance of the site will be next to the bus stop to make direct accessibility to the site.** Meanwhile the vehicle entrance should have different entrance access to create safe accessibility for pedestrian access

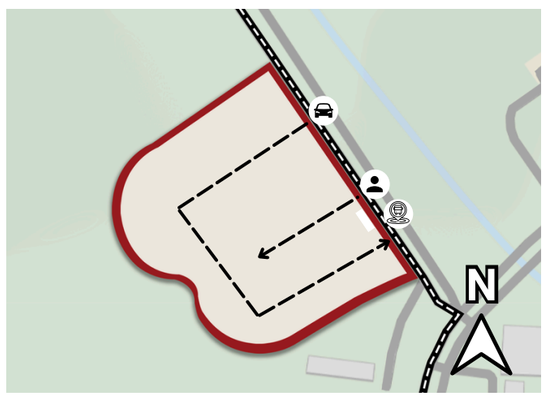


Figure 3.2 Pedestrian & Vehicle Access Concept
Source: *Author, 2025*

3.1.3 Site Development Landscape Concept to Respond Climate Data

The annual precipitation at the site is 143,6 mm which considered as medium, which according to BMKG medium precipitation is at range 100-300 mm. However since the type of soil at the site is damp soil and the gutter only have width 40cm it might became an issue with only 143,6 mm precipitation, therefore it might need a soil treatment as pre-build plan.

Therefore to **develop the site soil the main concept is to reduce the moisture of damp soil**, several method are to **add dry fill** (dry soil, sand, and gravel) and create **retention pond** to store excess rain water and prevent flooding.

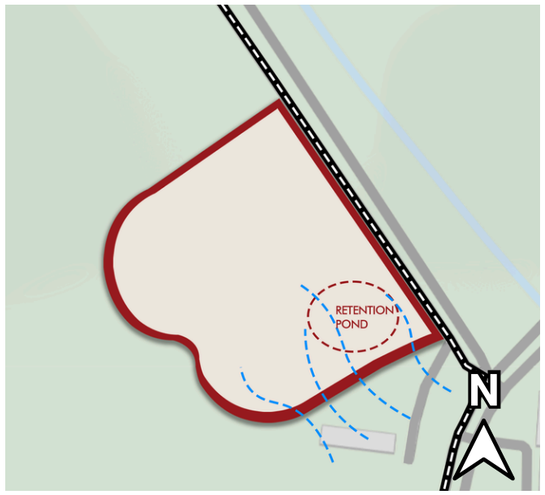


Figure 3.3 Retention Pond Concept to Respond Precipitation
Source: *Author, 2025*

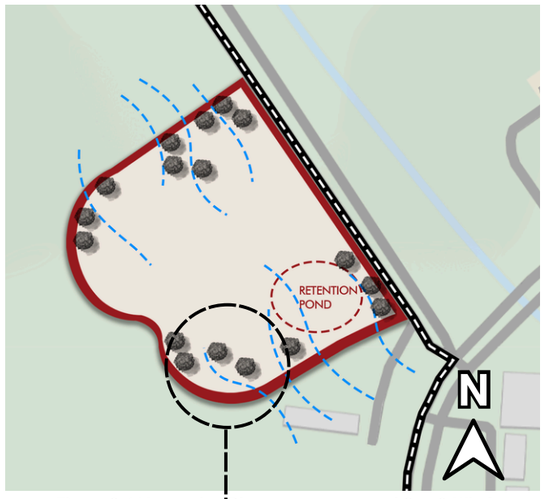


Figure 3.4 Vegetation Placement to respond Sun & Wind
Source: *Author, 2025*

The placement of retention pond should be placed near the gutter next to the road and recommended to **place it either at Northeast and Southeast to create natural passive cooling when the strongest wind passing through.**

Landscape development to respond wind is to **place the vegetation at each corner of the site.** This will **create wind funnels to directing the wind focus to the building**. In addition by arrange the small vegetation first then big vegetation is to **create wind effect gain gain more intake to the building.**

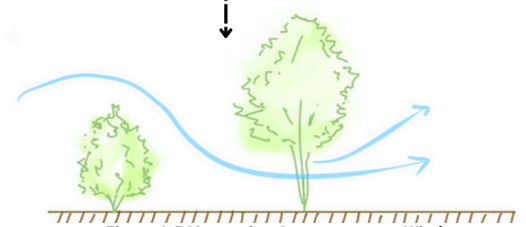


Figure 3.5 Vegetation Arrangement to Wind
Source: *Author, 2025*

Landscape development to respond sun and precipitation is to use **vegetation that have dense leaf as shading and able to absorb land moisture better.** The vegetation are Angsana that able to perform as shading and Lantana that able to perform as moisture control at the site.

3.2 PROPERTY SIZE USE

3.2.1 Property Size Concept According to Regulation Needs

According to “Peraturan Menteri Pemuda dan Olahraga Republik Indonesia NO 0445 Tahun 2014" sport center type B requires several sport field need to be fulfill. However since the sport center that will be design is specifically for difable and majority of the sports is a difable sports. Because of that, it will only follow partial of the function needs. **Such as basketball field requires two field,** which one for competition and the others is for practice. Therefore even though the basketball field that will be design specifically for difable, it will still follow the requirements of sport center type B.

Table 3.1 Main function property size according to regulation
Source: *Author, 2025*

MAIN FUNCTION NEED	Sport Type	Standard Area (m2)	Area + Circulation	Amount	Total Area
	Boccia	75	75 + (75 x 30%) = 98	6	588
	Paralympic Powerlifting	16	16 + (16 x 30%) = 21	3	63
	Wheelchair Basketball	420	420 + (420 x 30%) = 546	2	1.092
	Blind Chess	1,5	1,5 + (1,5 x 30%) = 2	24	48
	Blind Judo	225	225 + (225 x 30%) = 293	4	1.172

3.2.2 Property Size Concept According to Supporting Function

Other than the main sports need, there is a requirement of supporting function needs that need to be fulfill for sport center type B. Such as athlete changing room, coach & referee changing room, massage & physiotherapy room, medical room, dopping test room, gym, players lounge, storage room, management room, reporters lounge, sport event hall, VIP lounge, mushola, control room, and MEE room. This supporting facilities requires minimum quantity amount.

However since the sport center **will be design specifically for difable** therefore there are some of adjustment in several function. Such as **athlete changing room that require specific dimension of space for toilet and shower room.**

Table 3.2 Supporting function property size according to regulation
Source: *Author, 2025*

SUPPORTING FACILITY NEED	Facility Typology	Specific Typology	Minimum Amount	Standard Area (m2)	Area + Circulation	Amount Use	Total Area
	Difable athlete changing room	Toilet (man)	3 difable toilet + 3 sink	3,2	3,2 + (3,2 x 30%) = 4,2	3	12,6
			2 urinoir + sink	3,2	3,2 + (3,2 x 30%) = 4,2	1	4,2
		Shower room (man)	4 unit	2,4	2,4 + (2,4 x 30%) = 3,2	4	12,8
		Toilet (woman)	4 difable toilet + 4 sink	3,2	3,2 + (3,2 x 30%) = 4,2	4	16,8
		Shower room (woman)	4 unit	2,4	2,4 + (2,4 x 30%) = 3,2	4	12,8
		Changing area (man)	20 locker 20 seat	24	24 + (24 x 30%) = 31	1	31
		Changing area (woman)	20 locker 20 seat	24	24 + (24 x 30%) = 31	1	31
	Coach & referee changing room	2 units of changing room	1 sink 1 toilet 1 shower room 3 locker 3 seat	6	6 + (6 x 30%) = 8	2	16
	Massage & physiotherapy	-	2 massage table 1 sink 1 toilet	12 m2	12 + (12 x 30%) = 16	1	16
	Medical room	-	2 bed 1 sink 1 toilet	18 m2	18 + (18 x 30%) = 23,4	1	23,4
	Doping Test Room	-	1 sink 1 toilet 1 examination table 1 storage	6	6 + (6 x 30%) =7,8	1	7,8
	Gym	-	-	80 m2	-	1	80
	Players Lounge	-	seating area + 1 toilet	40 m2	-	1	40
	Storage room	-	-	60 m2 (sport tools) 40 m2 (cleaning tools)	-	1	100

3.2 PROPERTY SIZE USE

Table 3.2 Supporting function property size according to regulation
Source: *Author, 2025*

	Facility Typology	Specific Typology	Minimum Amount	Standard Area	Amount Use	Area + Circulation	Total Area
SUPPORTING FACILITY NEED	management room	manager room	-	12	1	-	12
		secretariat room	-	12	1	-	12
		match supervisor room	-	12	1	-	12
		referee room	-	12	1	-	12
		meeting room	-	25	1	-	25
	reporters lounge			25	1	-	25
	sport event hall			150	1	-	150
	VIP lounge			40	1	-	40
	mushola			25	1	-	48

	Facility Typology	Specific Typology	Minimum Amount	Standard Area	Amount Use	Area + Circulation	Total Area
SYSTEM NEEDS	control room	sound system, lighting system, screen, cctv	1	20	1	-	20
	ME room	LVMDP room	1	12	1	-	12
		trafo room	1	20	1	-	20
		water pump room	1	9	1	-	9
		generator room	1	24	1	-	24

Table 3.3 Main function capacity
Source: *Author, 2025*

	Sport Type	Capacity	Estimated Total Area (m2)
TRIBUN NEEDS	Boccia	200	160
	Paralympic Powerlifting	300	240
	Wheelchair Basketball	1000	800
	Blind Chess	100	100
	Blind Judo	400	320

Estimated total area need:

5.385m2

The rough calculation of the space is estimated around 5.000 m2 according to the pre-design need of the space. Since the room quantity of the building is not define yet, therefore it might have a changes in total area after building quantity analysis.

Boccia	Paralympic Powerlifting	Wheelchair Basketball	Blind Chess	Blind Judo
588 m2	63 m2	1.092 m2	48 m2	1.172 m2

The rough calculation about the sport field is more less around 3.000 m2 with blind judo that have the largest field size since it have quite large size requirement with 4 amount of field in the arena. Event though the total of the blind judo field size has the largest among all, the wheelchair basketball has the largest field if it count as individual field. Therefore it will be the main attraction of the sport center.

3.2 PROPERTY SIZE USE

Table 3.4 Main function and supporting function room quantity
Source: *Author, 2025*

TYPOLOGY	ROOM QUANTITY
Boccia Field	6
Paralympic Powerlifting Field	1
Wheelchair Basketball Field	2
Blind Chess Field	24
Blind Judo Field	2
Difable athlete changing room	3
Coach & refereechanging room	3
Massage & physiotherapy	1
Medical room	1
Doping Test Room	1
Gym	1
Players Lounge	3
Storage room	5
management room	1
reporters lounge	5
sport event hall	1
VIP lounge	5
mushola	1
control room	1
ME room	1

3.2.3 Property Size Concept According to Function Quantity Needs

Pada tabel di sebelah kiri menunjukkan banyakanya kebutuhan ruang pada desain, dimana tabel berwarna abu-abu menandakan fungsi utama yaitu lapangan olahraga yang dibutuhkan. Banyaknya kebutuhan ruang disesuaikan dengan standar yang dibutuhkan, seperti adanya peruntukan lapangan untuk pertandingan dan lapangan untuk latihan

3.2.4 Property Size Concept According to Room Zoning Category

Based on the new type of sport that will be design, the sport field differentiate into two zooning category based on the sport ambiance type and it size property. It consist of Active Zone , Power Zone , and Quiet Zone. Blind chess and Boccia categorize as quiet zone since this type of sport **require high focus and calm ambiance during the competition.**

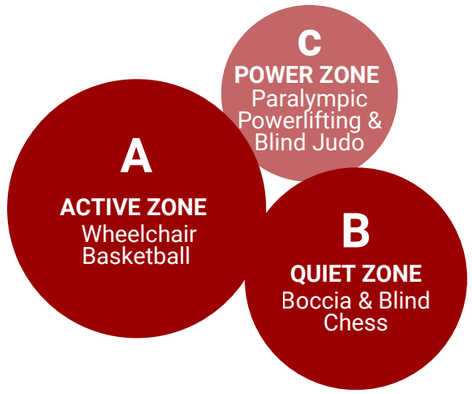


Diagram 3.2 Main function zoning according to sport ambiance typology
Source: *Author, 2025*

Then the building zone divide into three category based on it usage, which are public area, semi-public area, and private area. This zoning will help the circulation of the building and create the form of the building. The zoning will be analyze through bubble diagram.

ZONE CATEGORY Each zoning categorize by it use, which it categorize according to:

PUBLIC SPACE
- Able to be access by everyone without any exception (player, visitors, staff, etc)
- Had a huge type of space

SEMI- PUBLIC SPACE
- Able to be access by public but with special terms
- Had a medium type of space

PRIVATE SPACE
- Only accessible with specific users
- Had a small type of space

Diagram 3.3 Zoning classification according to type of space
Source: *Author, 2025*

3.2.5 Property Size Concept According to Room Zoning Category Implementation at Site



Figure 3.6 Zoning alternative 1
Source: *Author, 2025*



Figure 3.7 Zoning alternative 2
Source: *Author, 2025*

Based on functional requirements, the main functions of the building are divided into three zones: Active Zone, Power Zone, and Quiet Zone. However, supporting functions such as parking areas, landscaping, and main areas (office & management) are also required. The important zone placement is the **quiet zone, since sports require a calm space. Therefore, alternative 2 is more suitable, since the quiet zone is located at the corner and not next to the parking area.**

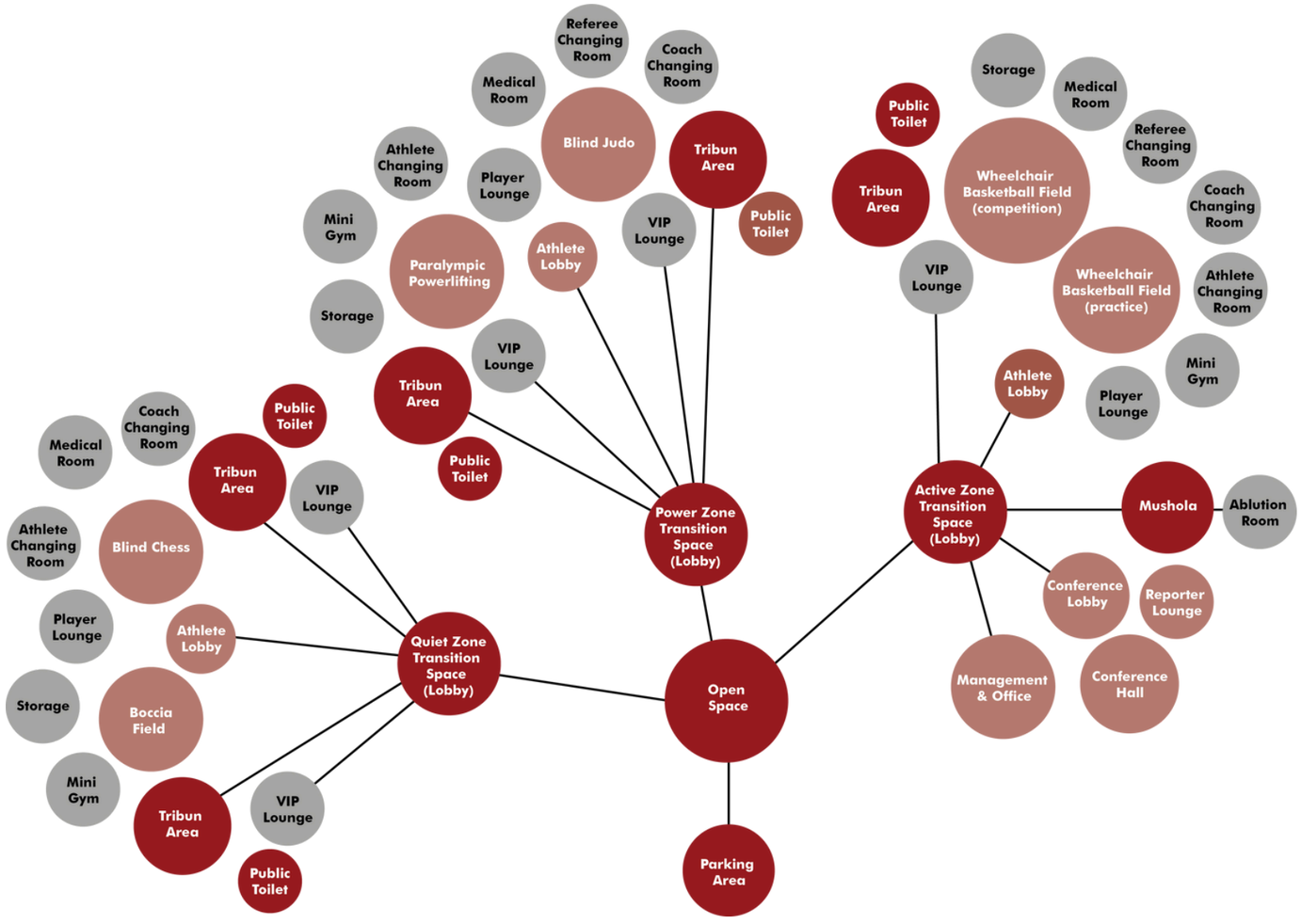


Diagram 3.4 Zoning classification according to Four Main Zone
Source: *Author, 2025*

3.2 PROPERTY SIZE USE

3.2.6 Property Size Concept According to Room Zoning Classification Detail

The space is divided into three areas: the Active Zone, Power Zone, and Quiet Zone. Each zone has public and private spaces. Public spaces are accessible to everyone, including visitors and management. Each zone has similar space requirements, but the Active Zone, which is the main zone, includes management and office areas. Additionally, this zone features conference areas and press rooms. The integration of these spaces within the Active Zone is designed to streamline activities, as this zone accommodates more popular sports activity.

LEGEND:

Public **Semi Public** **Private**

3.2 PROPERTY SIZE USE

3.2.6 Property Size Concept According to Room Zoning Classification Detail

The active zone is the largest zone that has a basketball field, where there are two fields in this zone, one competition field and one training field. There is a difference between the two, where the competition field has a tribune area and is accessible to the public, while the training field does not have a tribune area and is not accessible to the public. However, the training field is accessible by athletes and members of the public who rent it.

Table 3.5 Active Zone and It's Room Function Typology Programming
Source: *Author, 2025*

			FUNCTION	STANDARD	AREA	AMOUNT	TOTAL AREA	TOTAL	TOTAL ALL	COMERCIAL AREA	%	SERCVICE AREA	%
ACTIVE ZONE	Ground Level	Private	Player Lounge	40	155	1	155	6315	9534	5456	57%	4006	42%
			Man Athlete Changing Room	50.2	230	1	230						
			Woman Athelete Changing Room	63.16	230	1	230						
			Coach Changing Room	16	64	1	64						
			Referee Room	16	64	1	64						
			Medical Room + Massage & physiotherapy	47.2	128	1	128						
			Gym	80	127	1	127						
			Manager Room	12	32	1	32						
			Secretariat Room	12	32	1	32						
			Office	-	128	1	128						
			Staff Room	-	78	1	78						
			Meeting Room	25	176	1	176						
		Semi-Public	Wheelchair Basketball Field	1092	1092	1	1092						
			Storage	100	64	1	64						
			Wheelchair Basketball Field (Practice)	1092	1007	1	1007						
			Conference Room	-	176	1	176						
			Conference Lobby	-	32	1	32						
			Reporter Lounge	25	32	1	32						
			Medical Room + Massage & physiotherapy	47.2	128	1	128						
		Public	Lobby + Ticketing	-	495	1	495						
			Administrative Office	-	32	1	32						
			Mushola + Ablution Room	25	78	1	78						
			Emergency Stairs		24	2	48						
			Corridor	-	836	1	836						
			Green Space	-	600	1	600						
		Private	Generator Room	24	92	1	92						
			Trafo Room	20	64	1	64						
			LVMDP Room	12	63	1	63						
			Control Room	20	32	1	32						
	First Floor	Public	Public Toilet	-	128	1	128	3219					
			VIP lounge	40	89	1	89						
			Tribun Area	800	900	1	900						
			Sport Bar & Lounge	-	127	2	254						
			Emergency Stairs	-	24	2	48						
			Corridor	-	1800	1	1800						

3.2 PROPERTY SIZE USE

3.2.6 Property Size Concept According to Room Zoning Classification Detail

The quiet zone consists of two sports that require a quieter and more focused ambiance, which consist of boccia and blind chess. Both field are located in the same space but are separated by different areas, so that spectators have different access entrance.

Table 3.6 Quiet Zone and It's Room Function Typology Programming
Source: *Author, 2025*

			FUNCTION	STANDARD	AREA	AMOUNT	TOTAL AREA	TOTAL	TOTAL ALL	COMERCIAL AREA	%	SERCVICE AREA	%
QUIET ZONE	Ground Floor	Private	Player Lounge A		64	1	64	4285	6033	3424	57%	2620	43%
			Player Lounge B		64	1	64						
			Man Athlete Changing Room		96	1	96						
			Woman Athelete Changing Room		96	1	96						
			Coach Changing Room A		64	1	64						
			Coach Changing Room B		64	1	64						
			Referee Room A		74	1	74						
			Referee Room B		63	1	63						
			Medical Room + Massage & physiotherapy		80	1	80						
			Gym		80	1	80						
			Storage A		51	1	51						
			Storage B		130	1	130						
		Semi-Public	Boccia		1258	1	1258						
			Blind Chess		438	1	438						
		Public	Lobby + Ticketing		506	1	506						
			Blind Chess Tribune		202	1	202						
			Public Toilet		80	1	80						
			Emergency Stairs		39	1	39						
			Corridor		456	1	456						
			Green Space		380	1	380						
	First Floor	Public	Public Toilet		96	1	96	1748					
			VIP lounge		48	1	48						
			Boccia Tribune Area		226	1	226						
			Sport Bar & Lounge		139	1	139						
			Emergency Stairs		39	1	39						
			Corridor		1200	1	1200						

3.2 PROPERTY SIZE USE

3.2.6 Property Size Concept According to Room Zoning Classification Detail

The power zone also consists of two sports, blind judo and Paralympic powerlifting, which have separate areas. Compared to the other two zones, this zone has a smaller area due to the small number of users.

Table 3.7 Power Zone and It's Room Function Typology Programming
Source: *Author, 2025*

			FUNCTION	STANDARD	AREA	AMOUNT	TOTAL AREA	TOTAL	TOTAL ALL	COMERCIAL AREA	%	SERCVICE AREA	%
POWER ZONE	Ground Floor	Private	Player Lounge A		113	1	113	3529	5111	2891	57%	2220	43%
			Player Lounge B		34	1	34						
			Man Athlete Changing Room		93	1	93						
			Woman Athelete Changing Room		95	1	95						
			Coach Changing Room		64	1	64						
			Referee Room		64	1	64						
			Medical Room + Massage & physiotherapy		86	1	86						
			Gym		86	1	86						
			Storage		38	2	76						
		Semi-Private	Paralympic Powerlifting		962	1	962						
			Blind Judo		158	1	158						
		Public	Lobby + Ticketing		213	1	213						
			Paralympic Powerlifting Tribune		338	1	338						
			Public Toilet		127	1	127						
			Emergency Stairs		47	1	47						
			Green Space		106	1	106						
			Corridor		867	1	867						
	First Floor	Public	Public Toilet		127	1	127	1582					
			VIP lounge		47	1	47						
			Boccia Tribune Area		302	1	302						
			Sport Bar & Lounge		119	1	119						
			Emergency Stairs		47	1	47						
			Corridor		940	1	940						

3.3 BUILDING FORM

3.3.1 Building Form Concept According to Zoning Building Orientation (Orientation + Zoning)

Based on the exploration of alternative zoning 2, the zone is divided into 3. Where the Active Zone and Power Zone are placed side by side, while the Quiet Zone is placed separately. The placement of the Active Zone area closer to the road is intended to be the main image of the building when visitors enter the area. So, based on the zoning layout, the ideal orientation of the building entrance is towards the central area.

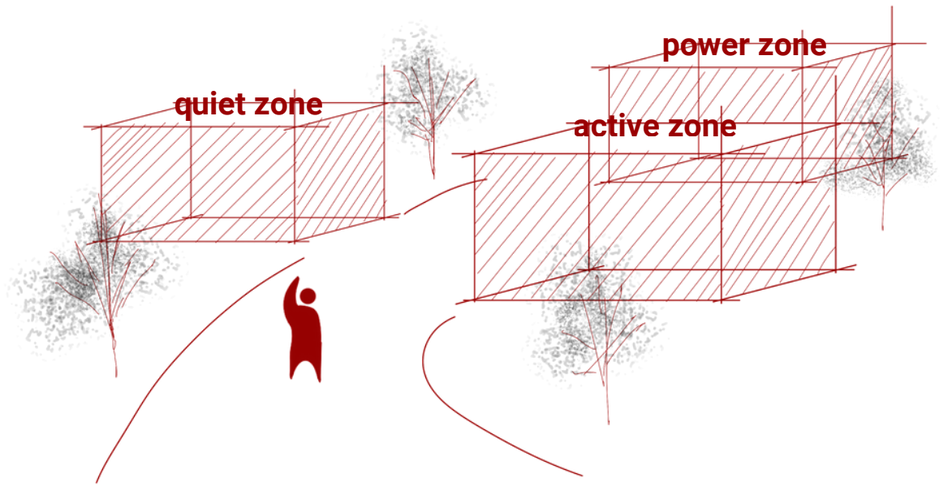


Figure 3.8 Building Orientation Visualisation Based on Zoning
Source: *Author, 2025*

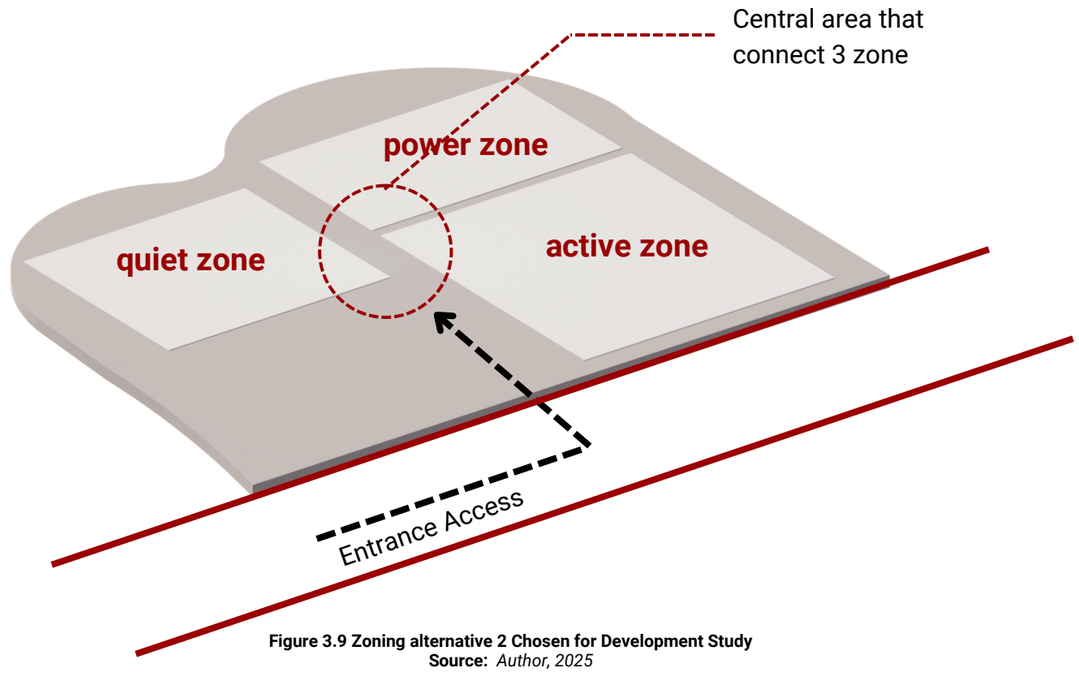


Figure 3.9 Zoning alternative 2 Chosen for Development Study
Source: *Author, 2025*

3.3 BUILDING FORM

3.3.2 Building Form Concept According to Zoning Based & Massing Arrangement on Climate Respond (Climate +Zoning)

Based on the previous orientation context, the orientation of the building is rechecked based on the climate in the form of wind direction and sun direction. The three zones that have been arranged based on their location are in accordance with the wind direction coming from the southwest, **where the building mass density in the south direction is lesser**, which only has one zone, that is the Quiet Zone. **This allows the wind to pass through to other buildings.**

However, based on the context, a curved/circular/**elliptical mass is more suitable for distributing wind** to other buildings. Therefore, the selected building mass is elliptical with different mass sizes and adjusted so that the wind can pass through the entire building mass.

Then, based on the **context of the sun's** direction, the building mass **minimizes larger areas in the east and west directions.** Thus, wider surfaces are placed in the north and south directions, as **implemented in the Active Zone and Quiet Zone.** This is different from the Power Zone, where the wide surface faces east and west, but this is not a big problem because the eastern area of the Power Zone will be shaded by the Active Zone.

As a result, **the main entrances to the Active Zone and Power Zone face each other**, benefiting from the shade provided by each other's buildings.

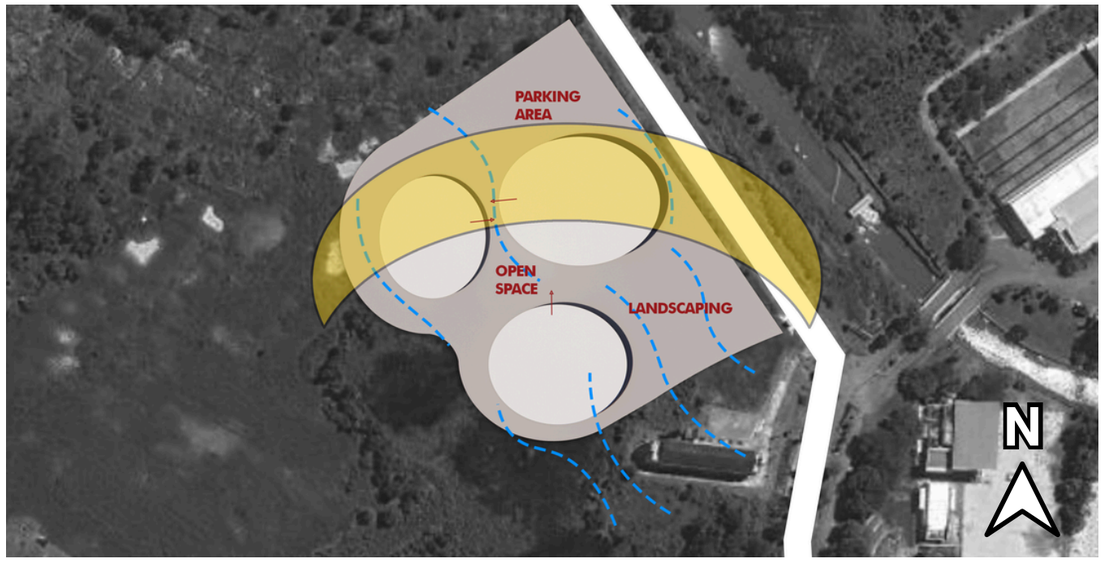


Figure 3.10 Conclusion of Building Form According to Climate
Source: *Author, 2025*

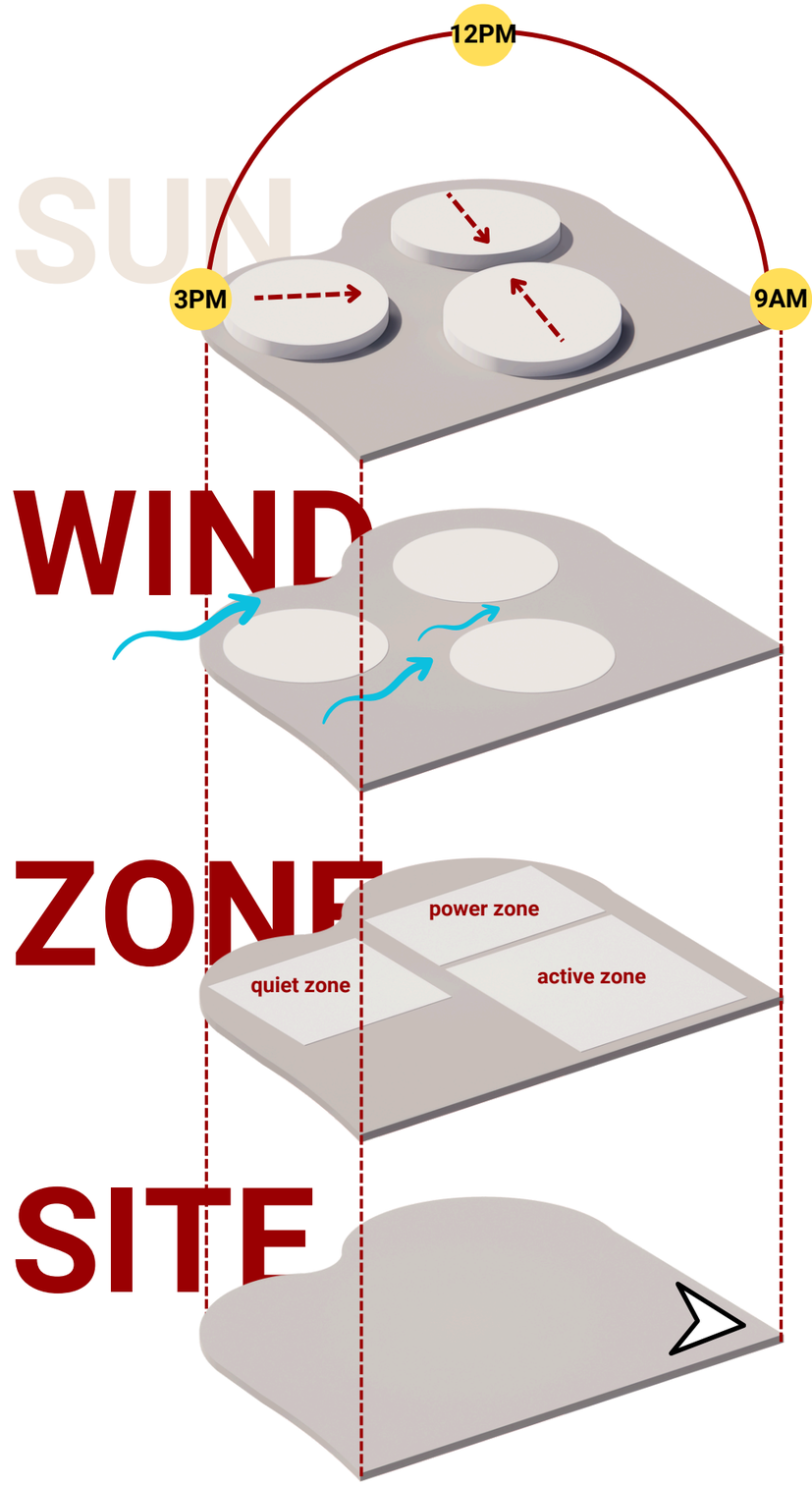


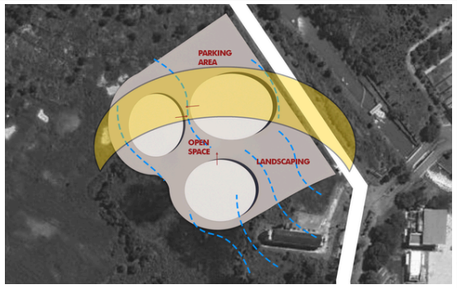
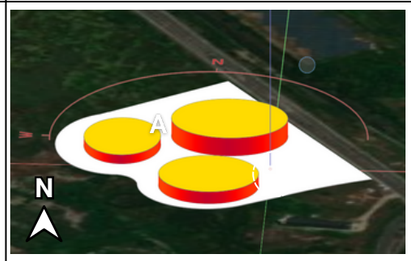
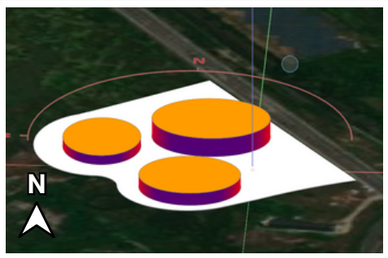
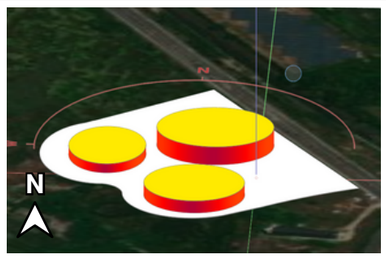
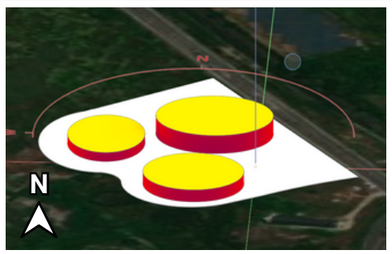
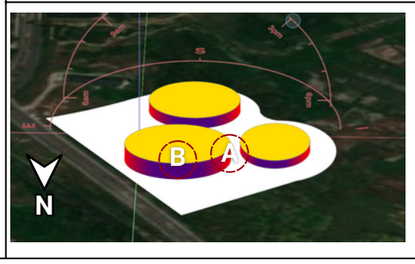
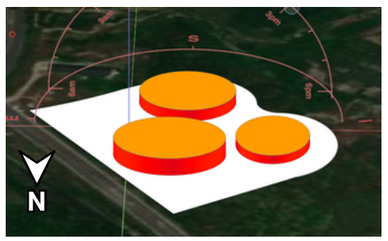
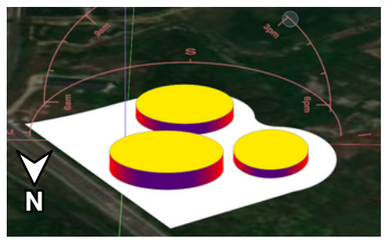
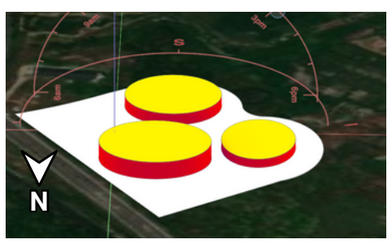
Figure 3.11 Zoning alternative 2 Chosen for Development Study
Source: *Author, 2025*

3.3 BUILDING FORM

3.3.3 Building Form Concept According to Massing Arrangement on Climate Respond Simulated Through Formit (Climate + Massing)

Based on the final simulation using Formit, there are color differences that indicate the amount of sunlight hitting the building's surface. As seen in the January 3 PM image, Surface B facing south is indicated by purple, while Surface A facing west is indicated by red. This confirms the previous concept of reducing the surface area on the east and west sides to minimize direct sunlight entering the building in the future. Since red color indicates that more sun hits the surface rather than the purple color. Therefore, the conclusions from this simulation can be used to determine the opening areas.

Table 3.8 Final Form Formit Simulation Result
Source: *Author, 2025*

	FINAL DESIGN	JANUARY	JUNE	NOVEMBER	YEARLY
9 AM					
3 PM					

3.4 ROOM LAYOUT

3.4.1 Room Layout Concept of Sport Field with Tribune According to Function

There are three building masses with different orientations, which will affect the layout of the field in each building phase, especially in terms of sunlight on the openings to avoid glare during sports activities.

therefore, the layout of the sports field has a layout direction with players facing north and south, while the openings for lighting are minimized in the west and east areas.

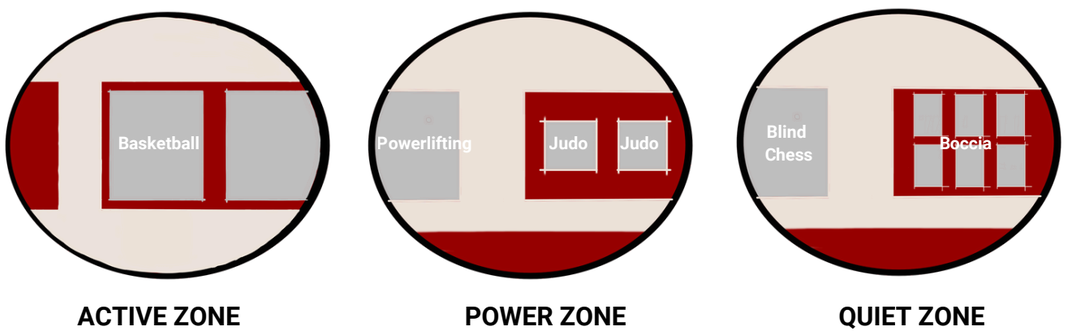


Figure 3.12 Field Layout Arrangement
Source: *Author, 2025*

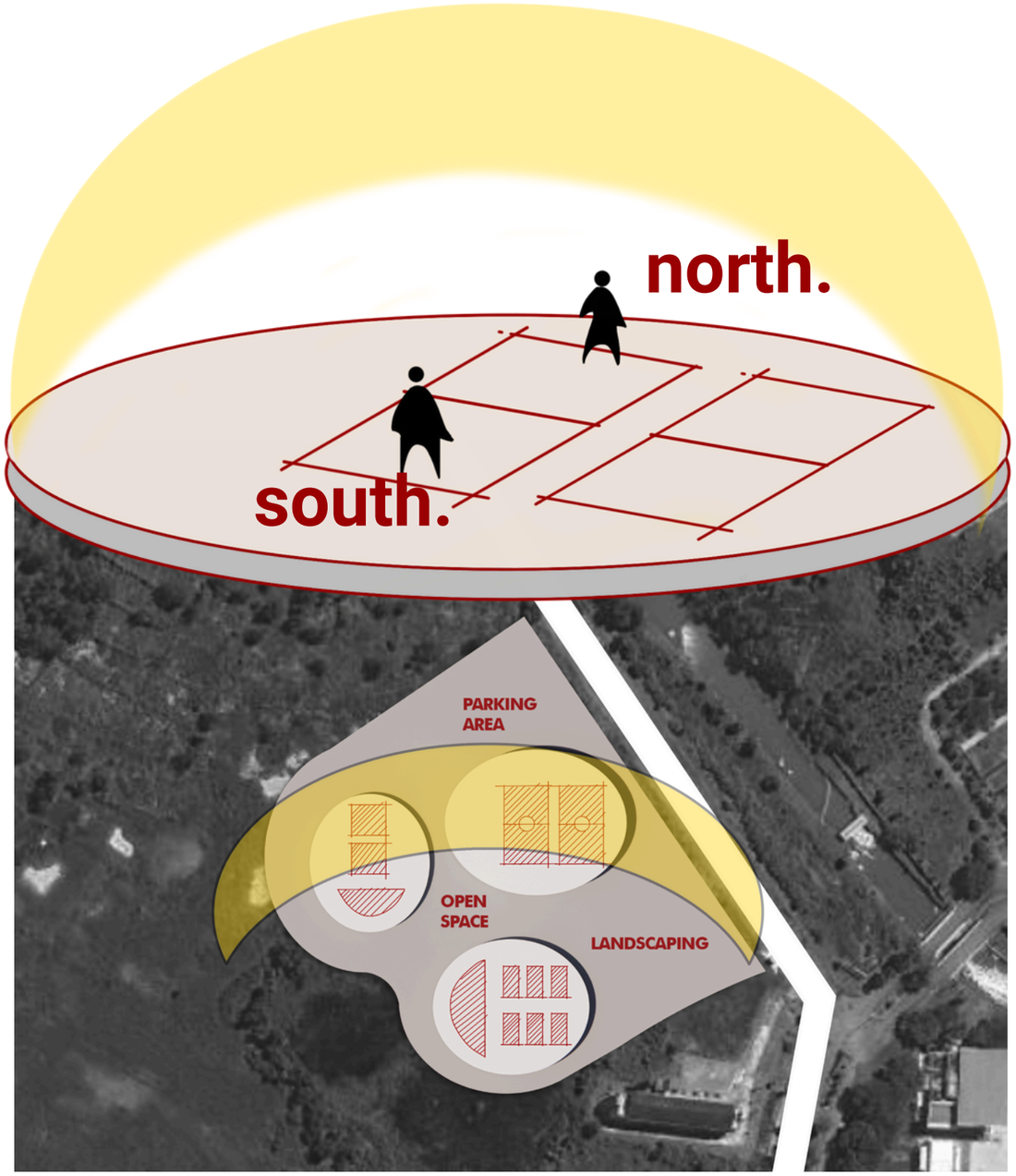


Figure 3.13 Field Orientation Towards Sunpath
Source: *Author, 2025*

3.4 ROOM LAYOUT

3.4.1 Room Layout Concept of Sport Field with Tribune According to Function

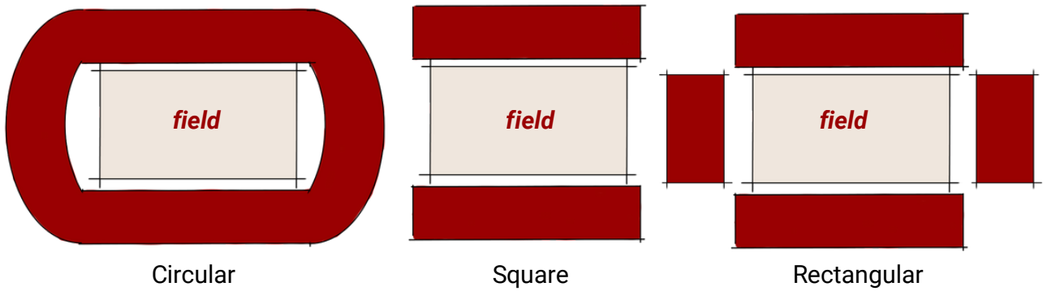


Figure 3.14 Sport Center Tribune Area Layout Type
Source: *Author, 2025*

The main function of the building is a sports field divided into 3 zones, of course a field requires a tribune area or spectator area. The form of field layout with stands has several types of layouts, but some popular layouts that are often used are circular, rectangular / square, and u shape. Each form of layout has advantages and disadvantages so that it can be adapted to the criteria of field-type needs. Some criteria for determining the layout concept for each zoning are:

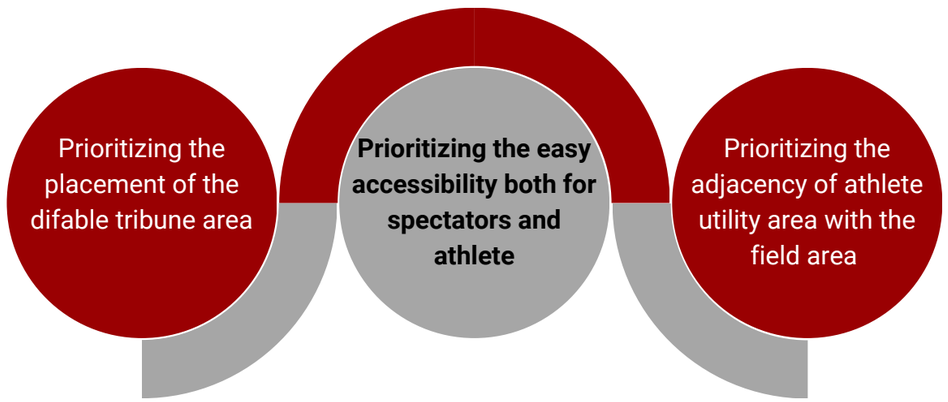


Diagram 3.5 Tribune Area Concept Criteria
Source: *Author, 2025*

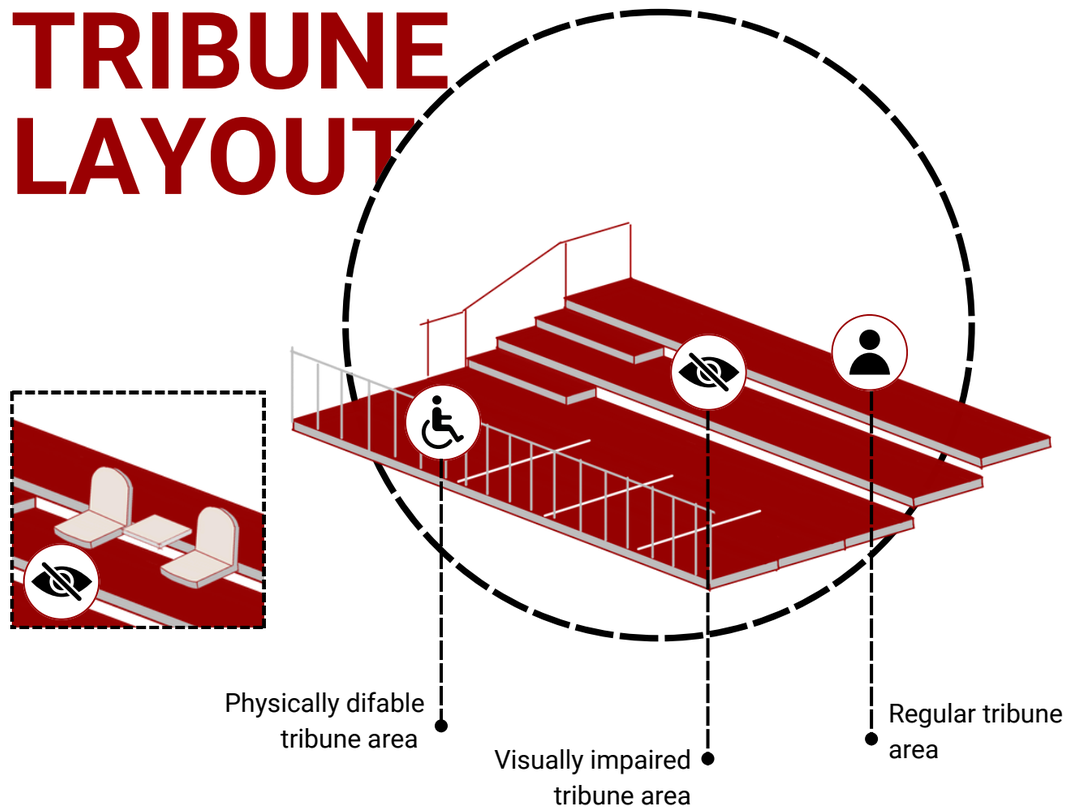


Figure 3.15 Tribune Distribution Layout
Source: *Author, 2025*

The seating areas are divided into three categories. The physically disabled seating area is located at the front near the barrier/railing with empty space so that users have more freedom of movement. Then, on the first floor of the stands is the visually impaired seating area with special seats and a table for spectator guides who provide live commentary on the match. Finally, the regular seating area is located on the second floor and above.

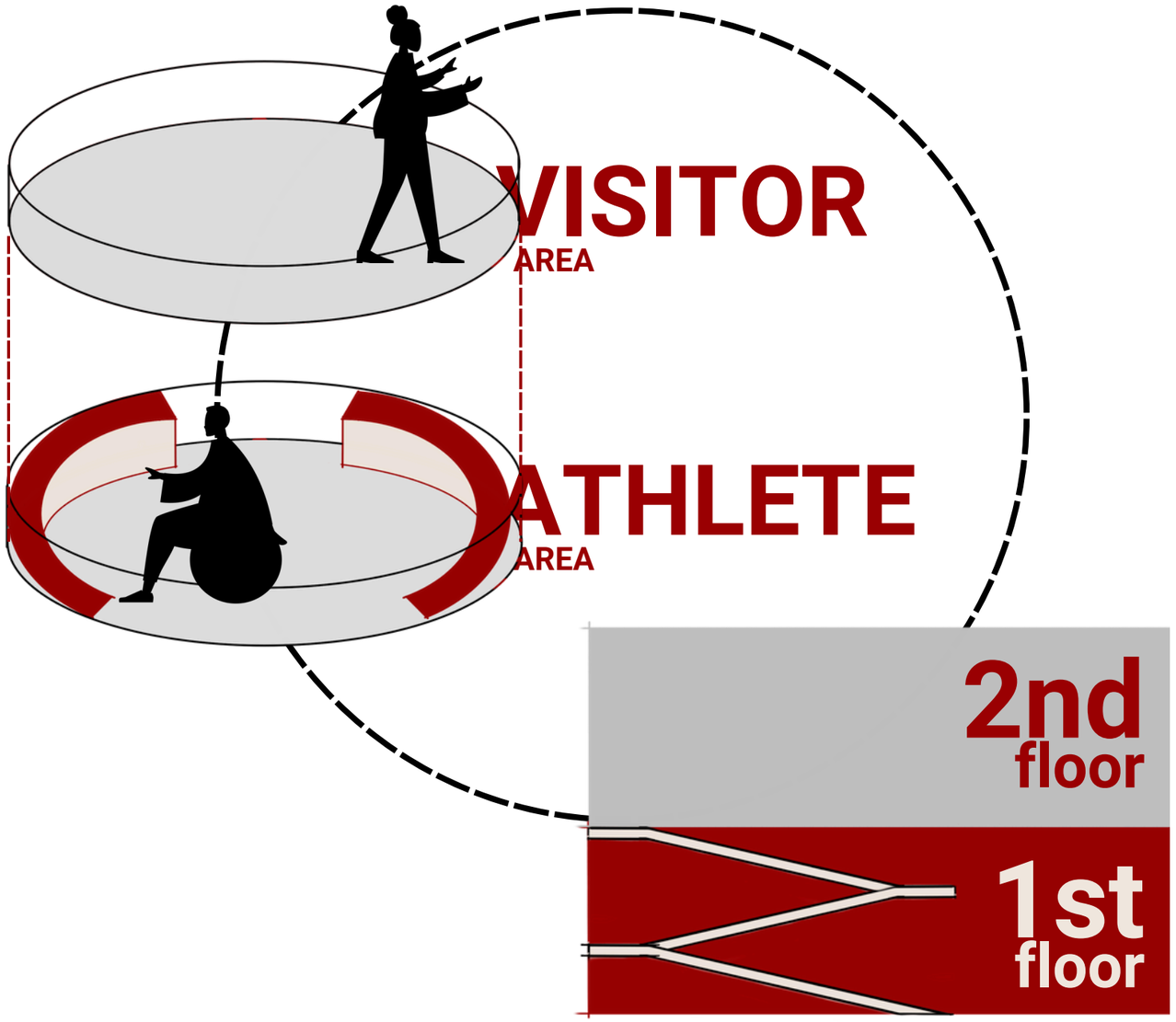


Figure 3.16 Users Distribution Zoning
Source: *Author, 2025*

3.4 ROOM LAYOUT

3.4.2 Room Layout Concept of Sport Field According to Function for Users

Based on user functions, which consist of athletes and visitors, the building floors are divided into two area. The first floor is an area for athletes, designed to facilitate the flow of athletes from the rooms they need to the field area.

Meanwhile, visitor facilities are located on the second floor, with the difable tribune having the same level as the second floor. **To access the second floor, visitors will use a ramp that circles the building, creating linear circulation**. Separating the functions of each floor will facilitate the circulation of each user.

3.5 LANDSCAPING

3.5.1 Green Space as Landscaping Concept of Green Space According to Climate Data at Open Space

Open spaces in landscaping are exposed to direct sunlight, which can cause direct heat on humans. Therefore, it is **necessary to plant trees with broad leaves for shading.** In addition, retention ponds also support rainwater storage and passive cooling effects in hot open spaces.

The use of hardscape materials also affects user comfort, so landscape materials use light-colored paving so that heat is not absorbed into the road material. The specific types of plants are also important, where there needs to be plants with a relaxing scent to support the sensory landscape. Thus, **the landscape concept in open spaces combines sensory texture, scent, and the sound of water.**

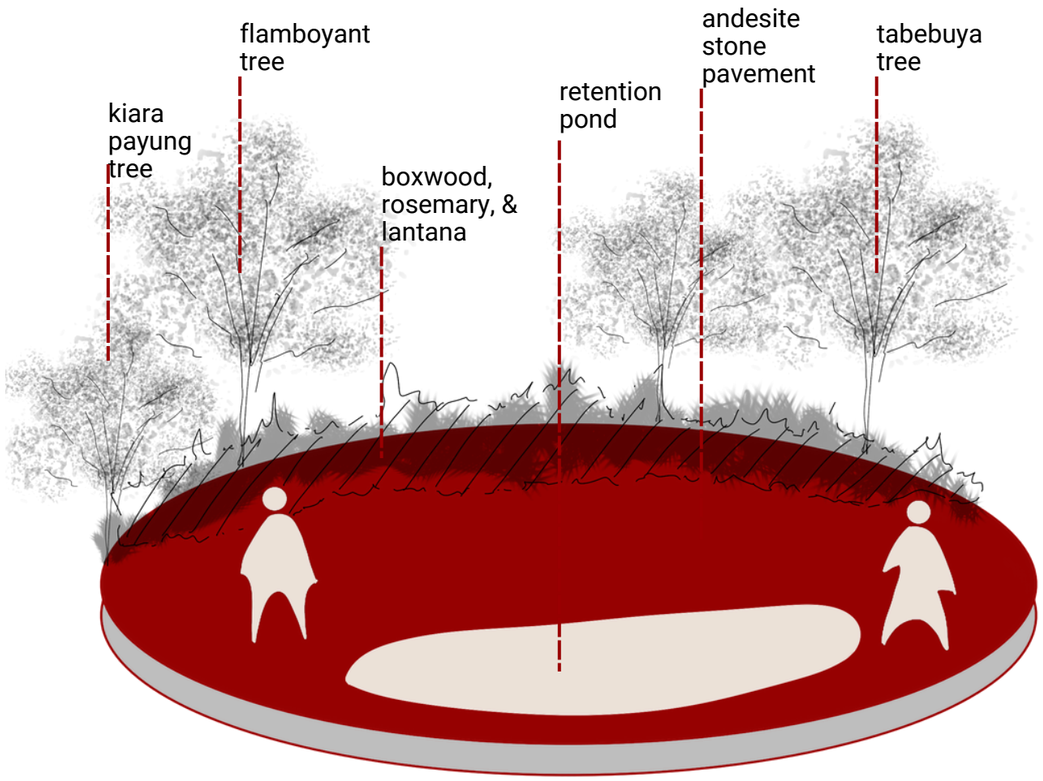


Figure 3.17 Open Space as Relaxing Area According to Climate Respond
Source: *Author, 2025*

3.5.2 Green Space as Landscaping Concept According to Paving Texture as Sensory Element at Open Space

People with disabilities, especially those with visual impairments, rely heavily on texture, therefore, one of the open spaces will use **contrasting materials** consisting of rough and smooth materials. This is **implemented in the design of open spaces with a therapeutic pathway concept**, where users can use the area as a walking track. This allows users to choose the texture of the pathway that suits them best.

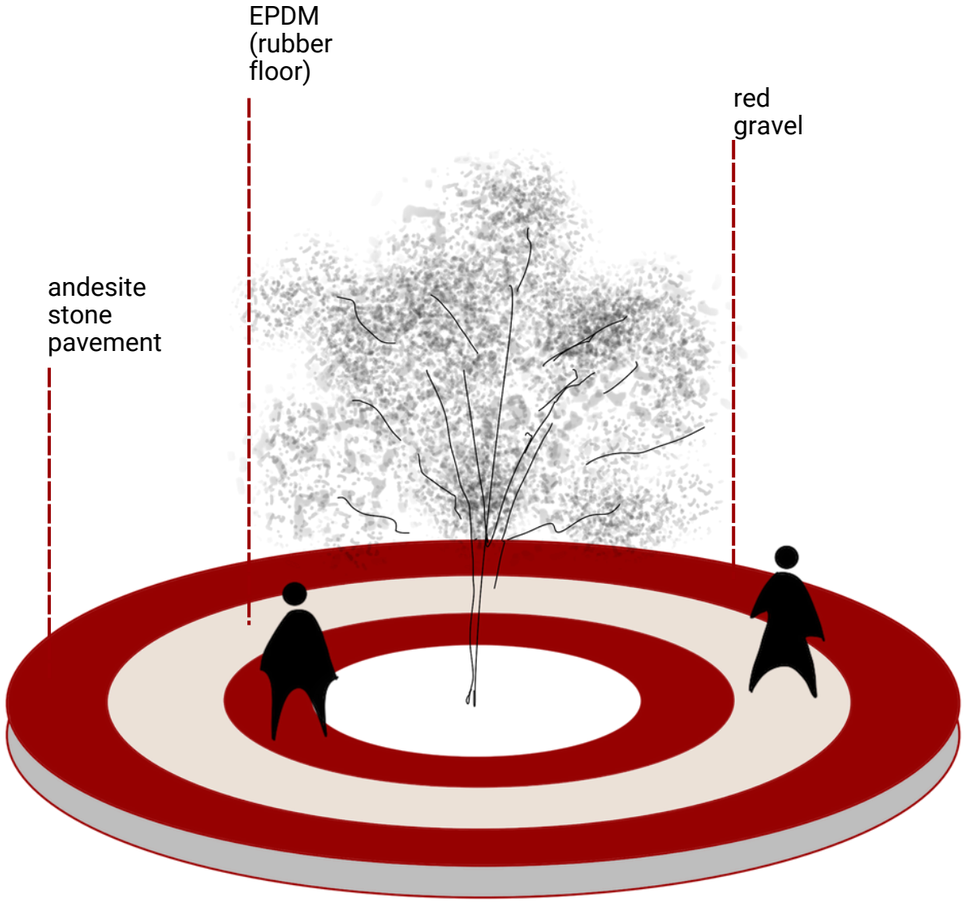
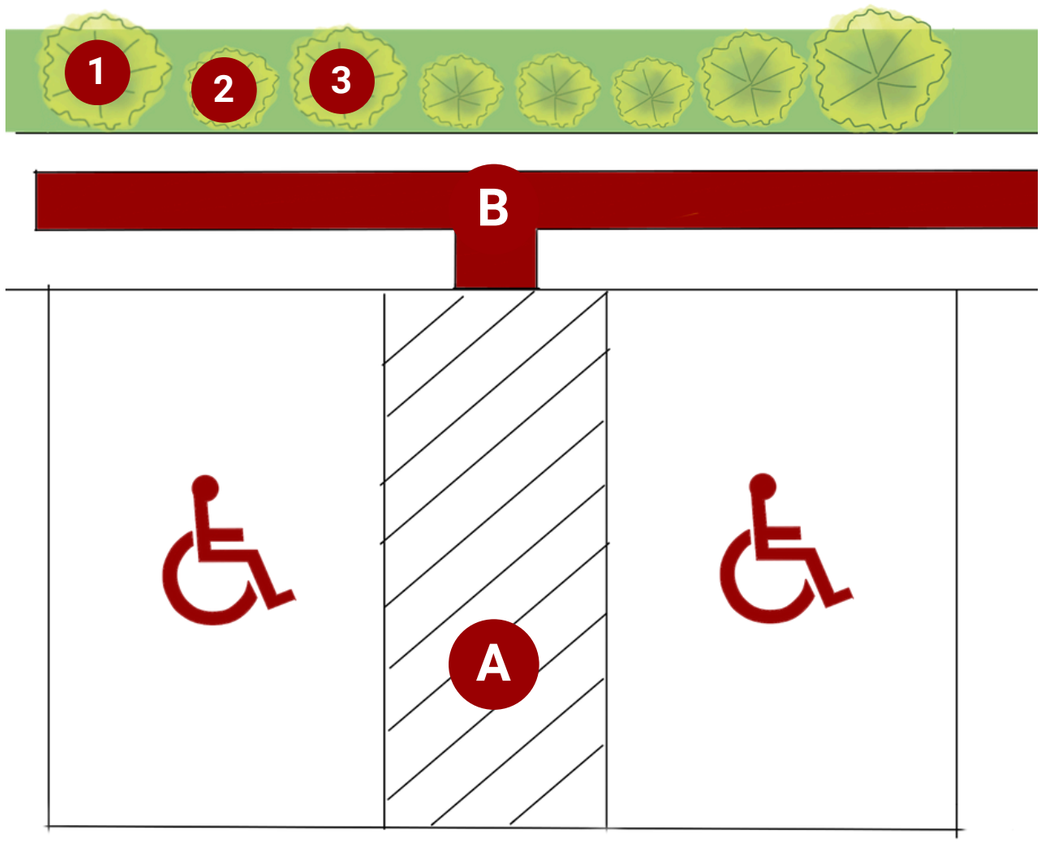


Figure 3.18 Tacticle Texture as Sensory Element Guide at Open Space
Source: *Author, 2025*



1 Kiara umbrella tree

2 Lantana

3 Flamboyant tree

Figure 3.19 Pavement and Green Space Concept for Difable Parking
Source: *Author, 2025*

3.5 LANDSCAPING

3.5.3 Green Space as Landscaping Concept of Difable Parking Accessibility

The difable parking space has a layout with access in the middle between the two disabled parking marked with point A, which is then connected to the pedestrian pavement marked with point B. This concept facilitates access for disabled users where **from the parking space users get direct access to the building using a pavement** path that has **safe circulation from vehicles**. Along the pedestrian pavement is equipped with tacticle pavement as a road guide and vegetation next to it as shading from the sun. Therefore **the vegetation used is a combination of kiara umbrella tree, flamboyant tree, and lantana.**

3.6 BUILDING STRUCTURE

3.6.1 Building Structure Concept According to Climate Respond to Damp Soil Type for Structure Stability

Main Structure Materiality

Damp soil type has more humid soil characteristics, therefore the selection criteria of the main structural material is waterproof and sturdy. Which there are several elements of the building structure that require material considerations to respond to damp soil, among the materials are:

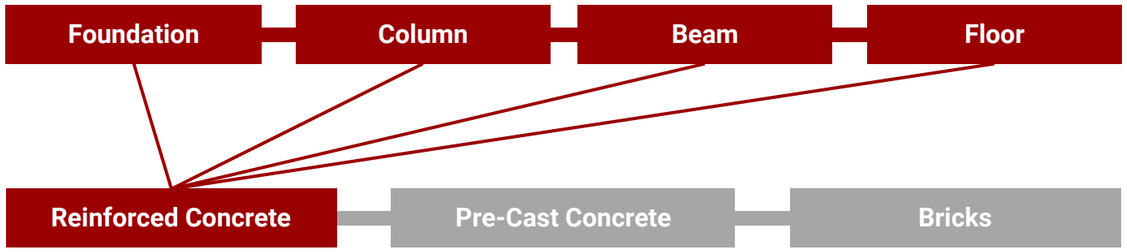
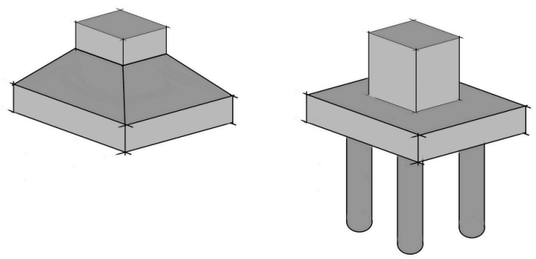


Diagram 3.6 Main Structure Material Concept
Source: *Author, 2025*

From several material options, **reinforced concrete was chosen as the main material for the building structure because it has good water resistance** and is also sturdy for the long term. In addition, reinforced concrete material is suitable for pile cap foundation types that are sturdy to respond to damp soil to reach the point of soil stability.

Foundation Type

Therefore the concept of the main foundation building structure uses a pile cap foundation with reinforced concrete material which aims to stabilize the building by channeling the building load to the hard soil layer which has a considerable depth. However, supporting foundations such as footplates are also needed to support practical structures.



Footplat Foundation (Supporting Foundation)

Pile Cap Foundation (Main Foundation)

Figure 3.20 Foundation Stability Concept Respond to Soil Type
Source: *Author, 2025*

Floor Type

To respond damp soil types, building floor concepts that can be used include stilt floor and split level. These two concept considerations both give the effect of a raised building floor so that it is not in direct contact with the ground. But considering from the efficiency and level of complexity to be implemented in the sports center typology is the stilt floor. Therefore the **stilt floor concept is implemented to raise the floor level to avoid soil moisture** while maintaining the ease of accessibility for difables. This concept is implemented in the main entrance to the sports fields.

Figure A shows the concept of a stilt floor in the sport field function, where the lowest point of the floor is the field area itself and then the tribune is placed above it. The advantage of the tribune structure placed above the ground floor provides space underneath that can be utilized into other space functions.

While in Figure B and C is the concept of stilt floor at the main entrance. The stilt floor concept will create a gap between the ground floor and the ground to prevent humid, so that it is necessary to consider the concept of an entrance that facilitates disabilities. Therefore the picture beside shows the access response of the stilt floor concept. In image B is access using a ramp while in image C is access using stairs.

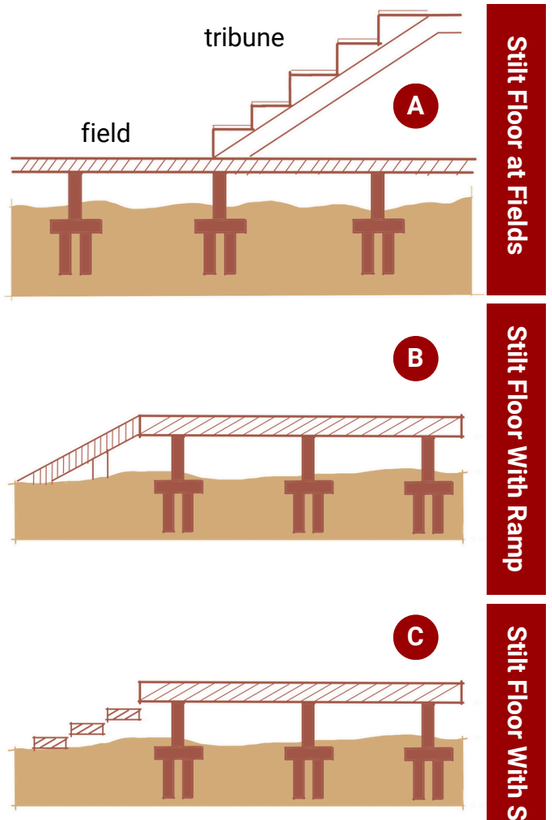


Figure 3.21 Stilt Floor Concept at Sport Fields & Entrance
Source: *Author, 2025*

3.6 BUILDING STRUCTURE

3.6.2 Building Structure Concept According to Climate Respond and room function at Roof Shape

The main function of the building as a sports center requires a large and column-free space, so a **wide span building structure concept is needed** that can provide extensive room flexibility. Therefore, strong building materials are needed to have sufficient span. Material options include:

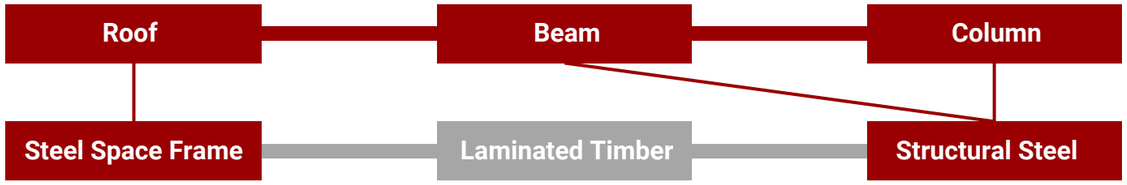


Diagram 3.7 Main Structure Material Concept 2
Source: *Author, 2025*

Based on the consideration of material options, steel space frame as roof material and structural steel as beam & column material were chosen because they have a wider span distance compared and easier material maintenance. So that **the main concept on the roof of the building is a wide span that uses steel material.**

Since the sports hall requires a fairly wide span of the building and is free of columns, so the structure chosen will affect the shape of the roof. In addition to requiring a wide space, the sports hall also requires natural sunlight and ventilation, **therefore the concept of passive design is applied to the roof shape.**

Criteria for considering the selection of roof form concepts based on the need for natural ventilation and space functions:

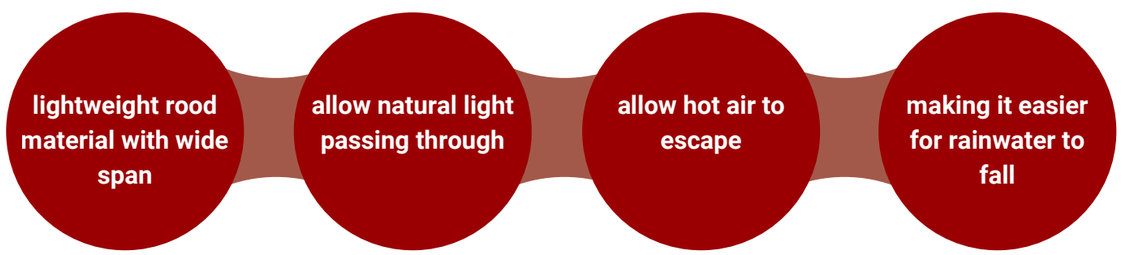


Diagram 3.8 Roof Structure Concept Criteria
Source: *Author, 2025*

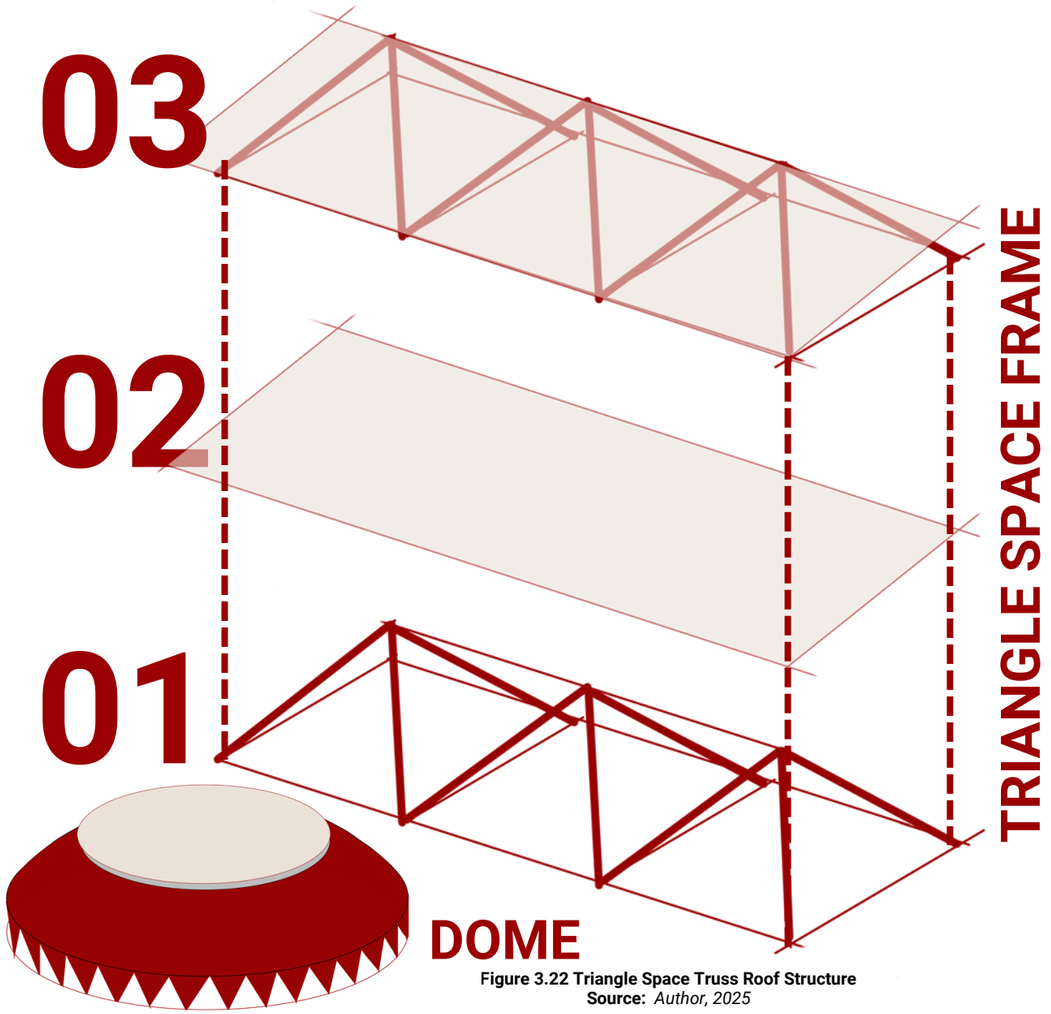


Figure 3.22 Triangle Space Truss Roof Structure
Source: *Author, 2025*

The roof structure uses a triangular space truss that has a pointed characteristic at one of its corners. **This roof characteristic has the best durability and strength in wide span structures.** The use of lightweight materials is also one of the factors that makes this structure strong in wide building spans. With this structure, there are many **roof shapes** that can be made, one of **which is a dome.**

3.7 BUILDING ENVELOPE

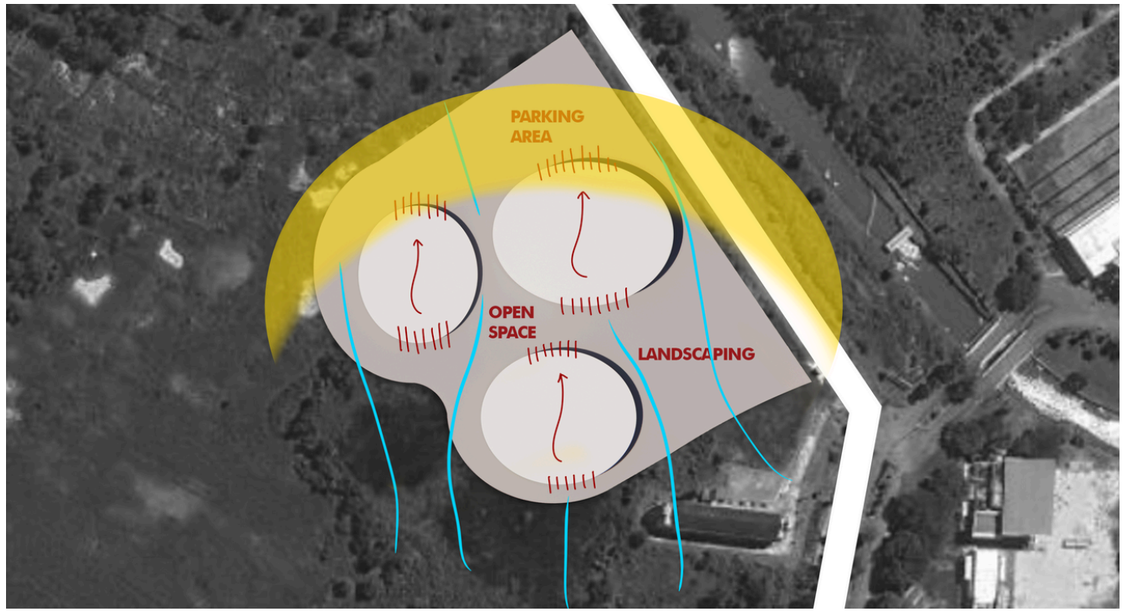


Figure 3.23 Secondary Skin Opening Concept Placement According to Orientation
Source: *Author, 2025*

3.7.1 Building Envelope Concept According to Climate Data & Building Orientation

The fastest wind direction comes from the southwest, therefore openings need to be placed in that area to allow wind to enter the building to create efficiency. There are advantages to the orientation of the building, with openings on the west and east sides to minimize heat gain in the building. This strategy not only supports thermal comfort indoors, but also helps reduce overall energy consumption. Thus, opening designs that take into account wind direction and solar orientation are important factors in creating efficient and environmentally friendly buildings.

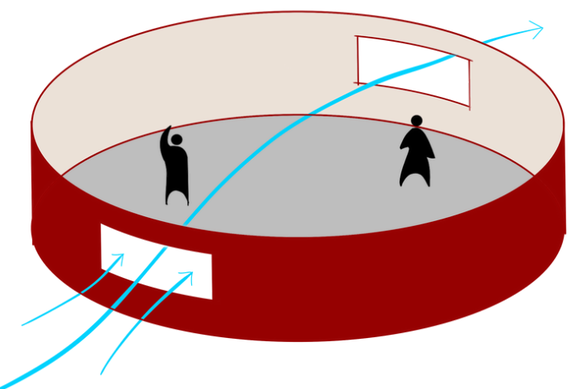


Figure 3.24 Secondary Skin Concept Opening Placement According to Orientation of Wind
Source: *Author, 2025*

3.7.2 Building Envelope Form Concept According to Roof Structure

Formed from the roof structure, the **building facade blends with the roof structure,** giving the impression of a unified whole. The facade takes the form of an **inverted triangle, with a composition of solid and void** elements in the arrangement of each structural component. The combination of solid and void elements in the facade surrounding the building **allows wind to flow around the structure from all directions and reduces sunlight, particularly from the east and west.**

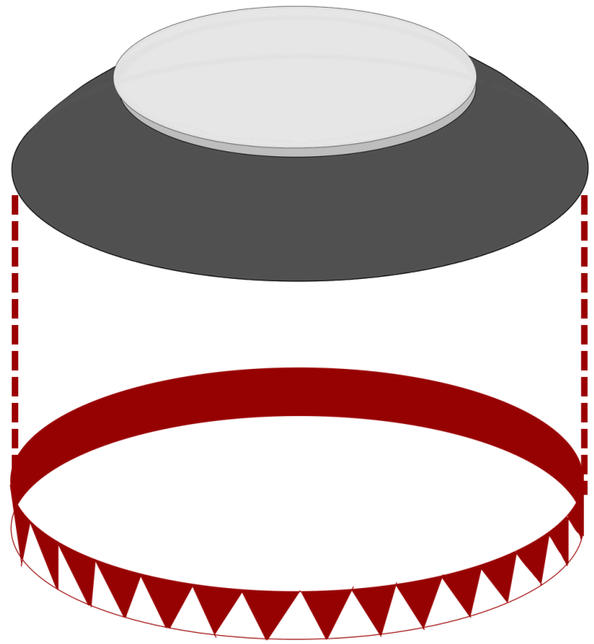


Figure 3.25 Secondary Skin Concept Form According to Roof Structure
Source: *Author, 2025*

3.7.3 Building Envelope Type Concept According to Building Mass & Climate

Based on climate aspects, especially wind, the secondary skin formed from the roof structure is still too wide for wind to enter the building; therefore, **a perforated wall is needed to reduce wind speed** so that the wind entering the building is smoother and more comfortable for users. **The perforated wall also uses a combination of solid and void so that some can block the wind and some can conduct the wind.**

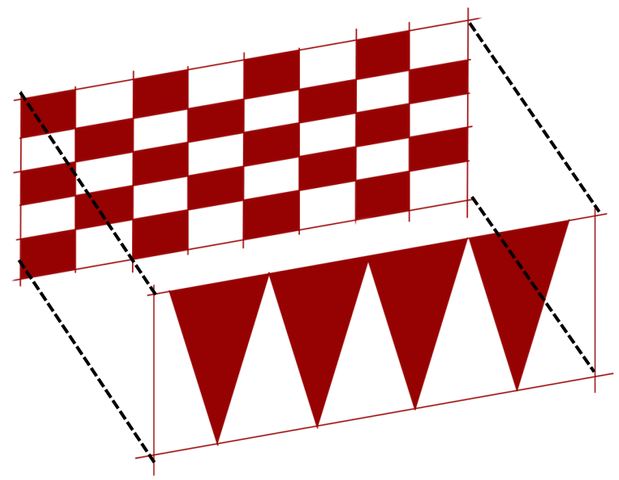


Figure 3.26 Double Layer of Secondary Skin Concept According to Wind
Source: *Author, 2025*

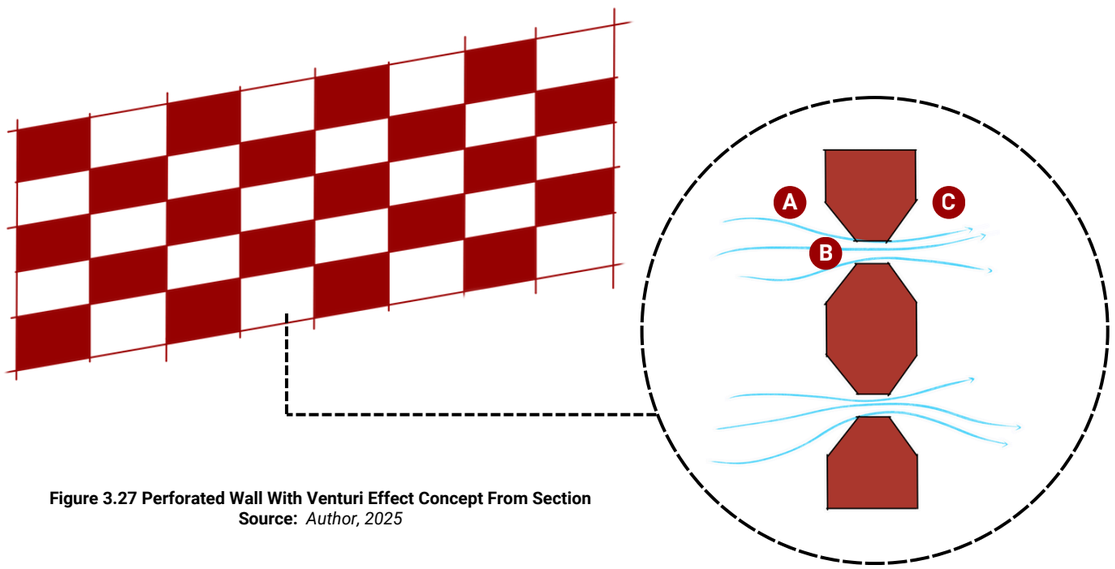


Figure 3.27 Perforated Wall With Venturi Effect Concept From Section
Source: *Author, 2025*

3.7 BUILDING ENVELOPE

3.7.4 Building Envelope Concept According to Cross Ventilation and Venturi Effect for Natural Passive Cooling

Perforated wall will have a venturi effect to emphasize passive design **by pressurize the air to gain more air and create cooling breeze.** In order to make venturi effect on secondary skin, the simple way is to create it **has a volume and make the opening for the air more smaller.** Therefore for the improvement the secondary skin develop from flat surface into 3D surface. **One way implementations of this concept is the use of roster material with these criteria.**

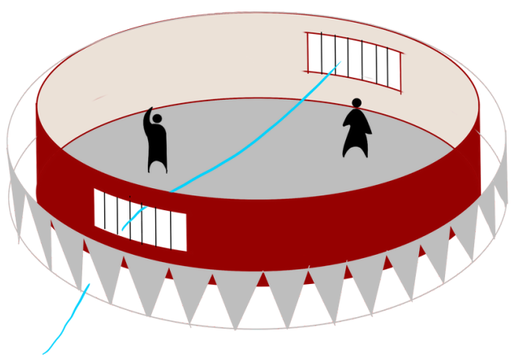


Figure 3.28 Facade as Ventilation When Paired with Perforated Wall
Source: *Author, 2025*

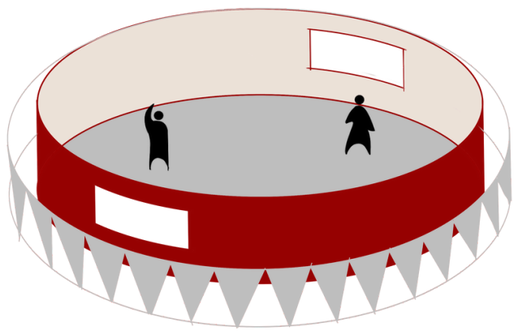


Figure 3.29 Facade as Shading When Paired with Glass
Source: *Author, 2025*

3.7.5 Building Envelope Concept According to Opening Type Specifically Window

The facade and its arrangement have the same shape and size on each side, but they work differently when faced with different openings. The f**acade works as ventilation** when installed **in front of a perforated wall**. Meanwhile, the **facade works as shading** when **paired with glass.** Glass is used more in the lobby area, so shading is needed to reduce sunlight entering the room and maintain a comfortable room temperature.

3.8 BUILDING MATERIAL

3.8.1 Building Material Concept According to Sensory Element

Building elements that can be reached by the human body sensory in the form of touch are walls and floors. Therefore that the concept of using materials emphasizes texture which can become movement guidance and distinguish zone functions.

Material at Tribune Area

At the access to the tribune floor material to be used is wood parquet with a vertical pattern from the direction of the road. This aims as a movement guidance where the access direction is heading, especially towards the difable tribune. In addition, along the way the wall material uses a combination of smooth wood panels and rough plaster. Rough plaster with a horizontal pattern is implemented above a height of 80 cm from the floor which is a safe height area for difable users using wheelchairs.

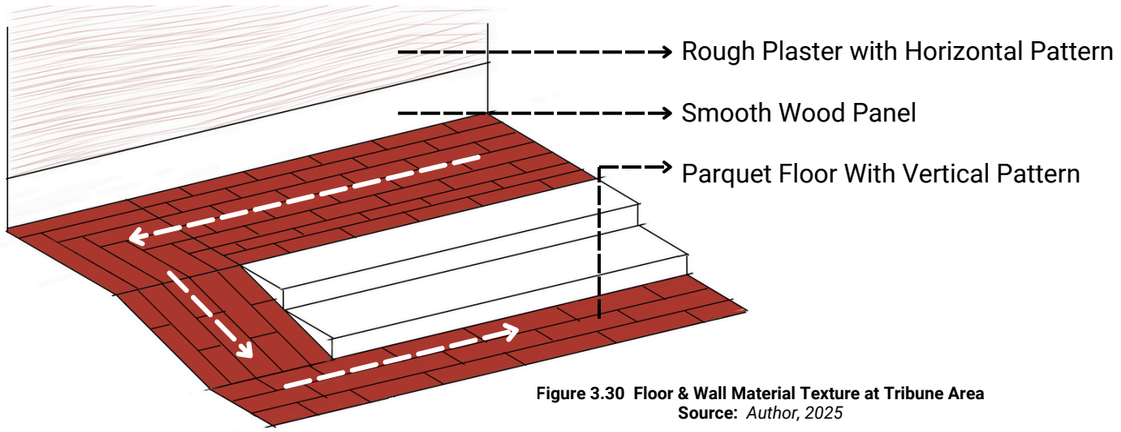


Figure 3.30 Floor & Wall Material Texture at Tribune Area
Source: *Author, 2025*

Material at Building Interior

The use of different textures on wall materials is intended as architectural guidance, especially in athlete rooms. Wall textures are divided into two types: smooth and embossed. Embossed textures are placed at a height of 100-150 cm, which is an area that can be reached by people with disabilities.

The embossed texture on the walls features a chevron pattern with a rough plaster texture. The pattern points toward each room's door, such as the athlete's room to the field.

Meanwhile, the flooring material uses contrasting colors to make it easier for users to find the room they want. The floor is also equipped with guiding blocks located next to the texture wall, giving users more options in terms of tactile cues for navigation.

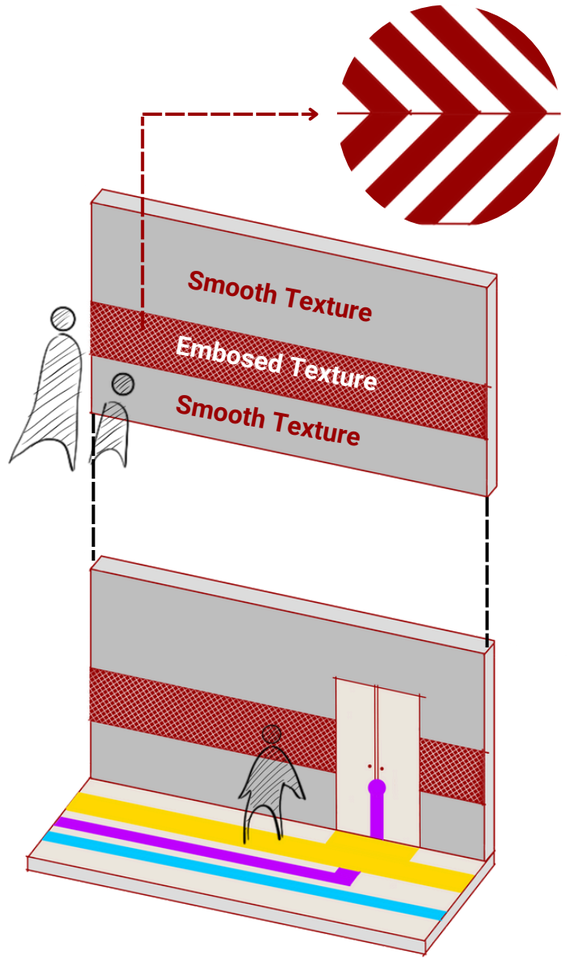


Figure 3.31 Interior Wall Texture and Floor Texture
Source: *Author, 2025*

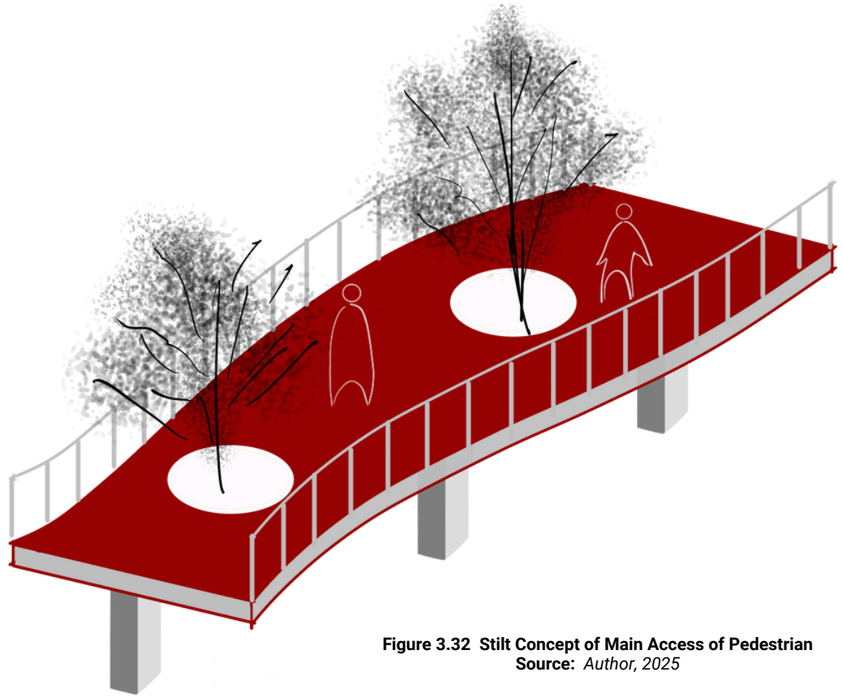


Figure 3.32 Stilt Concept of Main Access of Pedestrian
Source: *Author, 2025*

3.9 ACCESSIBILITY

3.9.1 Concept of Pedestrian Pavement According to Public Accessibility

At the main entrance area, the pedestrian pavement is designed like a bridge/stilt due to the difference in leveling on the site. In the middle of the pedestrian pavement, trees with broad leaves are planted to provide shade along the pedestrian pavement. This access is also equipped with railings that serve as a safety barrier for the difference in road levels.

3.9.2 Accessibility Concept According to Room Function

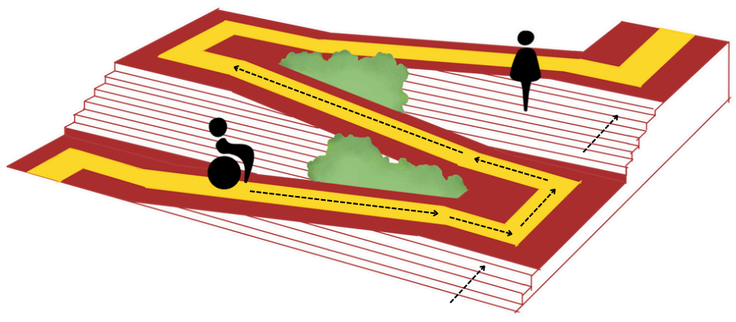


Figure 3.33 Pedestrian Main Access Concept to Building Alternative 1
Source: *Author, 2025*

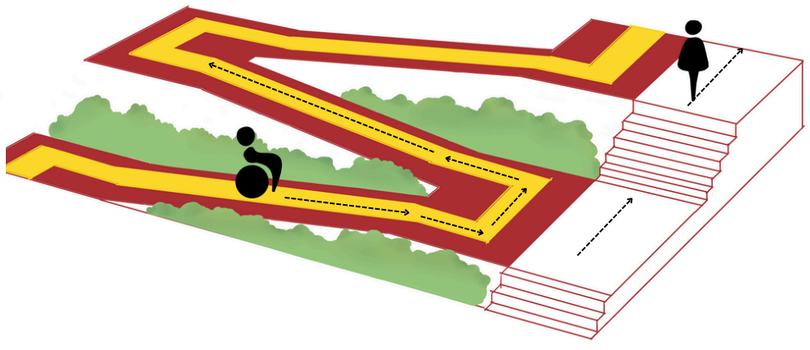


Figure 3.34 Pedestrian Main Access Concept to Building Alternative 2
Source: *Author, 2025*

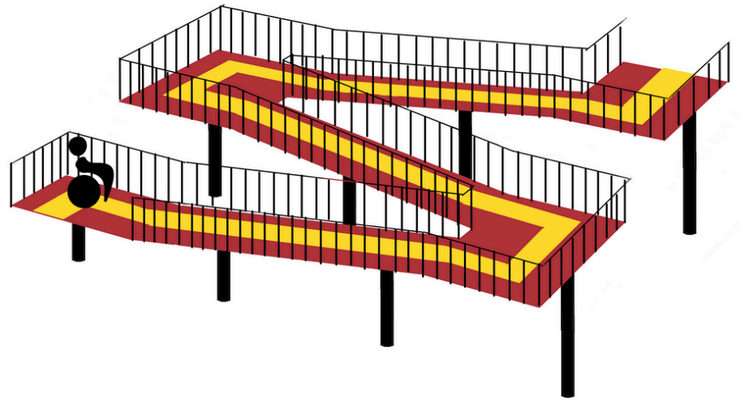


Figure 3.35 Pedestrian Ramp Access Concept Inside The Building
Source: *Author, 2025*

Main Entrance Ramp Access

Access to the building requires two types of access, namely stairs and ramps, this is needed because of the stilt building concept where the building cannot be accessed directly. There are two alternative concepts, alternative 1 has a concept to combine stair and ramp access into one unit. While alternative 2 has the concept of ramp and stair access that has its own area but side by side. Compared to the two alternatives, **alternative 2 has the advantage that the zones of disabled users and users in general do not have the possibility to collide because they have their own zones.**

Ramp Entrance to The Tribune

The access to the tribune that have higher floor level will use ramp as the main accessibility. Unlike ramp tin the main entrance, t**his ramp will provide with railing with 110 cm height and tacticle pavement as walk guidance.** The ramp will be in straight ramp form not circular in order to **have a landing for rest area**.