Hulhumale Hiyaa

GBV Shelter

Concept Masterplan Presentation

October 16th 2022

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01

Vision And Program

Project Context | Vision and Program Brief

Project Context

Understanding the overall vision and project context

Project Context

01 Ungoofaaru

Safe, accessible, publicly disclosed; limited accommodation; focus on services and activities for GBV prevention and response

02 Hulhumale

Safe and publicly disclosed; focus on overnight accommodation with limited on site services for drop in clients and residents; target is greater Male population

03 Addu

Safe, accessible, publicly disclosed; mix of accommodation and drop-in services for residents and non-residents; regional focus

Vision and Program Brief

Establishing the vision, goals, and overall program

VISION

A center that **focuses exclusively on the safety and aid** of DV/GBV survivors, primarily through shelter, rehabilitation and ancillary support.

The center offers **safe and secure accommodation,** and a place in which women and their dependent children can rest as well as physically and psychologically recover from the effects of DV/GBV through a relaxing and holistically healing environment.

For women who seek drop-in DV/GBV support services, it will provide **information, psychological support and referral.**

Enable access to a range of services including **health, justice and social protection benefits.** The centre will provide necessary access (emergency and non-emergency) to support services.

SHELTER DESIGN PRINCIPLES

- Survivor centered
- Privacy
- Safety
- Respectful
- Multi Sectoral
- Confidentiality
- Rights based

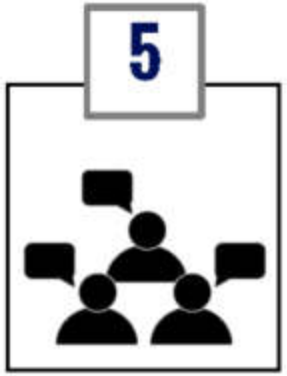
Common Goals and Key Activity Areas

Drop in

Case management

Services as per SOP

Referral of clients



Stakeholder and community engagement

Vocational skills development

To build self-reliance and start life afresh with dignity and confidence

1	**Primary needs**	Cater to the primary needs of safety, food, shelter (temporary), and physical/ psychological first aid, as necessary
2	**Case management**	Receive and assess clients and develop a plan of support to achieve the objectives agreed with the client
3	**Information hub and referral**	Provide information including on rights of clients and social protection benefits, and support the client to access health, police, education and other social services including children's schooling
4	**Counselling to support re-integration**	Enable women and their children to regain emotional strength and reintegrate with the society through psychological counselling
5	**Legal aid and guidance**	Refer clients for legal aid and guidance to support women pursue legal cases through the justice system, and enable readjustment in the family/ society
6	**Vocational support**	Provide off-site access to vocational/ skill upgrading training that could directly or indirectly lead to economic independence
7	**Supportive system**	Serve as a support ecosystem for residents who have faced different types of distress

No. of Residents, Overall Program and Human Resource Implications

Residents estimate	
Survivors	20
Adolescents	10
Kids (< 5 years)	14
TOTAL	44

Position	Grade	Staff Req.
Shelter manager	MS2 or MS3	1
Program Officer	MS2	1
Administrative officer	MSI	1
Senior Social Service Officer	MS2	1
Social Service Officer	MSI	2
Counsellor	MSI	3
Care assistant	GS3	2
Cook	SSI	2
Cleaner	SSI	2
Security officer	SSI	4
TOTAL		19

OVERALL PROGRAM

PUBLIC ZONE

Drop-in & Common Services

- Security Booth, Staff Rest Area and Toilet
- Reception/Info center and Waiting area
- Legal Aid Room
- Psychological Counseling Room
- Universally Accessible Toilet
- Utility and Services
- Shelter Manager's Room with Attached Toilet

SEMI- PUBLIC ZONE

Supporting Uses

- Kids Area (for Children <3 years of age) with Attached Toilet and Breast Feeding Room
- Prayer Room

PRIVATE ZONE

Accommodation

- Single Occupancy (Attached Toilet)
- Family/ Multiple Occupancy (Shared Toilet)
- Universally Accessible Rooms (Shared Toilet)

Supporting Uses

- Multipurpose Room

Kitchen and Dining

- Kitchen, Pantry and Utility Area
- Dining Hall (incl. Hand Wash)

Services and Storage

- Laundry Room
- Storage Room
- Clothes Drying Area

Office and Administrative Areas

- Office Staff- Staff Room and Toilets
- Maintenance Staff Room, Rest Area and Toilets
- Meeting Room with Video Conferencing Facility
- Common Utility Area for Staff
- Storage and Records

02

Site Context And Design Approach

Planning Principles | Site Analysis

Site Analysis

Analysing the site and developing planning strategies

Project Location

The site is located towards the northern part of Phase 2, Hulhumalé;

It is situated along the wide main road, in a zone primarily designated for institutional and government use. The area benefits from modern infrastructure and is part of the newly developed Phase 2 urban grid. The neighborhood is well-connected and lies close to major access routes. The surrounding area includes a growing mix of institutional buildings and government offices.

11.2 km
Velana International Airport

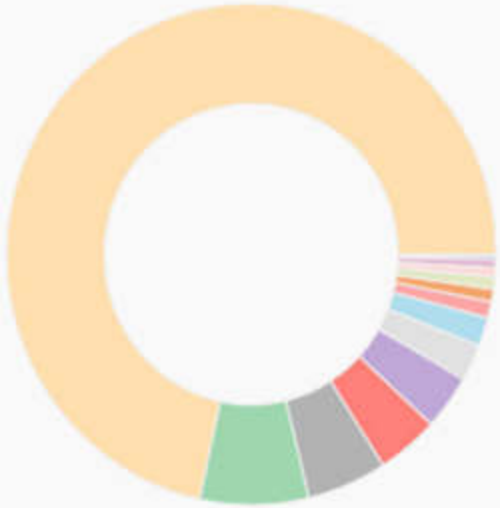
3 km
Ferry Terminal

2.7 km
Hulhumale Grand Mosque

2.85 km
Central Park

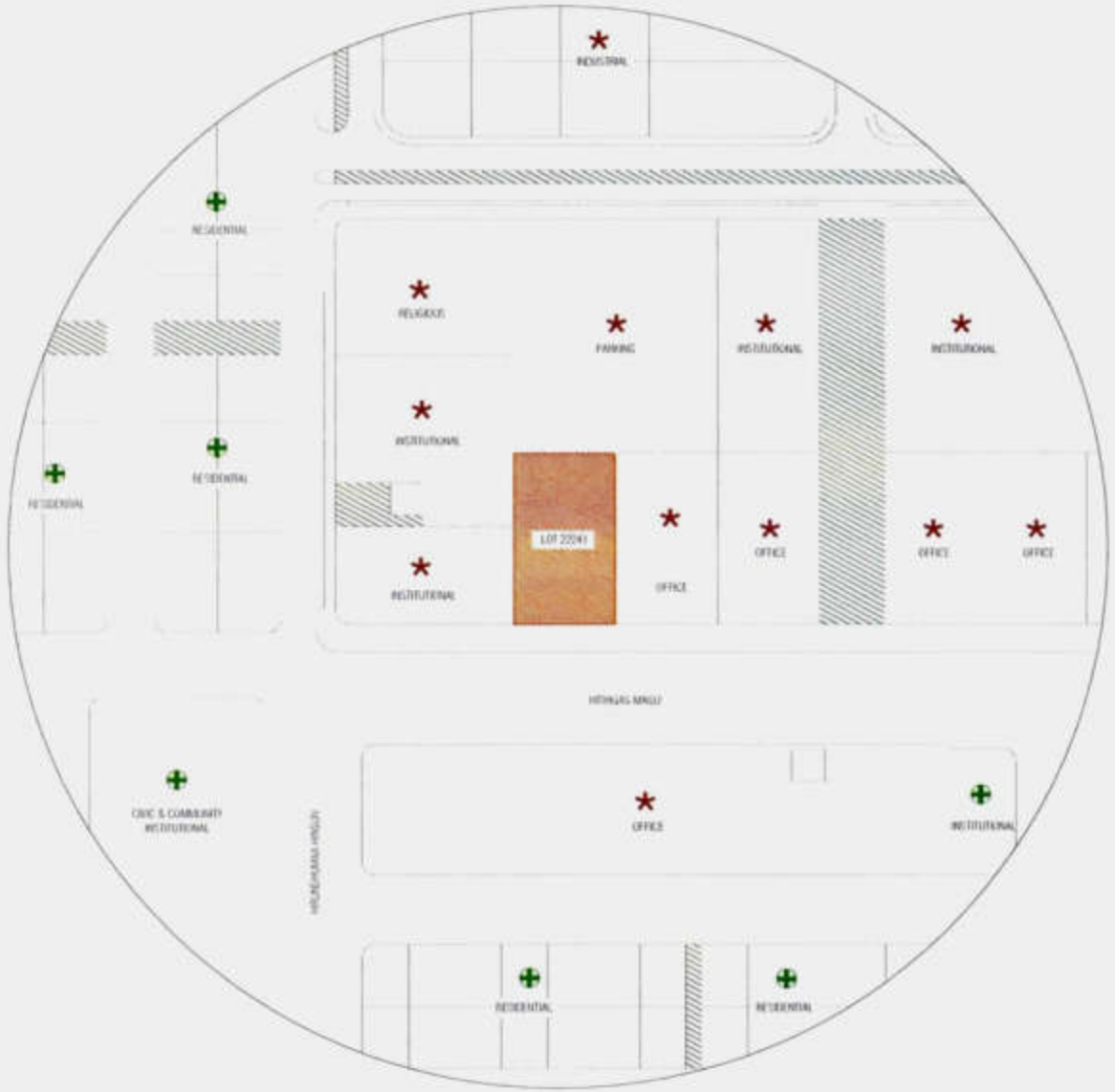
**All information (other than site location) is as per data collected through online sources*

Land Use Plan



- Residential
- Open / Green Space
- Commercial
- Educational
- Religious
- Industrial
- Office
- Transport Facilities
- Municipal / Utilities
- Civic and Community Institution
- Hotel
- Sports and Recreational
- Knowledge Park
- Mix-Use
- Port

Site Location & Zoning Plan



LEGEND:

- COMPLETED
- ONGOING
- ALLOCATED
- PROPOSED

03

Key Design Elements

Concept Master Plan | Open Space Programming

Concept Master Plan

Master Plan, Visualization of Building Exterior

Concept Master Plan

1. Entry
2. Court of Transition
3. Court of Joy
4. Court of Transformation
5. Court of Solitude
6. Court of Collaboration
7. Parking

N

0 5m 10m

View 1

Open Space Programming

Landscape ideas and key elements to enhance the built environment

Open Space Diagram

Court of Transition
Entry court, acting as a buffer between the public and private areas

Court of Joy
Court for children with play areas

Court of Transformation
Heart of the facility, located in the accommodation zone, providing a space for gathering, relaxation and reflection

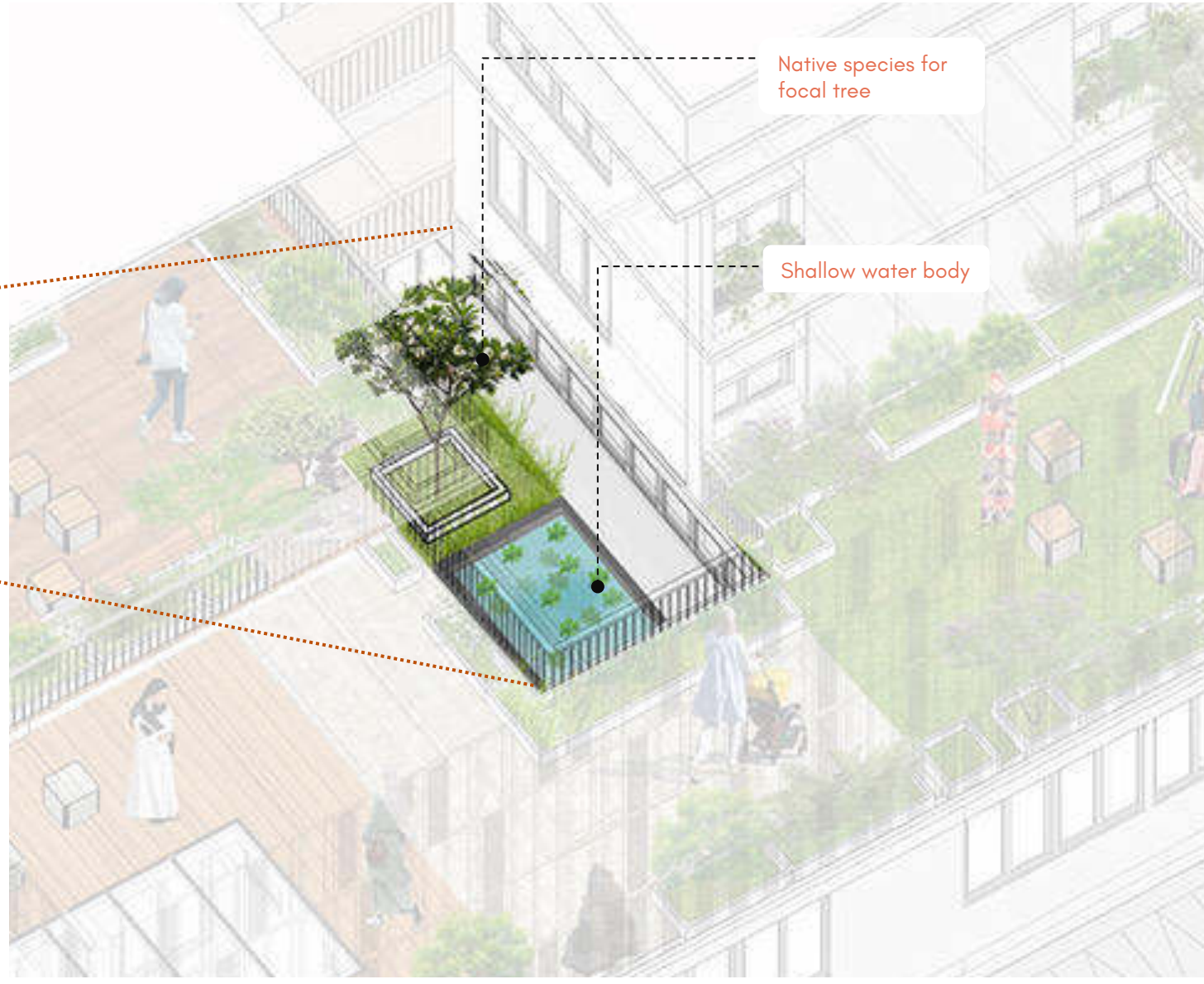
Court of Collaboration
A place of interaction in the first floor with a connect to nature

Court of Solitude
A quiet place of respite in a green setting

Court of Bliss
A dynamic spillover area overlooking all the floors of the facility

Court of Transition

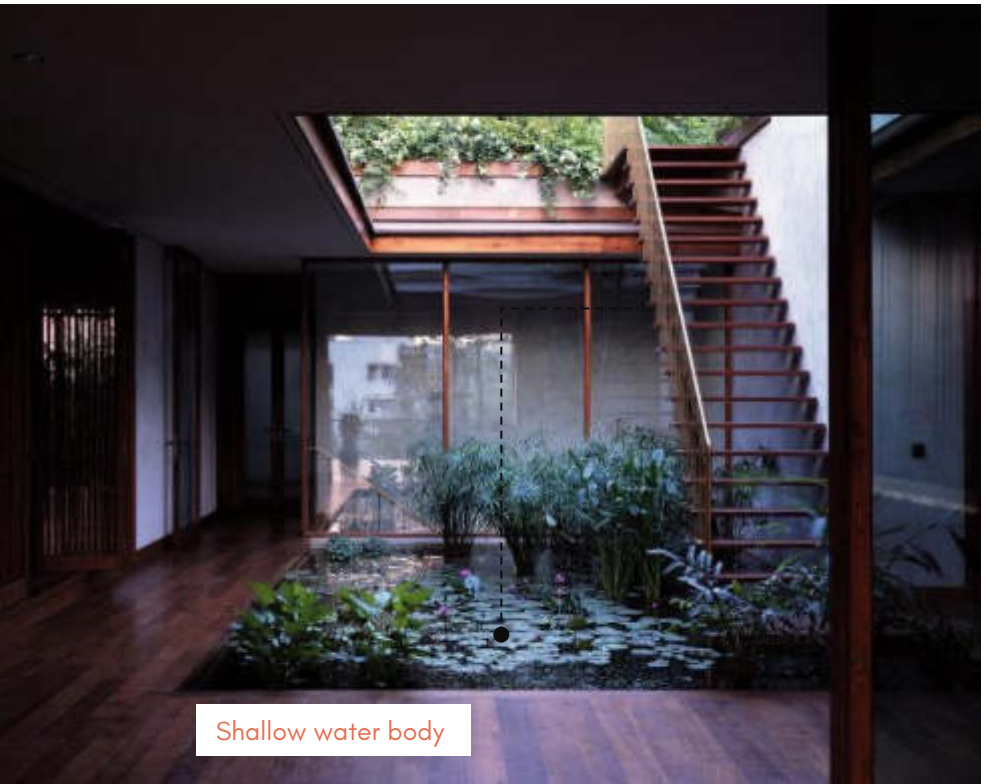
The open to sky court at the reception backdrop area forms an important part of the survivor's journey. It marks the first reference point as one enters the facility.



The court has an important role in bringing natural light and ventilation into the ground floor core areas. It also helps in creating a strong visual connection with the first-floor landscape courts and establishing a landscape connection.

Court of Transition

The court has minimal yet powerful landscape elements which help in creating a strong focal point and connects key functions in the public zone. This court also helps as a threshold between the public and private spaces. Elements of water and evergreen (all-season) plants are used to keep the court alive and rejuvenated all round the year.



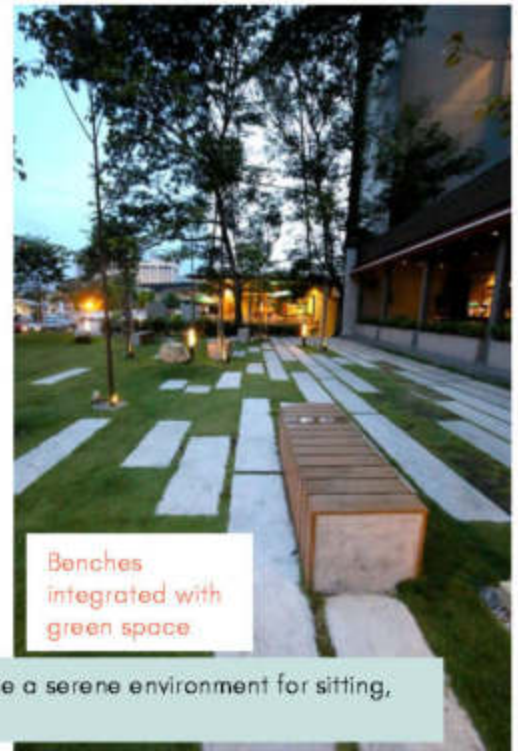
Court of Transformation

The court forms an integral part of the daily routine of the survivors. Elements of shade and textures are used to enhance the 'wellness factor' of this court. This court forms the heart of the facility and has the qualities to adapt to functions and seasons. The court also strategically located to bring in wind (from the primary wind direction) to the habitable areas.

The type of plants and warm textures are carefully chosen to create a soothing experience for the users. Multiple break-out spaces are planned with soft and hardscape strategies.

Court of Transformation

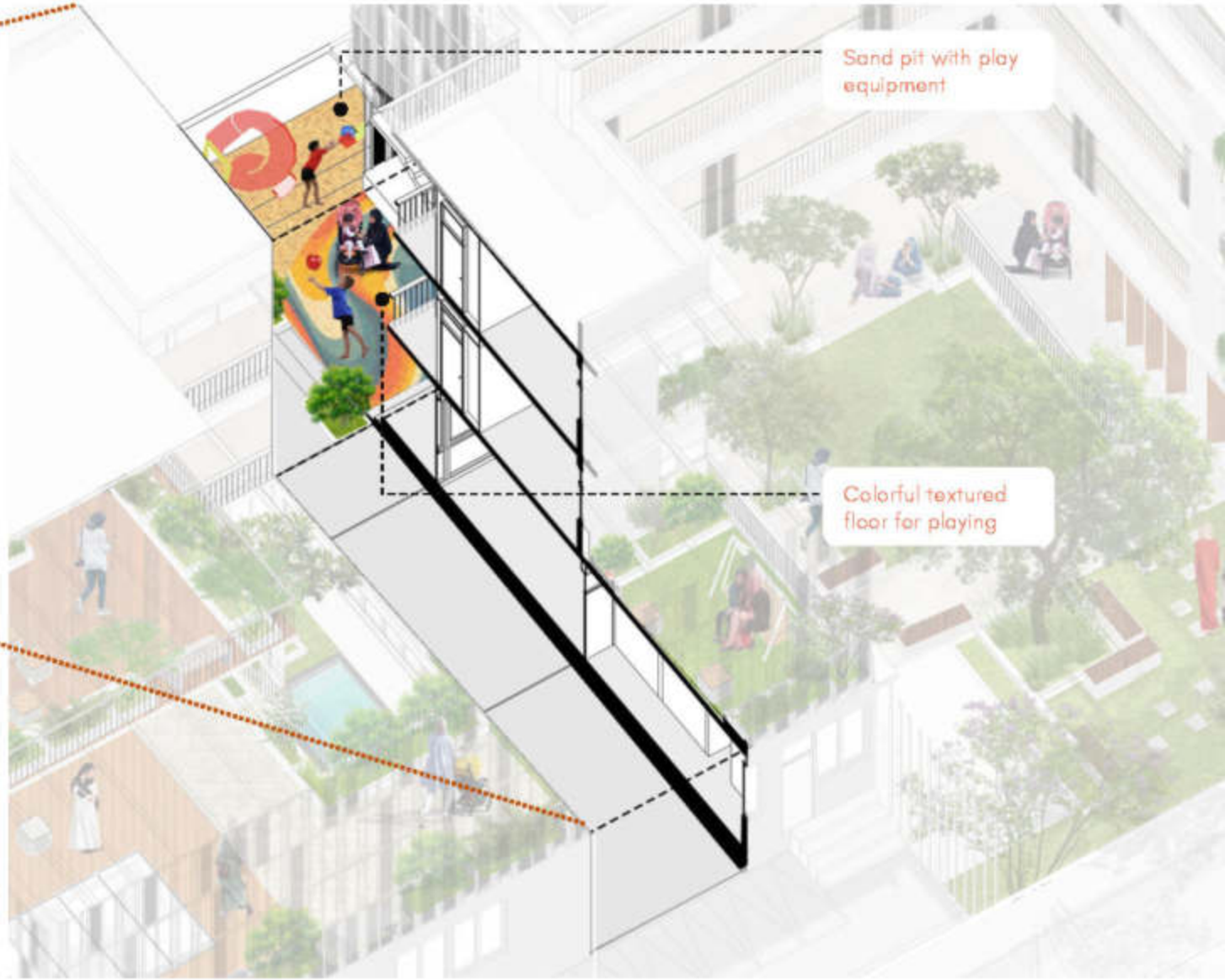
Multiple seating strategies as well as considerations for universal accessibility are the key factors which help in making this accessible and usable by all survivors.



Steps/ seating with softscape pockets provide a serene environment for sitting, relaxing, and reflecting.

Court of Joy

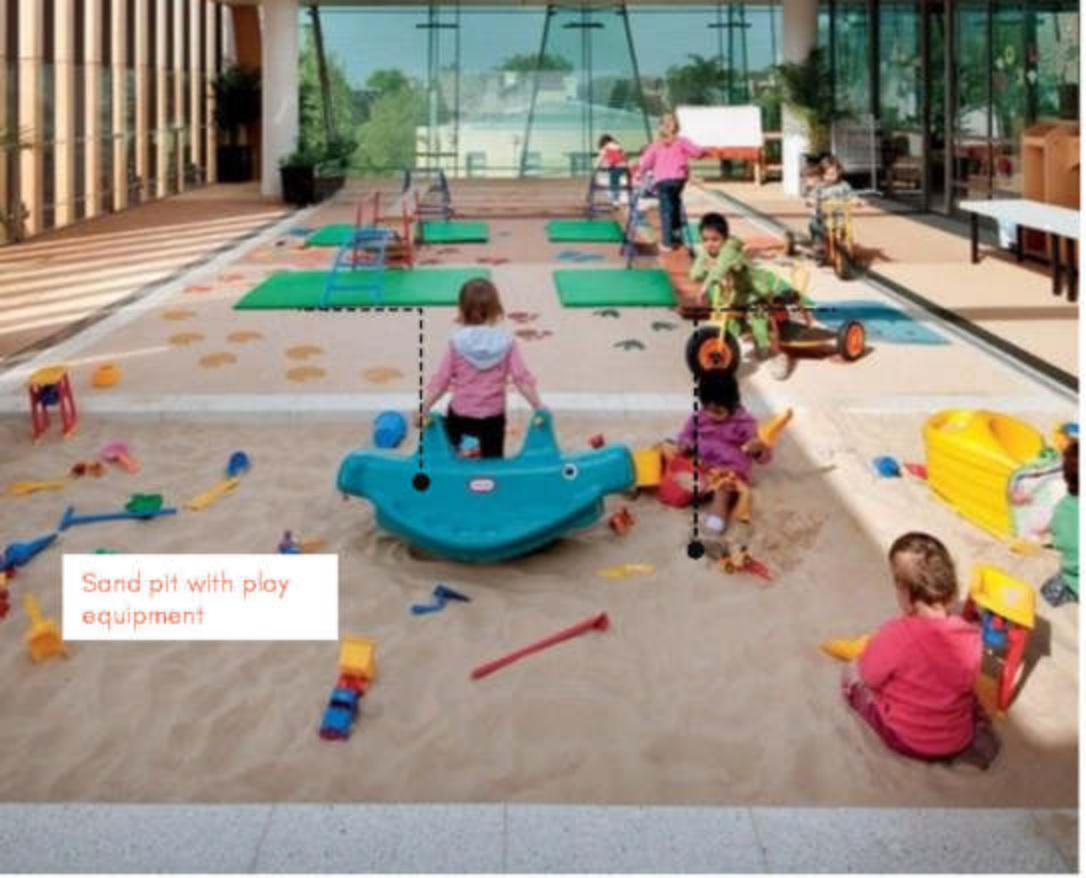
This court is specially designed for children. The court has specific flooring materials which support kids play activities.Child safety is considered in the detailing of this court.



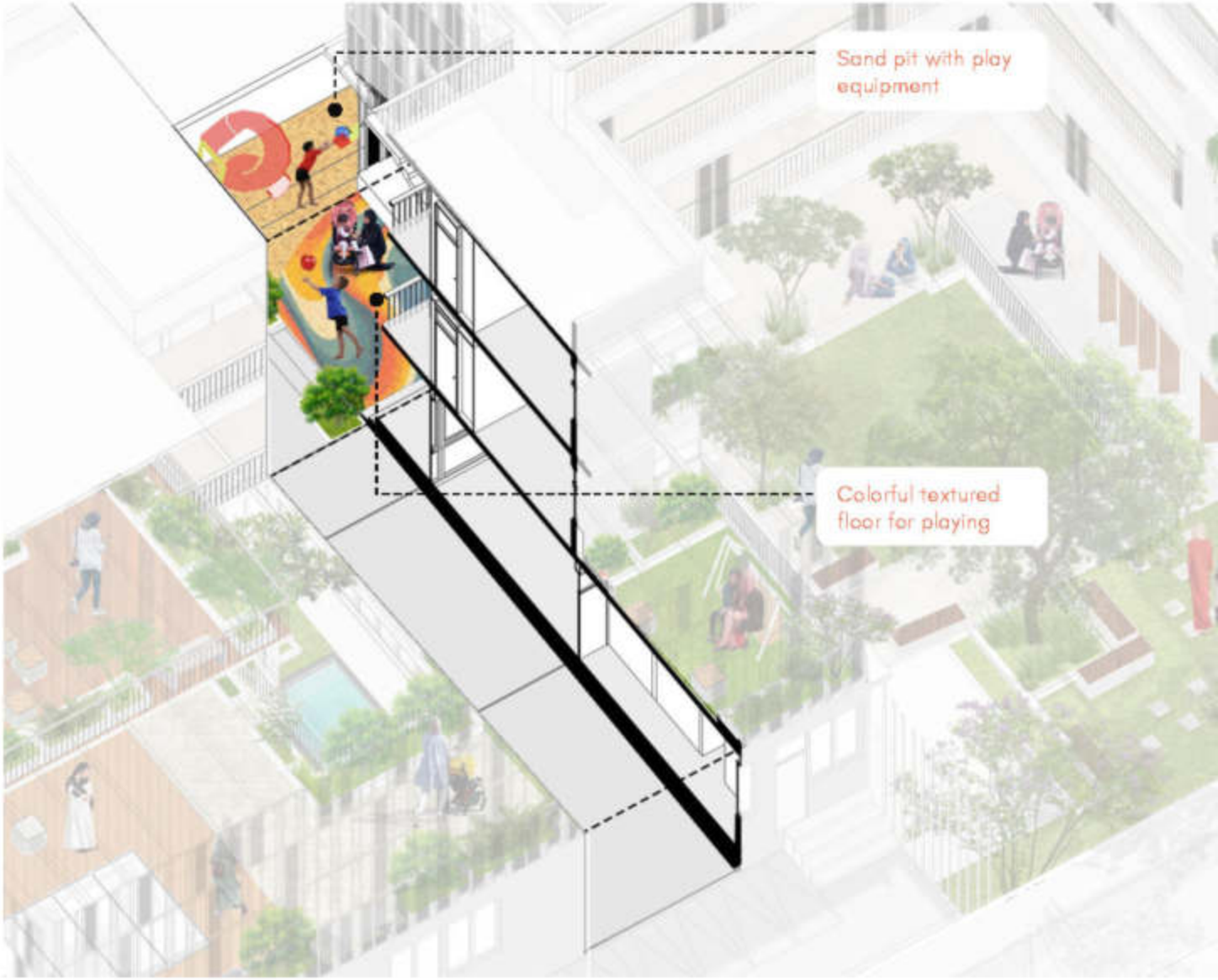
Play of colors and textures are used to curate this court especially for children. The walls that enclose this court could have interesting patterns of colors to create a sense of joy and wonder.

Court of Joy

Sand pit and soft synthetic flooring is used as primary safety elements. Sharp edges and hazardous elements are avoided in this court. Additional tensile covering could be planned for shade.

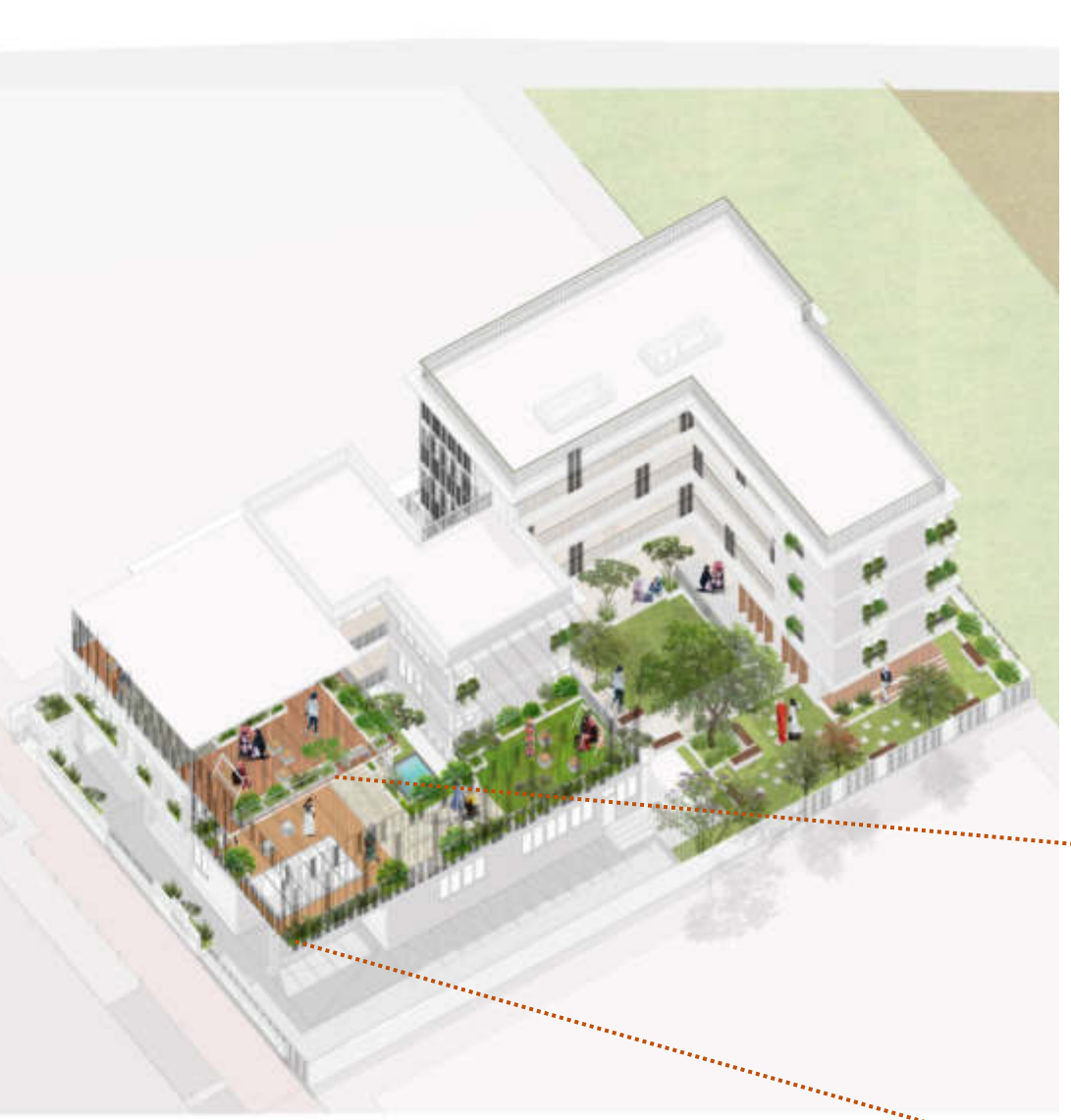


Play of color and texture is used to create interest



Court of Collaboration

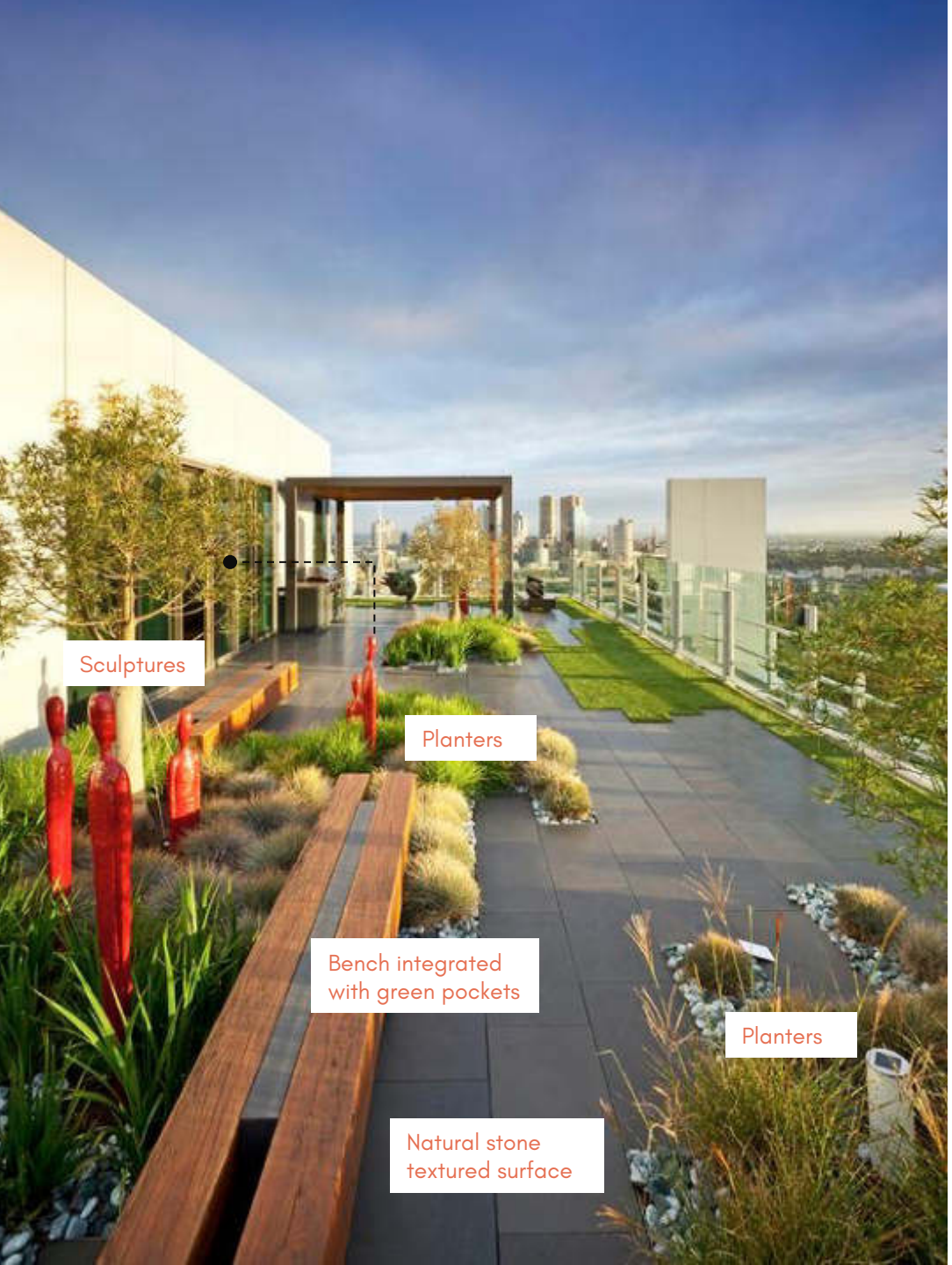
The court forms an integral part of uses (eg., staff areas) in the first floor. The double height relief space also gets in the breeze from the North and channelizes it into the habitable spaces. The court at this level acts as an important link for the cascading courts from the second floor to the ground.



Hardscape areas in this court are well complimented by the softscape pockets. The spaces are designed in a flexible manner and could be adapted for specific uses. Play of light and shadow is created using interesting vertical screening, which also enables privacy.

Court of Collaboration

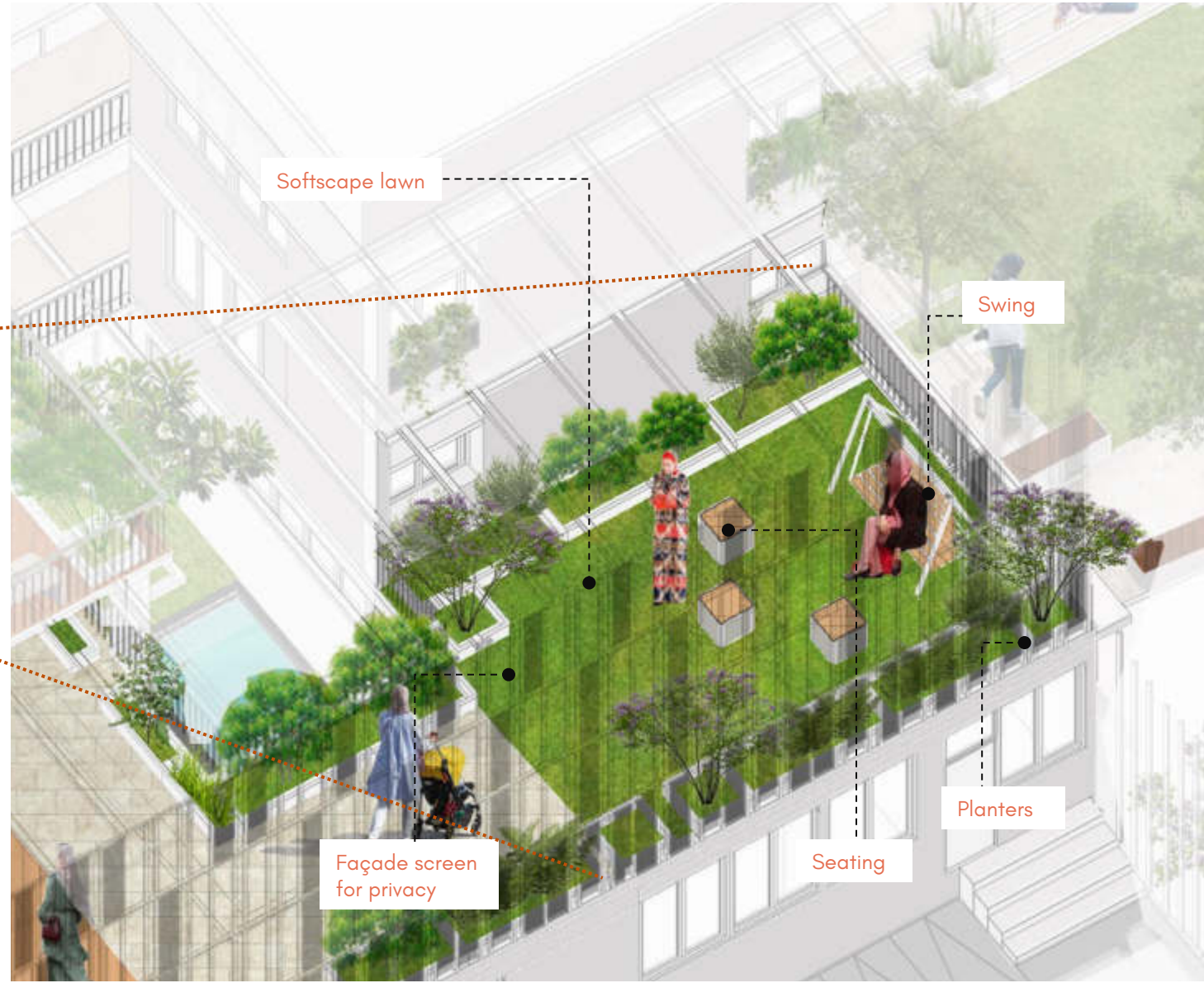
The court of collaboration hosts various activities in it. The flooring patterns and materials are carefully chosen to demarcate the active and passive areas. Since this court is on the ground floor roof slab, extra care is to be taken for rain water drain points and structural loading.



Court of Solitude

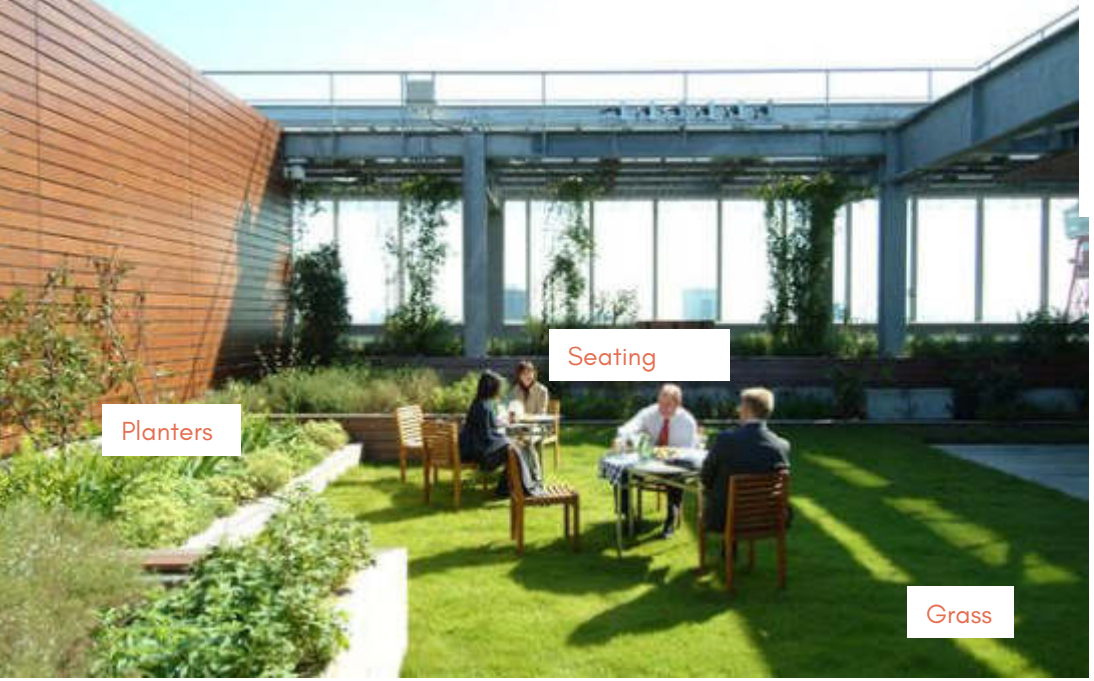
This court helps in providing a silent space for the users. Soothing lawn and simple furniture palettes are used in order to create a serene atmosphere. The court is strategically placed in the secluded zone so that other functions do not disturb the users seeking silent zones for self-healing.

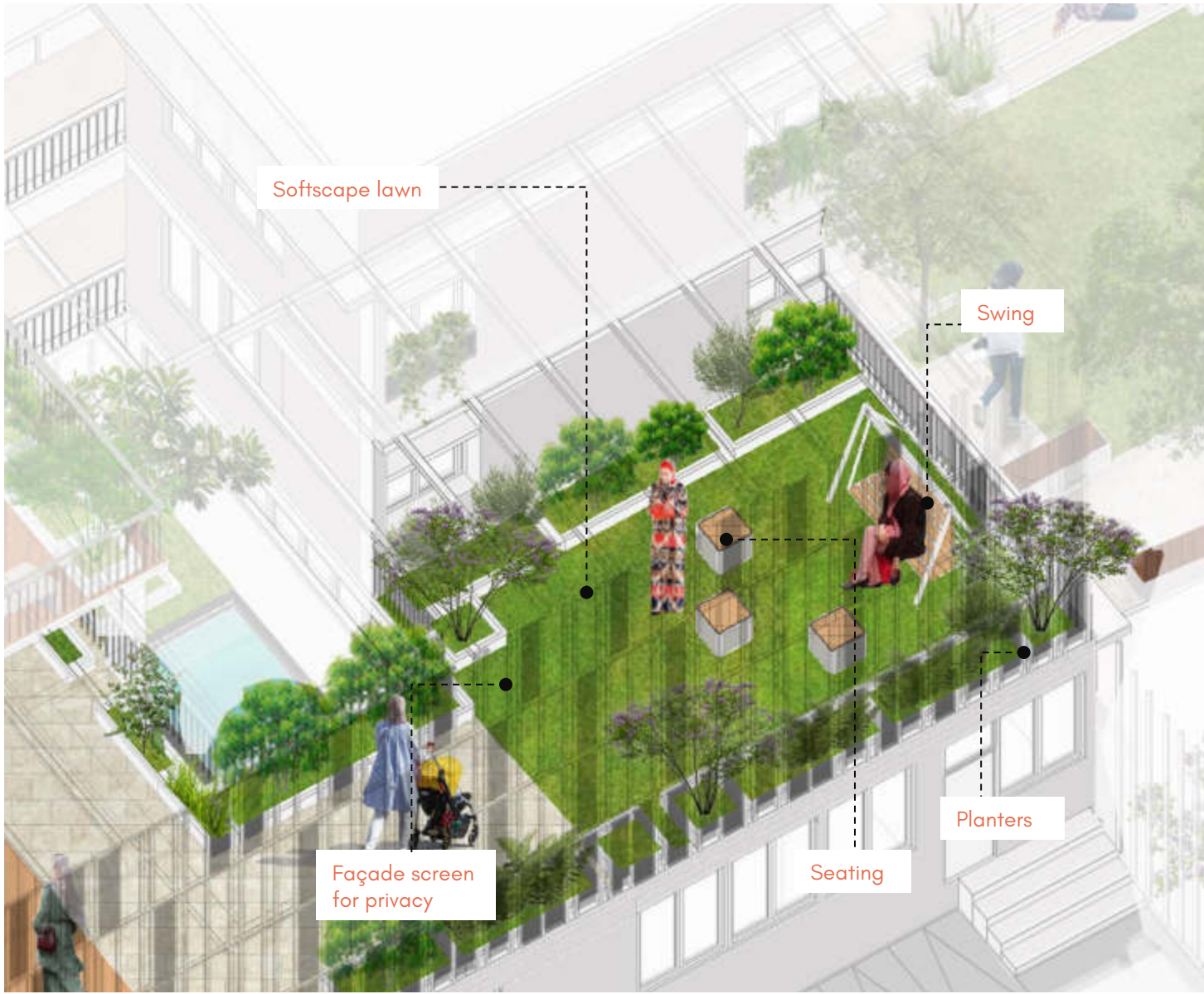
The Court of Solitude will have all-season green landscape elements. This is to enhance the space throughout the year.



Court of Solitude

The court has flexible seating clusters which could be adapted based on the type and number of users. Aspects such as foliage spread could be planned carefully to make the space soothing for the users.





Court of Bliss | Relief | Spillover

This court forms an extension to the multifunctional activities in the second floor. The court overlooks the court of the collaboration below and helps form a strong visual connection between the two floors.

This court acts as an active spillover and a good relief space for the second-floor users. With the North breeze filtering through the court, it helps to create a pleasant space for users to experience the double-height space next to it.

Court of Bliss | Relief | Spillover

The court is planned to be flexible with adaptive seating and landscape pockets. With the proportions of a large balcony spillover, this cannot be used for large gatherings and will serve as an extension to the multifunctional internal space next to it. This court also helps to create an interesting cascade effect with the court on the first floor, thus creating a continuous flow of open spaces.

Section

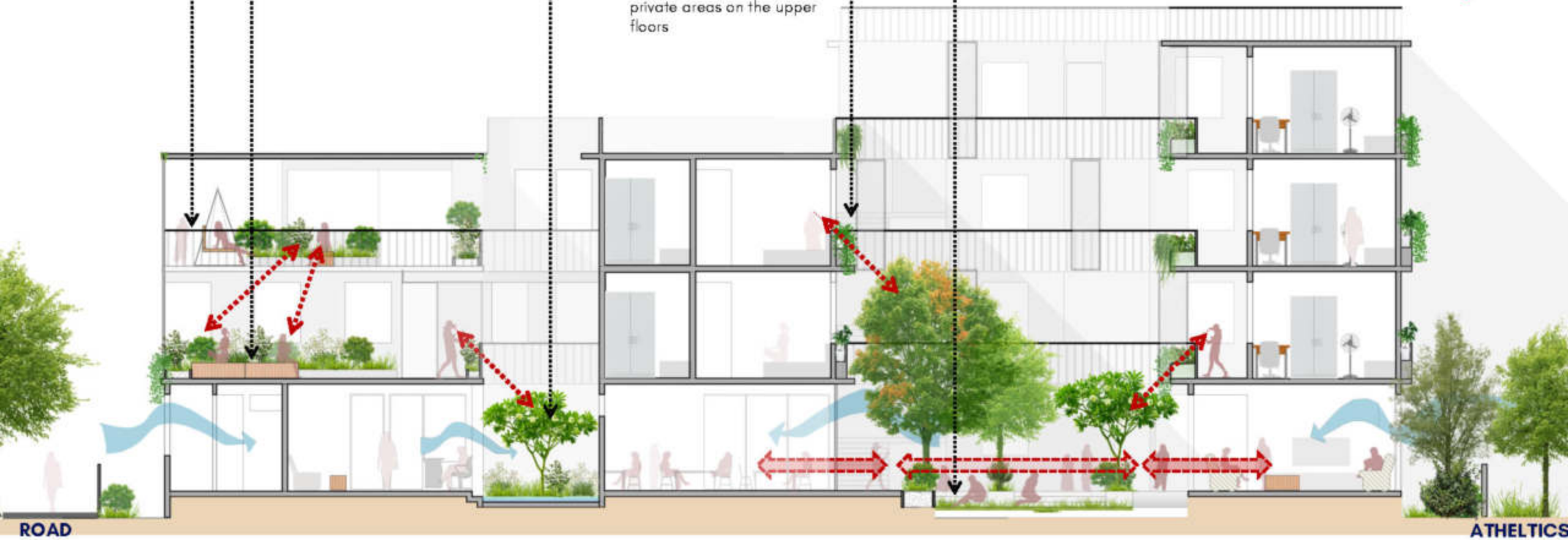
Court of Bliss
- Extension of the Multipurpose Hall
- Visual access to First-floor court to improve interaction and connectivity across floors

Court of Collaboration
- Gathering space for residents; visual access to Court of Transformation

Court of Transition
- Act as a threshold between the public and private zones.
- Visually accessible from the private areas on the upper floors

Green pockets in windows
- Windows designed with plantation boxes
- Easy, convenient, and manageable green pockets available directly for residents

Court of Transformation
- Visually accessible from the accommodation zone on all floors.
- Acts as connecting court between Dining and Multipurpose Hall.



04

Design Details

Floor Plans | Floor Plan Visualization | Unit Design Details

Floor Plans

Spatial design for all floors with suggested furniture layouts

Ground floor plan

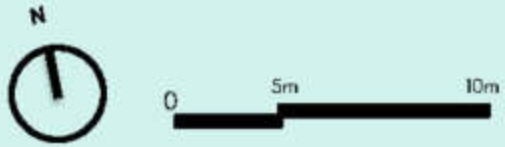
1 Reception and info
2 Waiting area
3 Counselling room
4 Legal aid room
5 Prayer room
6 Breast feeding room
7 Kids wash
8 Kids Area
9 Dining room
10 UA Unit -1
11 UA Bath-1
12 UA Unit - 2
13 UA Unit-3
14 UA Bath - 2
15 UA Unit - 4
16 Multi-purpose hall
17 Services
18 Utility
19 Kitchen
20 UA Toilet
21 Hand wash and disposal
22 Manager's room
23 Toilet
24 UA Toilet
25 Rest area for staff
26 Male staff toilet
27 Security booth

N

0 5m 10m

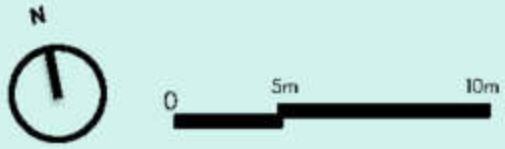
First floor plan

28 Office staff room
29 Meeting room
30 Records
31 Utility
32 UA Toilet
33 Female Maintenance staff rest room
34 Female Maintenance staff bathroom
35 Clothes drying area
36 Laundry room
37 Multi occupancy 1 - Plus room
38 Multi occupancy 1 - Single room
39 Toilet
40 Single room 1
41 Toilet
42 Toilet
43 Single room 2
44 Multi occupancy 2 - Single room
45 Toilet
46 Multi occupancy 2 - Plus room
47 Single room 3
48 Toilet
49 Toilet
50 Family unit 1 - Room 2
51 Family unit 1 - Room 1



Second floor plan

52 Multi purpose hall
53 Storage
54 Toilet
55 Family unit 2 – Room 1
56 Family unit 2 – Room 2
57 Multi occupancy 3 Single room
58 Multi occupancy 3 Plus room
59 Toilet
60 Single room 4
61 Toilet
62 Toilet
63 Single room 5
64 Mutli occupancy 4 – Single room
65 Toilet
66 Mutli occupancy 4 – Plus room
67 Single room 6
68 Toilet
69 Toilet
70 Family unit 3 – Room 2
71 Family unit 3 – Room 1



Third floor plan

72 Mutli occupancy 5 - Single room

73 Toilet

74 Mutli occupancy 5 - Plus room

75 Mutli occupancy 6 - Single room

76 Toilet

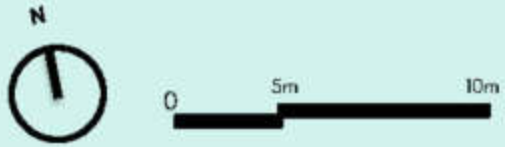
77 Mutli occupancy 6 - Plus room

78 Mutli occupancy 7 - Single room

79 Toilet

80 Mutli occupancy 7- Plus room

81 Laundry



Floor Plan Visualization

3-D exploration of the spaces and understanding layout

Ground floor space visualization

Public zone (Drop-in and common services)

1. Security booth
2. Toilet
3. Staff resting area
4. Waiting area
5. Reception
6. Common utilities
7. UA Toilet
8. Toilet
9. Manager room
10. Counselling room
11. Legal Aid

Semi-Public zone (Supporting uses)

12. Prayer room
13. Breast feeding room
14. Kid's wash
15. Kids Area

Private zone (Supporting services)

16. Kitchen
17. Dining
18. Hand wash and disposal
19. UA Toilet
20. Ultility
27. Multi purpose hall

Private zone (Accommodation)

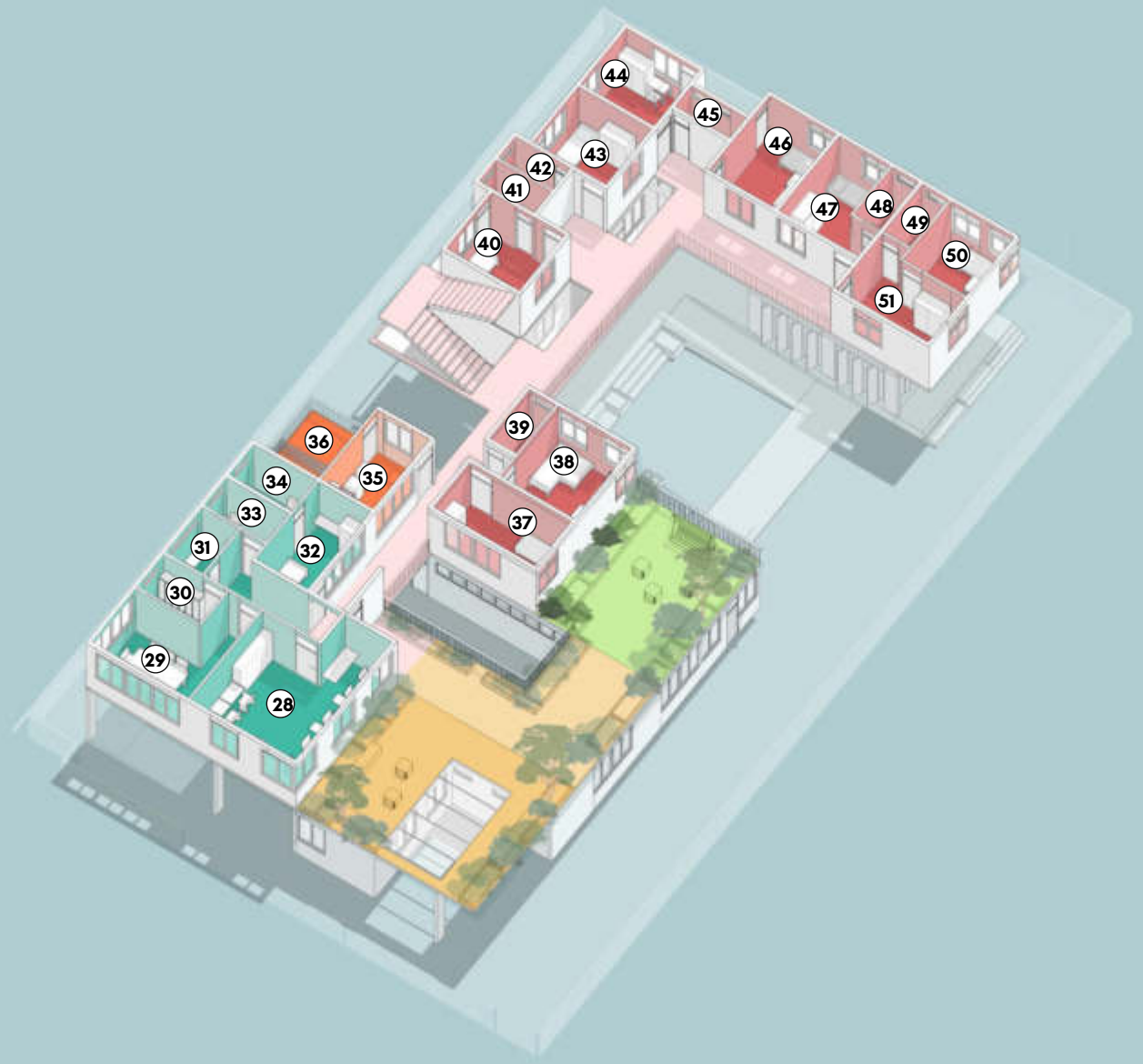
21. UA Unit 1
22. UA Bath 1
23. UA Unit 2
24. UA Unit 3
25. UA Bath 2
26. UA Unit 4

First floor space visualization

Private zone (Admin)
28. Office staff
29. Meeting room
30. Records
31. Utility
32. Female Maintenance staff rest room
33. UA Toilet
34. Female Maintenance staff bathroom

Private zone (Supporting services)
35. Laundry room
36. Clothes drying area

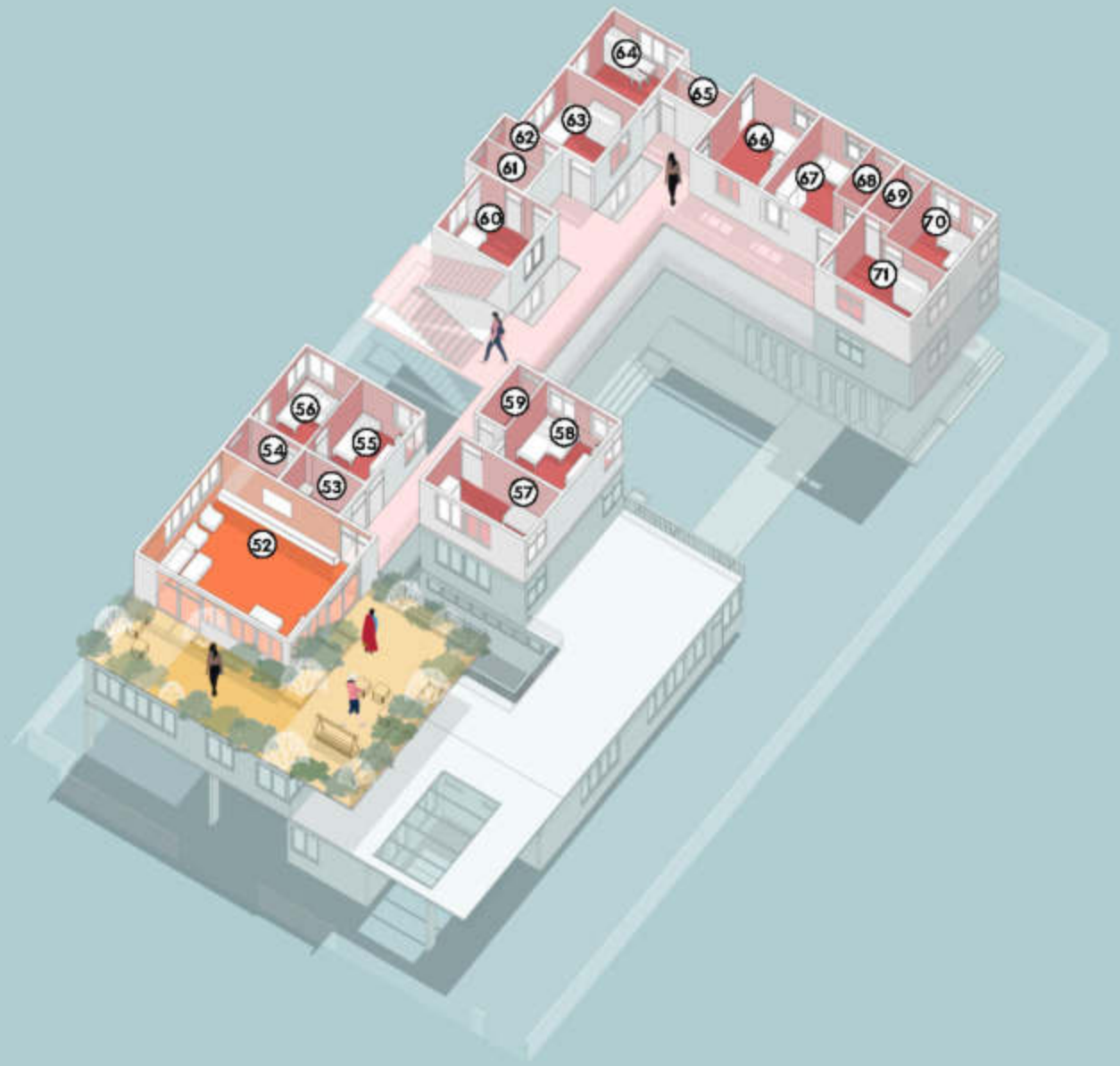
Private zone (Accommodation)
37. Multi occupancy 1 - Single room
38. Multi occupancy 1 - Plus room
39. Toilet
40. Single room 1
41. Toilet
42. Toilet
43. Single room 2
44. Multi occupancy 2 - Single room
45. Toilet
46. Multi occupancy 2 - Plus room
47. Single room 3
48. Toilet
49. Toilet
50. Family unit 1 - Room 2
51. Family unit 1 - Room 1



Second floor space visualization

Private zone (Supporting services)
52. Multi purpose hall

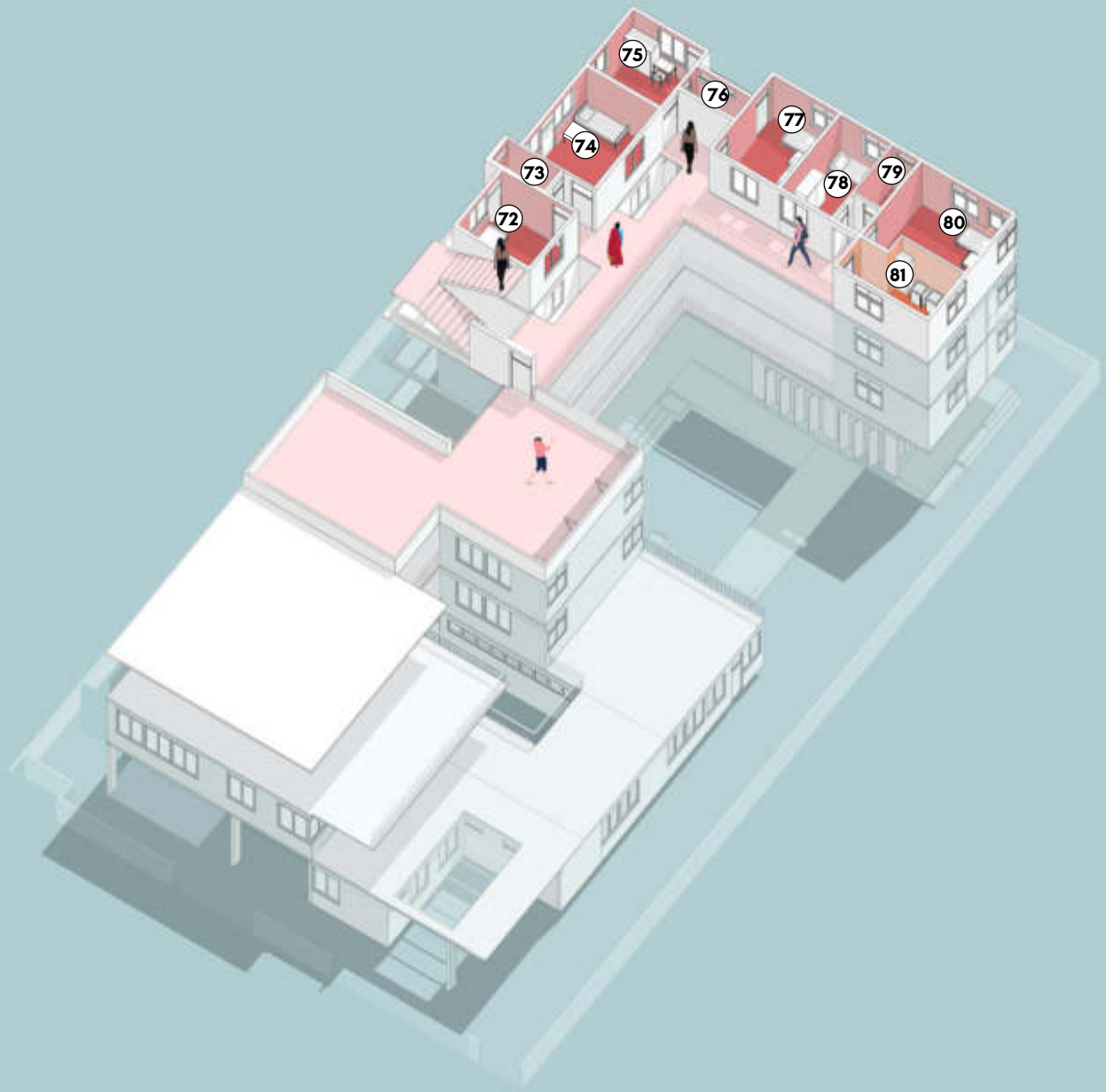
Private zone (Accommodation)
53. Storage
54.Bathroom
55. Family unit 2 - Room 1
56. Family unit 2 - Room 2
57. Multi occupancy 3 - Single room
58. Multi occupancy 3 - Plus room
59.Toilet
60. Single room 4
61. Toilet
62. Toilet
63. Single room 5
64. Mutli occupancy 4 - Single room
65. Toilet
66. Mutli occupancy 4 - Plus room
67. Single room 6
68. Toilet
69. Toilet
70. Family unit 3 - Room 2
71. Family unit 3 - Room 1



Terrace floor space visualization

Private zone (Accommodation)
72. Mutli occupancy 5 – Single room
73. Toilet
74. Mutli occupancy 5 – Plus room
75. Mutli occupancy 6 – Single room
76. Toilet
77. Mutli occupancy 6 – Plus room
78. Mutli occupancy 7 – Single room
79. Toilet
80. Mutli occupancy 7– Plus room

Private zone (Supporting services)
81. Laundry



3D Visualizations

3D Renderings of Key Spaces

View 1

Court of Transformation

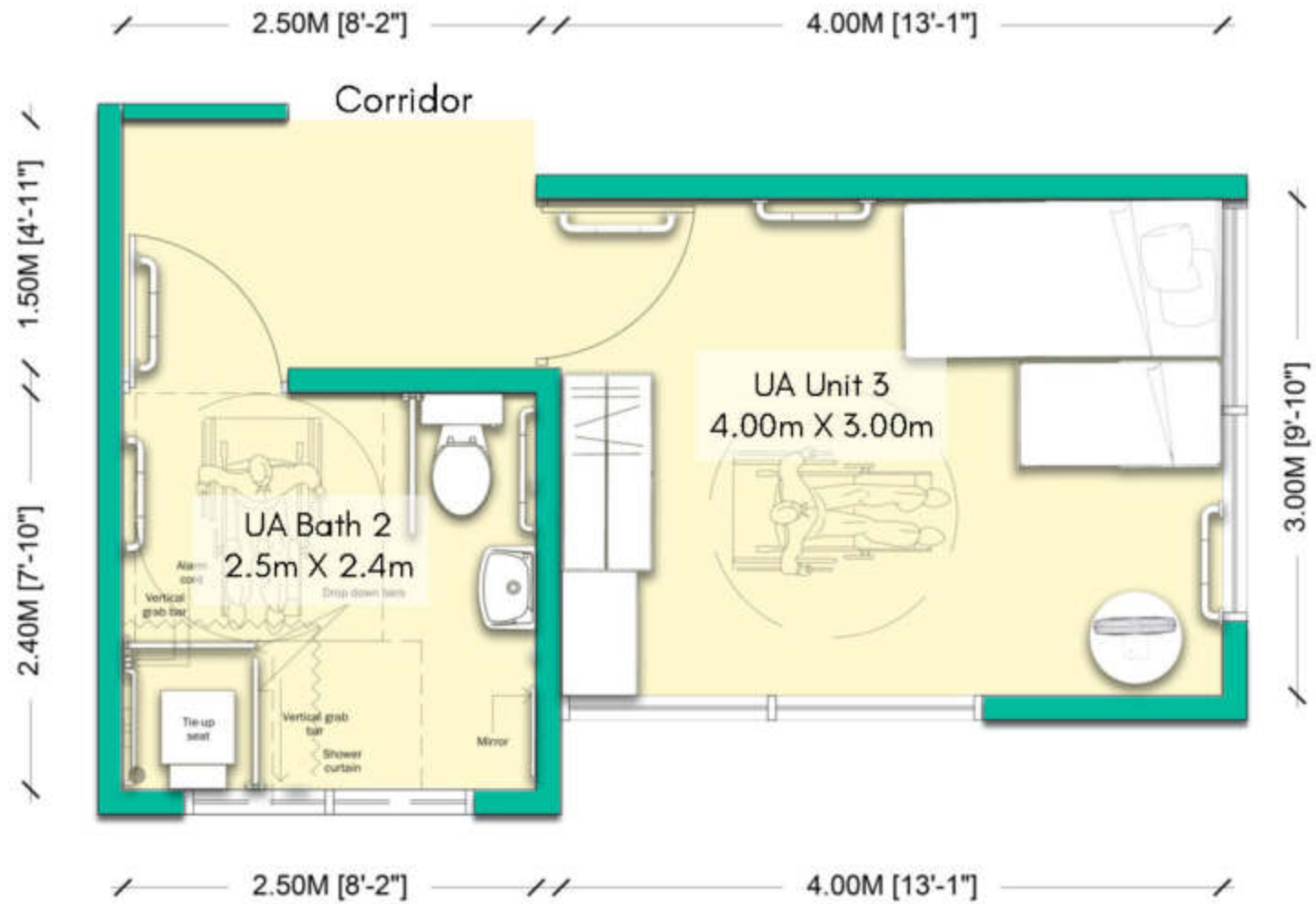
Court of Collaboration

Unit Design Details

Types of units and suggested layouts for user's comfort

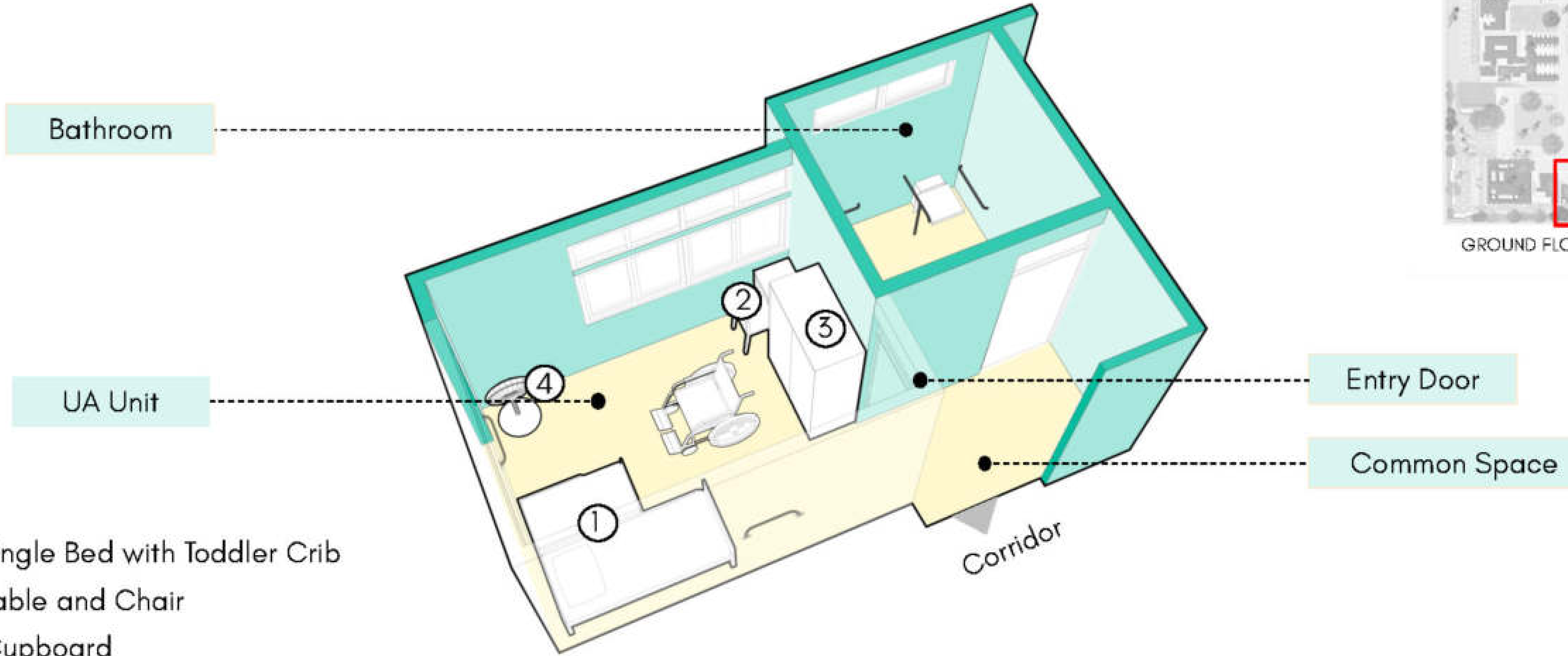
Unit plan – Universally Accessible Unit

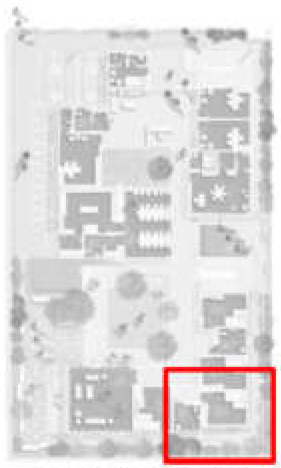
UA Room: 12.15 Sqm/ 130.80 Sqft
Bathroom : 6.15 Sqm/ 66.20 Sqft



GROUND FLOOR PLAN

Unit plan – Universally Accessible Unit



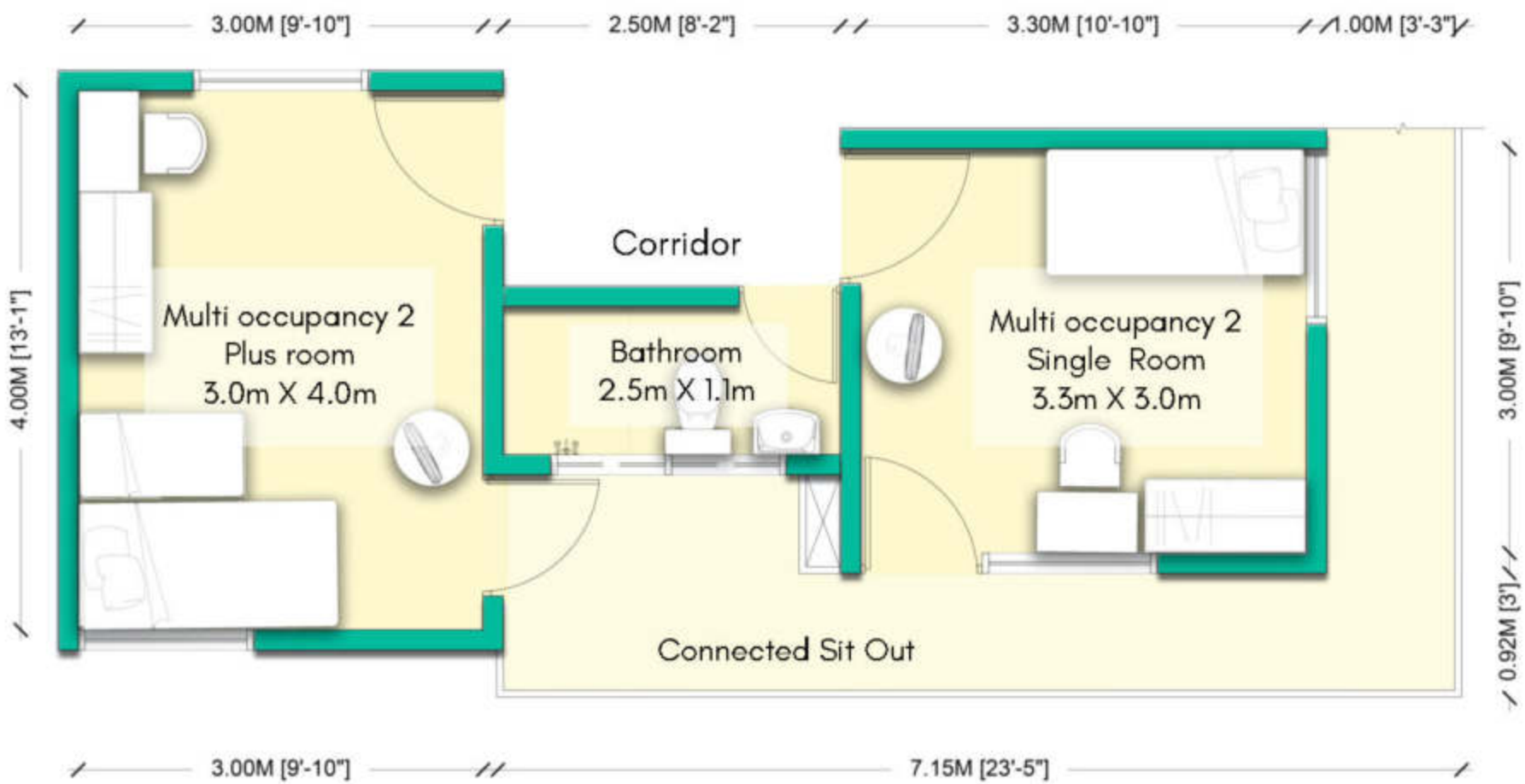


GROUND FLOOR PLAN

1. Single Bed with Toddler Crib
2. Table and Chair
3. Cupboard
4. Standing Fan

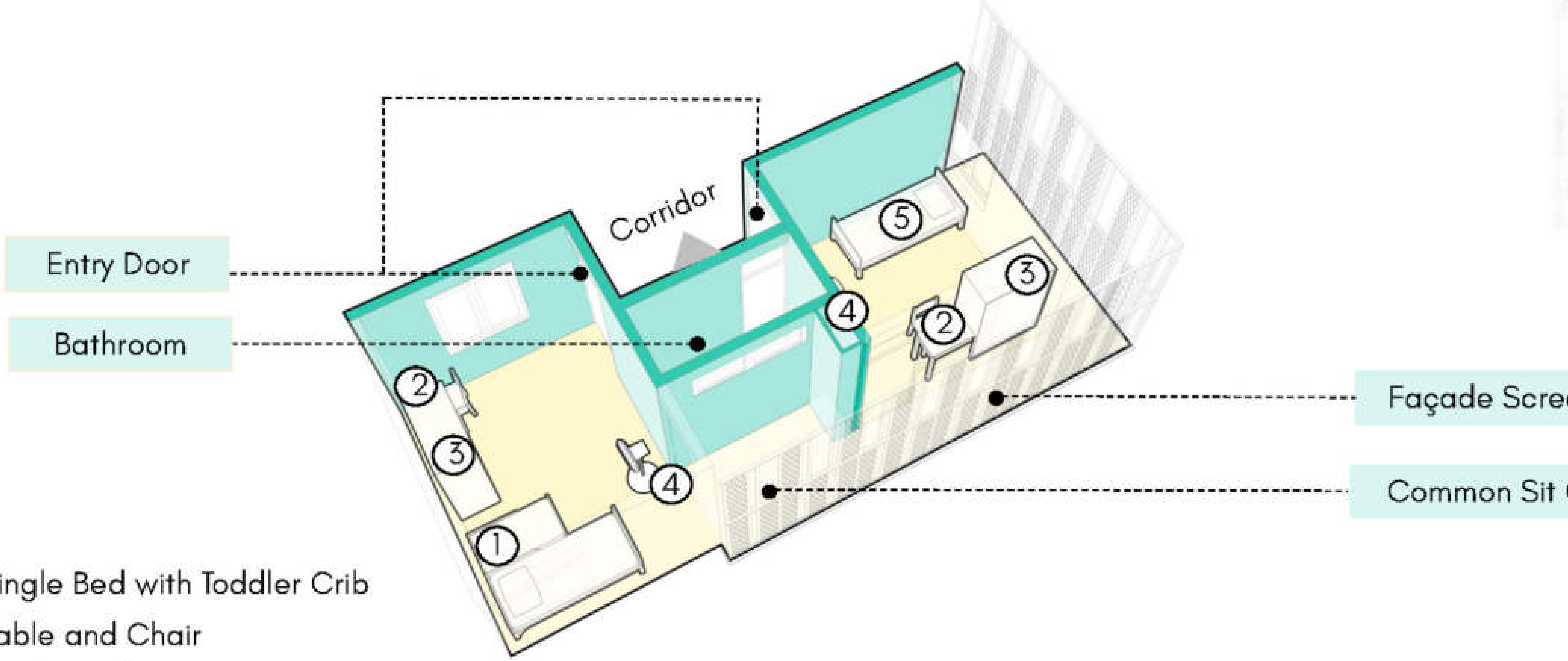
Unit plan –Multi Occupancy Room with Sit Out

Multi occupancy 2 Single room: 10.20 Sqm/ 109.80 Sqft
Multi occupancy 2 Plus room: 12.14 Sqm/ 130.67 Sqft
Bathroom : 2.86 Sqm/ 30.80 Sqft



FIRST FLOOR PLAN

Unit plan –Multi Occupancy Room with Sit Out

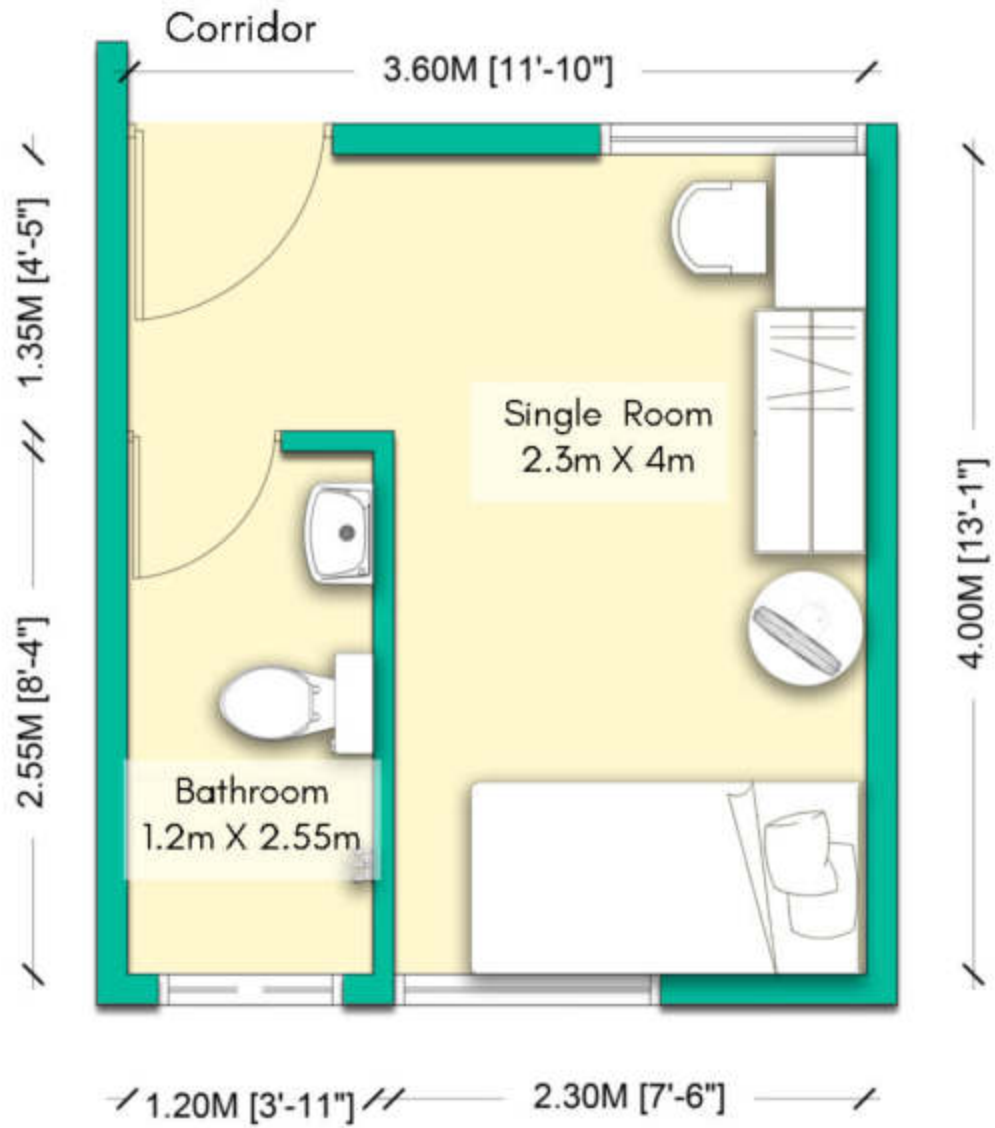


FIRST FLOOR PLAN

① Single Bed with Toddler Crib
② Table and Chair
③ Cupboard
④ Fan
⑤ Single Bed

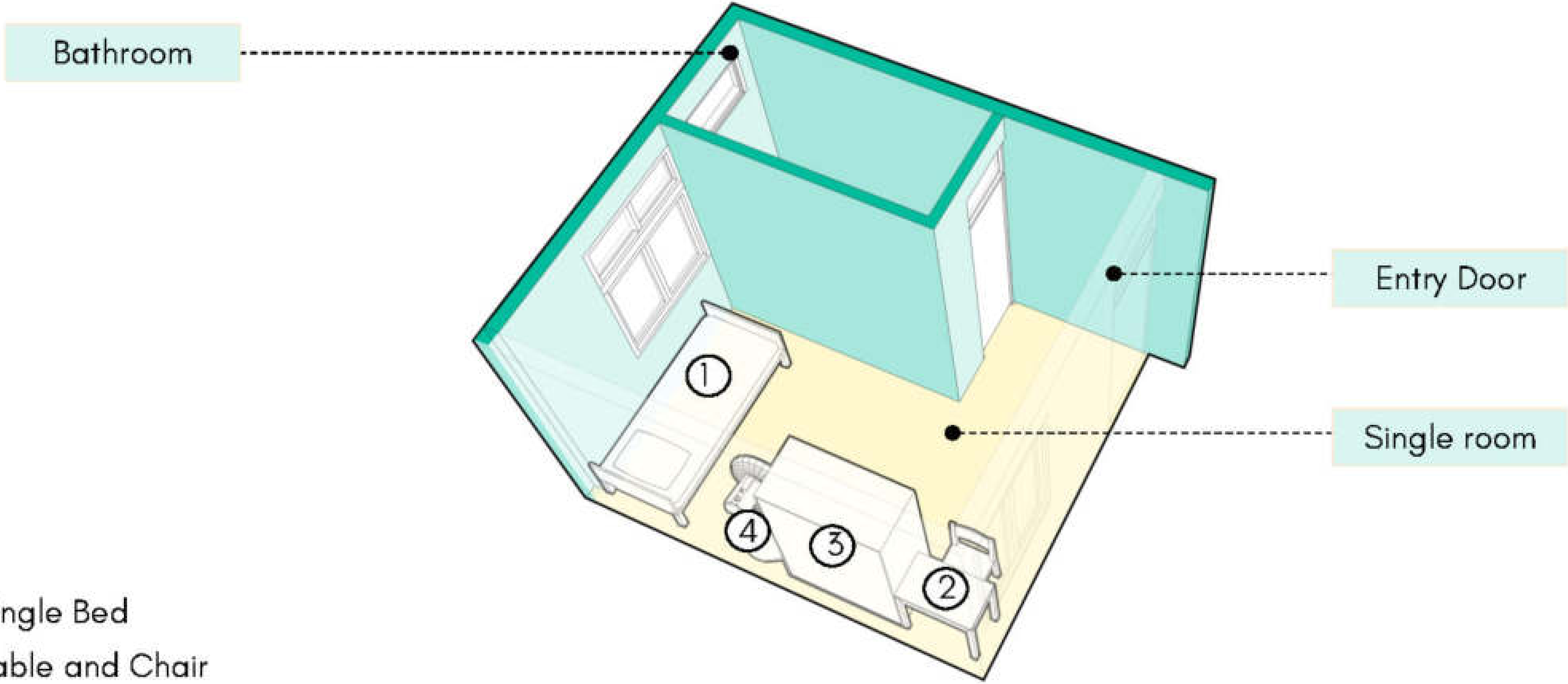
Unit Plan – Single Unit

Single Room 3 : 11.12 Sqm/ 119.70 Sqft
Bathroom : 3.13 Sqm/ 33.70 Sqft



FIRST FLOOR PLAN

Unit Plan – Single Unit

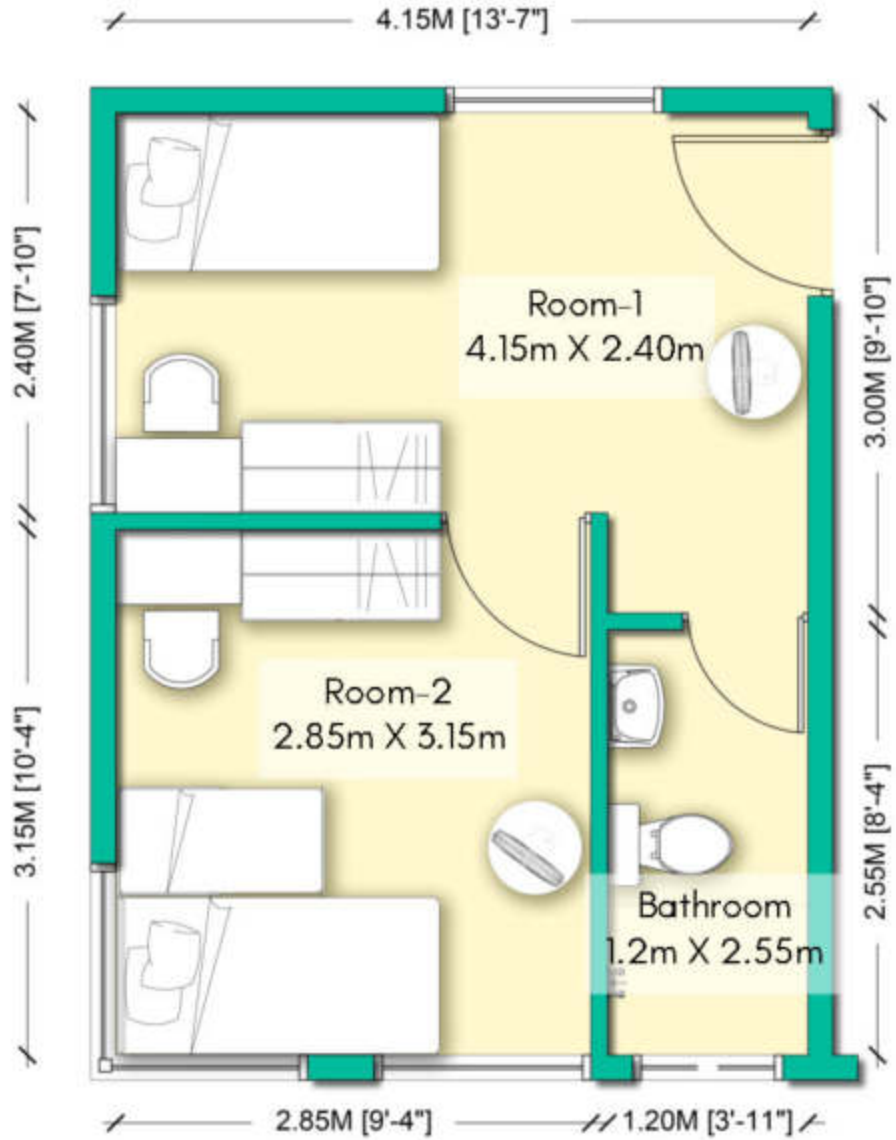


FIRST FLOOR PLAN

1. Single Bed
2. Table and Chair
3. Cupboard
4. Fan

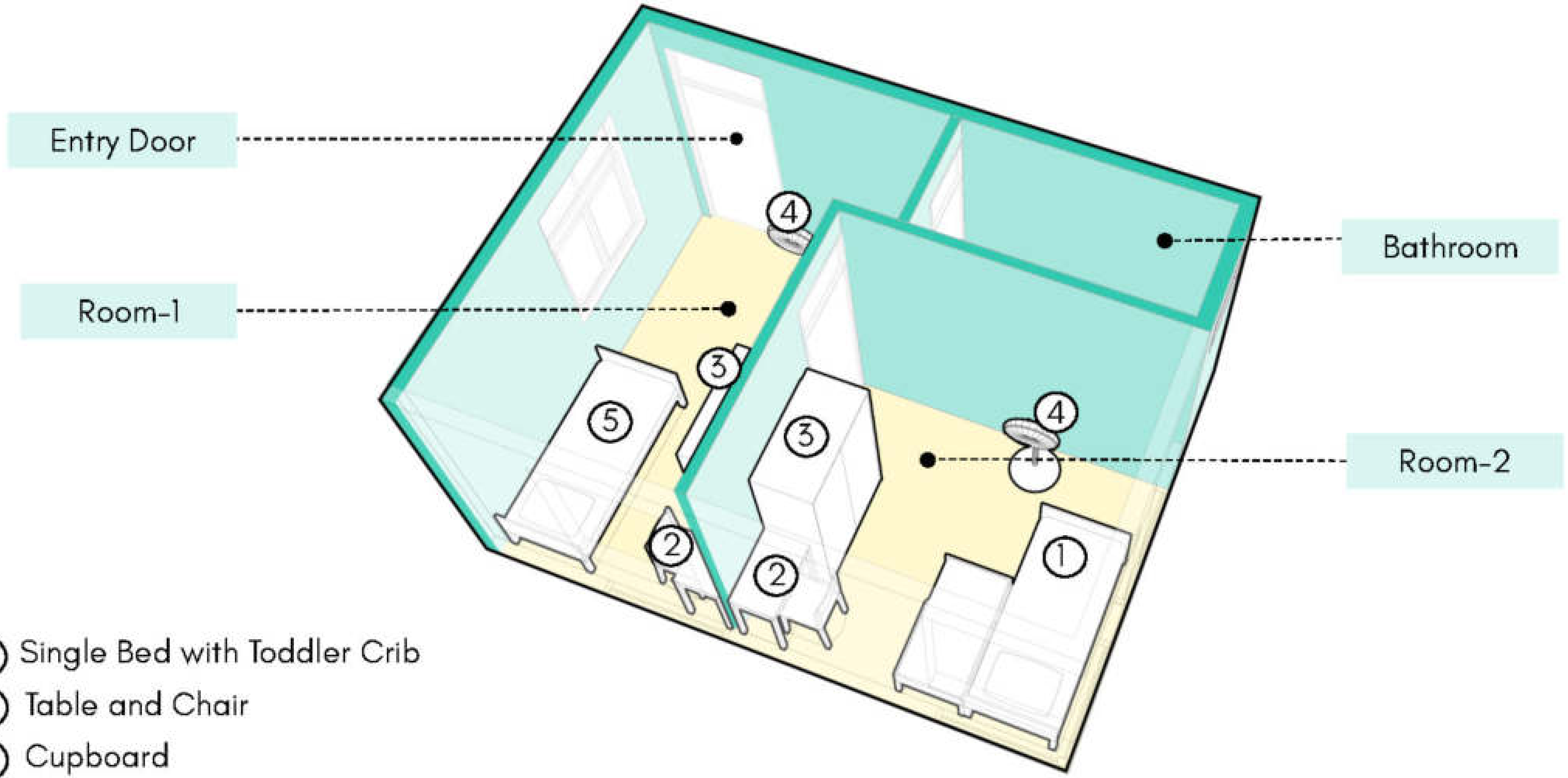
Unit Plan – Family Unit

Family Unit-1
Room-1: 10.82 Sqm / 116.46 Sqft
Room-2: 9.06 Sqm / 97.52 Sqft
Bathroom : 3.13 Sqm /33.70 Sqft



FIRST FLOOR PLAN

Unit plan – Family unit



1. Single Bed with Toddler Crib
2. Table and Chair
3. Cupboard
4. Fan
5. Single Bed

05

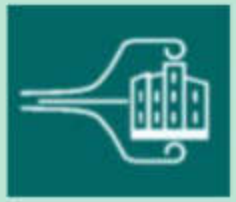
Design Performance Optimization

Site - External CFD and Irradiation | Building - Daylight, Energy and Internal CFD

Climate considerations

SITE LEVEL

EXTERIOR COMPUTATIONAL FLUID DYNAMICS



Understand the wind velocity and distribution around the buildings at site level and strategize for placement, inter-building distances, orientation and massing of buildings to achieve maximum cross ventilation.

Simulation Tool: Butterfly
Simulation Engine: openFOAM

IRRADIATION ANALYSIS

Through ground level irradiation maps, analyse the effect of building geometry on site at different times of the day to predict shaded and unshaded spaces and plan for landscape and outdoor activities.

Simulation Tool: Ladybug
Simulation Engine: Ladybug

BUILDING LEVEL

THERMAL ENERGY ANALYSIS

Evaluate the thermal performance of the building and individual spaces with respect to outdoor air temperature. Analyze the effect of shading and envelope specifications on indoor operative temperature to improve indoor thermal comfort.

Simulation Tool: Ladybug
Simulation Engine: Energyplus

DAYLIGHT ANALYSIS

Assess the amount of daylight levels inside the building through annual illuminance maps for various daylight metrics; use this to design shading, openings and interior layout for enhanced comfort.

Simulation Tool: Lightstanza
Simulation Engine: Radiance

INTERIOR CFD

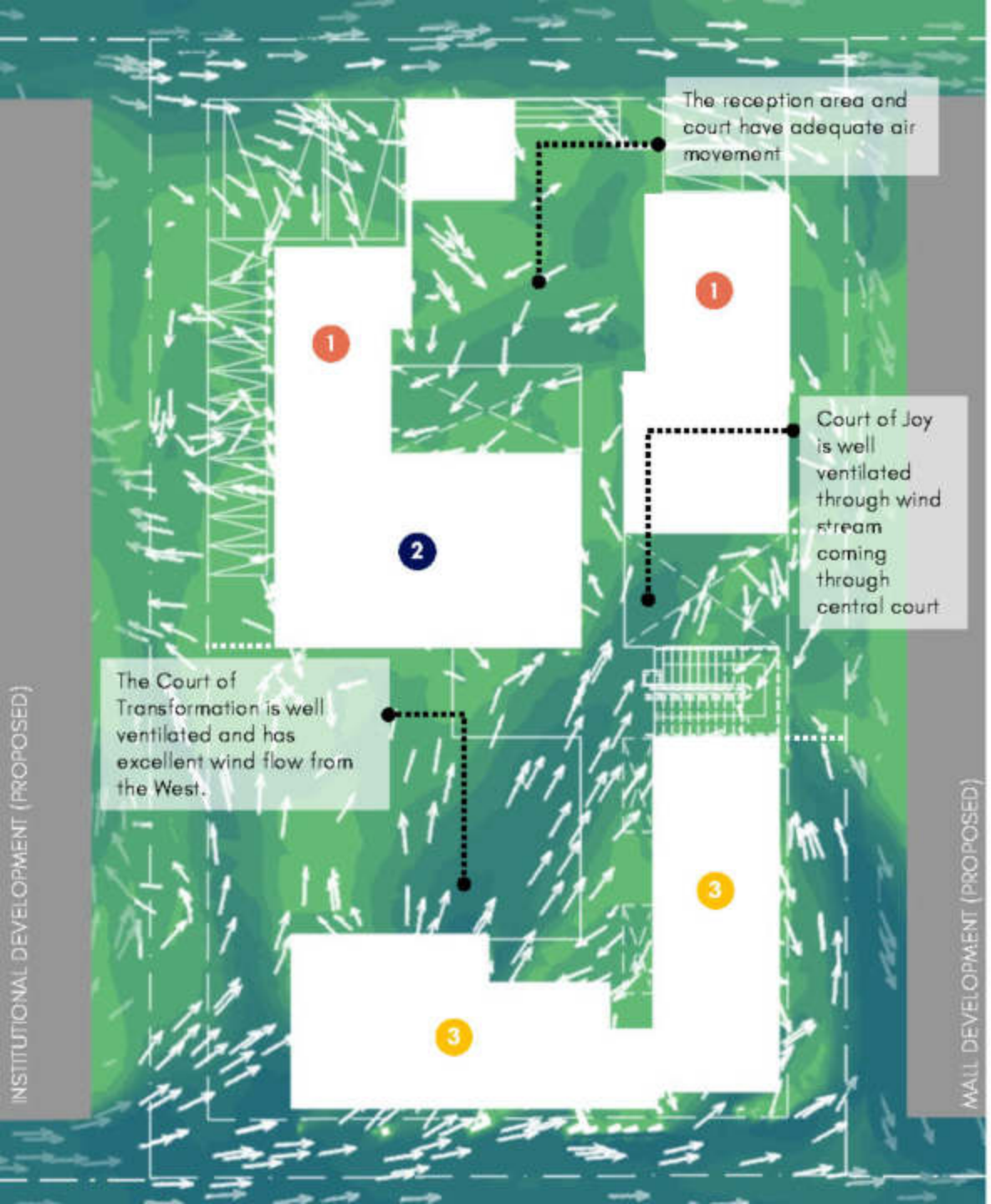
Predict and analyse airflow velocity and distribution inside the building for all regularly occupied spaces. This allows for strategic interior layout planning and placement of openings to achieve optimum ventilation and indoor comfort.

Simulation Tool: Butterfly
Simulation Engine: openFOAM

Site Level

Exterior CFD and Irradiation Analysis

Site level climate analysis- CFD and solar irradiation impact on master plan



Exterior CFD Analysis

Results at 2.1 m ht. from the ground

- **Considerations:**
  The prominent wind direction is from West; thus, courtyards and punctures are introduced in this direction as wind inlets to receive unobstructed wind flow throughout the site. Courtyards are provided in other strategic locations to increase wind flow throughout the site.

- **Key points/ Observation:**
  Predominant air streams are seen from West which get deflected into the site from South-West corner. Northwest corner also receives good airflow which keeps the office spaces well ventilated

- **Implication on Masterplan:**
  Openings and less obstructions in the predominant wind direction (west) allows unobstructed and streamlined wind flow into the site. The courtyards act as wind inlets and allow air circulation in the site

Legend
Air velocity (m/s)

2.5e+00
2.0
1.5
1.0
0.5
0.0e+00

1 Zone-1: Public Area

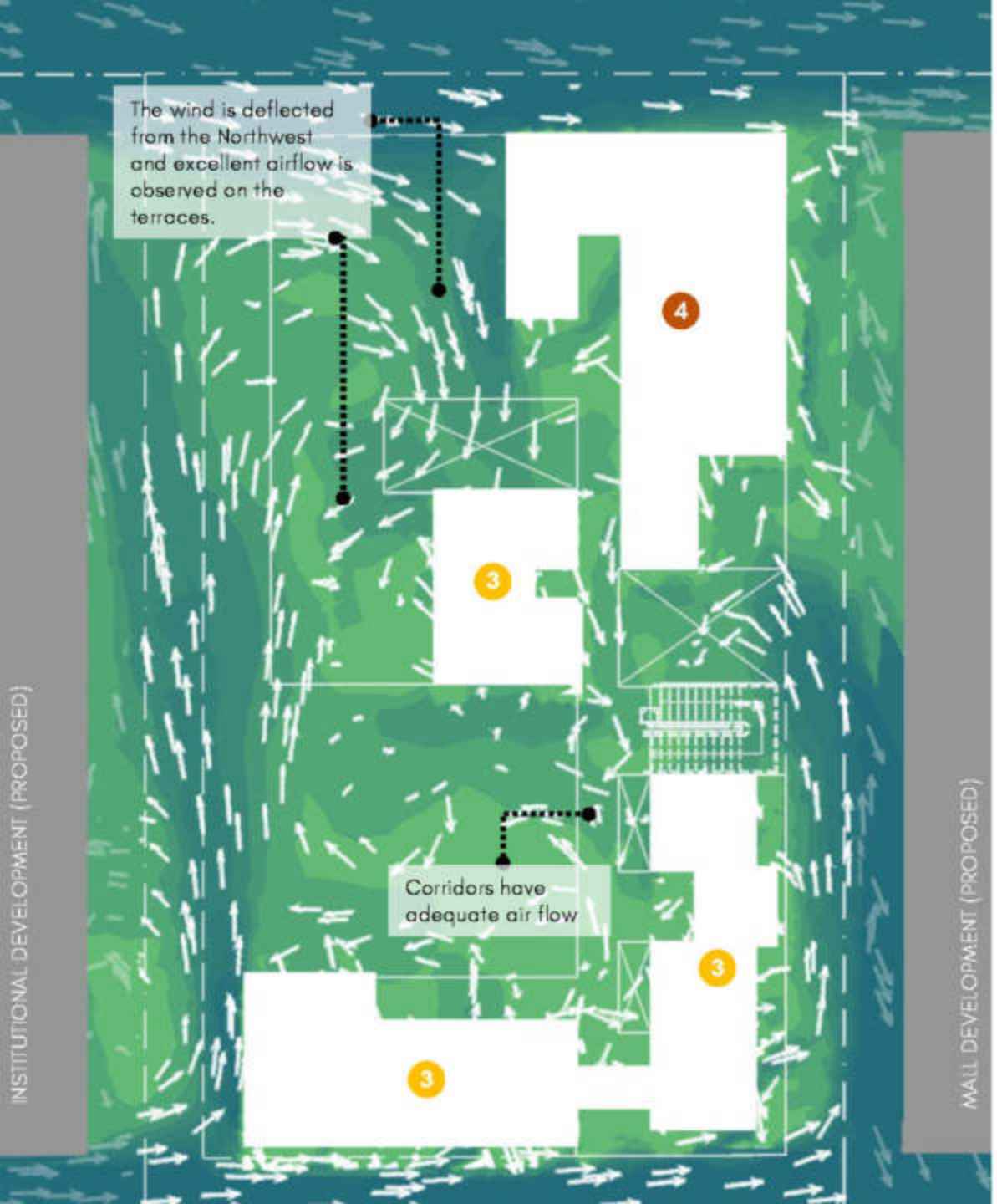
2 Zone-2: Private area (Accommodation supporting uses)

3 Zone 3 – Private Area (Accommodation Zone)

N

Wind Direction: 270°

0 5m 10m



Exterior CFD Analysis

Results at 5.3 m ht. from the ground

- **Considerations:**
  The building mass is kept towards the East side to induce the wind flow from Western side and improve the wind circulation within the site

- **Key points/ Observation:**
  West openings are effective and wind flow is observed from the North side of the site as well.

- **Implication on Masterplan:**
  Well-distributed airflow is observed on the terrace and other open areas. Provision of fans/other devices maybe required to assist in the wind flow in certain parts of the terrace.

Legend
Air velocity (m/s)

2.5e+00
2.0
1.5
1.0
0.5
0.0e+00

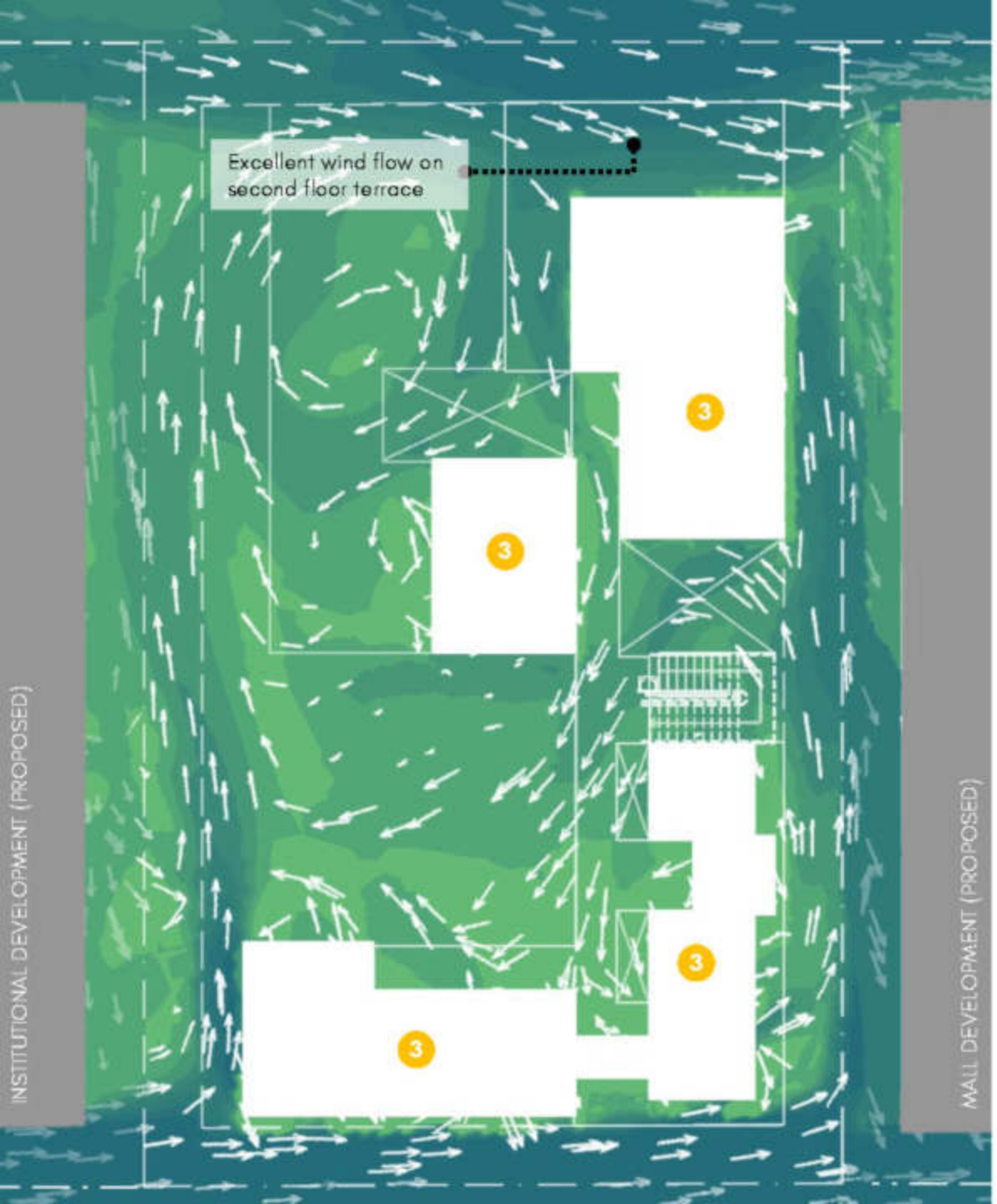
3 Zone 3 – Private Area (Accommodation Zone)

4 Zone 4 – Private Area (Administration)

N

Wind Direction: 270°

0 5m 10m



Exterior CFD Analysis

Results at 8.5 m ht. from the ground

- **Considerations:**
  The building mass is kept towards the East side to induce the wind flow from Western side and improve the wind circulation within the site

- **Key points/ Observation:**
  Higher wind speed is observed on the second floor due to increase in height. Predominant air streams deflected from the North are effective in ventilating the sit out spaces on Second Floor.

- **Implication on Masterplan:**
  Well-distributed airflow is observed on the terrace/sit out space on Second Floor.

Legend
Air velocity (m/s)

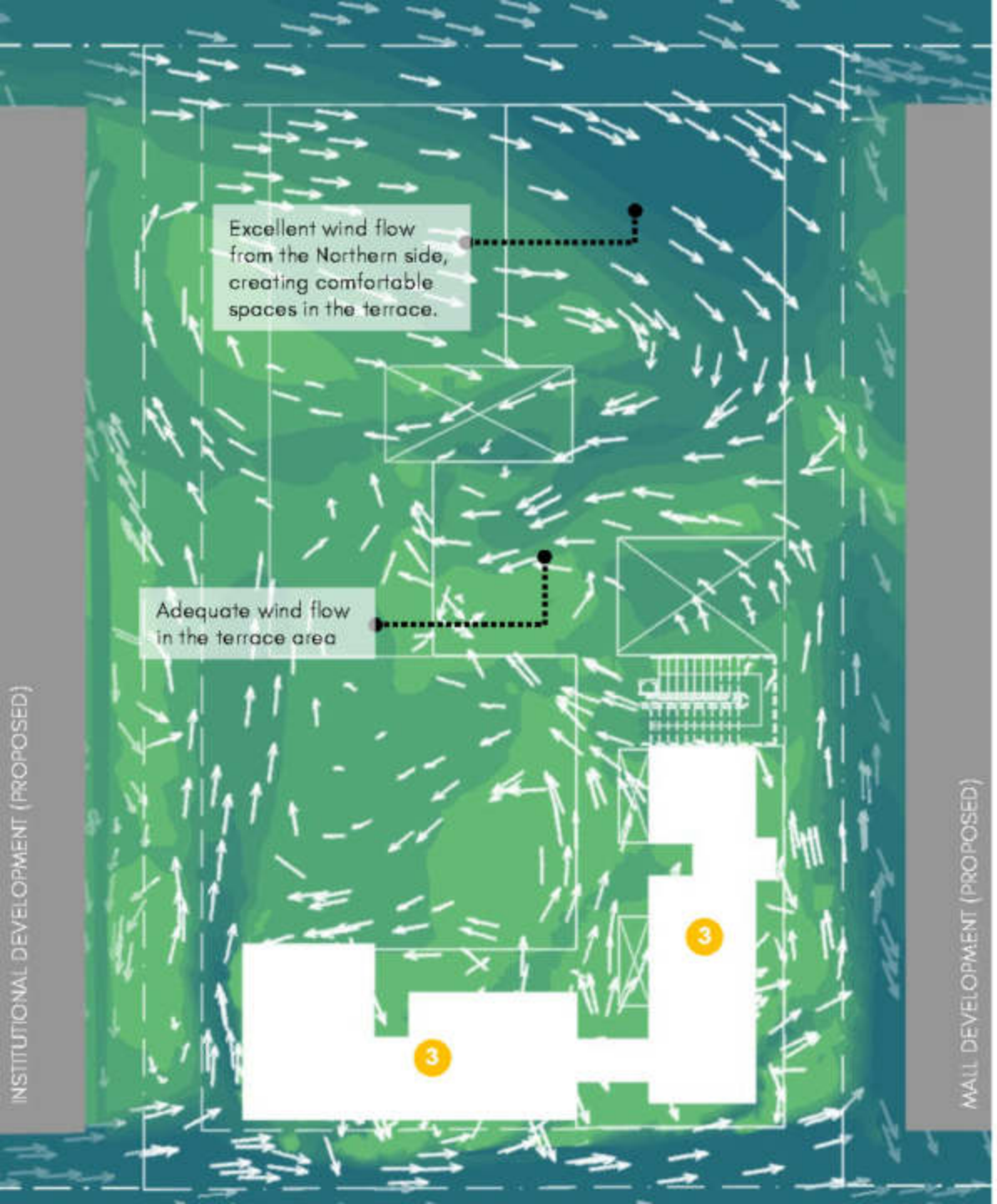
2.5e+00
2.0
1.5
1.0
0.5
0.0e+00

3 Zone 3 – Private Area (Accommodation Zone)

N

Wind Direction: 270°

0 5m 10m



Exterior CFD Analysis

Results at 11.6 m ht. from the ground

- **Considerations:**
  The building mass is kept towards the South side to induce the wind flow from the Northern side and improve the wind circulation on the terrace

- **Key points/ Observation:**
  Predominant air streams deflected from the North and West are effective in ventilating the terrace space. Central courtyard has negative pressure which can induce cross flow from the south, in the residential units.

- **Implication on Masterplan:**
  Well-distributed airflow is observed on the entire terrace area. Residential units benefit from the parallel wind flow towards the south.

Legend
Air velocity (m/s)

2.5e+00
2.0
1.5
1.0
0.5
0.0e+00

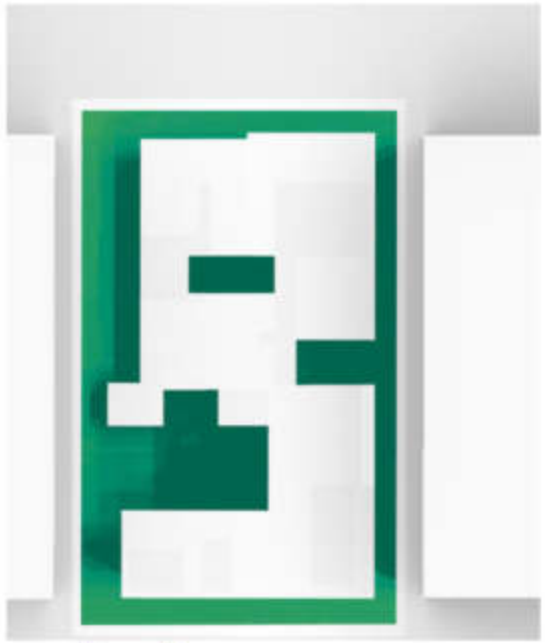
3 Zone 3 – Private Area (Accommodation Zone)

N

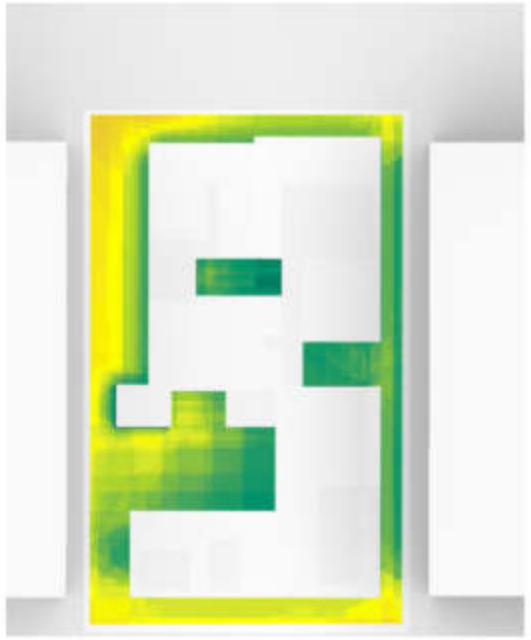
Wind Direction: 270°

0 5m 10m

Solar Irradiation Analysis

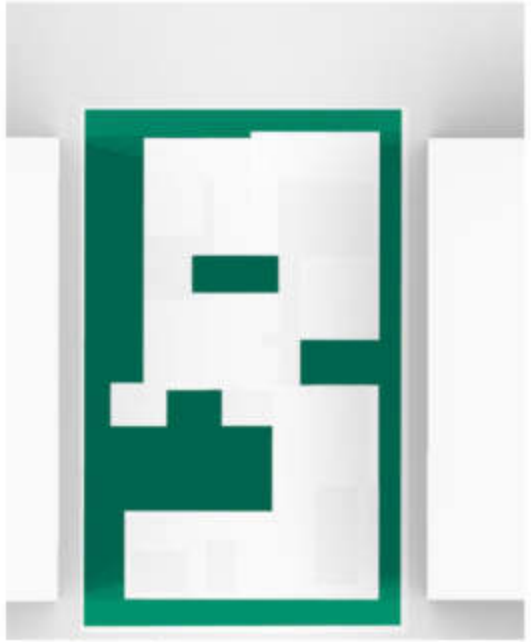


7am- 9am



9am- 12pm

12pm- 3pm

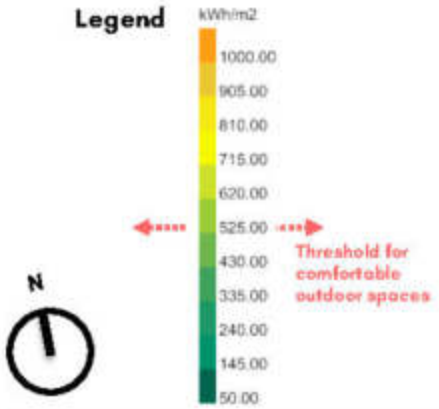


3pm- 6pm

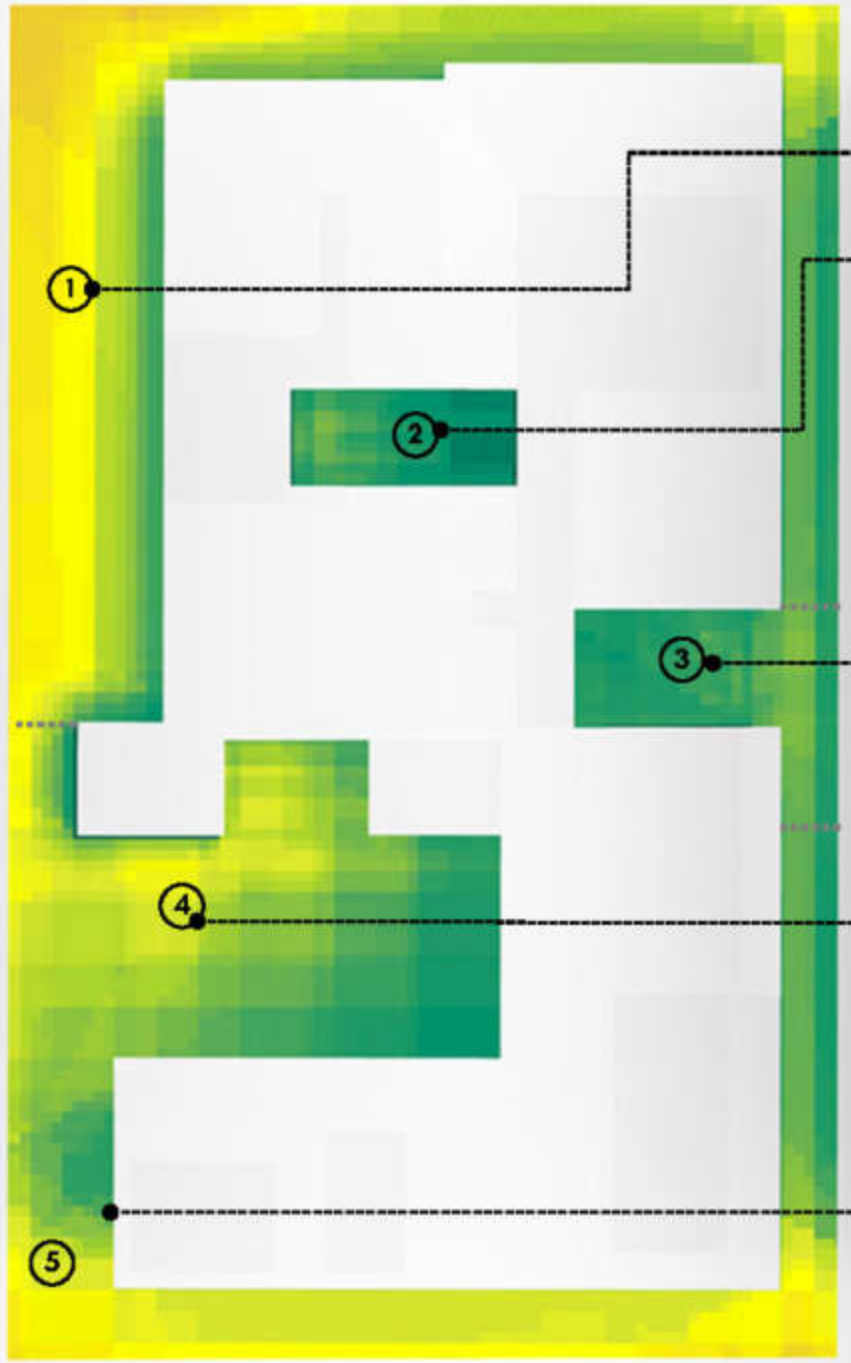
- **Consideration:**
  Solar irradiation at site level determines outdoor thermal comfort and thereby, usability of the outdoor spaces at any given time. The areas receiving high solar radiation will require external shading elements to reduce the heat island effect and create a cooler microclimate.

- **Key points/ Observation:**
  The site is mostly well shaded at all times of the day due to dense shading by context buildings.
  9 AM to 12 PM is observed as most critical time for which thermal comfort of the outdoor spaces needs to be considered and resolved to create a comfortable environment for the users. The site receives high incident irradiation during this period especially on the west and south. The east side is relatively more shaded by context and hence can be used during this period.

- **Implication on Masterplan:**
  The cumulative (annual) solar irradiation maps generated help identify the shaded areas receiving lower direct solar radiation throughout the year and thus determining probable outdoor space use and planning of landscape elements.



Solar Irradiation- Key Observations



INSTITUTIONAL DEVELOPMENT (PROPOSED)

MALL DEVELOPMENT (PROPOSED)

1. Parking areas are exposed to higher solar radiation and thus require shading. Hardscape materials with low SRI pavers (grass pavers) can be used in this area
2. Mutual shading from all sides is effective in keeping the Court of Transition cool, reducing the solar gains, thereby improving outdoor thermal comfort.
3. Court of Joy receives minimal direct solar incidence, and the area is completely and evenly shaded through mutual shading of adjacent building blocks and context.
4. Located towards West, the court experiences high solar irradiation. Mutual shading due to building block placement provides respite for a majority area of the courtyard. Additional shading elements like trees will further improve outdoor thermal comfort in spaces receiving high solar irradiation.
5. The spillover area of the court experiences higher solar gains from the south. Placement of shading elements like trees on the south will further improve outdoor thermal comfort.

No requirement for additional shading

Additional shading required

Legend

kWh/m2

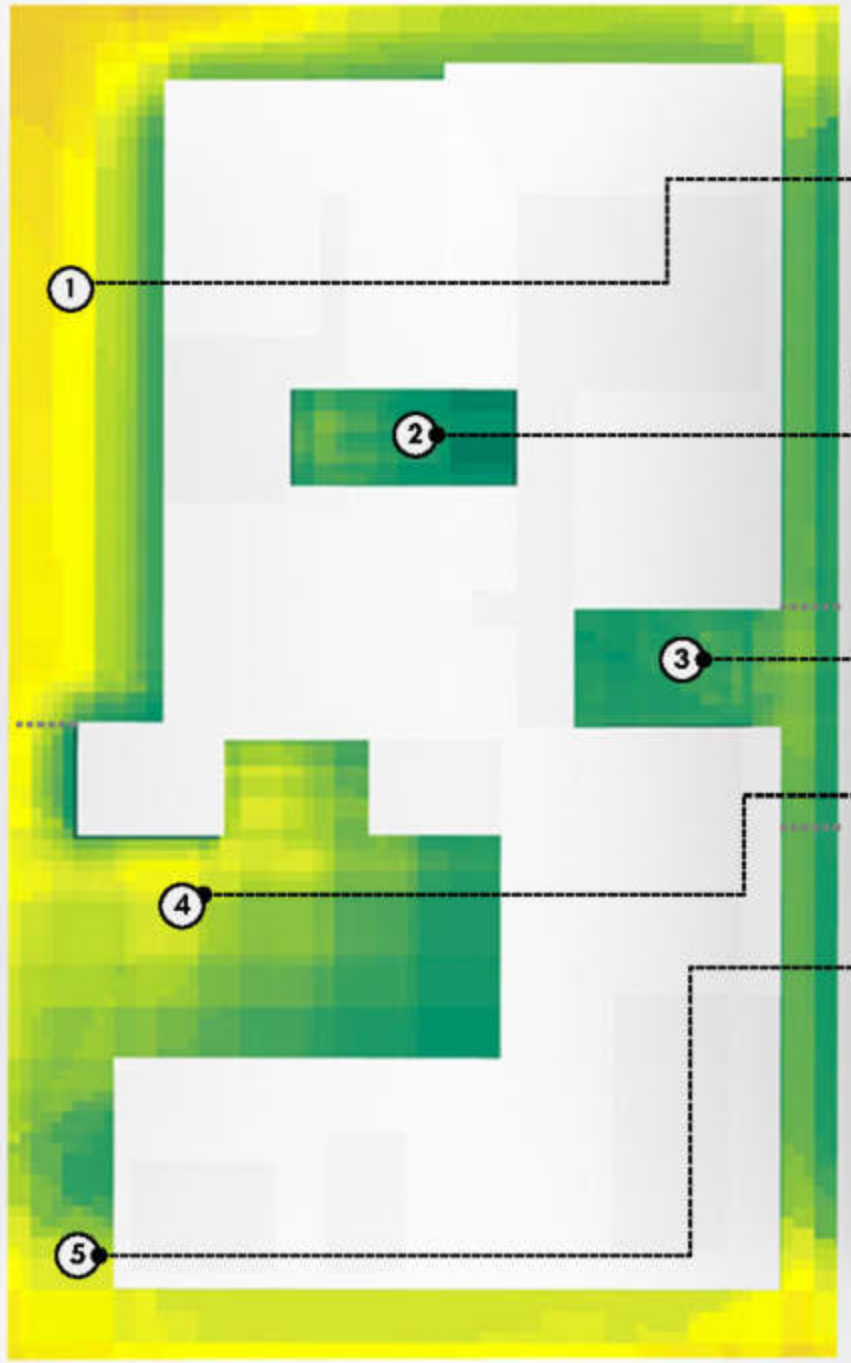
1000.00
905.00
810.00
715.00
620.00
525.00
430.00
335.00
240.00
145.00
50.00

Threshold for comfortable outdoor spaces

N

0 5m 10m

Solar Irradiation- Design Overlay



1. Parking
Parking area for cars.

W L

2. Court of transition
A green space intended for the survivors to have moments of respite while waiting for their session.

C M

3. Court of Joy
A green space for children, with seating and spillover spaces for gathering/ observing the kids at play.

C H

4. Court of Transformation
A large green space for the residents to get comfortable, reflect and interact.

W H

5 . Court of Transformation- Spillover
A spillover space from the multipurpose room, acting as a continuation of the main court

W H

Building Level

Daylight, Thermal/ Energy and Interior CFD

Building level climate analysis- thermal/energy, daylight and CFD impact on building plan

Lighting in counselling rooms largely adequate

Reception and waiting area receives a good amount of light from the adjacent Court of Transition

Kids Area receives optimum daylight through the Court of Transition and the East opening

Manager's Room receives optimum daylight

Kitchen and dining areas receive optimum light from adjacent open court

Multipurpose hall is overlit due to larger exposed area

Accommodation units towards East receive adequate daylight for the planned use.

Accommodation units towards south are overlit

Ground floor

DA 300 = 65.93 %

Daylight Autonomy (DA)

Daylight Autonomy at 300 lux

Overall percentage- 74.28 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction to maximize useful daylight and minimize glare, and the strategic location of courts ensures optimum daylight in areas that may fall under shaded areas due adjacent buildings.

- **Key points/ Observation:**

  The ground floor receives excellent daylight for more than 65% of the time. In most of the areas, even distribution of daylight is observed. Courts are effective in bringing in daylight. Lintel height has been optimized to bring in maximum daylight. The spaces on the east receive lesser daylight due to context shading.

Daylight Autonomy (DA) is a daylight availability metric that corresponds to the percentage of the occupied time when the target illuminance at a point in a space is met by daylight. DA helps to evaluate spaces for autonomy in daylight and helps in restricting use of electrical lighting in these spaces.

1. Reception and Info
2. Waiting area
3. Rest area for staff
4. Security booth
5. Manager's room
6. Counselling room
7. Legal aid room
8. Prayer room
9. Kids Area
10. Dining room
11. Utility
12. Kitchen
13. UA Unit-1
14. UA Unit-2
15. UA Unit-3
16. UA Unit-4
17. Multi-purpose hall

Legend

DA 300

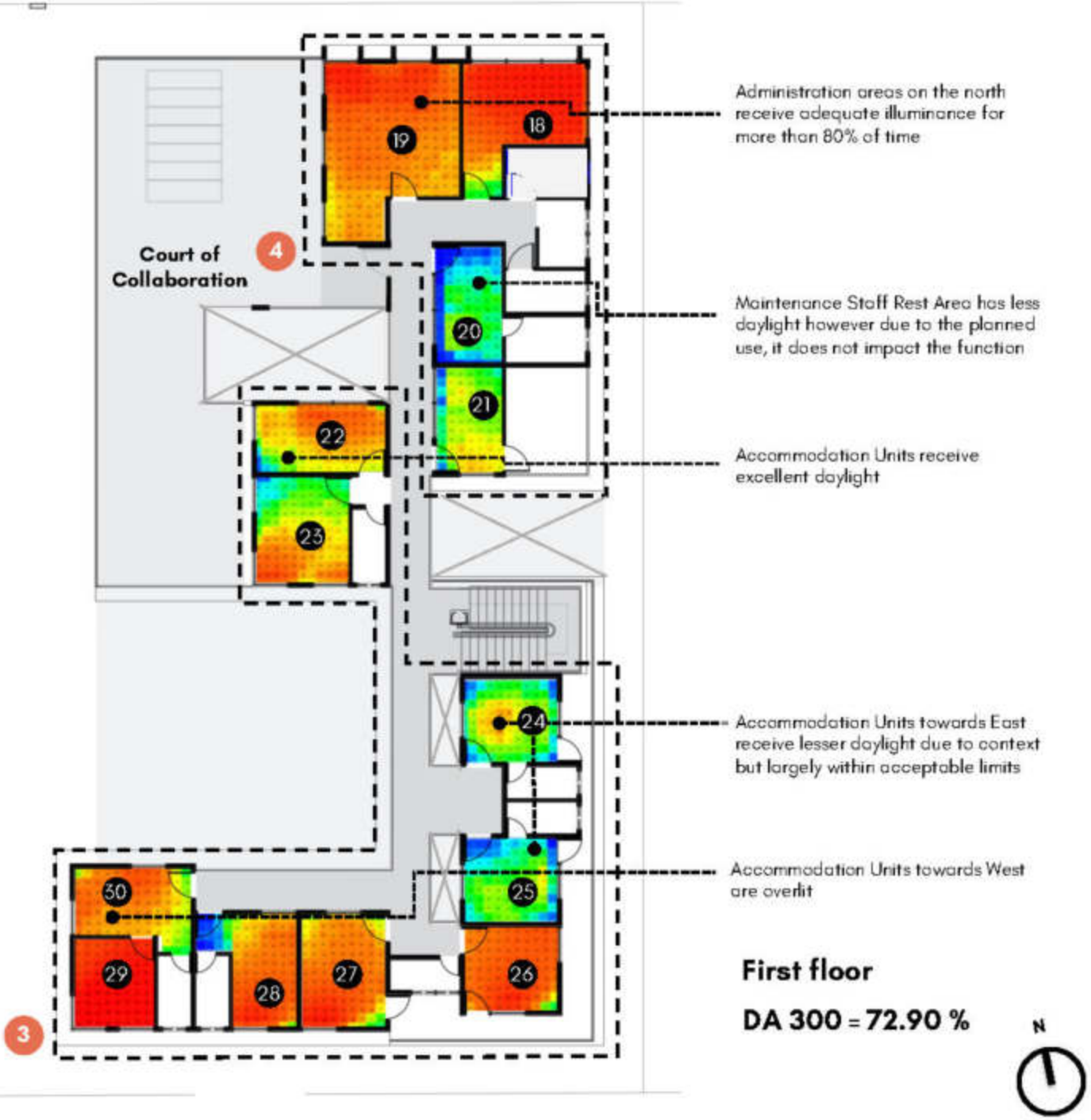
0 — 100%

1. Zone-1: Public Area
2. Zone-2: Private area (Accommodation supporting uses
3. Zone 3 - Private Area (Accommodation Zone)

N

0 — 5m — 10m

Daylight Autonomy (DA)



Daylight Autonomy at 300 lux

Overall percentage- 74.28 %

- **Consideration:**

  Orientation of the spaces and open courts ensures maximum daylight in the interiors and shading devices control unwanted glare and discomfort

- **Key points/ Observation:**

  The first floor receives excellent daylight for more than 70% of the time. All the regularly occupied spaces receive adequate daylight

18. Meeting room
19. Office staff room
20. Female maintenance staff rest room
21. Laundry room
22. Multi occupancy -1 Single room
23. Multi occupancy -1 Plus room
24. Single room - 1
25. Single room -2
26. Multi occupancy - 2 Single room
27. Multi occupancy -2 Plus room
28. Single room - 3
29. Family unit-1 Room 2
30. Family unit-2 Room 1

Legend

DA 300

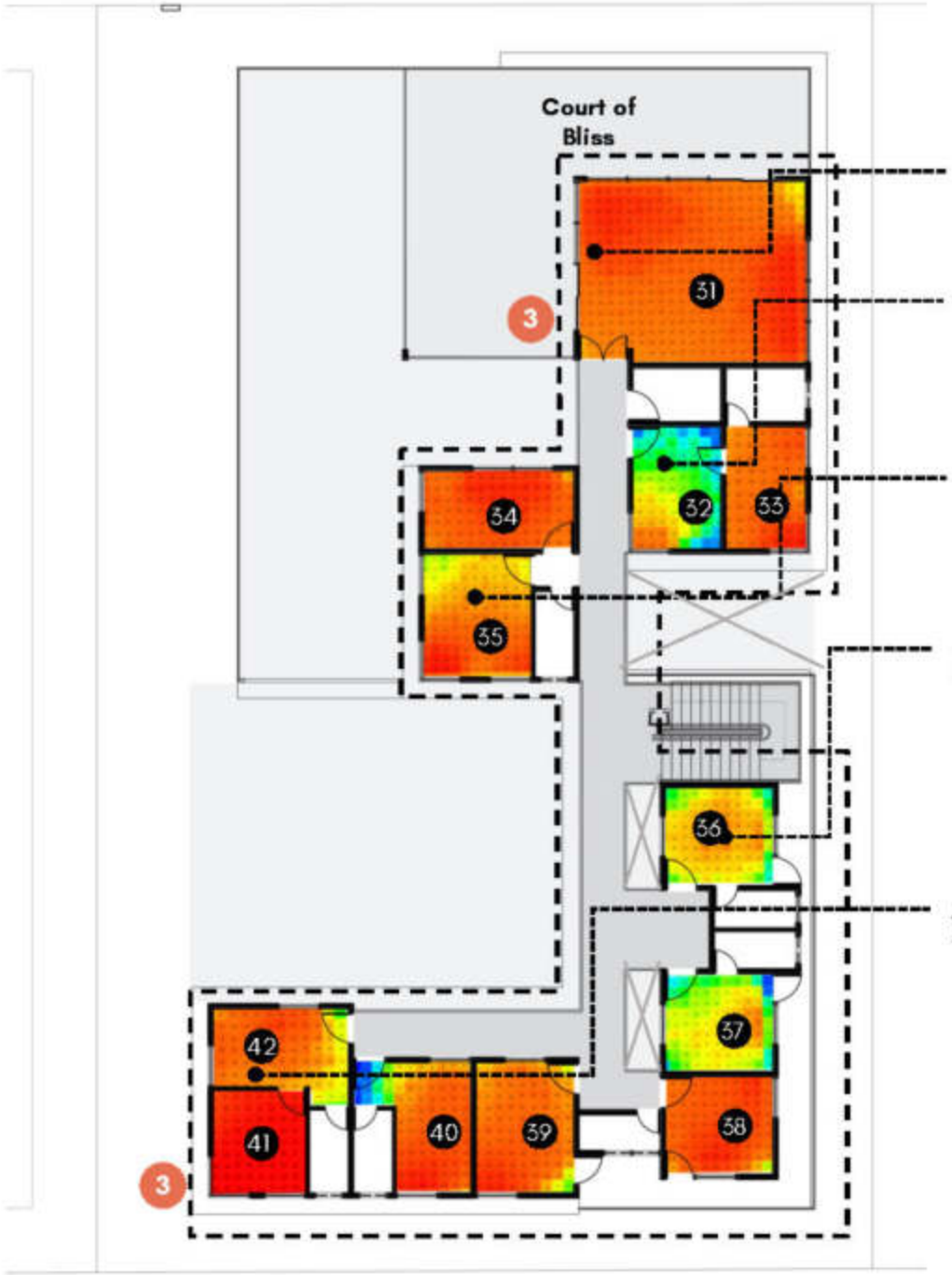
0 — 100%

3 Zone 3 - Private Area (Accommodation Zone)

4 Zone 4 - Private Area (Administration Zone)

0 — 5m — 10m

Daylight Autonomy (DA)



North facing multipurpose hall receive ample amount of daylight

Accommodation Units towards East receive average daylight, but openings towards corridors are effective in addressing the issue

Accommodation Units towards West receives excellent daylight

Accommodation Units towards East receives optimum daylight

Accommodation Units towards West receives excellent daylight

Second floor

DA 300 = 84.52 %

Daylight Autonomy at 300 lux

Overall percentage- 74.28 %

- **Consideration:**

  Orientation of the spaces and open courts ensures maximum daylight in the interiors and shading devices control unwanted glare and discomfort

- **Key points/ Observation:**

  The second floor receives excellent daylight for more than 80% of the time. Only 2 rooms are slightly compromised due to uneven distribution of the daylight.

31. 32. Multi purpose Hall
32. Family Unit 2 - Room 1
33. Family Unit 2 - Room 2
34. Multi occupancy 3 - Single room
35. Multi occupancy 3 - Plus room
36. Single room 4
37. Single room 5
38. Multi occupancy-4 Single room
39. Multi occupancy-4 Plus room
40. Single room - 6
41. Family unit-3 Room 1
42. Family unit-3 Room 2

Legend

DA 300

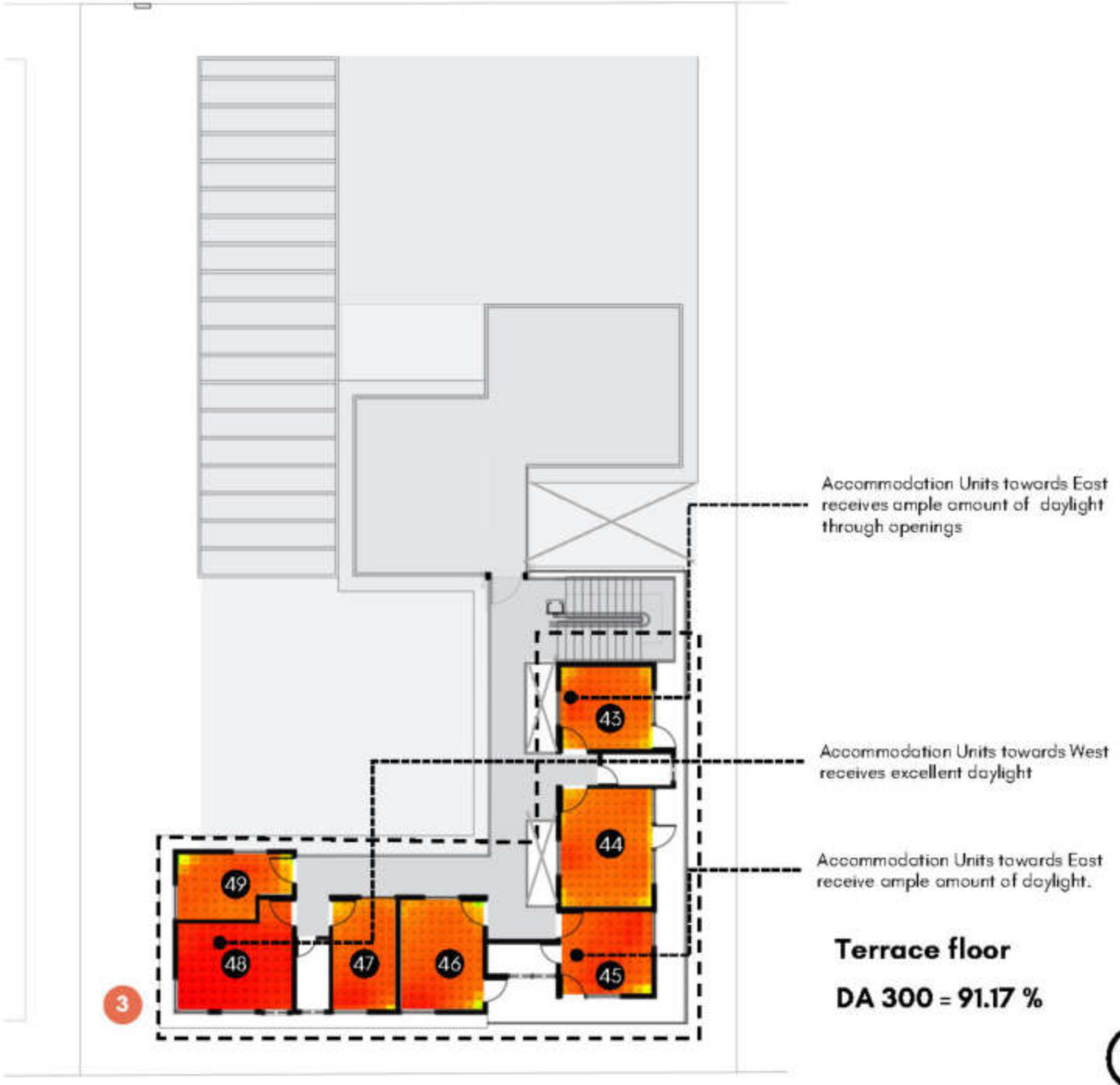
0 100%

3 Zone 3 - Private Area (Accommodation Zone)

N

0 5m 10m

Daylight Autonomy (DA)



Terrace floor

DA 300 = 91.17 %

Daylight Autonomy at 300 lux

Overall percentage- 74.28 %

- **Consideration:**

  Orientation of the spaces and open courts ensures maximum daylight in the interiors and shading devices control unwanted glare and discomfort

- **Key points/ Observation:**

  The third floor receives excellent daylight for more than 90% of the time. In all the rooms, daylight is evenly distributed.

43. 44. Multi occupancy-5 Single room
44. Multi occupancy-5 Plus room
45. Multi occupancy-6 Single room
46. Multi-occupancy-6 Plus room
47. Multi occupancy-7 Single room
48. Multi occupancy-7 Plus room
49. Laundry

Legend

DA 300

0 — 100%

3 Zone 3 - Private Area (Accommodation Zone)

0 — 5m — 10m

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

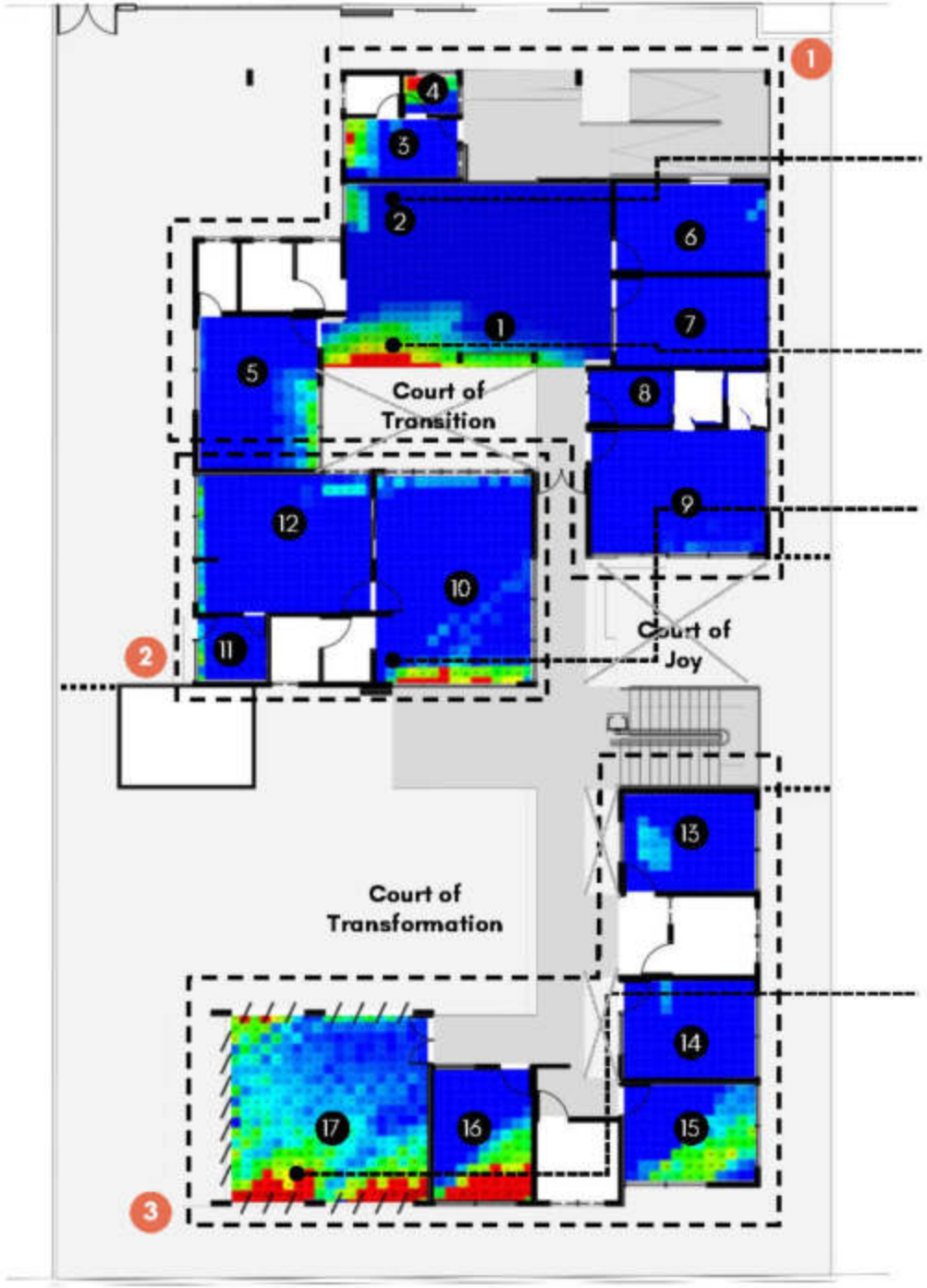
Overall percentage- 2.86 %

- **Consideration:**

  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  Most of the glare is observed in the Waiting area and Multi-purpose Hall. Flexible shading devices are used to reduce glare and balance daylight.



No glare observed in the rooms towards North

Minimal glare observed from the courtyard opening

Dining space receives minimal glare from South opening

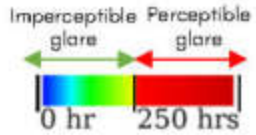
Openings towards south contribute towards increased glare which are greatly controlled by shading devices

Ground floor

ASE 1000 = 3.54 %

1. Reception and Info
2. Waiting area
3. Rest area for staff
4. Security booth
5. Manager's room
6. Counselling room
7. Legal aid room
8. Prayer room
9. Kids Area
10. Dining room
11. Utility
12. Kitchen
13. UA Unit-1
14. UA Unit-2
15. UA Unit-3
16. UA Unit-4
17. Multi-purpose hall

Legend



1. Zone-1: Public Area
2. Zone-2: Private area (Accommodation supporting uses)
3. Zone 3 - Private Area (Accommodation Zone)

First floor

ASE 1000 = 1.69 %

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

Overall percentage- 2.86 %

- **Consideration:**

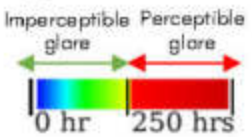
  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  Most of the areas have minimal glare and overall the entire floor performs well in terms of the indoor environment and there is no issue of visual discomfort. In a few cases, glare is observed from South-Western windows

18. Meeting room
19. Office staff room
20. Female maintenance staff rest room
21. Laundry room
22. Multi occupancy -1 Single room
23. Multi occupancy -1 Plus room
24. Single room - 1
25. Single room -2
26. Multi occupancy - 2 Single room
27. Multi occupancy -2 Plus room
28. Single room - 3
29. Family unit-1 Room 2
30. Family unit-2 Room 1

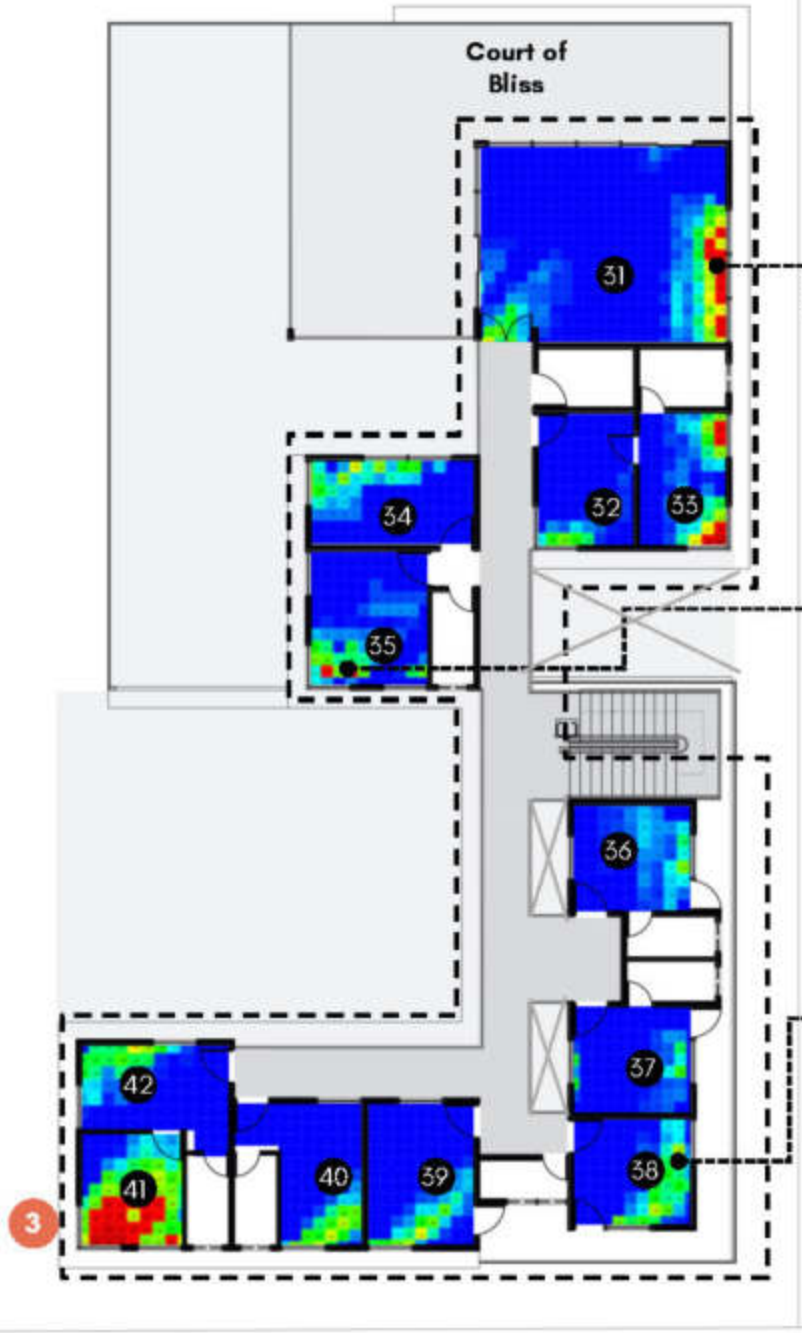
Legend



3 Zone 3 - Private Area (Accommodation Zone)

4 Zone 4 - Private Area (Administration)

Wind Direction: 270°



Minimal glare observed towards Eastern side

Reduced glare observed towards the South-Western opening

Reduced glare in rooms towards East due to mutual shading and façade screen

Second Floor

ASE 1000 = 2.37 %

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

Overall percentage- 2.86 %

- **Consideration:**

  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  Minimal/no glare is observed in most of the rooms. The screens in the façade are effective in reducing the glare from the Eastern side.

31. Multi purpose Hall
32. Family Unit 2 - Room 1
33. Family Unit 2 - Room 2
34. Multi occupancy 3 - Single room
35. Multi occupancy 3 - Plus room
36. Single room 4
37. Single room 5
38. Multi occupancy-4 Single room
39. Multi occupancy-4 Plus room
40. Single room - 6
41. Family unit-3 Room 1
42. Family unit-3 Room 2

Legend

Imperceptible glare — Perceptible glare

0 hr — 250 hrs

3 Zone 3 - Private Area (Accommodation Zone)

N

Wind Direction: 270°

0 — 5m — 10m

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

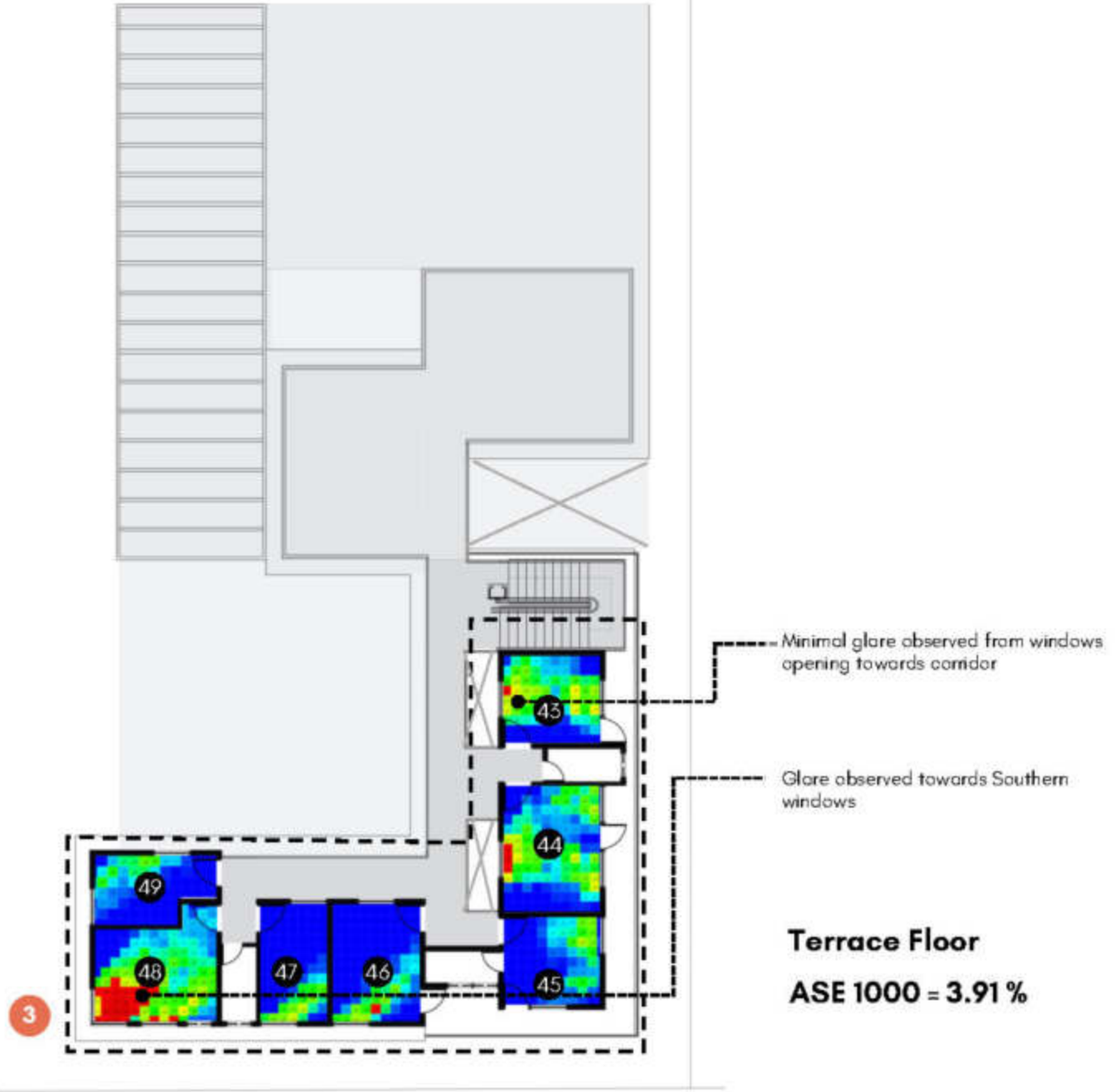
Overall percentage- 2.86 %

- **Consideration:**

  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  More glare is observed on Third floor due to lack of mutual shading on Third floor. However, screens are still effective in reducing the overall glare in the rooms.



Terrace Floor

ASE 1000 = 3.91 %

43. Multi occupancy-5 Single room
44. Multi occupancy-5 Plus room
45. Multi occupancy-6 Single room
46. Multi-occupancy-6 Plus room
47. Multi occupancy-7 Single room
48. Multi occupancy-7 Plus room
49. Laundry

Legend

Imperceptible glare | Perceptible glare

0 hr | 250 hrs

3 Zone 3 - Private Area (Accommodation Zone)

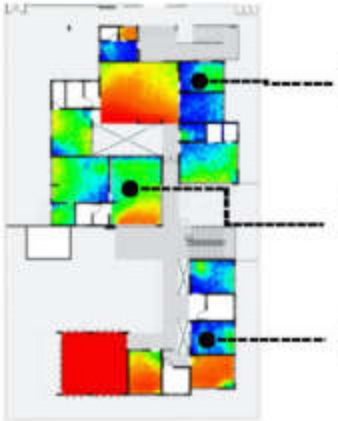
N

Wind Direction: 270°

0 | 5m | 10m

Daylight (DA) Comparison and Design Implications

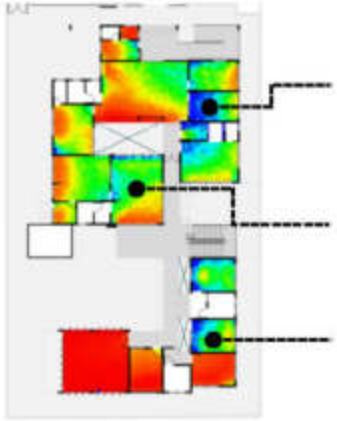
Ground Floor



Under lit counseling rooms

Adequate daylight in dining zone

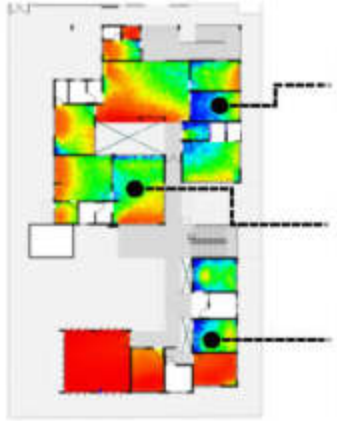
Insufficient daylight in rooms towards East



Improved daylighting in counseling rooms

Improved daylight distribution in Dining zone

With increased opening size, considerable improvement is observed in daylight

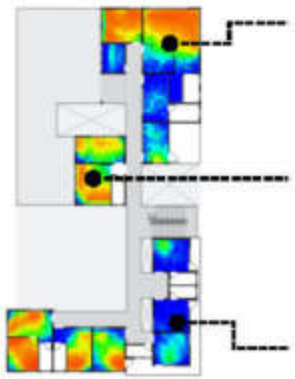


Improved daylighting in counseling rooms

Improved daylight distribution in Dining zone

With increased opening size, considerable improvement is observed in daylight

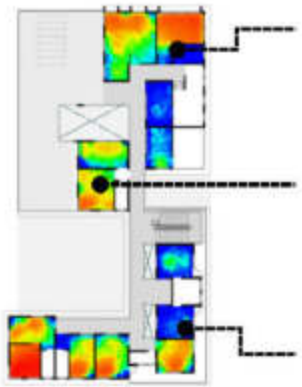
First Floor



Uneven daylight distribution observed in office area

Adequate daylight in rooms towards West side

Under-lit rooms towards East side



Improved daylighting in the Office area

Adequate daylight in rooms towards West side

Improved lighting observed in rooms towards East

Excellent daylight observed in Office staff area

Improved daylight towards West side

Considerable improvement seen in Eastern rooms

Legend

DA 300

0 100%

N

ITERATION - 1

Considerations

- Window Size- 1.5 m x 1.5 m
- No shading elements, dense façade screen towards East

Result

- Most spaces are under-lit, especially towards East.

ITERATION - 2

Considerations

- Window Size- 1.5 m x 1.7 m
- No shading elements, less dense façade screen towards East, façade elements incorporated

Result

- Most spaces are well-lit due to increase in lintel height of the windows, compromised daylight observed towards Eastern side

ITERATION - 3

Considerations

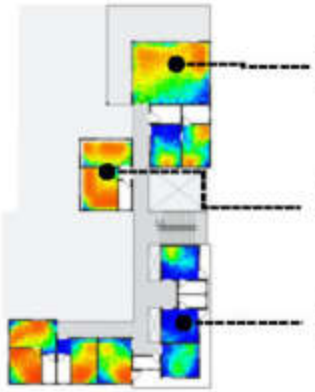
- Window Size- 1.5 m x 1.7 m
- Shading elements added to reduce glare, optimized façade screen towards East, façade elements incorporated, increased ventilators size (Itr-2 : Total opening- 0.45 m, Itr-3 : Total opening- 0.5 m)

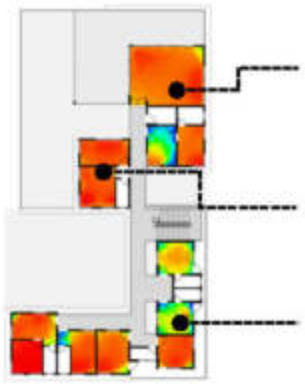
Result

- All the regularly occupied spaces are well-lit with evenly distributed daylight

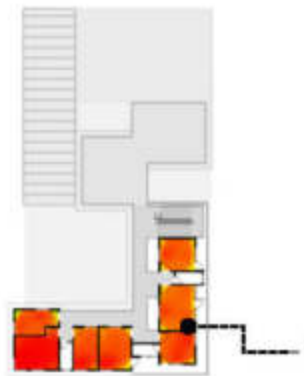
Daylight (DA) Comparison and Design Implication

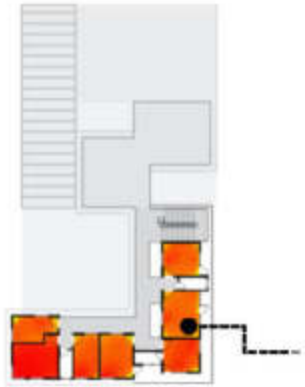
Second Floor





Third Floor





Legend

DA 300

0 100%

N

ITERATION - 1

Considerations
- Window Size- 1.5 m x 1.5 m
- No shading elements, dense façade screen towards East

Result
- Most spaces are under-lit, especially towards East. Areas towards North have adequate, but unevenly distributed daylight.

ITERATION - 2

Considerations
- Window Size- 1.5 m x 1.7 m
- No shading elements, less dense façade screen towards East, façade elements incorporated

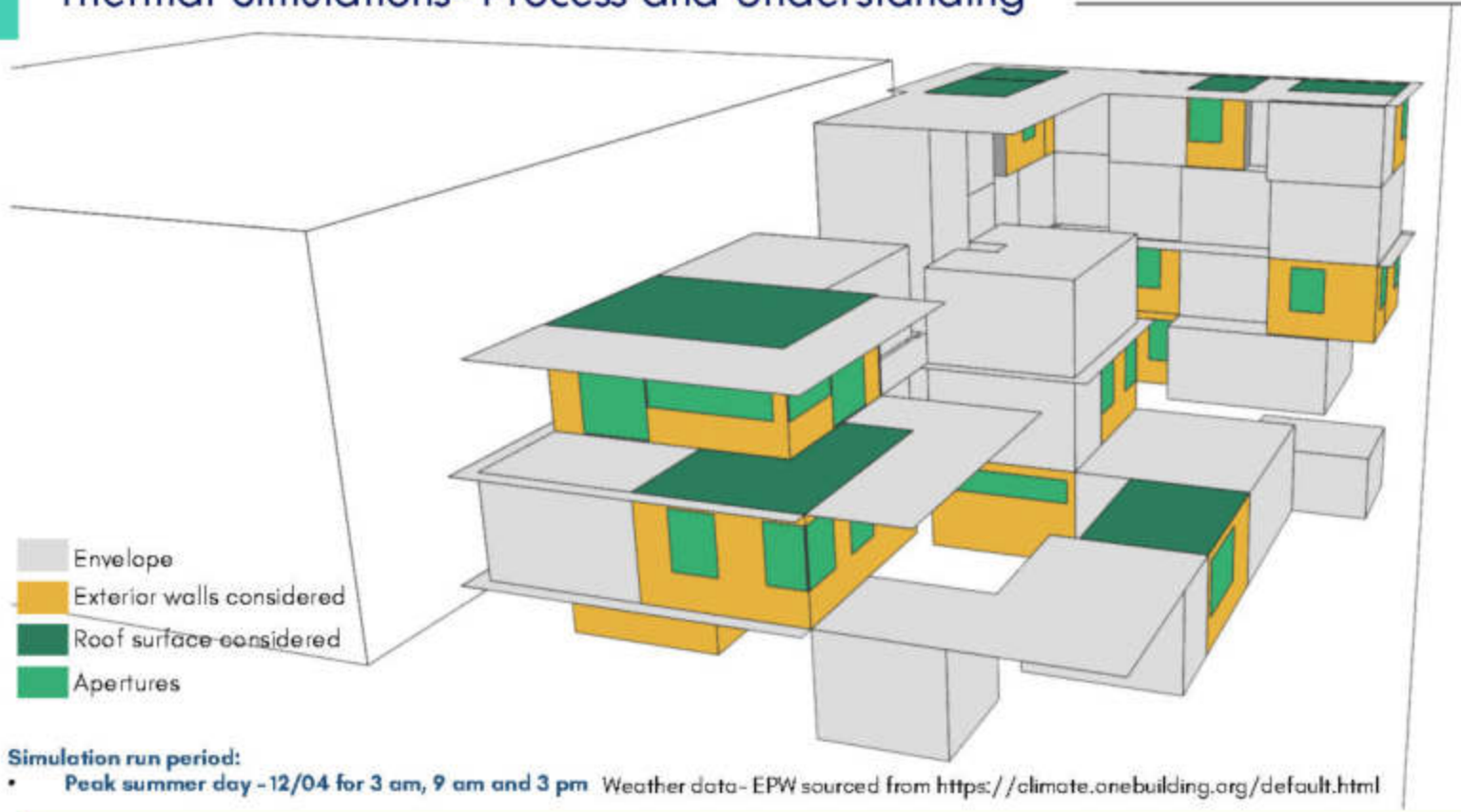
Result
- Most spaces are well-lit due to increase in opening size of the windows. Spaces towards North and East are also well lit and have evenly distributed daylight

ITERATION - 3

Considerations
- Window Size- 1.5 m x 1.7 m
- Shading elements added to reduce glare, optimized façade screen towards East, façade elements incorporated, increased ventilators size (Itr-2 : Total opening- 0.45 m, Itr-3 : Total opening- 0.5 m)

Result
- All spaces are extremely well-lit with evenly distributed daylight

Thermal Simulations- Process and Understanding



Simulation run period:

- **Peak summer day - 12/04 for 3 am, 9 am and 3 pm** Weather data- EPW sourced from https://climate.onebuilding.org/default.html

1	**BASE CASE**	**Only Common Specs**	As per defined parameters and internal loads, without shading devices
2	**SHADING**	**Common Spec + Spec B**	The defined parameters and internal loads, with 0.3 m shading device on selected windows, and 0.5 m slab extension
3	**SHADING + FAN**	**Common Spec + Spec C**	All above specification, with considerations for impact of fan within the internal spaces
4	**SHADING + FAN + SPECIFICATIONS**	**Common Spec + Spec D**	All above consideration, with improved material specifications to reduce thermal gain

Common Spec

Defined parameters-

- WWR- As per design
- Window Operation: Open, no A/C

Internal loads

- Occupancy as per plans
- Lighting loads:
  Dwelling units - 6 W/m²
  Office and common areas - 7.5 W/m²
- Equipment loads:
  Dwelling units - 2 W/m²
  Office- 7 W/m²
  Common areas - 4W/m²

Envelope Specifications-

Base Case

- Wall: 2.4W/m2K
- Roof: 2.5W/m2K
- Window: 5 W/m²K
- SHGC: 0.65

Specs: concrete blocks, 200mm RCC slab and single pane clear glass 6mm

Spec- B

Shading parameter-

- Overhead shading- 0.3 m sunshade and 0.5 m slab extension

Spec- C

Internal Specifications

- Fans inside the rooms

Spec- D

Improved specifications

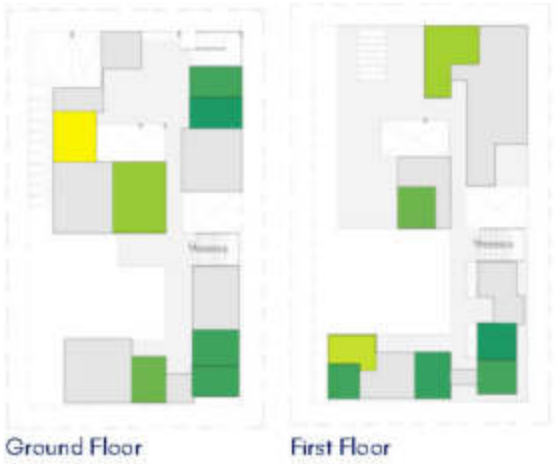
- Walls: 1 w/m2K AAC blocks 200mm
- Roof :1.5 w/m2K - metal decking / 125mm RCC + 50mm insulation
- Window U value: 5 W/m²K

Operative Temperature Comparison

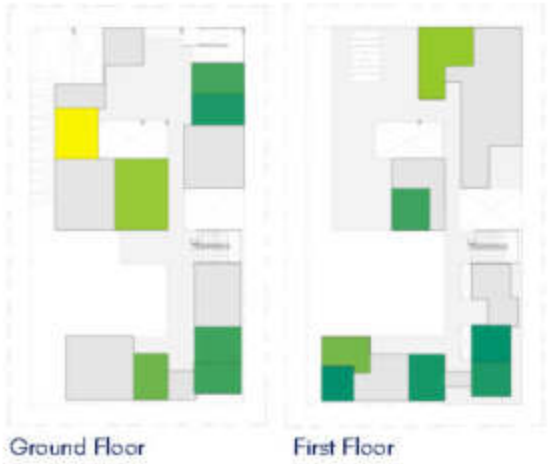
Simulation run period: 9 AM

The building morphology is such that all the spaces are oriented facing North and South to limit heat gains. A few spaces towards West and North side like Manager's Room and Multipurpose Hall on Second Floor have higher operative temperatures due to exposed roof. This has been mitigated with fans and optimized envelope specification in the proposed case

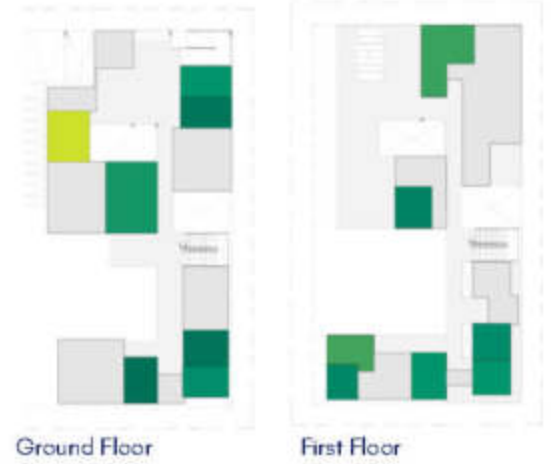
BASE CASE



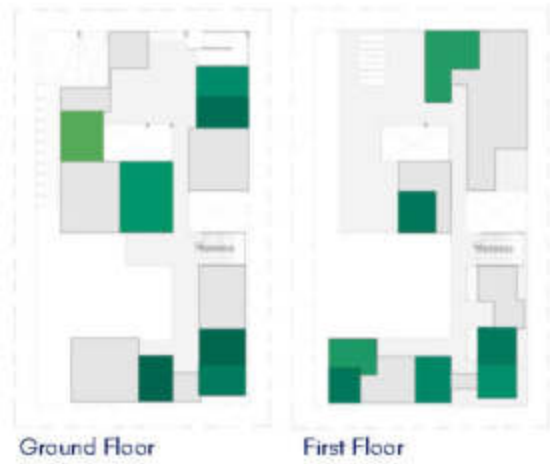
SHADING



SHADING + FAN



WITH OPTIMAL SPECS



Operative Temperature Comparison

Simulation run period: 3 PM

Spaces with the exposed roof (Multipurpose Hall on the Second Floor) and towards the South (accommodation rooms) experience excessive heat gains at 3 PM when the outdoor DBT peaks ~32°C. Shading devices (screens, sunshades) , fans and optimized envelope specifications have been proposed to reduce operative temperatures and improve indoor thermal comfort. In the proposed case, indoor operative temperatures below outdoor DBT have been achieved.

BASE CASE

SHADING

SHADING + FAN

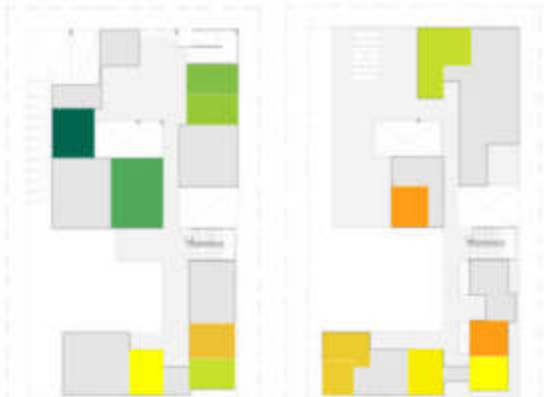
WITH OPTIMAL SPECS

Operative Temperature Comparison

Simulation run period: 3 AM

Outdoor temperatures at night time are much lower ~29°C and there is no solar gains during this time, therefore the internal temperatures are comfortable even in base case. Lower floors are much hotter since there is no exposed surface to lose heat. However, with improved specifications, lower operative temperatures are achieved.

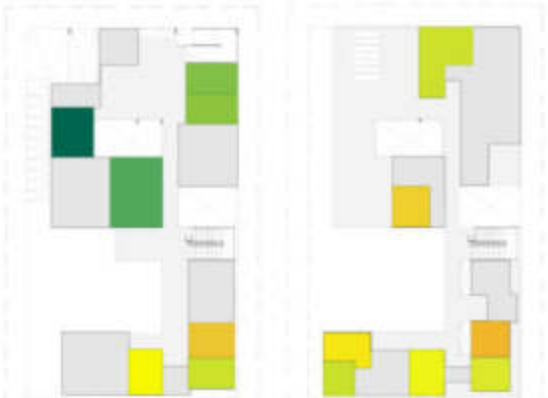
BASE CASE



Ground Floor | First Floor

Second Floor | Third Floor

SHADING



Ground Floor | First Floor

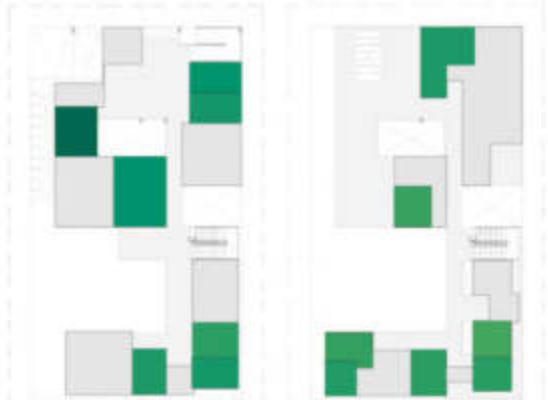
Second Floor | Third Floor

SHADING + FAN

Ground Floor | First Floor

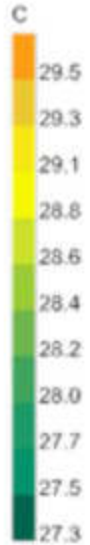
Second Floor | Third Floor

WITH OPTIMAL SPECS



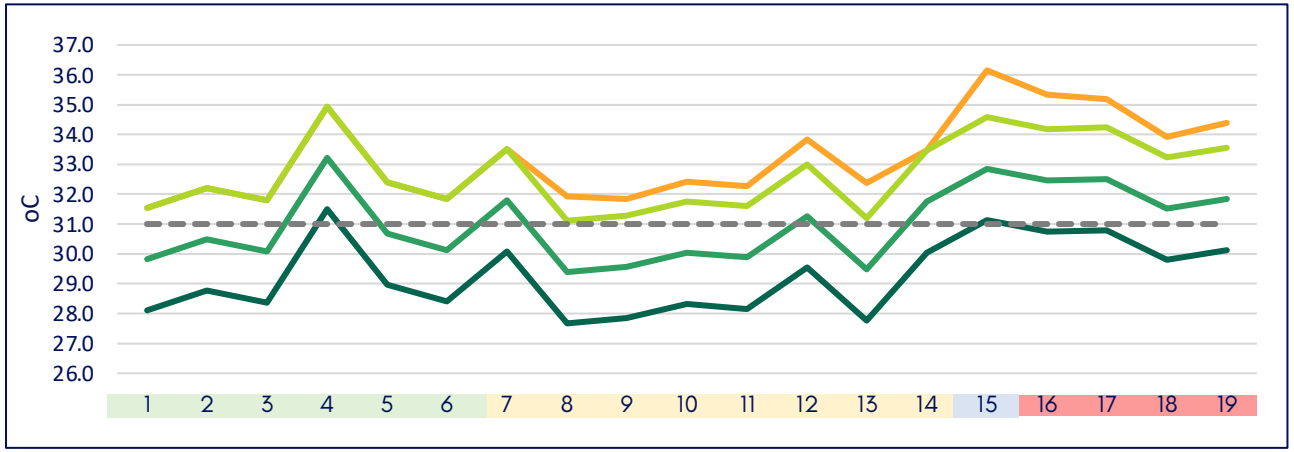
Ground Floor | First Floor

Second Floor | Third Floor

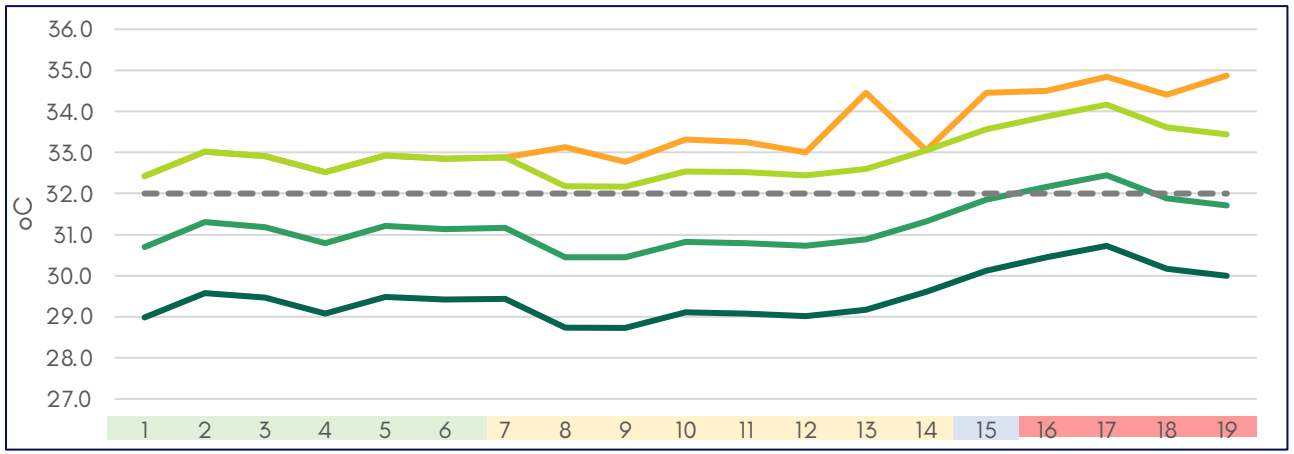


Operative Temperature Comparison

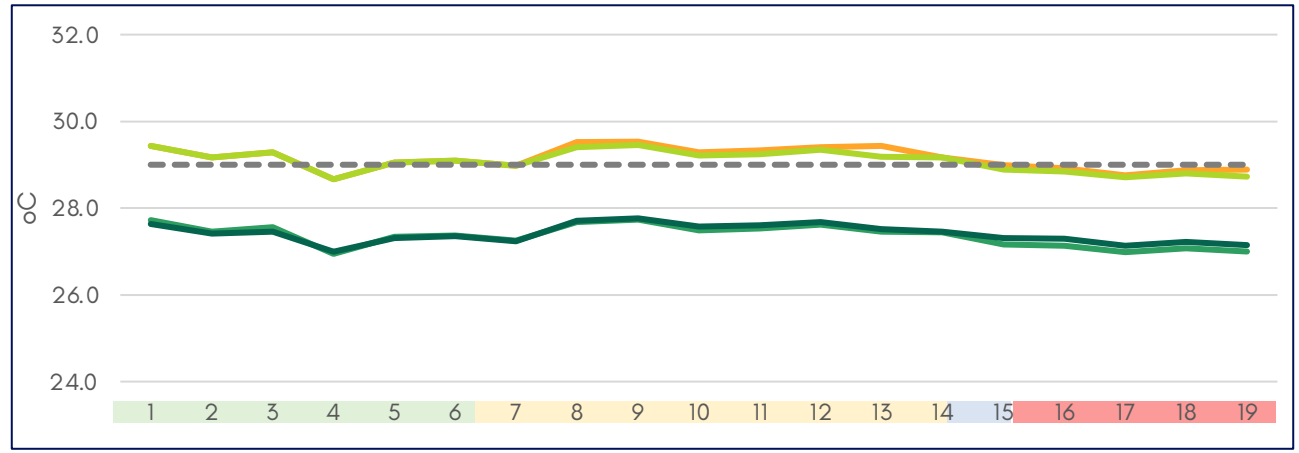
Operative Temperature 9 AM



Operative Temperature 3 PM



Operative Temperature 3 AM



- **Consideration:**

  The indoor operative temperatures for all cases are compared and analyzed for time periods - 9 AM, 3 PM and 3 AM. Impact of shading devices, fans and improved material specification with optimum U-value are analyzed in detail to improve indoor temperature.

- **Key points/ Observation:**

  Significant improvement can be seen in internal operative temperature by adding fans and optimum shading devices. With improved envelope specs, the indoor operative temperatures are lesser than outdoor DBT, hence indoor comfort is achieved in proposed case (shading+ fan + optimized specifications)

Ground Floor	1.	UA Unit-2
	2.	UA Unit-3
	3.	UA Unit-4
	4.	Manager's Room
	5.	Legal Aid Room
	6.	Counseling Room
	7.	Dining Room
	8.	Multi occupancy Unit-1 Plus Room
First Floor	9.	Single Room-2
	10.	Multi occupancy Unit-2 Single Room
	11.	Multi occupancy Unit-2 Plus Room
	12.	Family Unit-1 Room-1
	13.	Family Unit-1 Room-2
Second Floor	14.	Office Staff Room
	15.	Multipurpose Hall
Third Floor	16.	Multi occupancy Unit-5 Plus Room
	17.	Multi occupancy Unit-6 Single Room
	18.	Multi occupancy Unit-7 Plus Room
	19.	Multi occupancy Unit-7 Single Room

- Base Case
- Base Case with shading
- Shading + Fan
- Optimal specs for walls and roof
- Outdoor DBT

Base Case 9 AM

North-East

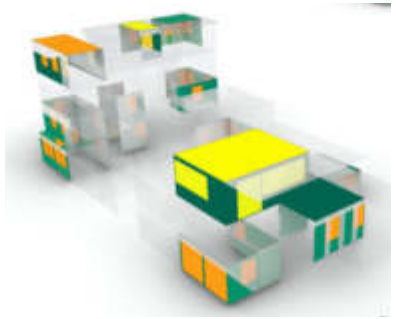
South-West

Proposed 9 AM

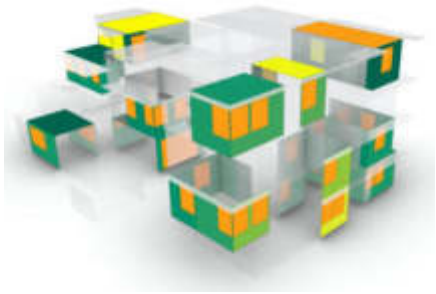
North-East

South-West

Base Case 3 PM

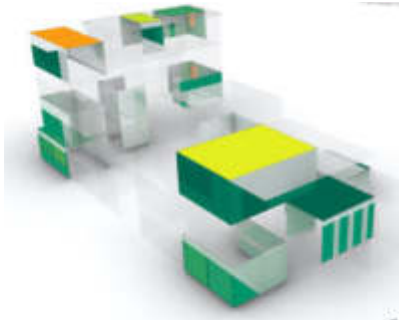


North-East



South-West

Proposed 3 PM

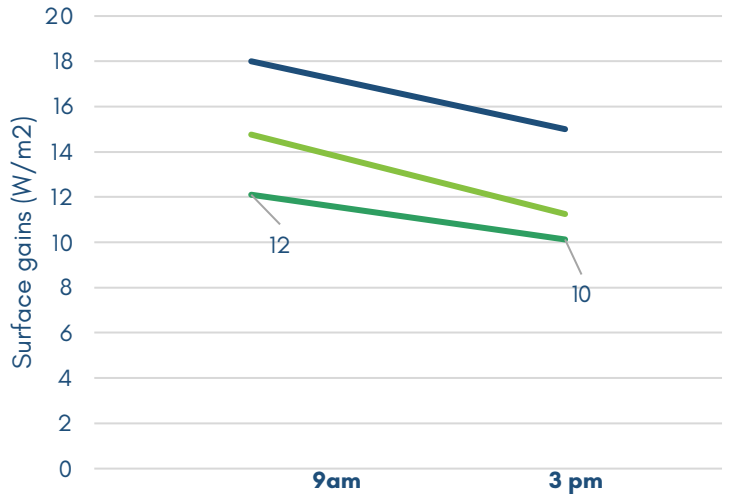


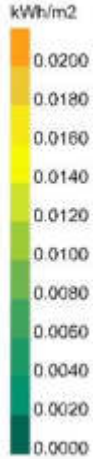
North-East

South-West

Peak Envelope Gains

Comparison -peak envelope gains





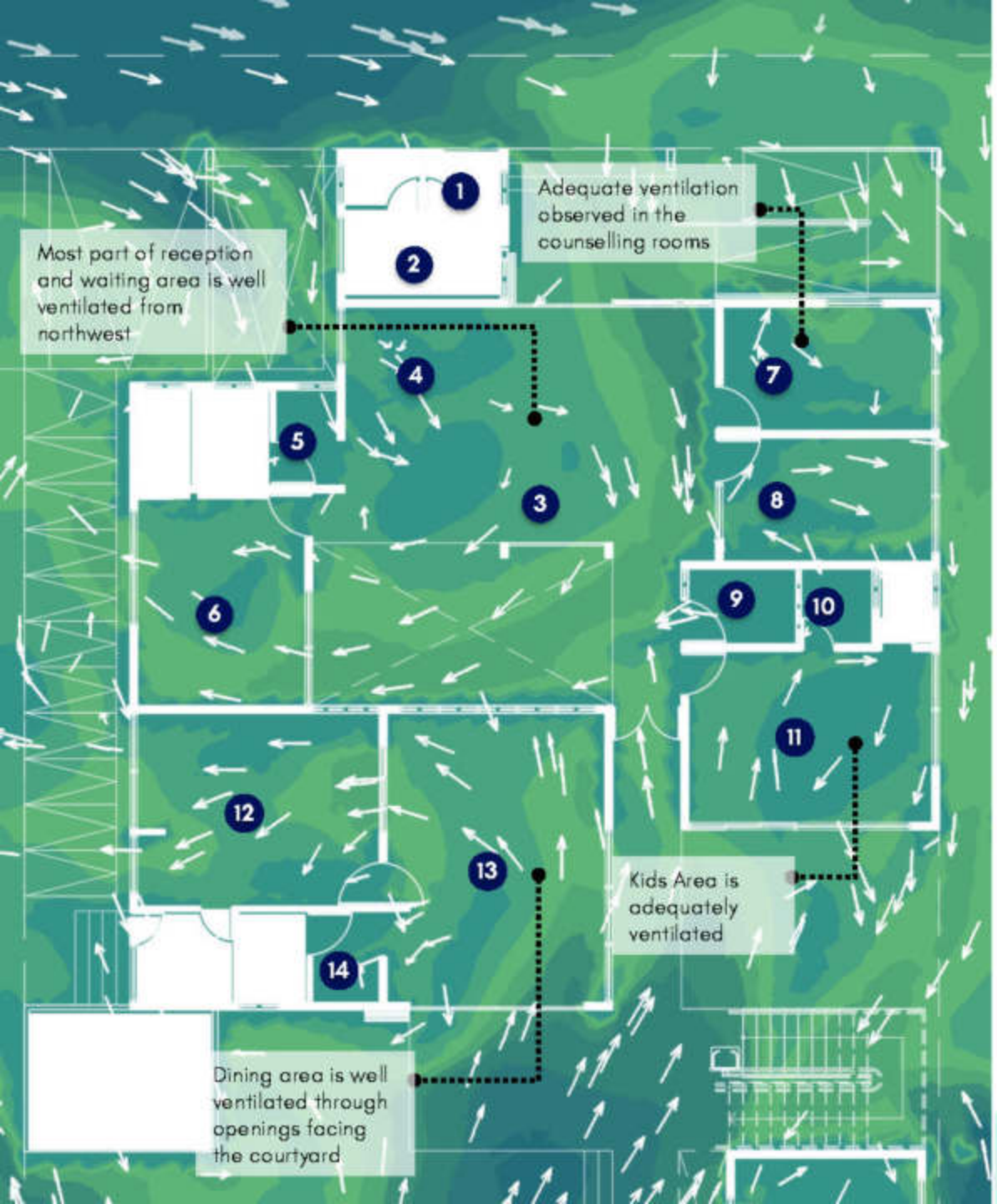
- **Key points/ Observation:**

  Windows contribute to the highest direct heat gains followed by roof and walls.
  Surface heat gains can be reduced significantly through proposed shading along with improved envelope specifications with lower U values

Base Case

Base Case with shading

With shading + improved envelope specs



Interior CFD Analysis

Zone - 1, 2 | Ground Floor |Results at 2.1m ht. from the ground

- **Considerations:**
  The primary wind flow is parallel (W-E) to the built mass and thus openings and courtyards are utilized to channel the primary wind streams into the site and subsequently into the interior areas

- **Key points/ Observation:**
  Predominant air streams from the West get deflected through built mass into the site and landscaped courts. The site receives wind flow from the northern end as well and this helps in ventilating the office spaces. Crossflow is observed in all the regularly occupied spaces.

- **Implication on Masterplan:**
  Most of the rooms are well-ventilated, and overall air flow distribution can be improved considerably by support of fans or other mechanical aids.

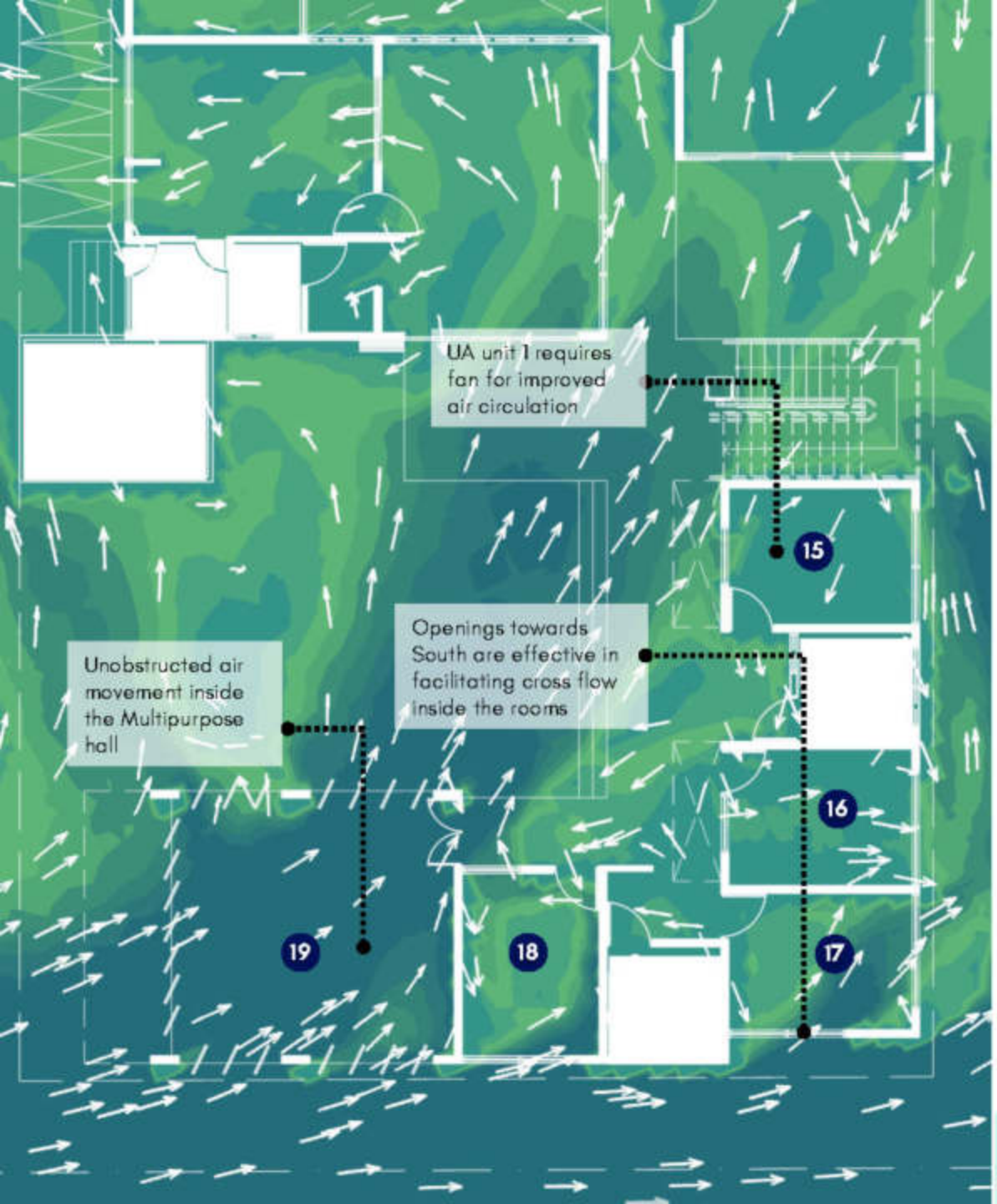
Legend
Air velocity (m/s)

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

1. Security Room
2. Staff Rest Area
3. Reception
4. Waiting Lounge
5. Utility Area
6. Manager's Room
7. Counseling Room
8. Legal Aid Room
9. Prayer Room
10. Brest Feeding Room
11. Kids Area
12. Kitchen
13. Dining Room
14. Hand Wash and Disposal



Interior CFD Analysis

Zone - 3| Ground Floor |Results at 2.1m ht. from the ground

- **Key points/ Observation:**

  I. Most of the areas receive excellent airflow through openings on the West and South.

  II. Due to openings located on the Eastern side (leeward side), few rooms like UA unit 1 & 2 are not adequately ventilated and fans will be required for improved ventilation

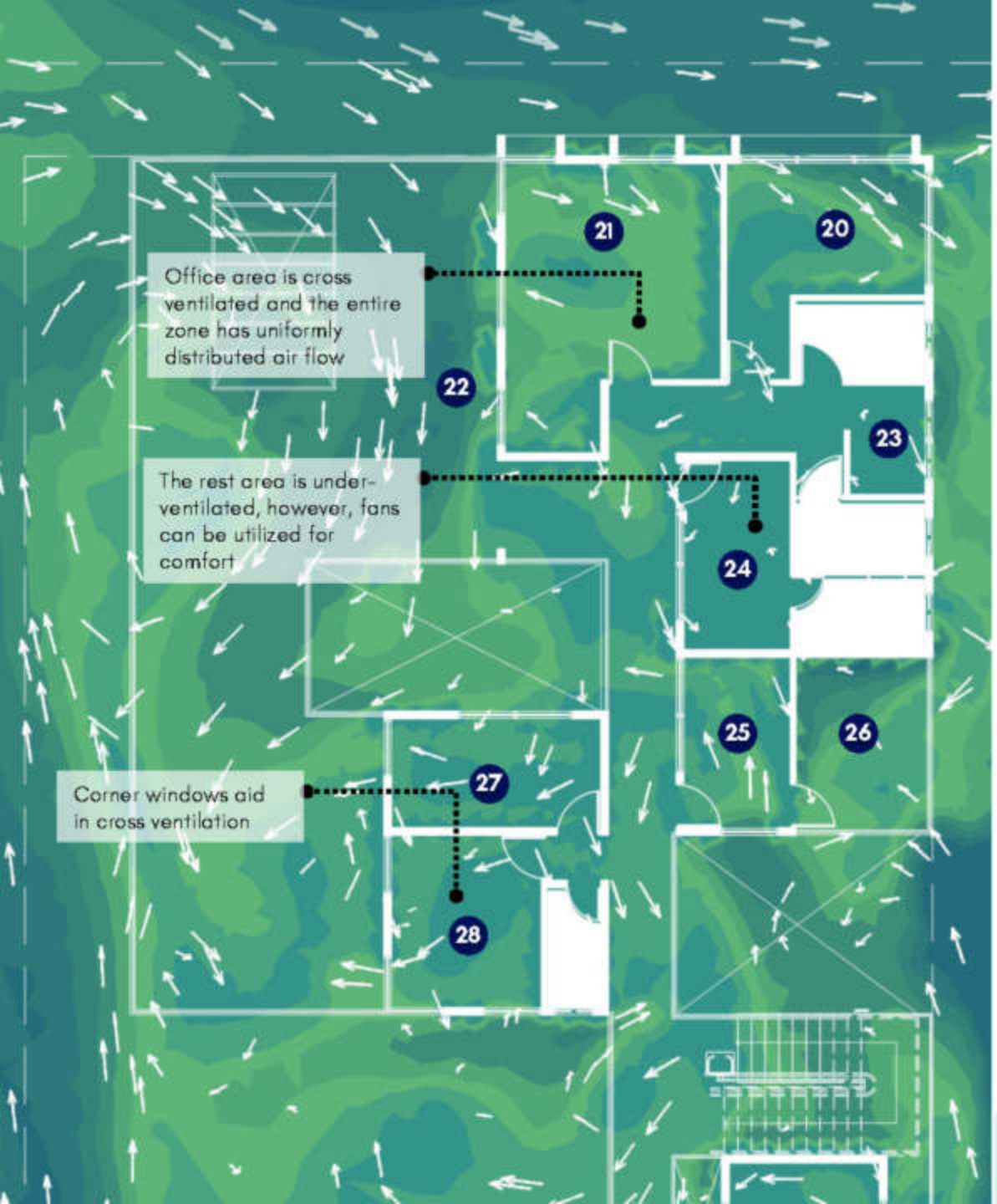
Legend
Air velocity (m/s)

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

15 UA Unit-1
16 UA Unit-2
17 UA Unit-3
18 UA Unit-4
19 Multi-purpose Hall



Interior CFD Analysis

Zone - 3, 4| First Floor |Results at 5.3 m ht. from the ground

- **Considerations:**
  Building mass is kept towards East to introduce terraces towards West side. This allows more open area towards the West to channel the airflow from the Western side

- **Key points/ Observation:**
  I. Excellent wind flow observed in most of the areas including Office space and Meeting room

  II. Maintenance staff area lacks good ventilation, however given the use, it does not impact the overall performance

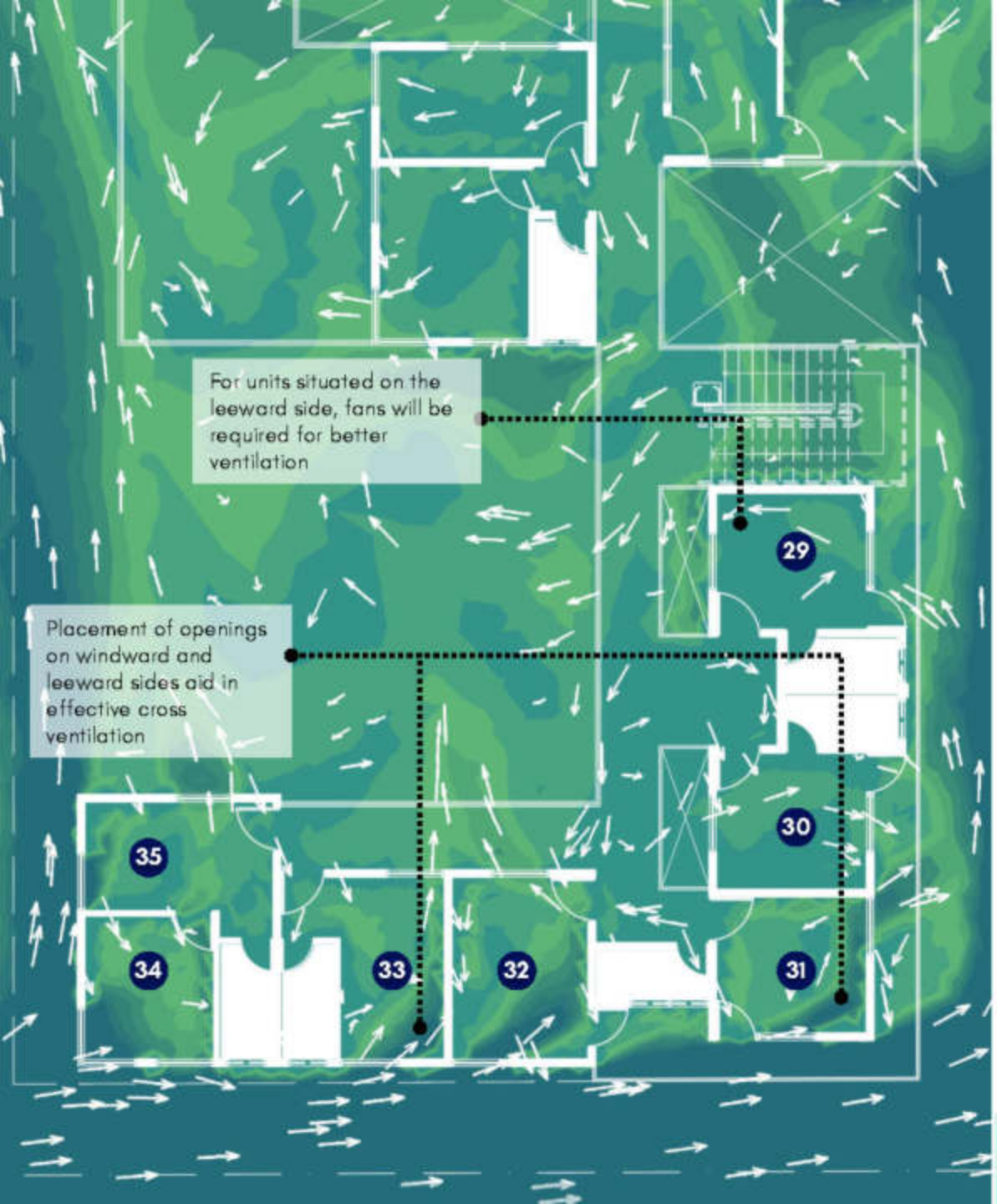
Legend
Air velocity (m/s)

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

20 Meeting Room
21 Office staff Room
22 Court of Collaboration (outdoor)
23 Utility
24 Female Maintenance staff rest room
25 Laundry Room
26 Clothes drying area
27 Multi occupancy -1 Single Room
28 Multi occupancy -1 Plus Room



Interior CFD Analysis

Zone - 3| First Floor |Results at 5.3 m ht. from the ground

- **Key points/ Observation:**

  I. Rooms with openings towards the Western and Southern sides are well ventilated through wind channels entering into the rooms from the South

  II. The rooms towards the East benefit from windows towards the corridor which are effective in bringing in the wind flow inside the rooms.

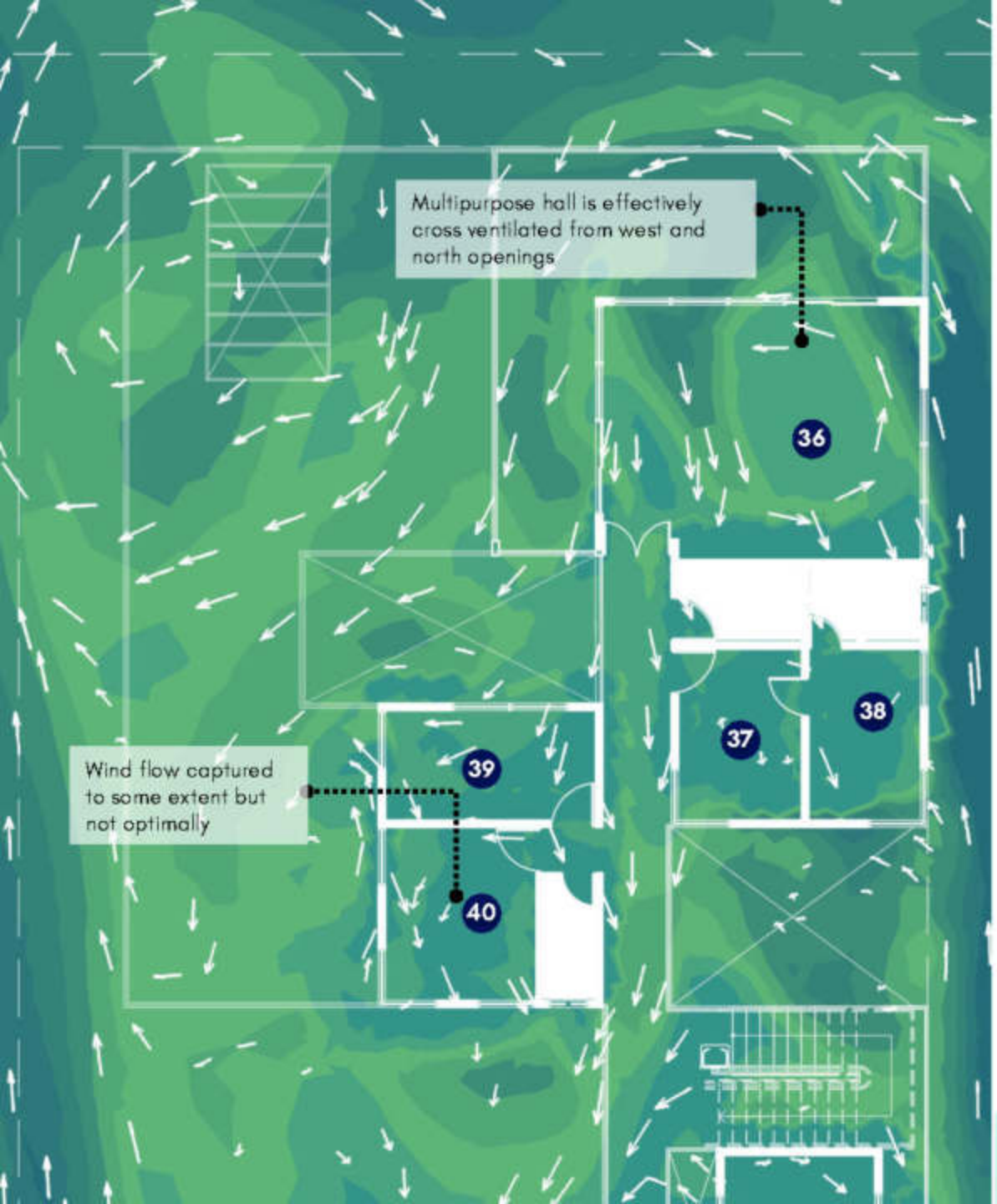
Legend
Air velocity (m/s)

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

29 Single Room -1
30 Single Room -2
31 Multi occupancy -2 Single Room
32 Multi occupancy -2 Plus Room
33 Single Room -3
34 Family unit -1 Room -2
35 Family unit -1 Room -1



Interior CFD Analysis

Zone - 3| Second Floor |Results at 8.5m ht. from the ground

- **Key points/ Observation:**

  I. Rooms with openings towards the Western and Southern sides are well ventilated through wind channels entering into the rooms from the South despite parallel wind flow

  II. The rooms towards the East benefit from windows towards the corridor which are effective in bringing in the wind inside the rooms.

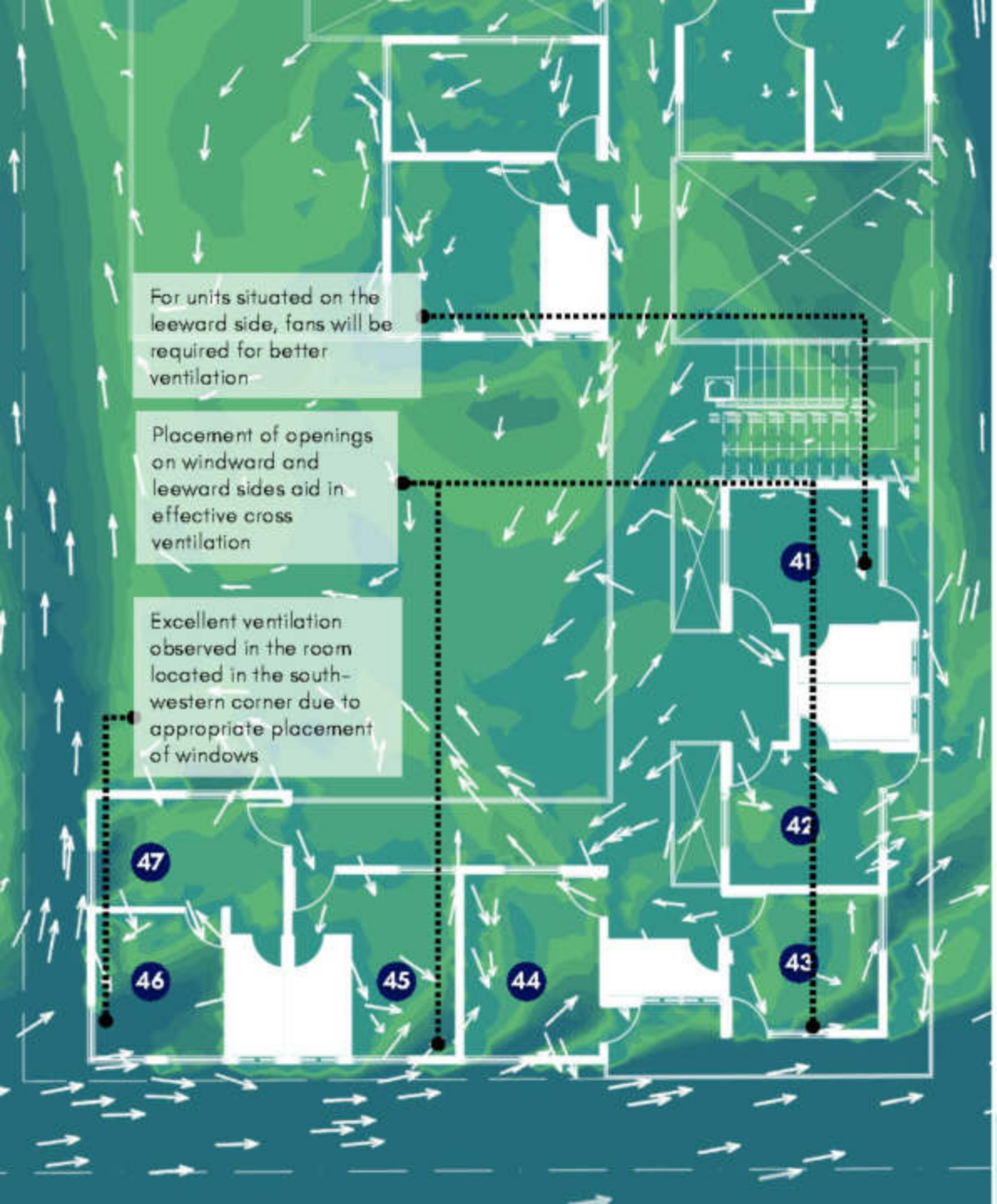
Legend
Air velocity (m/s)

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

36 Multi Purpose Hall
37 Family Unit -2 Room -1
38 Family Unit -2 Room -2
39 Multi occupancy -3 Single Room
40 Multi occupancy -3 Plus Room



Interior CFD Analysis

Zone - 3| Second Floor |Results at 8.5m ht. from the ground

- **Key points/ Observation:**

  I. Second floor experiences a similar wind flow pattern as the First floor, with increased wind speed. The openings towards the South are effective in bringing in the wind flow inside the rooms.

  II. The room with openings in the East-West direction are not adequately ventilated and requires fans or other mechanical aids to improve the ventilation.

Legend
Air velocity (m/s)

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

41 Single Room -4
42 Single Room -5
43 Multi occupancy -4 Single Room
44 Multi occupancy -4 Plus Room
45 Single Room -6
46 Family unit -3 Room -2
47 Family unit -3 Room -1

Interior CFD Analysis

Zone - 3| Third Floor |Results at 11.6m ht. from the ground

- **Key points/ Observation:**

  I. Excellent airflow observed in the rooms on the West and South. The openings are very effective in brining in the wind which can be further supported by fans to improve the overall indoor environment.

  II. The units on the east are not adequately ventilated and requires fans or other mechanical aids to improve the ventilation.

  III. Windows towards the corridor are effective in improving the airflow inside the rooms.

Legend
Air velocity (m/s)

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

48 Multi occupancy -5 Single Room
49 Multi occupancy -5 Plus Room
50 Multi occupancy -6 Single Room
51 Multi occupancy -6 Plus Room
52 Multi occupancy -7 Single Room
53 Multi occupancy -7 Plus Room
54 Laundry

06

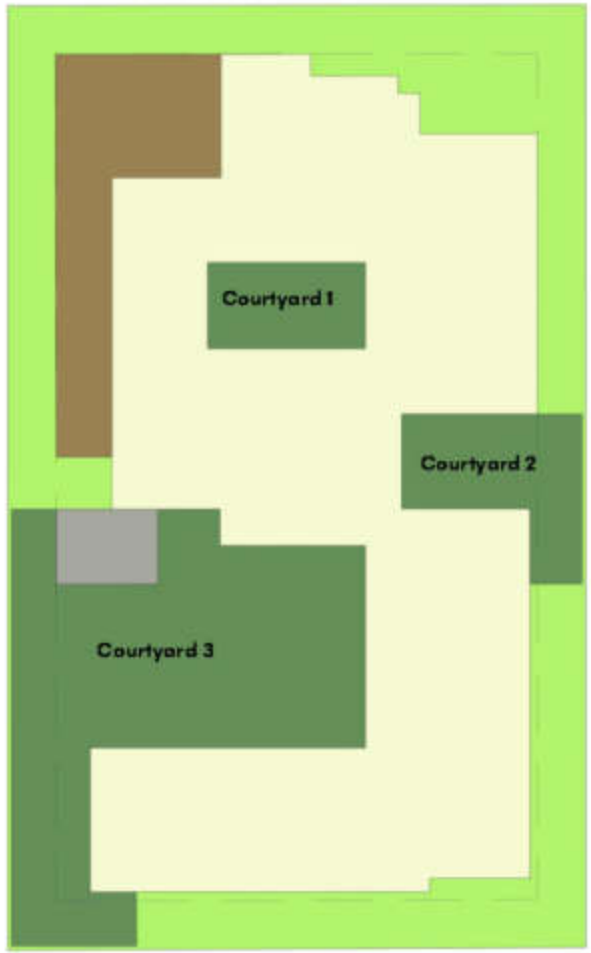
Appendix

Area Calculations | Climate Analysis Data reference Iteration-1 | Iteration-2

Area Calculations

Detailed area statement for the programs and spaces

Area Calculations



TOTAL SITE AREA	929.03 sq. m	
Function	Area (sq. m.)	Percentage
Plinth Area	422.33	45.46 %
Total open space (inclusive of all open area)	506.7	54.54 %
1. Courtyards Open Space	211.77	22.79 %
2. Parking Area	61.43	6.61 %
3. Rest open	233.5	25.13 %

GROUND FLOOR - PUBLIC FACILITIES	
Reception and Waiting	48.34
Security Room	2.05
Security Toilet	2.05
Rest area for Staff	6.56
Legal Aid	12.46
Counselling Room	12.46
Prayer Room	4.02
Manager's office	17.16
Manager's washroom	2.63
LIA Toilet	5.46
Utility	2.98
TOTAL	**113.97**

GROUND FLOOR - SUPPORTING FACILITIES	
Kids Area	20.02
Kid's Washroom	2
Breast Feeding Room	2.67
Prayer Room	4.02
TOTAL	**28.71**

GROUND FLOOR- RESIDENT'S ZONE	
Multi-purpose Hall	54.15
Dining area	30.67
Hand wash and disposal	2.48
LIA Toilet	5.7
Kitchen and Pantry	22.45
Utility	4.4
Service (future use)	13
LIA Unit 1	12.15
LIA Bath	6.15
LIA Unit 2	12.15
LIA Unit 3	12.15
LIA Bath 2	6.15
LIA Unit 4	12.15
TOTAL	**171.75**

FIRST FLOOR- OFFICE BLOCK	
Storage and Records	5.08
Meeting Room/ Office with Video facility	15.4
Office Staff Room	26
Office Staff Toilet	4.57
Staff Utility	4.12
Maintenance Staff Rest Room	9.91
Maintenance Staff Bathroom	4.76
TOTAL	**69.64**

FIRST FLOOR- RESIDENT'S ZONE	
Laundry	9.06
Clothes Drying Area (semi-open)	11.69
Multi Occ. Unit 1 Single Room	11.18
Multi Occ. Unit 1 Plus Room	12.63
Multi Occ. Unit-1 Bath Room	5.28
Single Room 1	10.20
Single Room 1 Bath	2.88
Single Room 2	10.20
Single Room 2 Bath Room	2.88
Multi Occ. Unit-2 Single Room	10.04
Multi Occ. Unit-2 Plus Room	12.14
Multi Occ. Unit 2 Bath	2.86
Single Room 3	11.12
Single Room 3 Bath Room	5.13
Family Unit-1 Room-1	10.82
Family Unit-1 Room-2	9.06
Family Unit-1 Bath Room	3.13
TOTAL	**136.30**

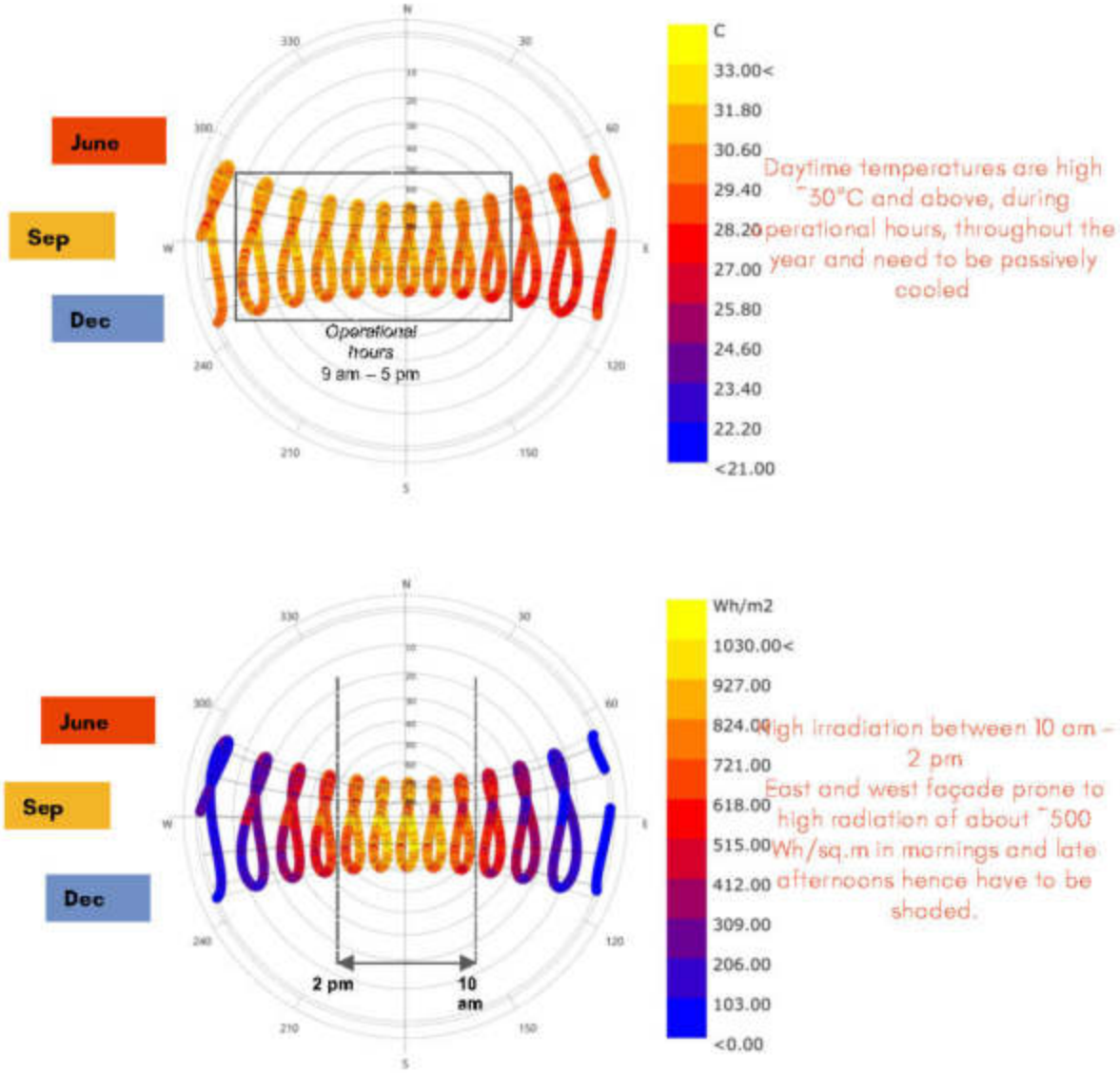
SECOND FLOOR- RESIDENT'S ZONE	
Multi-purpose Hall	59.10
Storage	4.59
Family Unit-2 Room-1	10.27
Family Unit-2 Room-2	9.52
Family Unit-2 Bath Room	4.14
Multi Occ. Unit 3 Single Room	11.18
Multi Occ. Unit 3 Plus Room	12.63
Multi Occ. Unit-3 Bath Room	5.28
Single Room 4	10.20
Single Room 4 Bath	2.98
Single Room 5	10.20
Single Room 5 Bath Room	2.98
Multi Occ. Unit-4 Single Room	10.20
Multi Occ. Unit-4 Plus Room	12.29
Multi Occ. Unit 4 Bath	2.86
Single Room 6	11.12
Single Room 6 Bath Room	5.13
Family Unit-3 Room-1	10.82
Family Unit-3 Room-2	9.06
Family Unit-3 Bath Room	5.13
TOTAL	**183.48**

THIRD FLOOR- RESIDENT'S ZONE	
Multi Occ. Unit 5 Single Room	10.20
Multi Occ. Unit 5 Plus Room	14.44
Multi Occ. Unit-5 Bath Room	2.98
Multi Occ. Unit 6 Single Room	10.20
Multi Occ. Unit 6 Plus Room	12.29
Multi Occ. Unit-6 Bath Room	2.86
Multi Occ. Unit 7 Single Room	9.52
Multi Occ. Unit 7 Plus Room	14.24
Multi Occ. Unit-7 Bath Room	5.13
Laundry Room	8.95
TOTAL	**88.59**

Climate Analysis Data Reference

Solar irradiation and wind rose data for Hulhumale Island

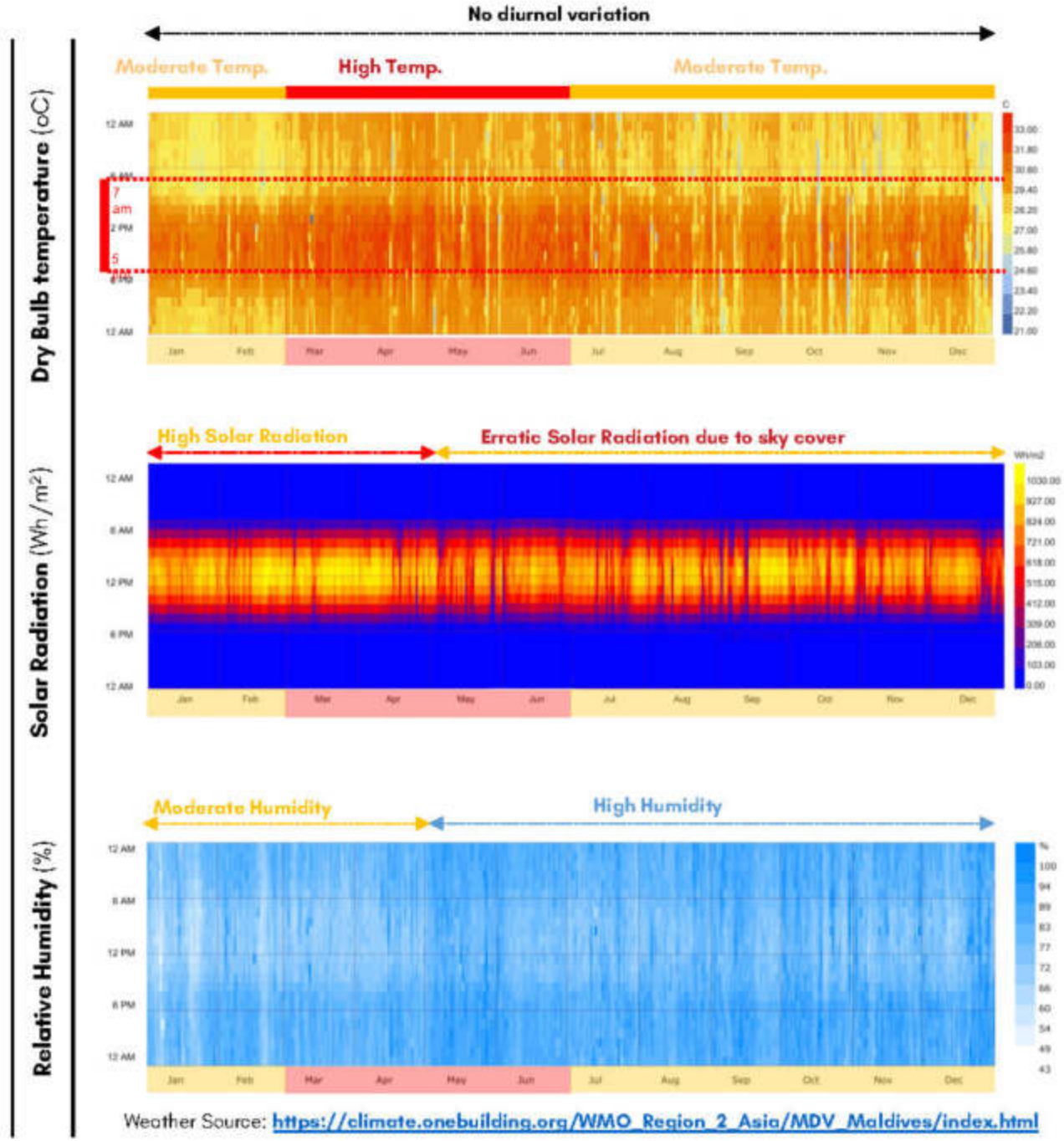
Hulhumale | DBT and Solar irradiation



Daytime temperatures are high ~30°C and above, during operational hours, throughout the year and need to be passively cooled

High irradiation between 10 am – 2 pm

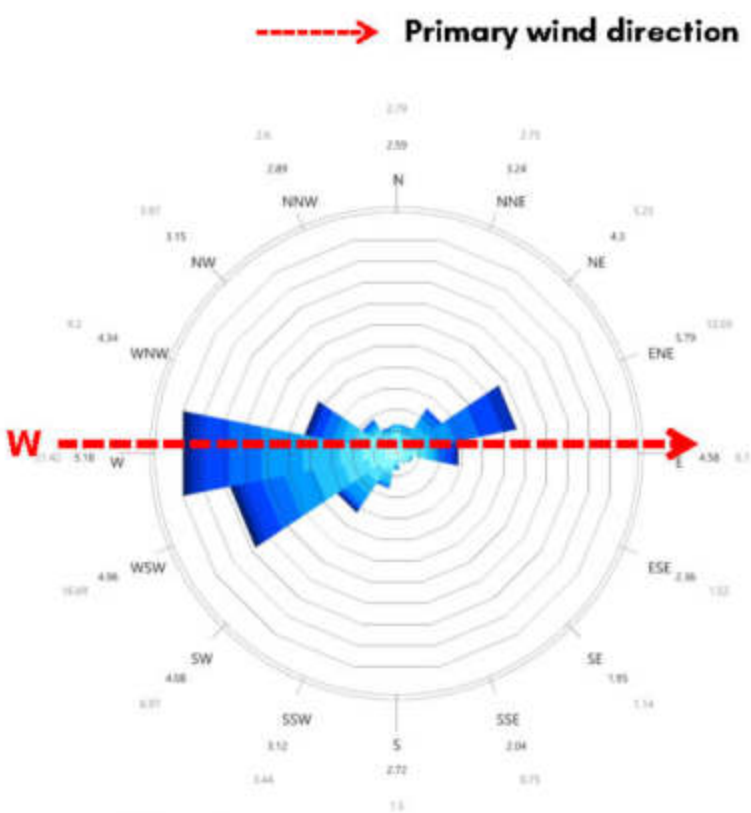
East and west façade prone to high radiation of about ~500 Wh/sq.m in mornings and late afternoons hence have to be shaded.



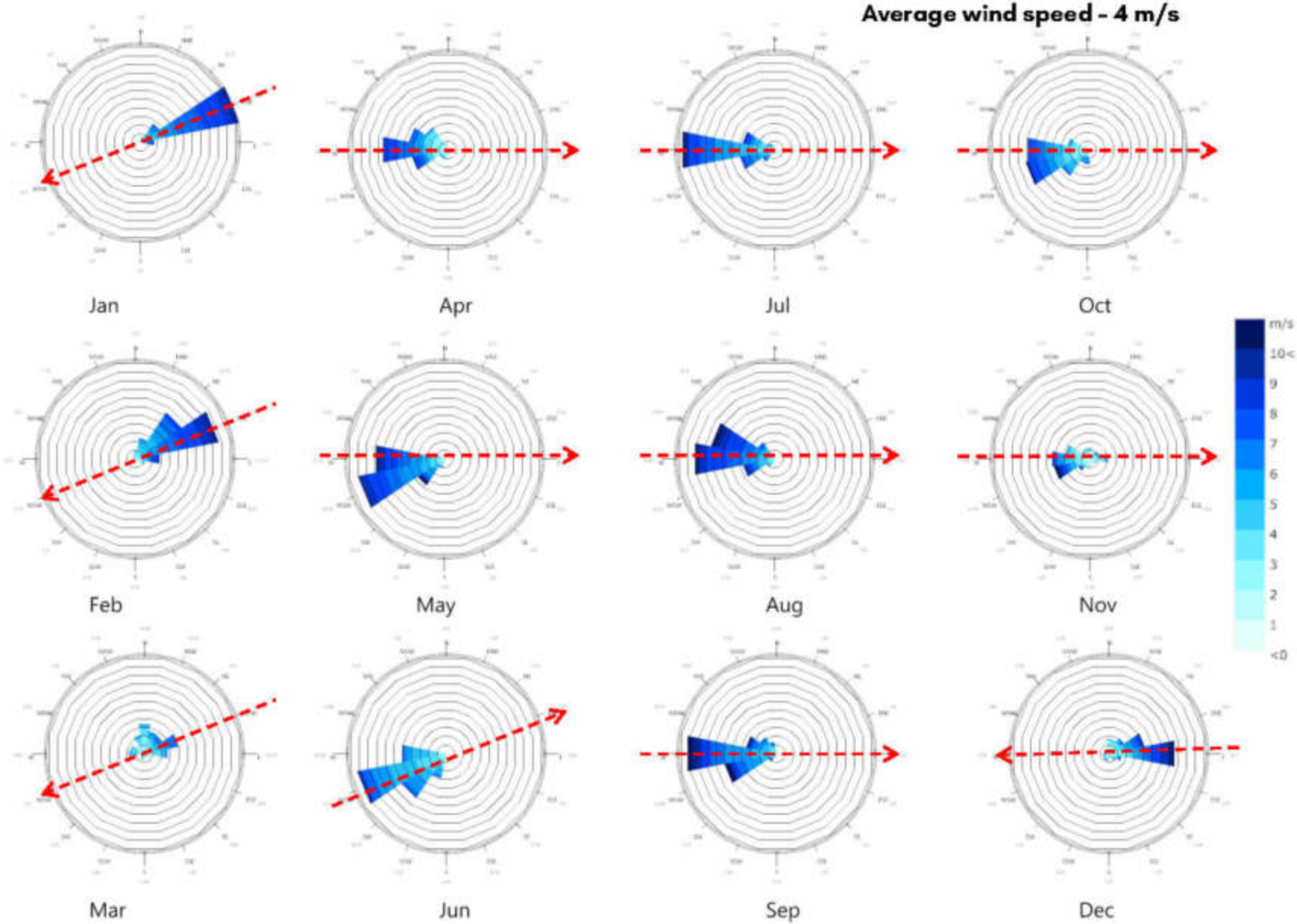
Weather Source: https://climate.onebuilding.org/WMO_Region_2_Asia/MDV_Maldives/index.html

Hulhumale | Wind rose diagram

Predominant wind direction - West
Average wind speed - 4 m/s



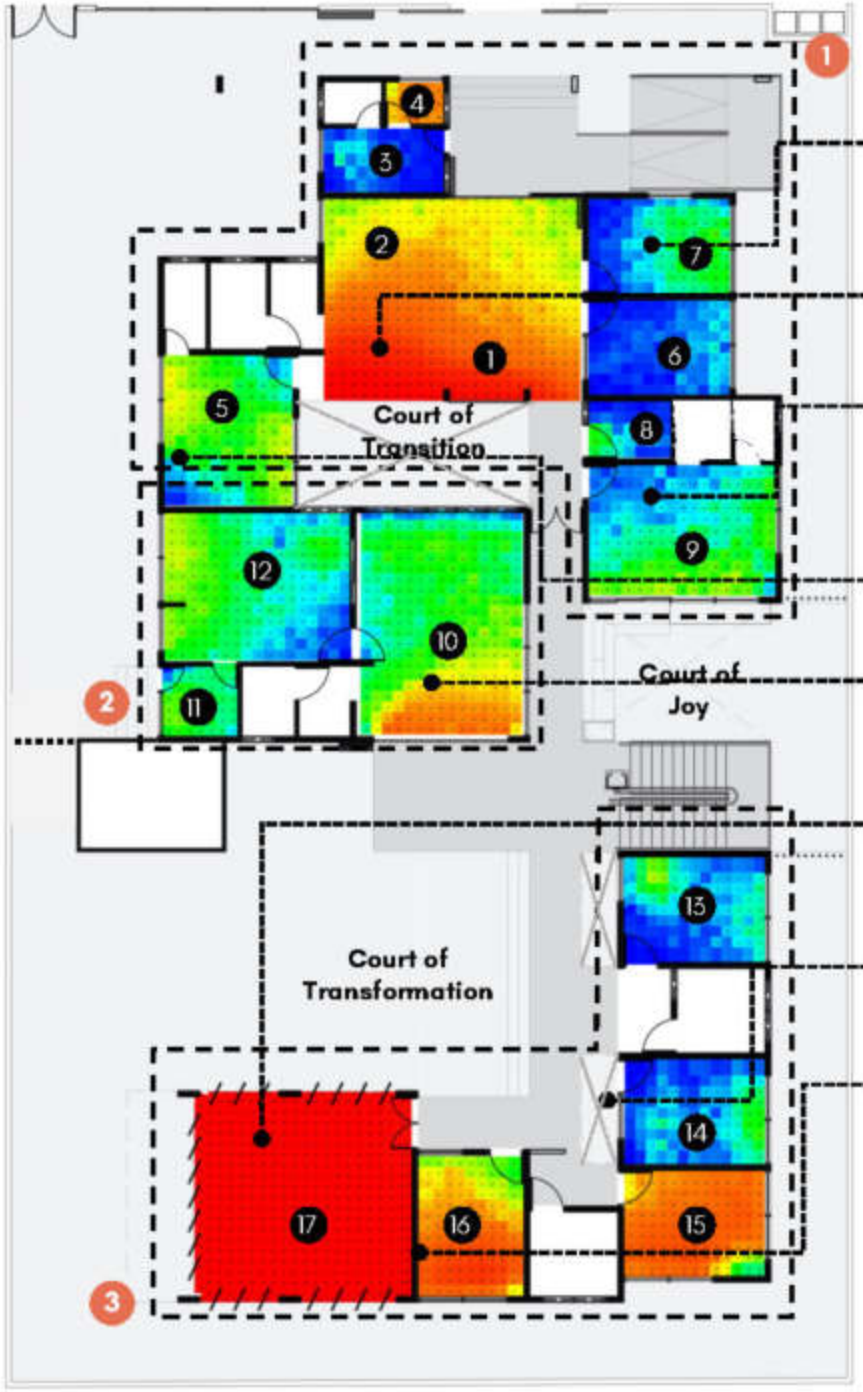
Wind-Rose
Male-Nasir.Intl.AP_MA_MDV
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Wind Speed (m/s)
Calm for 1.85% of the time = 162 hours.
Each closed polyline shows frequency of 2.1%. = 187



Weather Source:
https://climate.onebuilding.org/WMO_Region_2_Asia/MDV_Maldives/index.html

Iteration-1

Building level analysis- Daylight and Internal CFD



Counselling rooms do not have adequate daylight

Reception and waiting area has good amount of light from adjacent open court

Kids Area receives sufficient daylight but part of the room is not well lit.

Administrative area and kitchen receive average daylight

Dining area receive optimum light from adjacent open court

Multipurpose hall has ample amount of evenly distributed daylight due to the openings on the three walls

Accommodation units towards East observe less daylight due to the context building

Accommodation units towards south get good daylight through South opening

Ground floor

DA 300 = 56.54%

Daylight Autonomy (DA)

Daylight Autonomy at 300 lux

Overall percentage- 52.86 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction to maximize daylight, and the strategic location of courts ensures optimum daylight in areas that may fall under shaded areas due to adjacent buildings

- **Key points/ Observation:**

  Approximately 55% of the internal area receives adequate daylight. Courts are effective in bringing in adequate daylight.

Daylight autonomy (DA) is a daylight availability metric that corresponds to the percentage of the occupied time when the target illuminance at a point in a space is met by daylight. DA helps to evaluate spaces for autonomy in daylight and helps in restricting use of electrical lighting in these spaces.

1. Reception and Info
2. Waiting area
3. Rest area for staff
4. Security booth
5. Manager's room
6. Legal aid room
7. Counseling room
8. Prayer room
9. Kids area
10. Dining room
11. Utility
12. Kitchen
13. UA Unit-1
14. UA Unit-2
15. UA Unit-3
16. UA Unit-4
17. Multi-purpose hall

Legend

DA 300

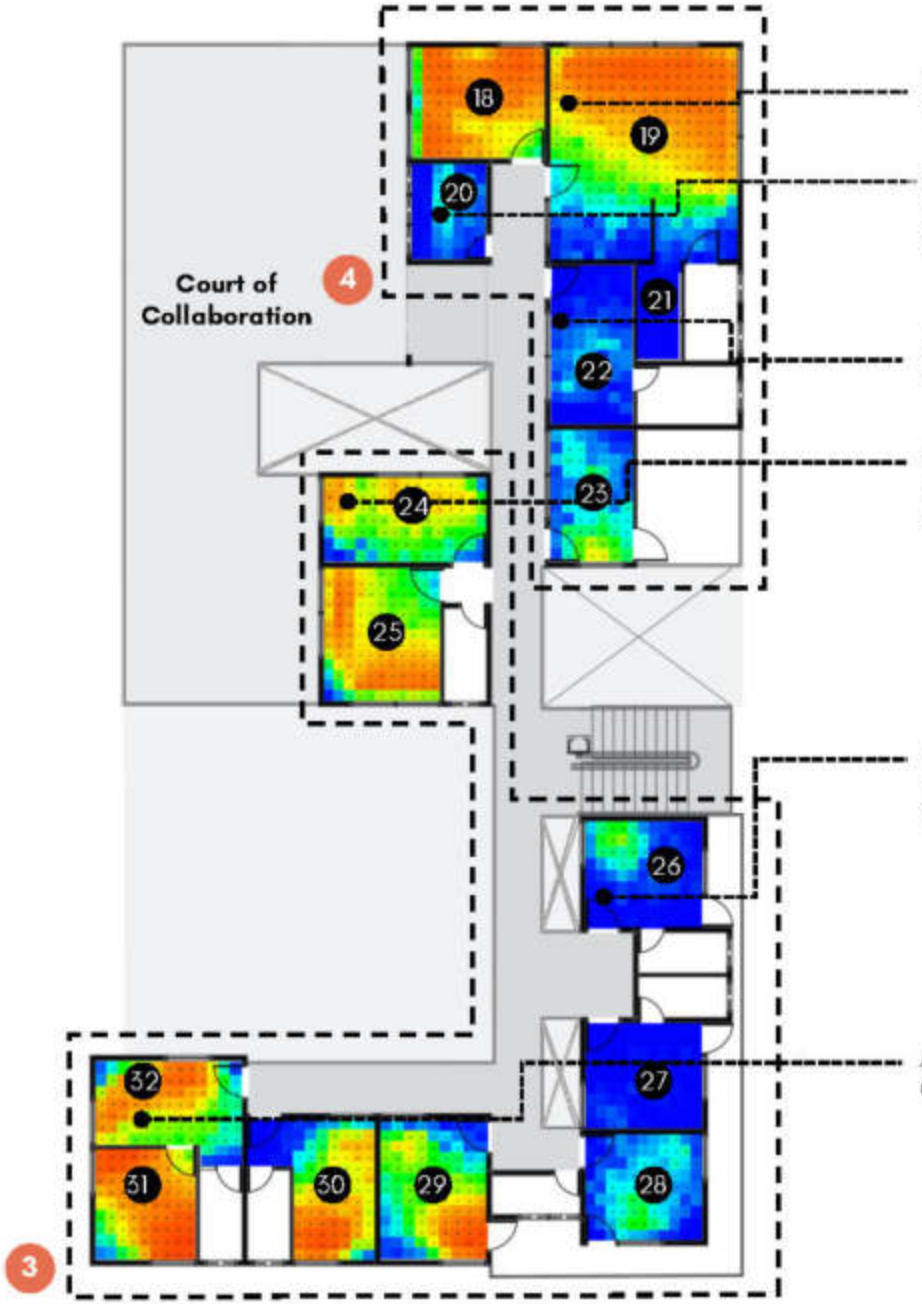
0 — 100%

1. Zone-1: Public Area
2. Zone-2: Private area (Accommodation supporting uses)
3. Zone 3 – Private Area (Accommodation Zone)

N

0 — 5m — 10m

Daylight Autonomy (DA)



Administration area towards North has ample amount of daylight

Office staffroom receives minimal amount of daylight due to less openings

Administration area that faces East, has lower level of daylight

Accommodation Units towards West receives excellent daylight through open court

Accommodation Units towards East receives less than optimum daylight due to context buildings

Accommodation Units towards West receives excellent daylight

First floor

DA 300 = 45.09%

Daylight Autonomy at 300 lux

Overall percentage- 52.86 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction to maximize daylight and building mass towards East to reduce the areas under shading from building in West

- **Key points/ Observation:**

  Only 45% of the internal area receives optimum daylight, evenly distributed in most cases. Due to mutual shading from adjacent buildings from West and East, the daylight is compromised to a large extent.

18. Meeting room
19. Office staff room
20. Records room
21. Utility
22. Female maintenance staff rest room
23. Laundry room
24. Multi occupancy -1 Single room
25. Multi occupancy -1 Plus room
26. Single room - 1
27. Single room -2
28. Multi occupancy - 2 Single room
29. Multi occupancy -2 Plus room
30. Single room - 3
31. Family unit-1 Room 1
32. Family unit-2 Room 2

Legend

DA 300

0 — 100%

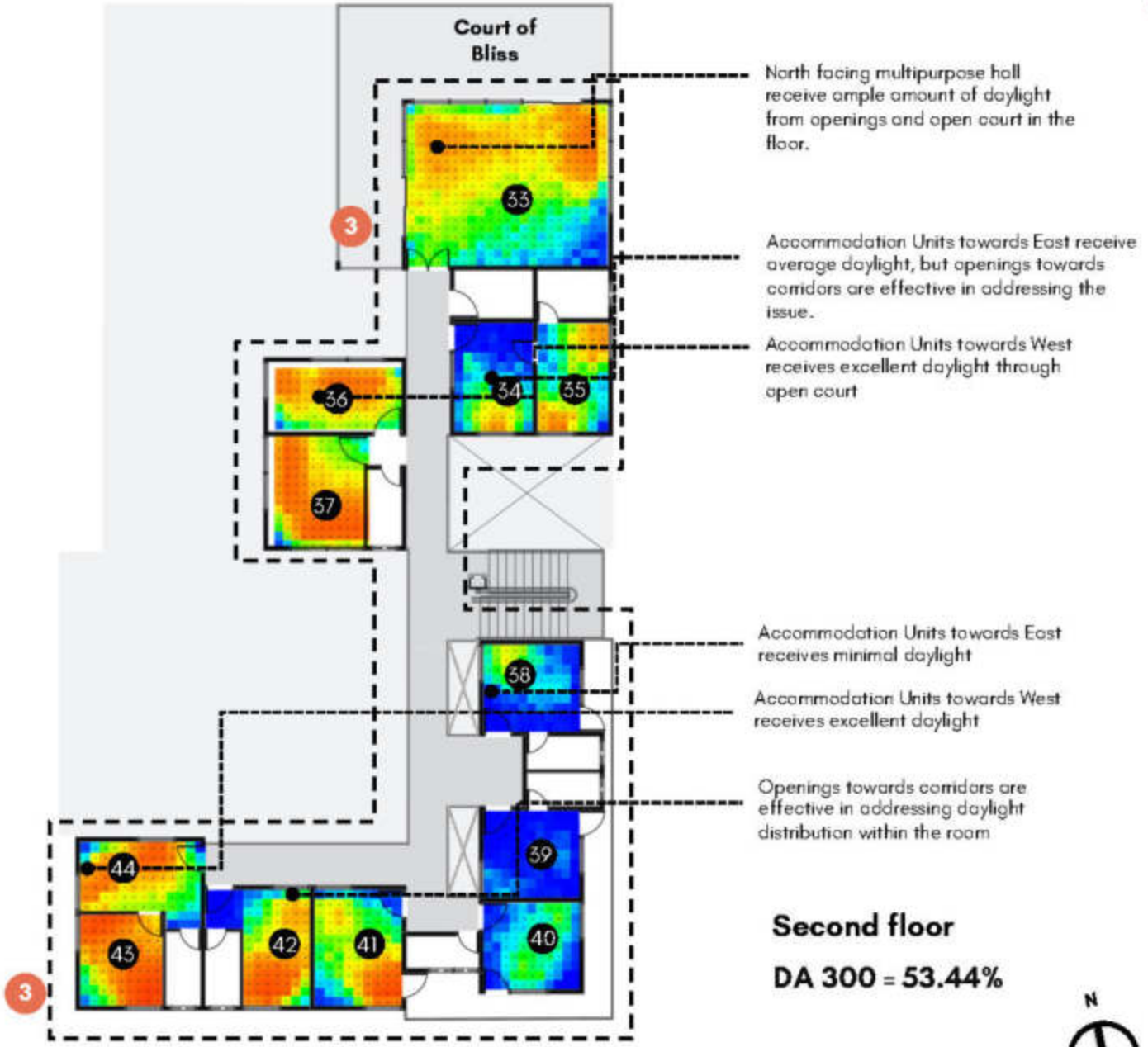
3 Zone 3 - Private Area (Accommodation Zone)

4 Zone 4 - Private Area (Administration Zone)

N

0 — 5m — 10m

Daylight Autonomy (DA)



North facing multipurpose hall receive ample amount of daylight from openings and open court in the floor.

Accommodation Units towards East receive average daylight, but openings towards corridors are effective in addressing the issue.

Accommodation Units towards West receives excellent daylight through open court

Accommodation Units towards East receives minimal daylight

Accommodation Units towards West receives excellent daylight

Openings towards corridors are effective in addressing daylight distribution within the room

Second floor

DA 300 = 53.44%

Daylight Autonomy at 300 lux

Overall percentage- 52.86 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction to maximize daylight and building mass towards East to reduce the areas under shading from building in West

- **Key points/ Observation:**

  Approximately 50% of the area receives less than optimum daylight due to mutual shading and dense external screens utilized for privacy.

33. Multi purpose Hall
34. Family Unit 2 - Room 1
35. Family Unit 2 - Room 2
36. Multi occupancy 3 - Single room
37. Multi occupancy 3 - Plus room
38. Single room 4
39. Single room 5
40. Multi occupancy-4 Single room
41. Multi occupancy-4 Plus room
42. Single room - 6
43. Family unit-3 Room 1
44. Family unit-3 Room 2

Legend

DA 300

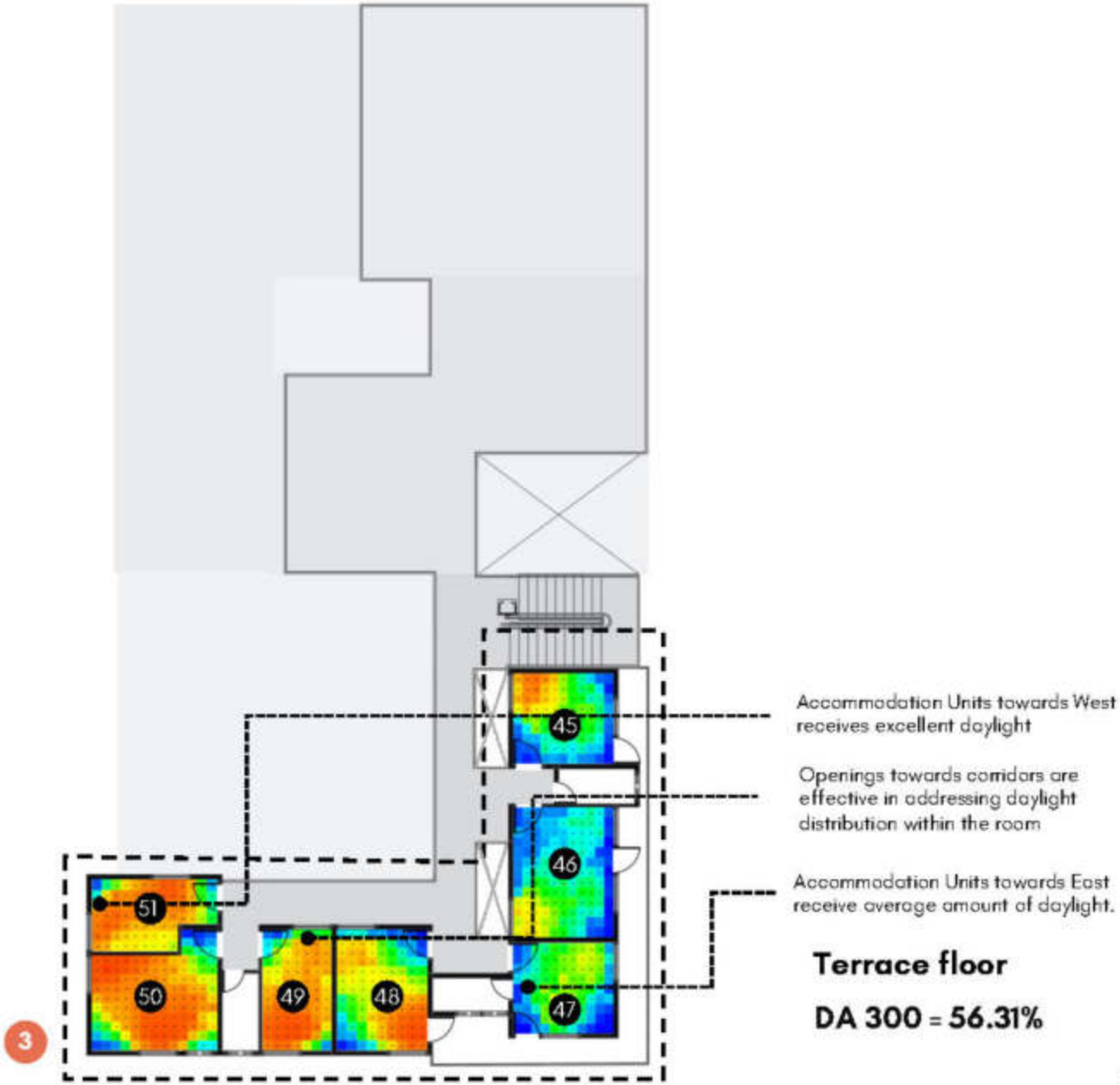
0 — 100%

3 Zone 3 - Private Area (Accommodation Zone)

N

0 — 5m — 10m

Daylight Autonomy (DA)



Accommodation Units towards West receives excellent daylight

Openings towards corridors are effective in addressing daylight distribution within the room

Accommodation Units towards East receive average amount of daylight.

Terrace floor

DA 300 = 56.31%

Daylight Autonomy at 300 lux

Overall percentage- 52.86 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction which allows maximum daylight to enter, and building mass towards East-South to ensure maximum daylight.

- **Key points/ Observation:**

  Rooms towards East receive less than optimum daylight due to mutual shading and dense screen utilized for privacy.

45. Multi occupancy-5 Single room
46. Multi occupancy-5 Plus room
47. Multi occupancy-6 Single room
48. Multi-occupancy-6 Plus room
49. Multi occupancy-7 Single room
50. Multi occupancy-7 Plus room
51. Laundry

Legend

DA 300

0 — 100%

3 Zone 3 - Private Area (Accommodation Zone)

N

0 — 5m — 10m

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

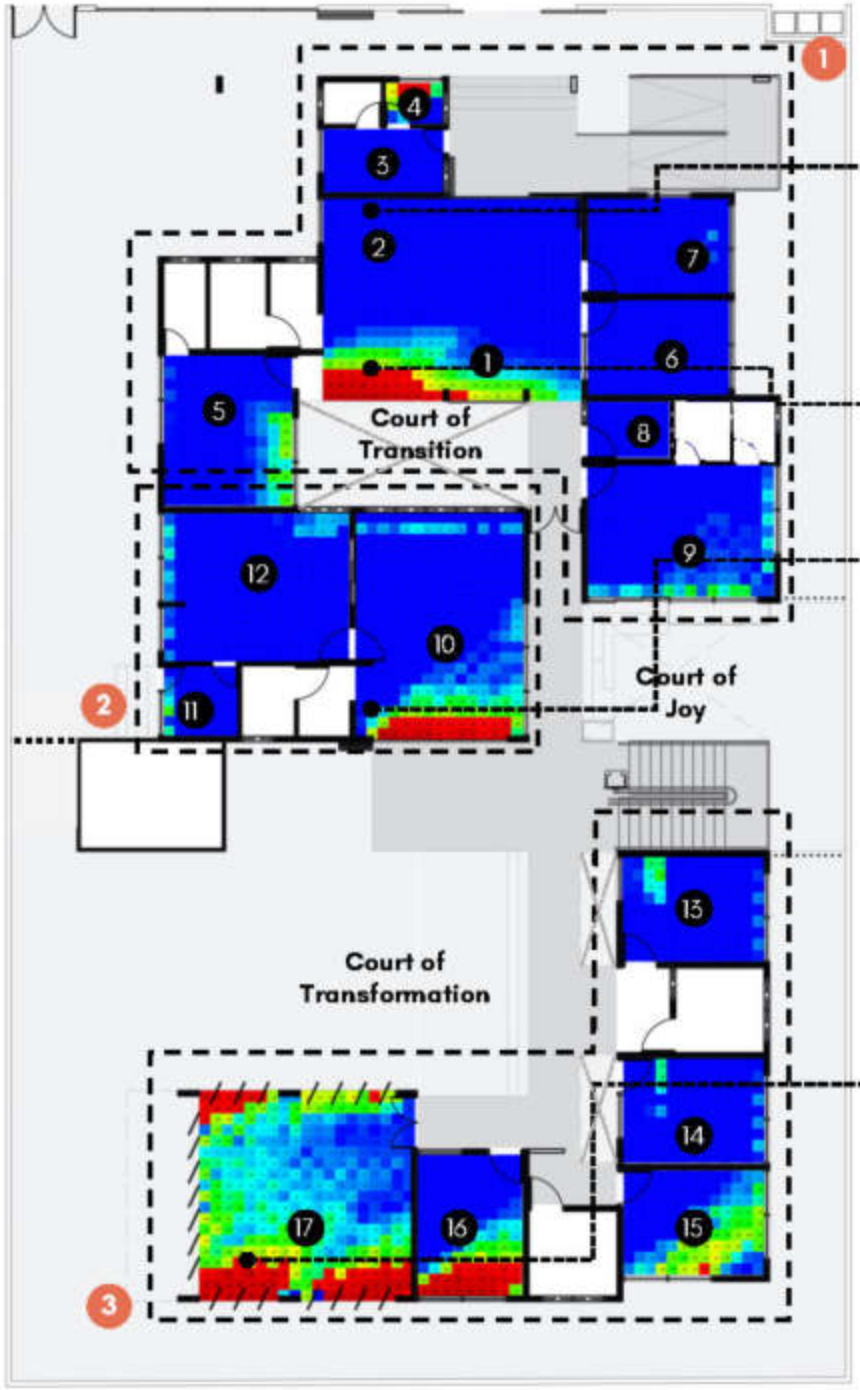
Overall percentage- 5.25 %

- **Consideration:**

  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  Most of the glare is observed in the Waiting area and Multi-purpose Hall. Flexible shading devices are used to reduce glare and balance daylight.



Rooms towards North do not experience any glare and thus internal environment of rooms is not compromised.

The glare in waiting zone and reception may cause some visual discomfort, however, it is limited to very small part of the room

Dining space also faces some amount of glare , however, it is limited to very small part of the room

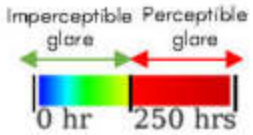
Openings towards West contribute towards increased glare but shading devices are very effective in reducing the glare

Ground floor

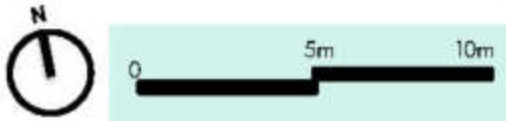
ASE 1000 = 5.59%

1. Reception and Info
2. Waiting area
3. Rest area for staff
4. Security booth
5. Manager's room
6. Counselling room
7. Legal aid room
8. Prayer room
9. Kids Area
10. Dining room
11. Utility
12. Kitchen
13. UA Unit-1
14. UA Unit-2
15. UA Unit-3
16. UA Unit-4
17. Multi-purpose hall

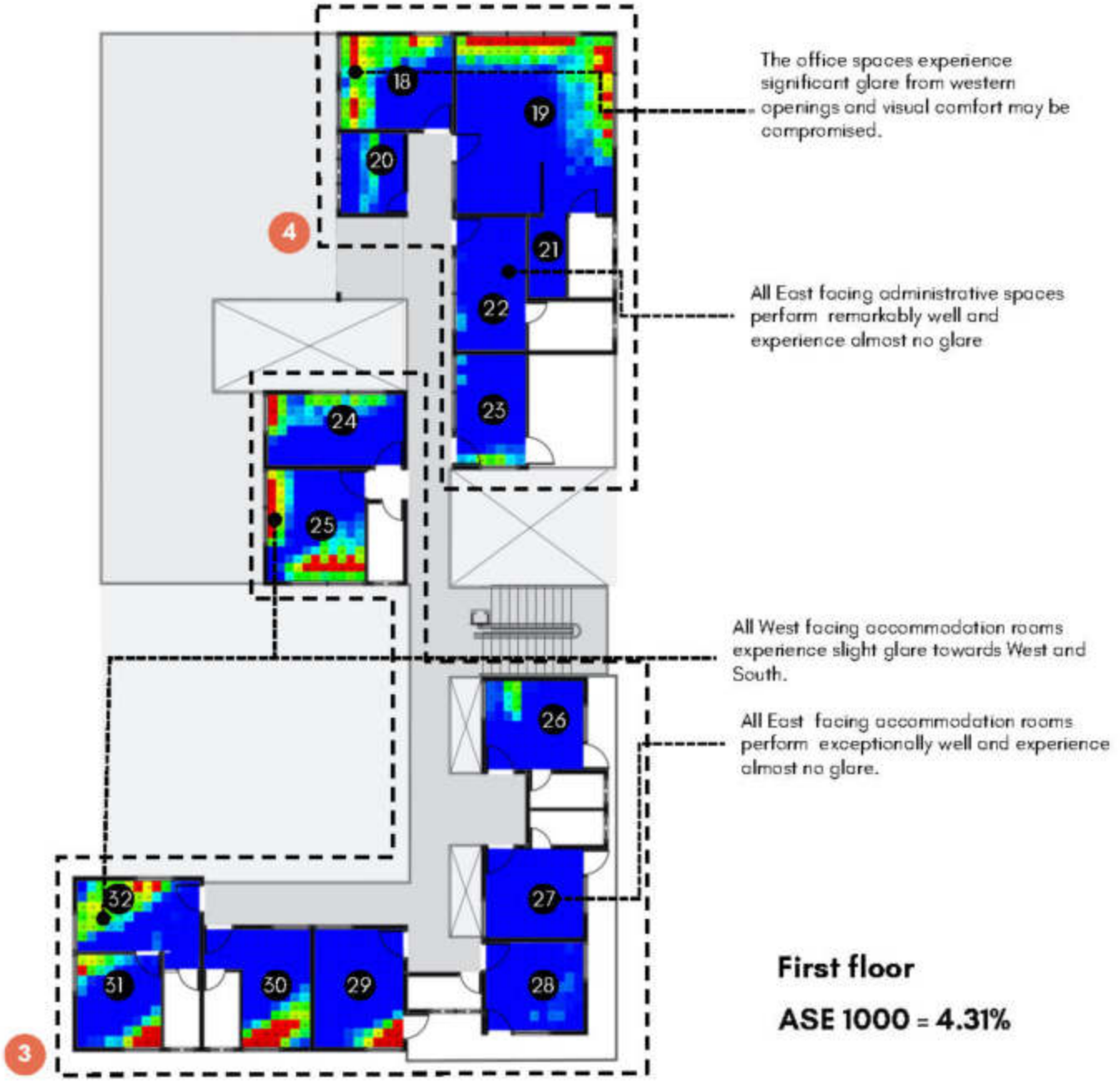
Legend



1. Zone-1: Public Area
2. Zone-2: Private area (Accommodation supporting uses)
3. Zone 3 - Private Area (Accommodation Zone)



Annual Solar Exposure (ASE)



The office spaces experience significant glare from western openings and visual comfort may be compromised.

All East facing administrative spaces perform remarkably well and experience almost no glare

All West facing accommodation rooms experience slight glare towards West and South.

All East facing accommodation rooms perform exceptionally well and experience almost no glare.

First floor

ASE 1000 = 4.31%

1000 lux > 250 hrs

Overall percentage- 5.25 %

- **Consideration:**

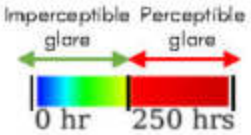
  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  Most of the areas have minimal glare and overall the entire floor performs well in terms of the indoor environment but there may be issue of visual discomfort in the administrative/ office spaces. In a few cases, glare is observed from Southern and Western windows

18. Meeting room
19. Office staff room
20. Records room
21. Utility
22. Female maintenance staff rest room
23. Laundry room
24. Multi occupancy -1 Single room
25. Multi occupancy -1 Plus room
26. Single room - 1
27. Single room -2
28. Multi occupancy - 2 Single room
29. Multi occupancy -2 Plus room
30. Single room - 3
31. Family unit-1 Room 1
32. Family unit-2 Room 2

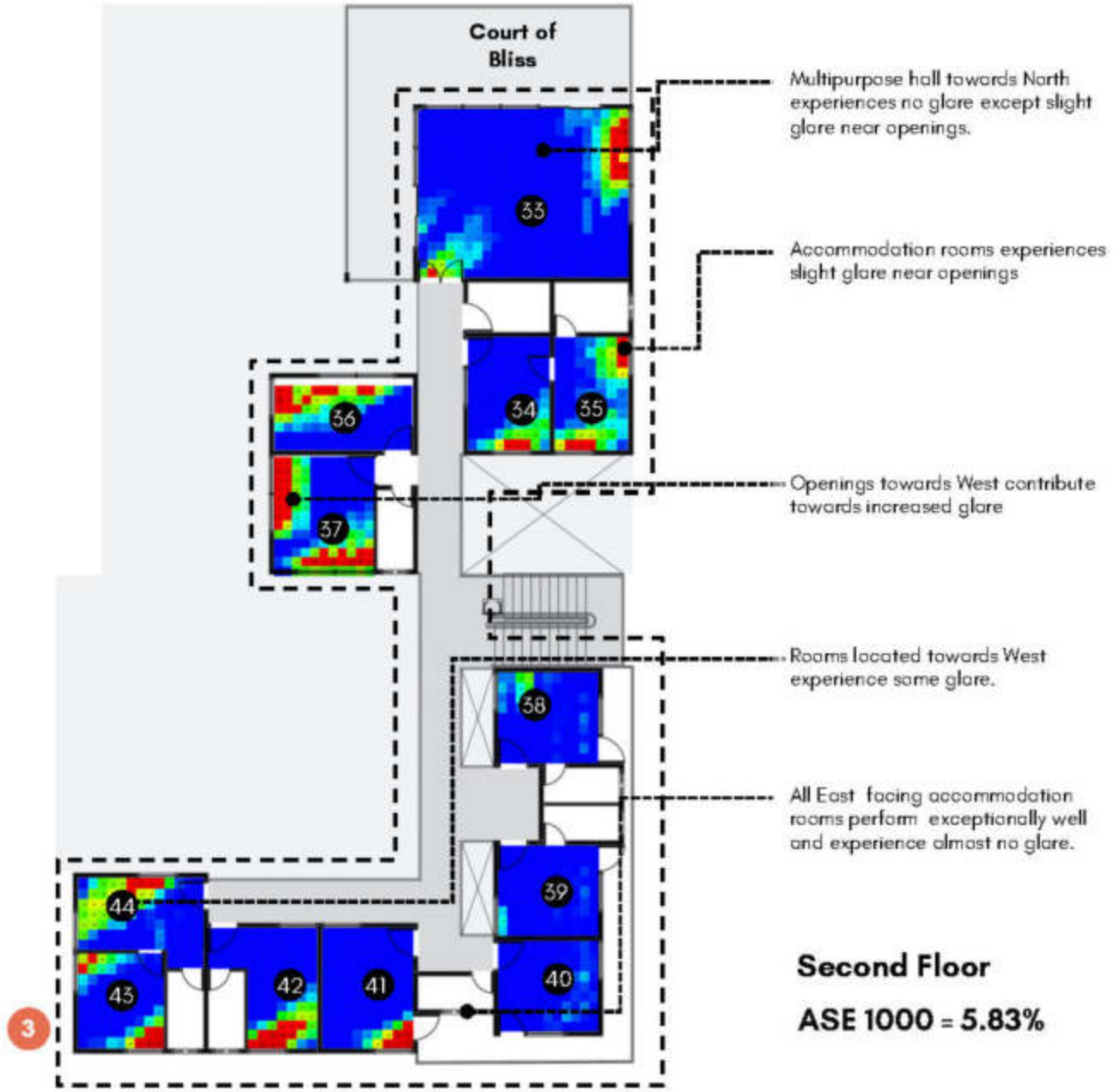
Legend



3 Zone 3 - Private Area (Accommodation Zone)

4 Zone 4 - Private Area (Administration)

Annual Solar Exposure (ASE)



1000 lux > 250 hrs

Overall percentage- 5.25 %

- **Consideration:**

  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  Minimal/no glare is observed in most of the rooms. The screens in the façade are effective in reducing the glare from the Eastern side.

33. Multi purpose Hall
34. Family Unit 2 - Room 1
35. Family Unit 2 - Room 2
36. Multi occupancy 3 - Single room
37. Multi occupancy 3 - Plus room
38. Single room 4
39. Single room 5
40. Multi occupancy-4 Single room
41. Multi occupancy-4 Plus room
42. Single room - 6
43. Family unit-3 Room 1
44. Family unit-3 Room 2

Legend

Imperceptible glare | Perceptible glare

0 hr | 250 hrs

3 Zone 3 - Private Area (Accommodation Zone)

N

0 5m 10m

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

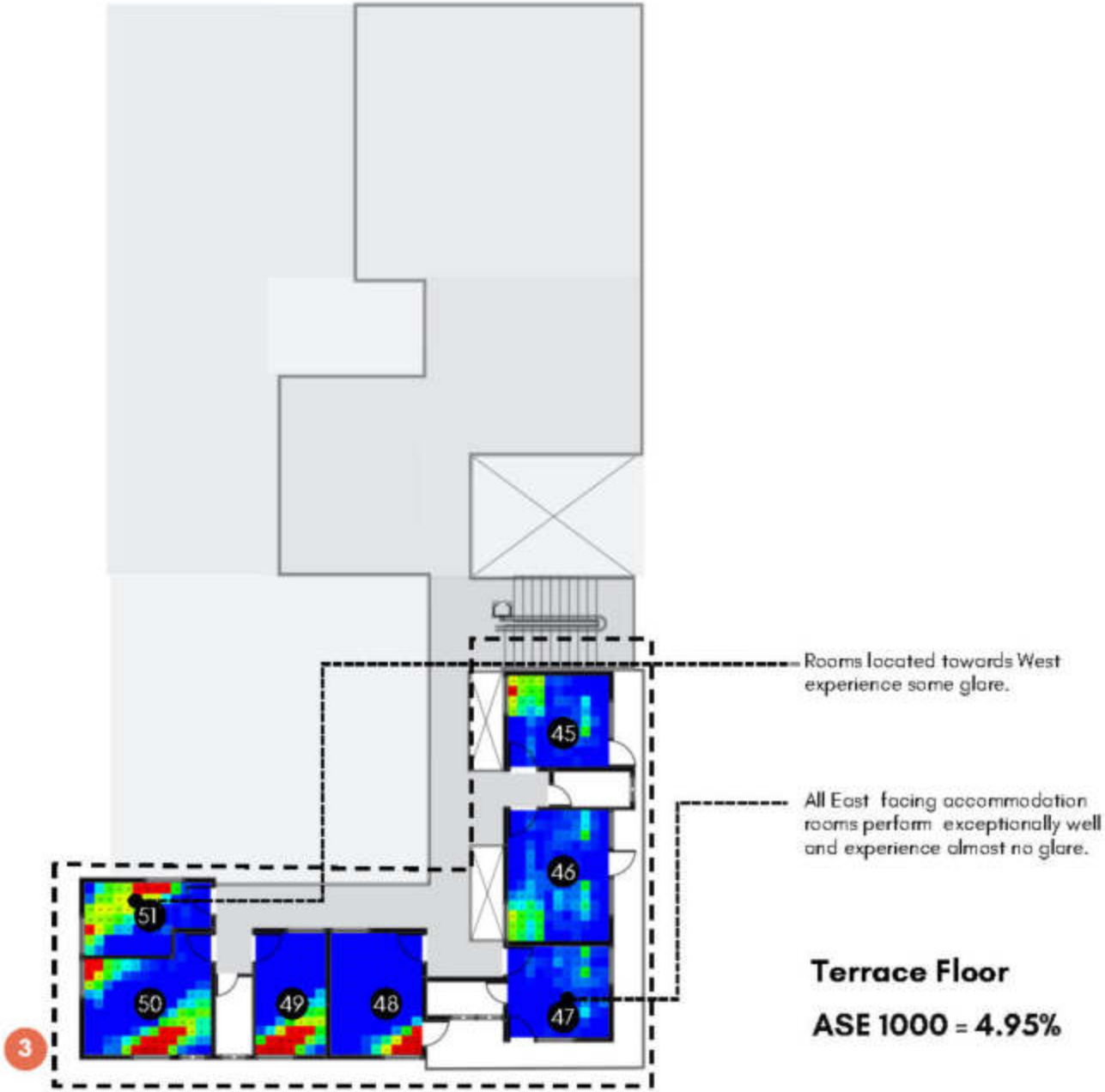
Overall percentage- 5.25 %

- **Consideration:**

  Careful shading and façade elements (screens, inset windows) added to ensure shading

- **Key points/ Observation:**

  More glare is observed on Third floor due to lack of mutual shading on Third floor. However, screens are still effective in reducing the overall glare in the rooms.



Terrace Floor

ASE 1000 = 4.95%

45. Multi occupancy-5 Single room
46. Multi occupancy-5 Plus room
47. Multi occupancy-6 Single room
48. Multi-occupancy-6 Plus room
49. Multi occupancy-7 Single room
50. Multi occupancy-7 Plus room
51. Laundry

Legend

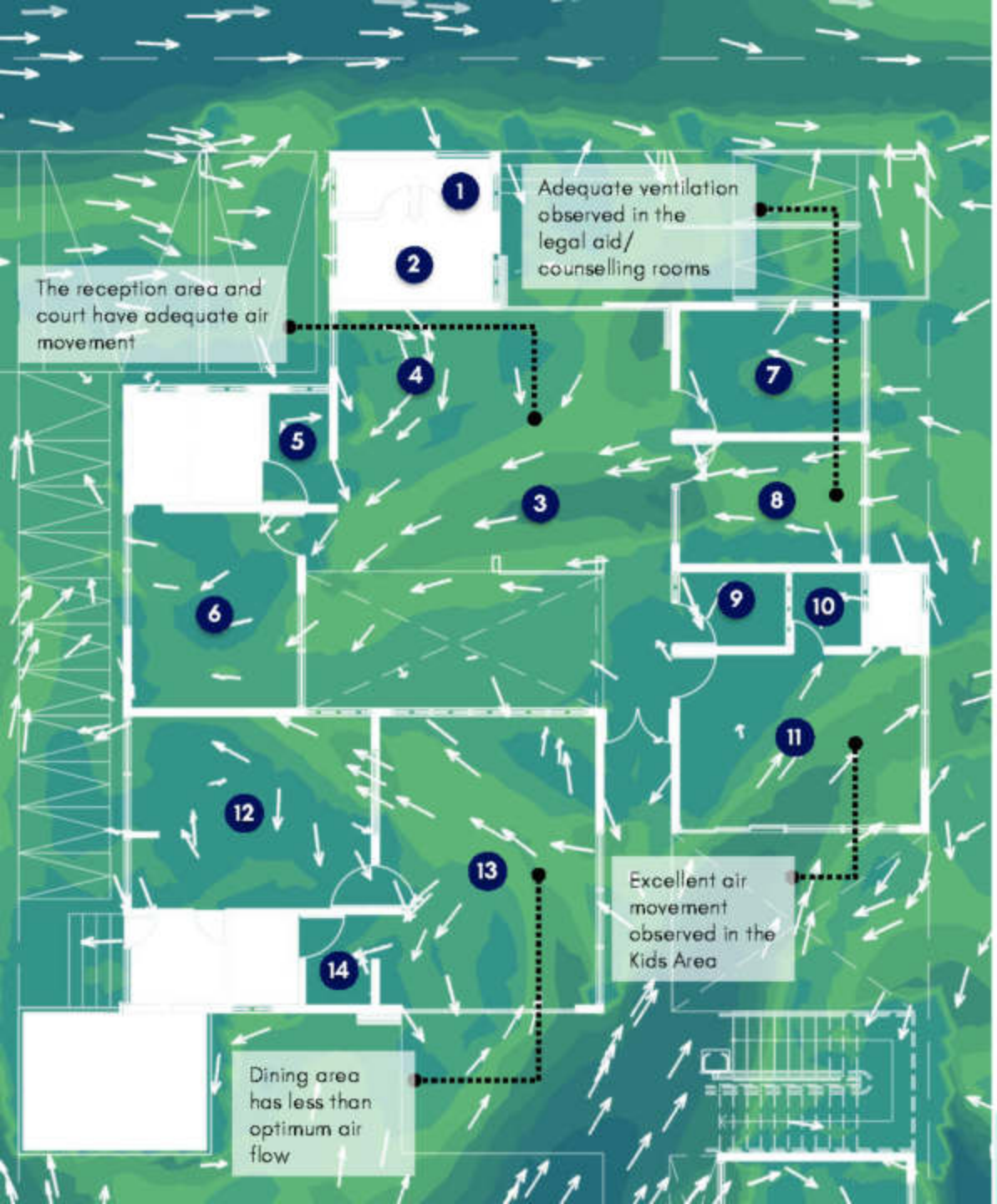
Imperceptible glare | Perceptible glare

0 hr | 250 hrs

3 Zone 3 - Private Area (Accommodation Zone)

N

0 | 5m | 10m



Interior CFD Analysis

Zone - 1, 2 | Ground Floor |Results at 2.1m ht. from the ground

- **Considerations:**
  The primary wind flow is parallel (W-E) to the built mass and thus openings and courtyards are utilized to channel the Western wind into the site and subsequently into the interior areas

- **Key points/ Observation:**
  Predominant air streams are seen from West which get deflected through built mass into the site and landscaped courts.

- **Implication on Masterplan:**
  Western openings capture the wind flow effectively and wind flow from court is effective in improving the air flow within the rooms.

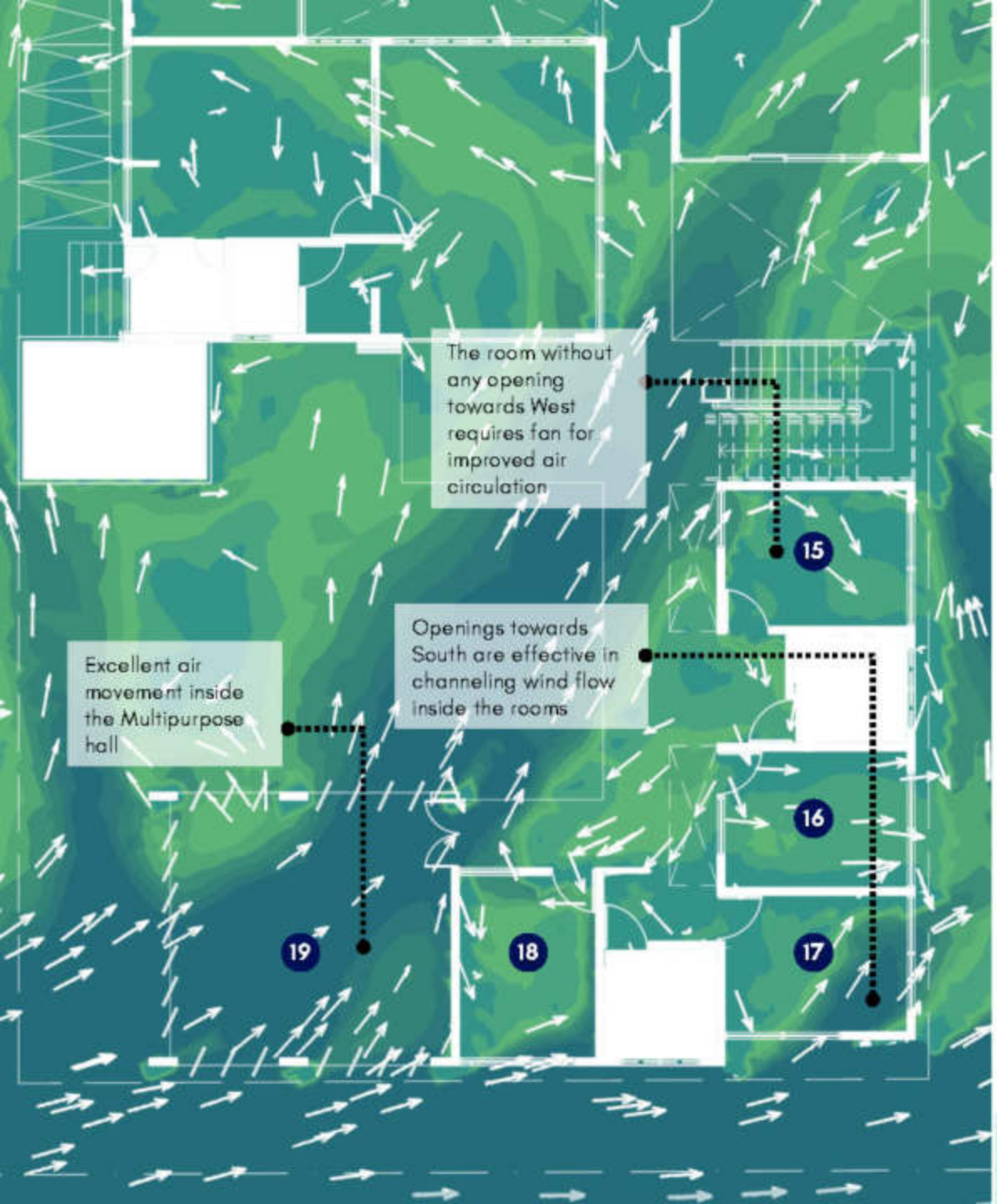
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

1. Security Room
2. Staff Rest Area
3. Reception
4. Waiting Lounge
5. Utility Area
6. Manager's Room
7. Counseling Room
8. Legal Aid Room
9. Prayer Room
10. Brest Feeding Room
11. Kids Area
12. Kitchen
13. Dining Room
14. Hand Wash and Disposal



Interior CFD Analysis

Zone - 3| Ground Floor |Results at 2.1m ht. from the ground

- **Key points/ Observation:**

  I. Even with parallel wind flow, openings towards the West and South are quite effective in channelling the wind flow inside the rooms.

  II. Rooms towards East also have adequate ventilation which can be improved through fans etc.

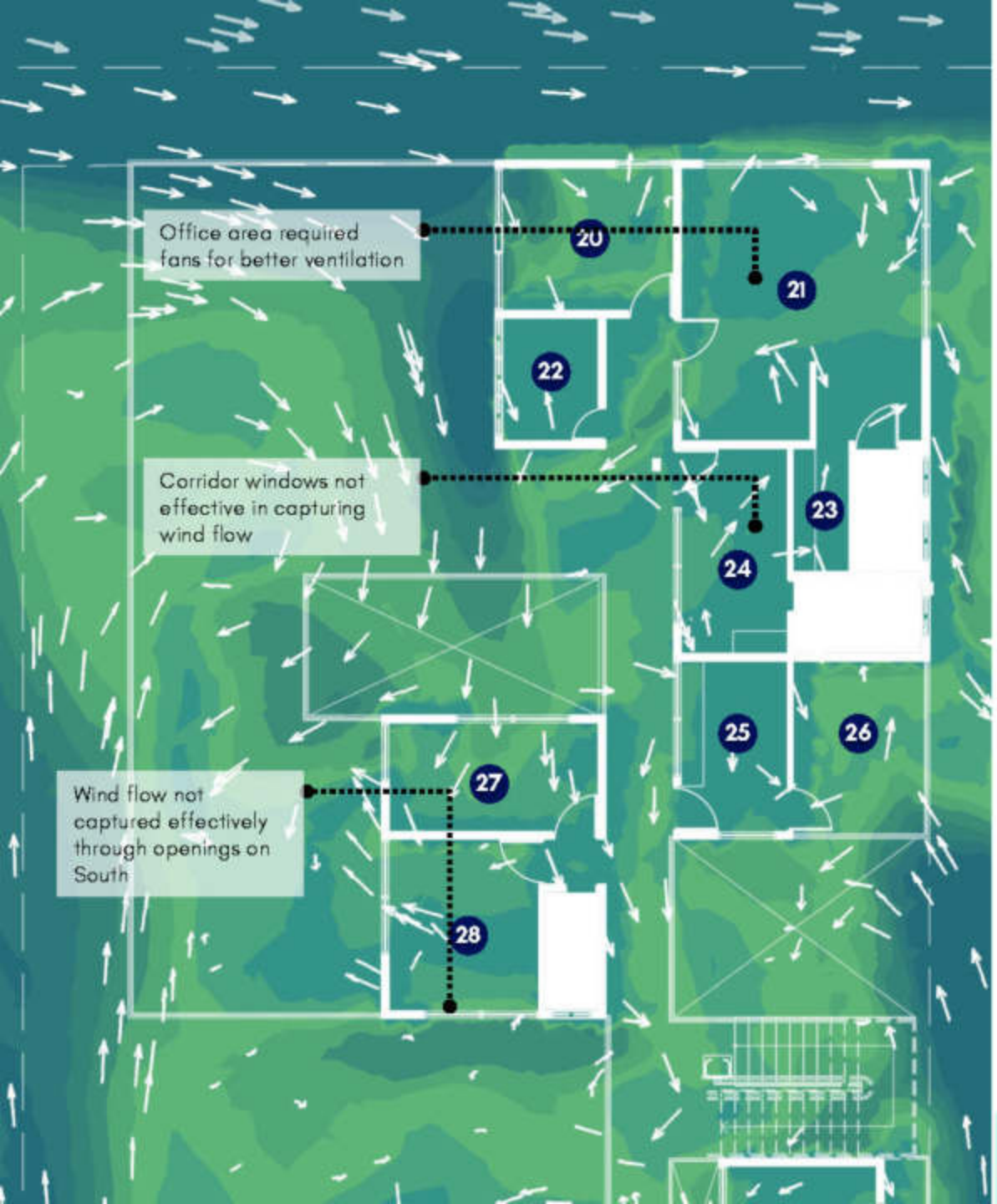
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

15 UA Unit-1
16 UA Unit-2
17 UA Unit-3
18 UA Unit-4
19 Multi-purpose Hall



Interior CFD Analysis

Zone - 3, 4| First Floor |Results at 5.3 m ht. from the ground

- **Key points/ Observation:**

  I. Due to the parallel wind flow direction, openings towards the North are not very effective in capturing the wind flow.

  II. The location of openings towards West is not optimum as per wind flow and thus minimal wind flow observed in Multi Occupancy rooms.

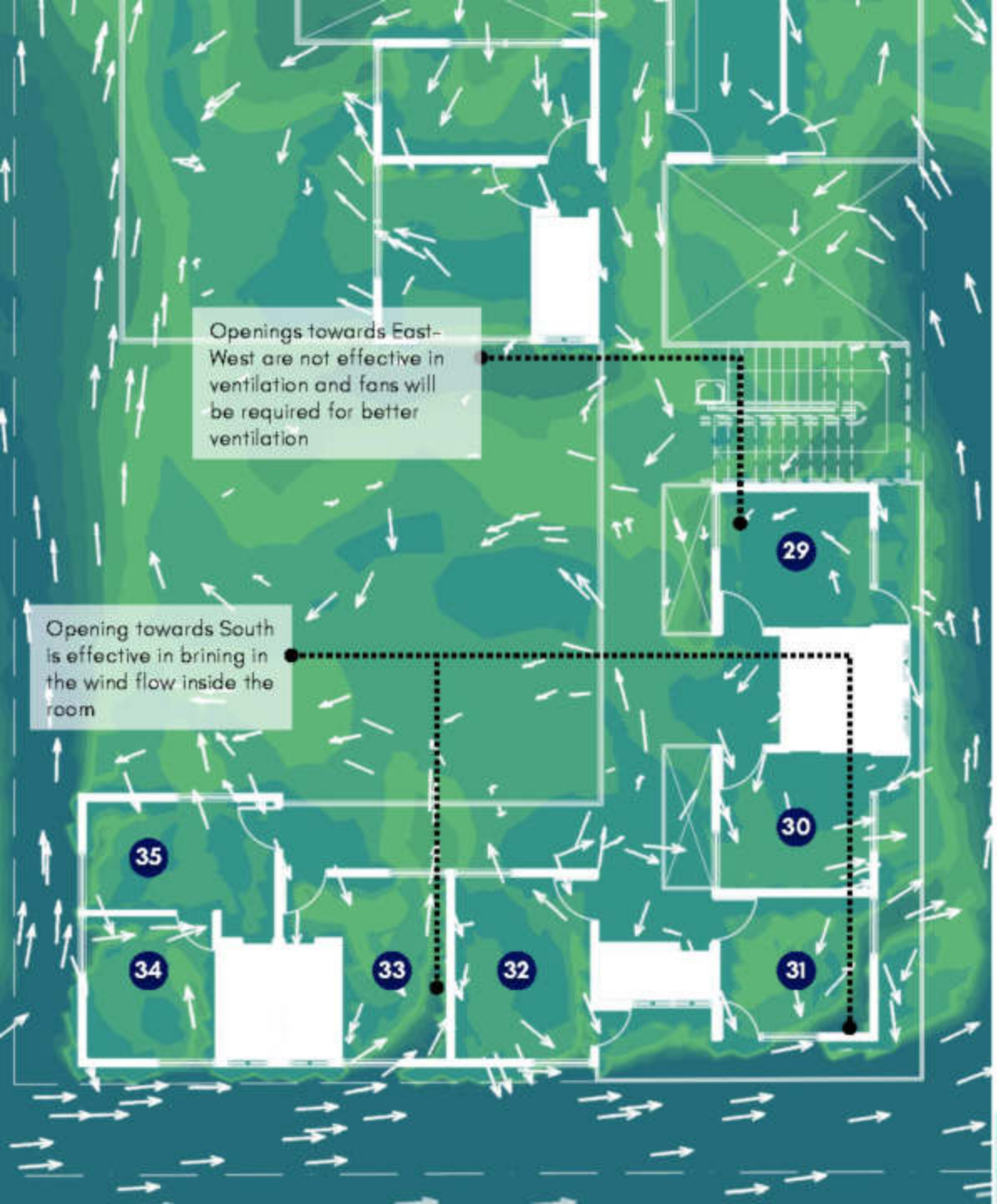
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

20 Meeting Room
21 Office staff Room
22 Records
23 Utility
24 Maintenance staff rest room
25 Laundry Room
26 Clothes drying area
27 Multi occupancy -1 Single Room
28 Multi occupancy -1 Plus Room



Interior CFD Analysis

Zone - 3| First Floor |Results at 5.3 m ht. from the ground

- **Key points/ Observation:**

  I. Even with parallel wind flow, openings towards South are effective in capturing the wind flow from West. However, the location of windows is not optimum as per wind flow pattern.

  II. Openings on West and East are not able to capture the airflow very effectively and thus the rooms with East/West openings are not well-ventilated and require fans or other mechanical aids to improve the air circulation.

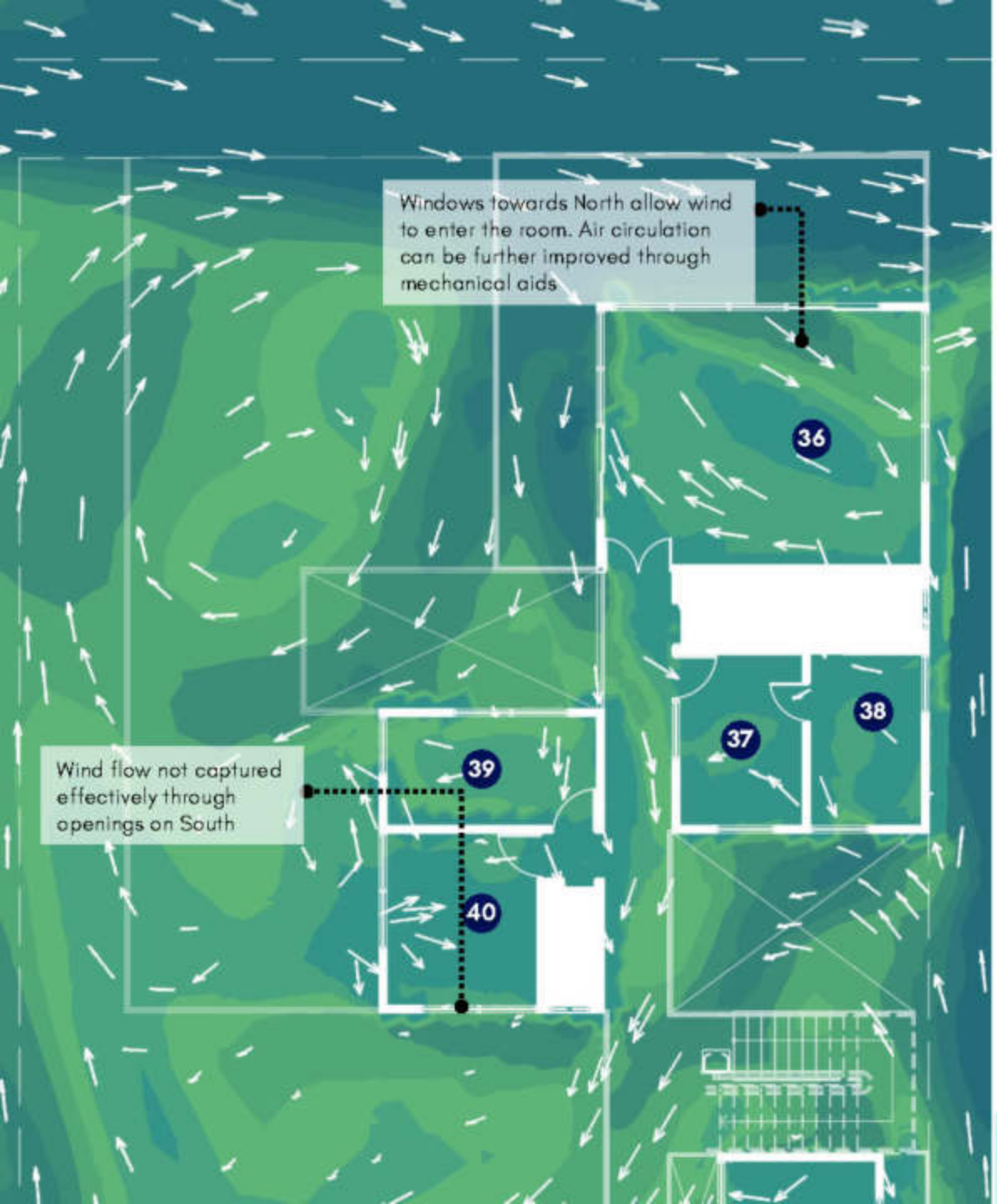
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

29 Single Room -1
30 Single Room -2
31 Multi occupancy -2 Single Room
32 Multi occupancy -2 Plus Room
33 Single Room -3
34 Family unit -1 Room -2
35 Family unit -1 Room -1



Interior CFD Analysis

Zone - 3| Second Floor |Results at 8.5m ht. from the ground

- **Key points/ Observation:**

  I. In most areas, some wind flow is observed inside the rooms which can be improved through mechanical means like fans etc. to improve the overall ventilations and achieve better indoor environment.

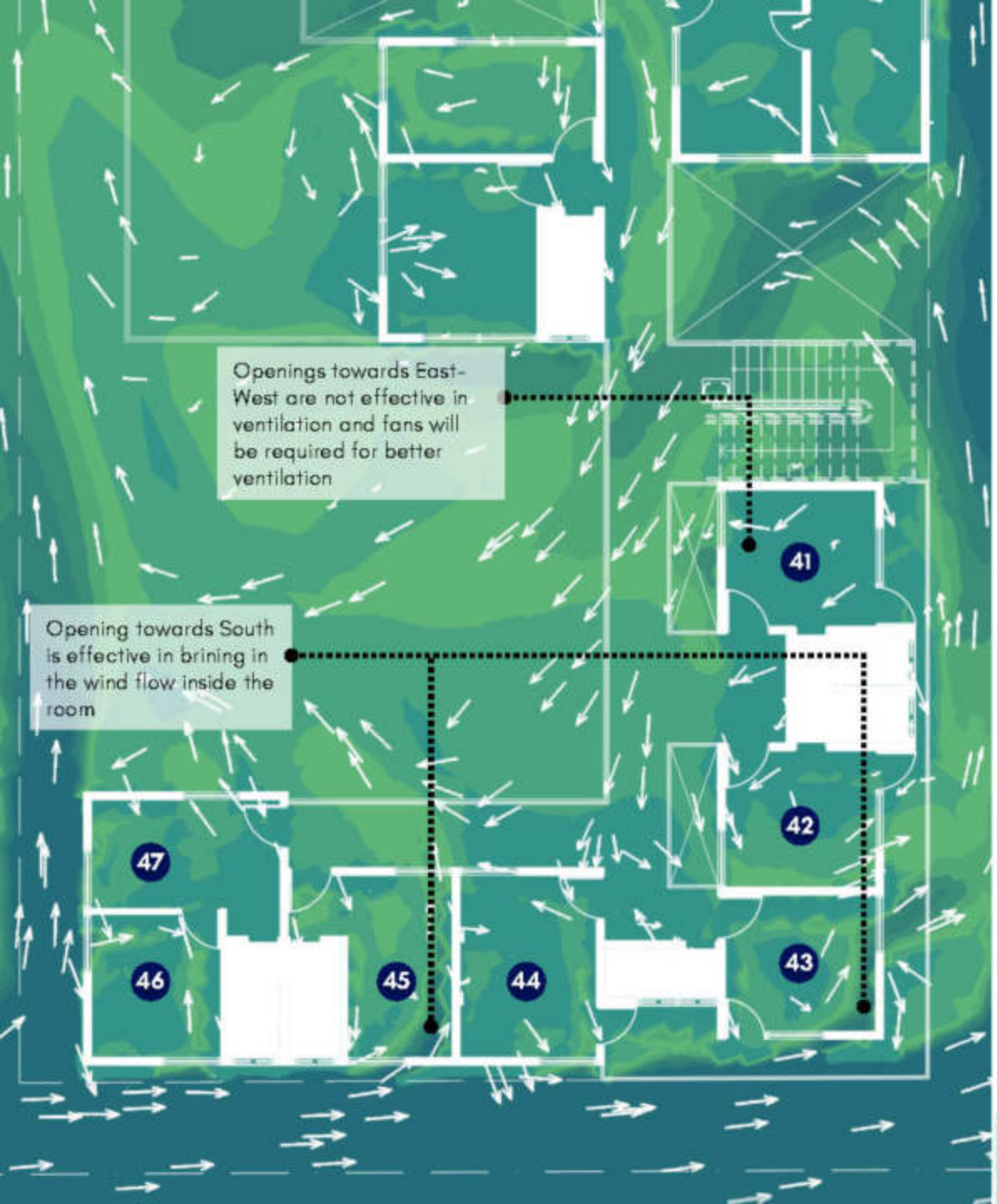
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

36 Multi Purpose Hall
37 Family Unit -2 Room -1
38 Family Unit -2 Room -2
39 Multi occupancy -3 Single Room
40 Multi occupancy -3 Plus Room



Interior CFD Analysis

Zone - 3| Second Floor |Results at 8.5m ht. from the ground

- **Key points/ Observation:**

  I. Second floor experiences a similar pattern as the First floor. The openings towards the South are effective in bringing in the wind flow inside the rooms.

  II. The room with openings in East-West direction is not well-ventilated and will be dependent on fans or other devices for ventilations.

Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

41 Single Room -4
42 Single Room -5
43 Multi occupancy -4 Single Room
44 Multi occupancy -4 Plus Room
45 Single Room -6
46 Family unit -3 Room -2
47 Family unit -3 Room -1

Interior CFD Analysis

Zone - 3| Third Floor |Results at 11.6m ht. from the ground

- **Key points/ Observation:**

  I. The openings towards West are not located optimally and thus West wind is not captured effectively. The rooms are thus not well ventilated.

  II. Openings towards corridor for rooms in East are effective in brining in the wind and improving the ventilation of rooms.

Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

48 Multi occupancy -5 Single Room
49 Multi occupancy -5 Plus Room
50 Multi occupancy -6 Single Room
51 Multi occupancy -6 Plus Room
52 Multi occupancy -7 Single Room
53 Multi occupancy -7 Plus Room
54 Laundry

Iteration-2

Building level analysis- Daylight and Internal CFD

Reception and waiting area has good amount of light from adjacent open court .

Counselling and legal aid room average amount of daylight due to increase of opening's extent.

Administrative area and kitchen receives good amount of daylight due to due to increase of opening's extent.

Dining area receive optimum light from adjacent open court

Multipurpose hall has ample amount of evenly distributed daylight due to the openings in 3 walls

UA unit in SE corner gets good amount of light through openings in 2 exterior walls

Ground floor

DA 300 = 65.93 %

Daylight Autonomy (DA)

Daylight Autonomy at 300 lux

Overall percentage- 74.82 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction to maximize daylight, and the strategic location of courts ensures optimum daylight in areas that may fall under shaded areas due to adjacent buildings

- **Key points/ Observation:**

  Over 65% of the internal area receives excellent daylight. The rooms towards East are compromised due to the adjacent proposed development.

Daylight autonomy (DA) is a daylight availability metric that corresponds to the percentage of the occupied time when the target illuminance at a point in a space is met by daylight. DA helps to evaluate spaces for autonomy in daylight and helps in restricting use of electrical lighting in these spaces.

1. Reception and Info
2. Waiting area
3. Rest area for staff
4. Security booth
5. Manager's room
6. Counselling room
7. Legal aid room
8. Prayer room
9. Kids Area
10. Dining room
11. Utility
12. Kitchen
13. UA Unit-1
14. UA Unit-2
15. UA Unit-3
16. UA Unit-4
17. Multi-purpose hall

Legend

DA 300

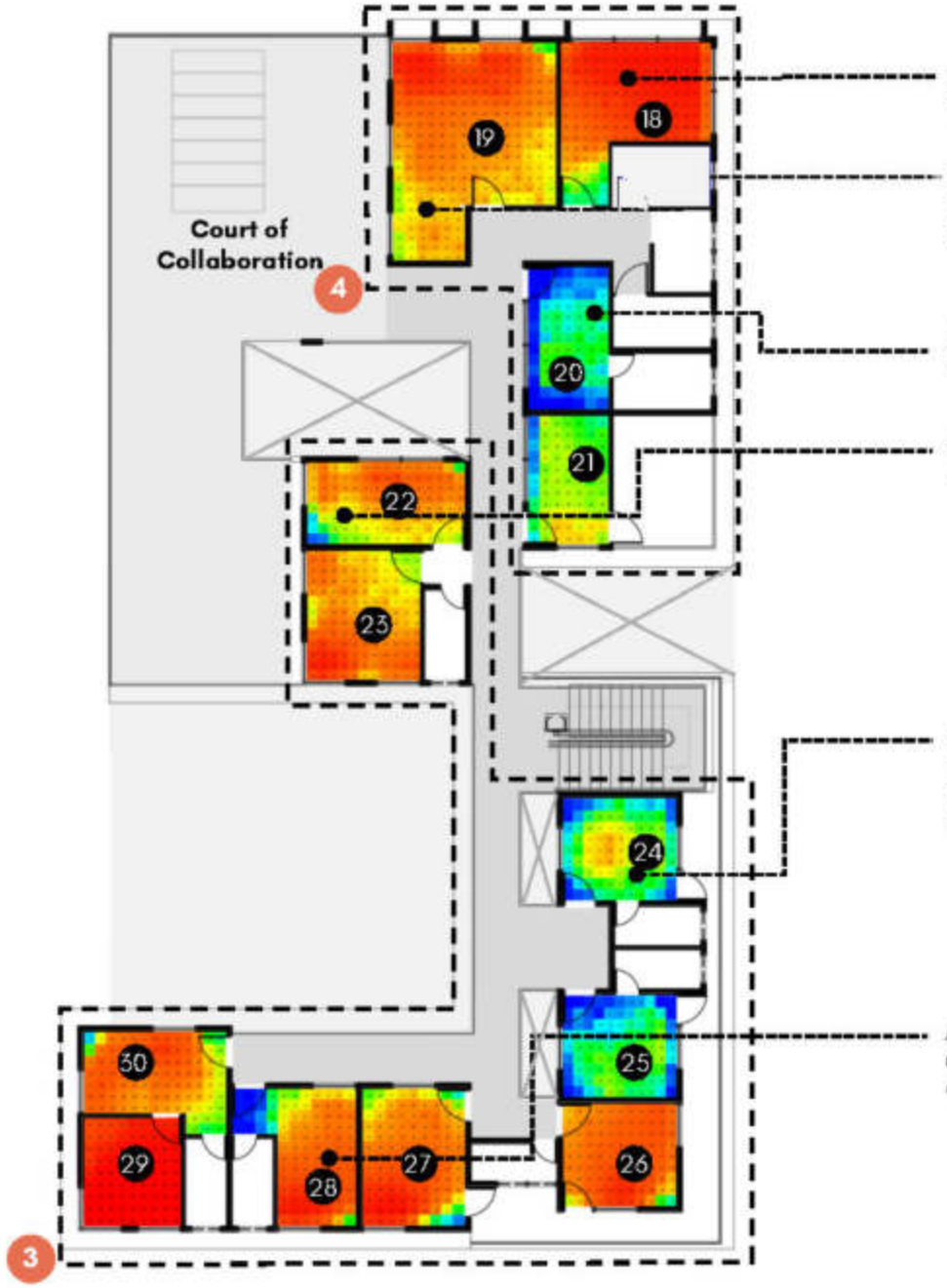
0 — 100%

1. Zone-1: Public Area
2. Zone-2: Private area (Accommodation supporting uses)
3. Zone 3 - Private Area (Accommodation Zone)

N

0 — 5m — 10m

Daylight Autonomy (DA)



Administration area towards North has ample amount of daylight.

The expansion and rearrangement of office staffroom has helped in capturing more daylight.

Administration area that faces East, has average level of daylight .

Accommodation Units towards West receives excellent daylight

Accommodation Units towards East receives average daylight due to mutual shading from context buildings

Accommodation Units towards South receives excellent daylight from openings

First floor

DA 300 = 72.61%

Daylight Autonomy at 300 lux

Overall percentage- 74.82 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction to maximize daylight and building mass towards East to reduce the areas under shading from building in West

- **Key points/ Observation:**

  Approximately 72% of the internal area receives optimum daylight. It is also evenly distributed to a large extent. Due to mutual shading from the proposed building on the western side, rooms on the western side have compromised daylighting levels.

18. Meeting room
19. Office staff room
20. Female maintenance staff rest room
21. Laundry room
22. Multi occupancy -1 Single room
23. Multi occupancy -1 Plus room
24. Single room - 1
25. Single room -2
26. Multi occupancy - 2 Single room
27. Multi occupancy -2 Plus room
28. Single room - 3
29. Family unit-1 Room 2
30. Family unit-2 Room 1

Legend

DA 300

0 100%

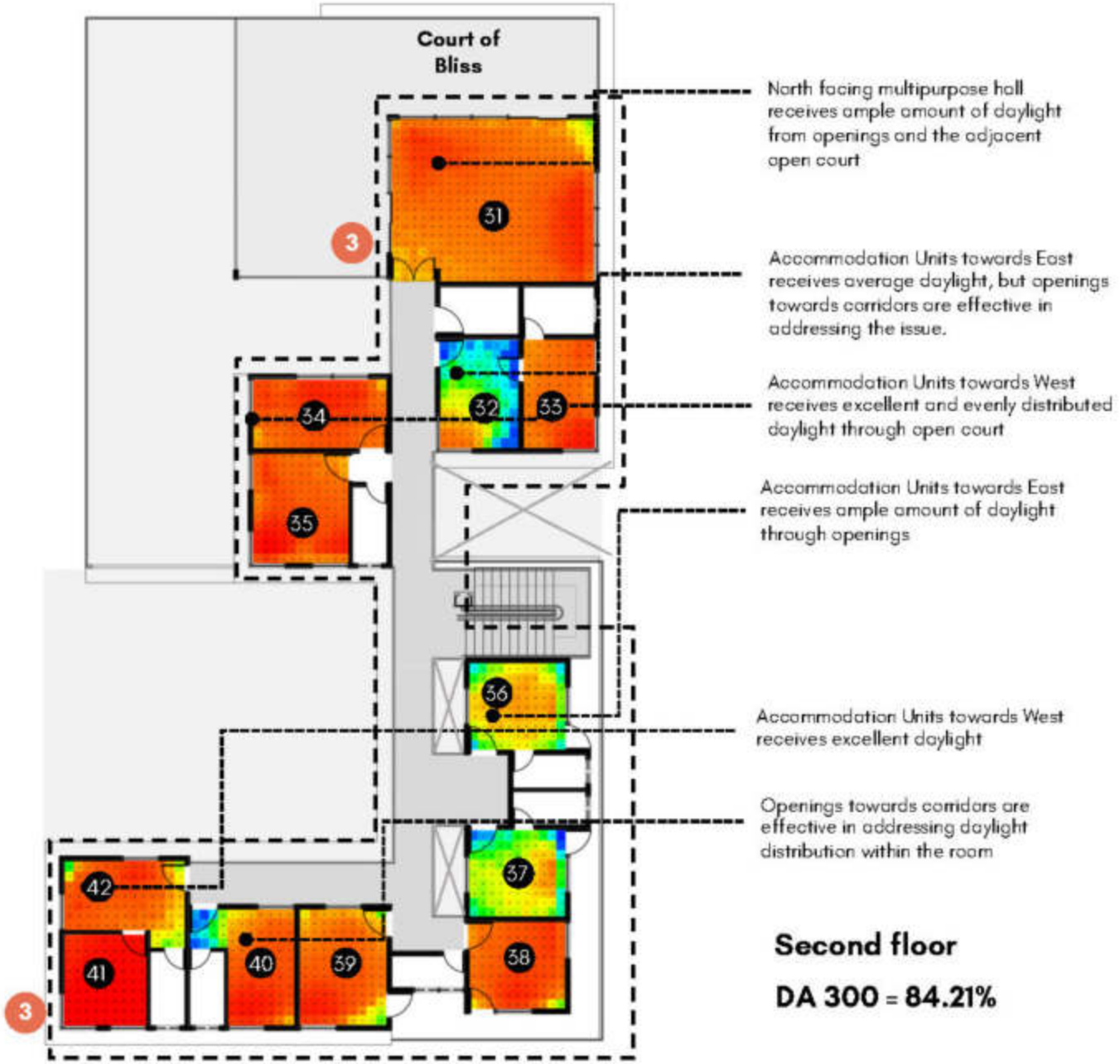
3 Zone 3 - Private Area (Accommodation Zone)

4 Zone 4 - Private Area (Administration Zone)

N

0 5m 10m

Daylight Autonomy (DA)



Daylight Autonomy at 300 lux

Overall percentage- 74.82 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction to maximize daylight and building mass towards East to reduce the areas under shading from building in West

- **Key points/ Observation:**

  Approximately 85% of the area receives excellent and well-distributed daylight.
  Openings towards corridor are less effective, however, significant improvement is seen in the rooms overall.

31. 32. Multi purpose Hall
32. Family Unit 2 - Room 1
33. Family Unit 2 - Room 2
34. Multi occupancy 3 - Single room
35. Multi occupancy 3 - Plus room
36. Single room 4
37. Single room 5
38. Multi occupancy-4 Single room
39. Multi occupancy-4 Plus room
40. Single room - 6
41. Family unit-3 Room 1
42. Family unit-3 Room 2

Legend

DA 300

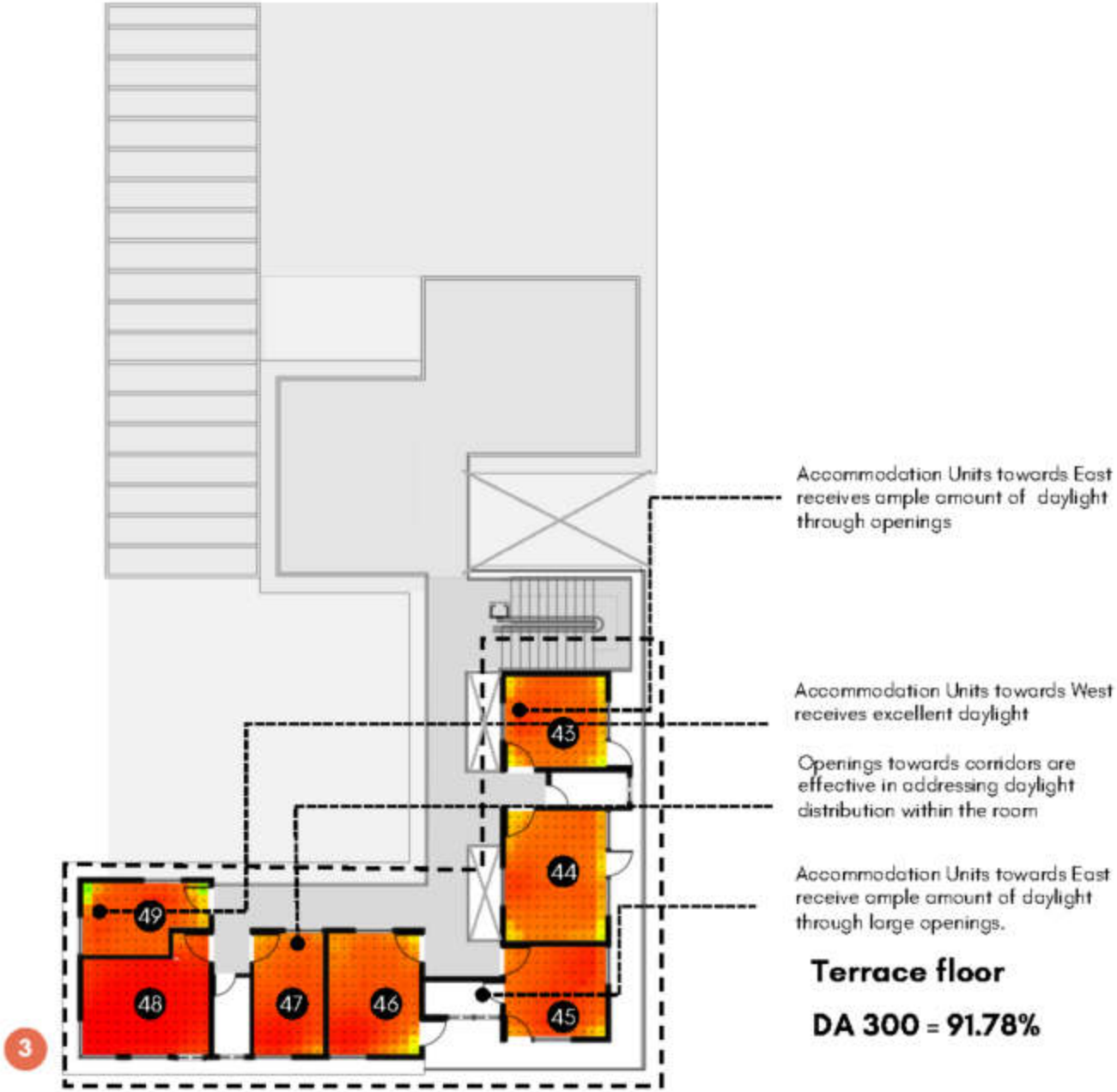
0 100%

3 Zone 3 - Private Area (Accommodation Zone)

N

0 5m 10m

Daylight Autonomy (DA)



Accommodation Units towards East receives ample amount of daylight through openings

Accommodation Units towards West receives excellent daylight

Openings towards corridors are effective in addressing daylight distribution within the room

Accommodation Units towards East receive ample amount of daylight through large openings.

Terrace floor

DA 300 = 91.78%

Daylight Autonomy at 300 lux

Overall percentage- 74.82 %

- **Consideration:**

  Orientation of the spaces (W-E) ensures maximum openings in N-S direction which allows maximum daylight to enter, and building mass towards East-South to ensure maximum daylight.

- **Key points/ Observation:**

  Excellent daylight distribution in all the rooms. The increased opening size is very effective in improving the daylight.

43. 44. Multi occupancy-5 Single room
44. Multi occupancy-5 Plus room
45. Multi occupancy-6 Single room
46. Multi-occupancy-6 Plus room
47. Multi occupancy-7 Single room
48. Multi occupancy-7 Plus room
49. Laundry

Legend

DA 300

0 100%

3 Zone 3 - Private Area (Accommodation Zone)

N

0 5m 10m

Rooms towards North do not experience any glare and thus internal environment of rooms is not compromised.

The glare in waiting zone and reception may cause some visual discomfort, however, it is limited to very small part of the room

Dining space also faces some amount of glare , however, it is limited to very small part of the room

Openings towards West contribute towards increased glare but shading devices are very effective in reducing the glare

Ground floor

ASE 1000 = 3.54 %

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

Overall percentage- 4.49 %

- **Consideration:**

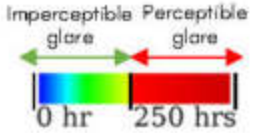
  Orientation of the buildings (W-E) ensures maximum openings in N-S direction which allows maximum daylight to enter, and reduced glare through careful shading.

- **Key points/ Observation:**

  Approximately 3.5 % of the area experiences glare or over-lit spaces, mostly located in Public zone and Multi-purpose Hall. Some habitable spaces need shading due to glare from Western and Southern openings.

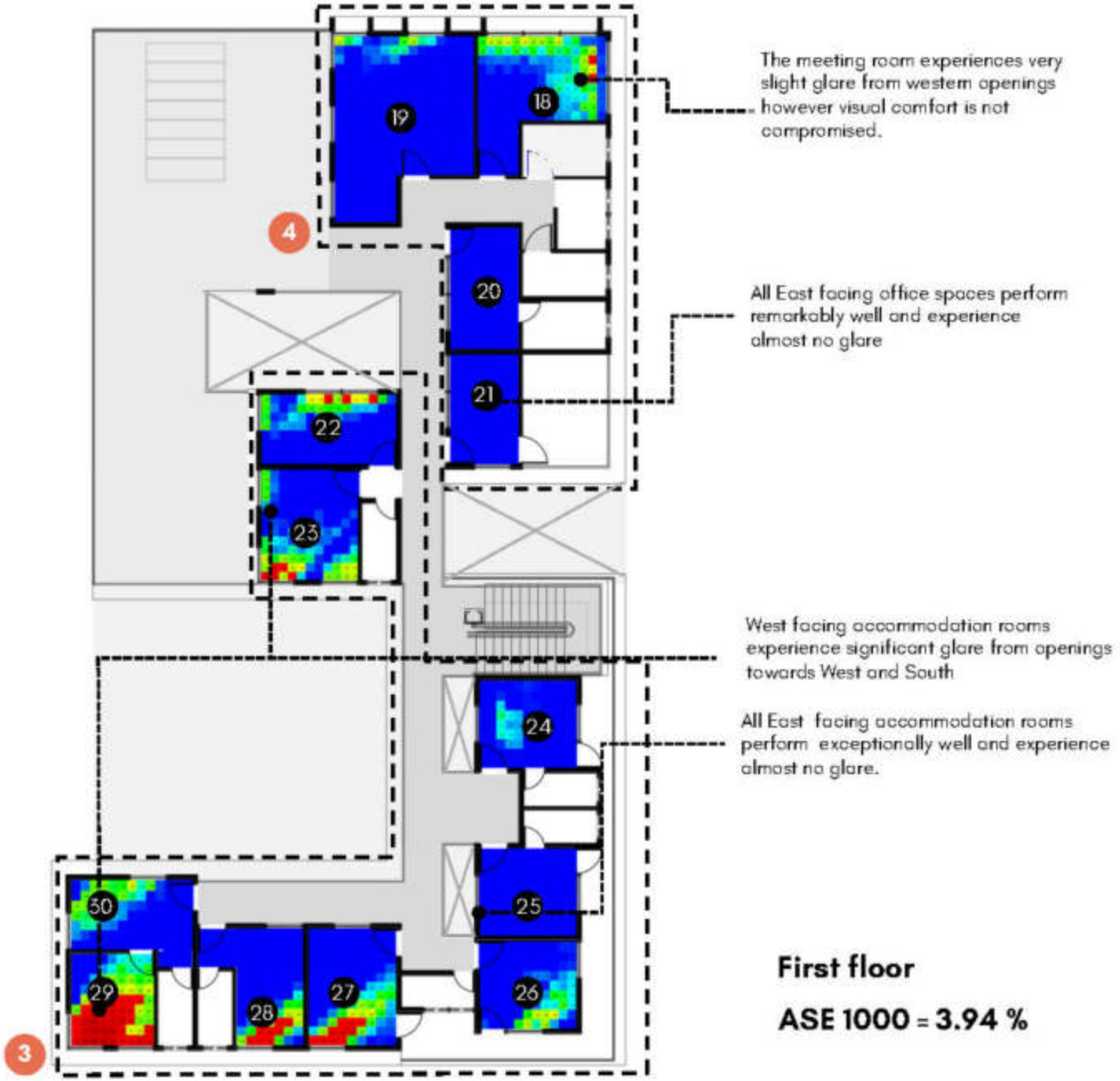
1. Reception and Info
2. Waiting area
3. Rest area for staff
4. Security booth
5. Manager's room
6. Counselling room
7. Legal aid room
8. Prayer room
9. Kids Area
10. Dining room
11. Utility
12. Kitchen
13. UA Unit-1
14. UA Unit-2
15. UA Unit-3
16. UA Unit-4
17. Multi-purpose hall

Legend



1. Zone-1: Public Area
2. Zone-2: Private area (Accommodation supporting uses)
3. Zone 3 - Private Area (Accommodation Zone)

Annual Solar Exposure (ASE)



First floor

ASE 1000 = 3.94 %

1000 lux > 250 hrs

Overall percentage- 4.49 %

- **Consideration:**

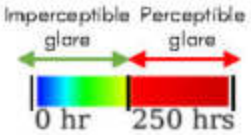
  Orientation of the buildings (W-E) ensures maximum openings in N-S direction which allows maximum daylight to enter, and reduced glare through careful shading.

- **Key points/ Observation:**

  Approximately 4 % of the area experiences glare or over-lit spaces.
  To improve the indoor environment, shading elements are required for the openings in West and South sides. Façade screen is effective in reducing glare.

18. Meeting room
19. Office staff room
20. Female maintenance staff rest room
21. Laundry room
22. Multi occupancy -1 Single room
23. Multi occupancy -1 Plus room
24. Single room - 1
25. Single room -2
26. Multi occupancy - 2 Single room
27. Multi occupancy -2 Plus room
28. Single room - 3
29. Family unit-1 Room 2
30. Family unit-2 Room 1

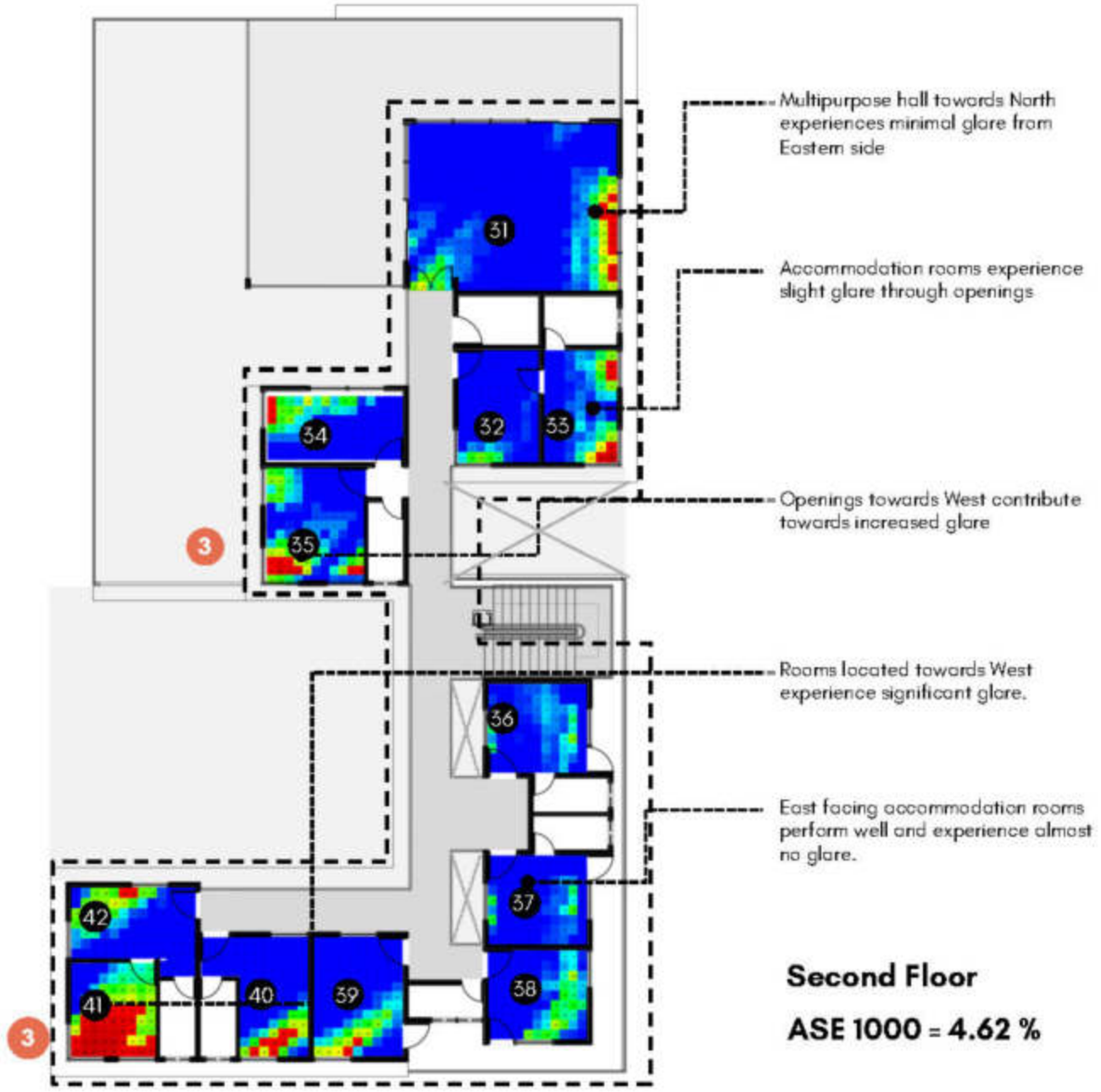
Legend



3 Zone 3 - Private Area (Accommodation Zone)

4 Zone 4 - Private Area (Administration)

Annual Solar Exposure (ASE)



Second Floor

ASE 1000 = 4.62 %

1000 lux > 250 hrs

Overall percentage- 4.49 %

- **Consideration:**

  Orientation of the buildings (W-E) ensures maximum openings in N-S direction which allows maximum daylight to enter, and reduced glare through careful shading.

- **Key points/ Observation:**

  Over 4.5 % of the area experiences glare or over-lit spaces. The glare can be observed in all rooms with external openings. Rooms with large openings towards West and South require effective shading elements to improve the indoor environment.

31. 32. Multi purpose Hall
32. Family Unit 2 - Room 1
33. Family Unit 2 - Room 2
34. Multi occupancy 3 - Single room
35. Multi occupancy 3 - Plus room
36. Single room 4
37. Single room 5
38. Multi occupancy-4 Single room
39. Multi occupancy-4 Plus room
40. Single room - 6
41. Family unit-3 Room 1
42. Family unit-3 Room 2

Legend

Imperceptible glare | Perceptible glare

0 hr | 250 hrs

3 Zone 3 - Private Area (Accommodation Zone)

N

0 5m 10m

Annual Solar Exposure (ASE)

1000 lux > 250 hrs

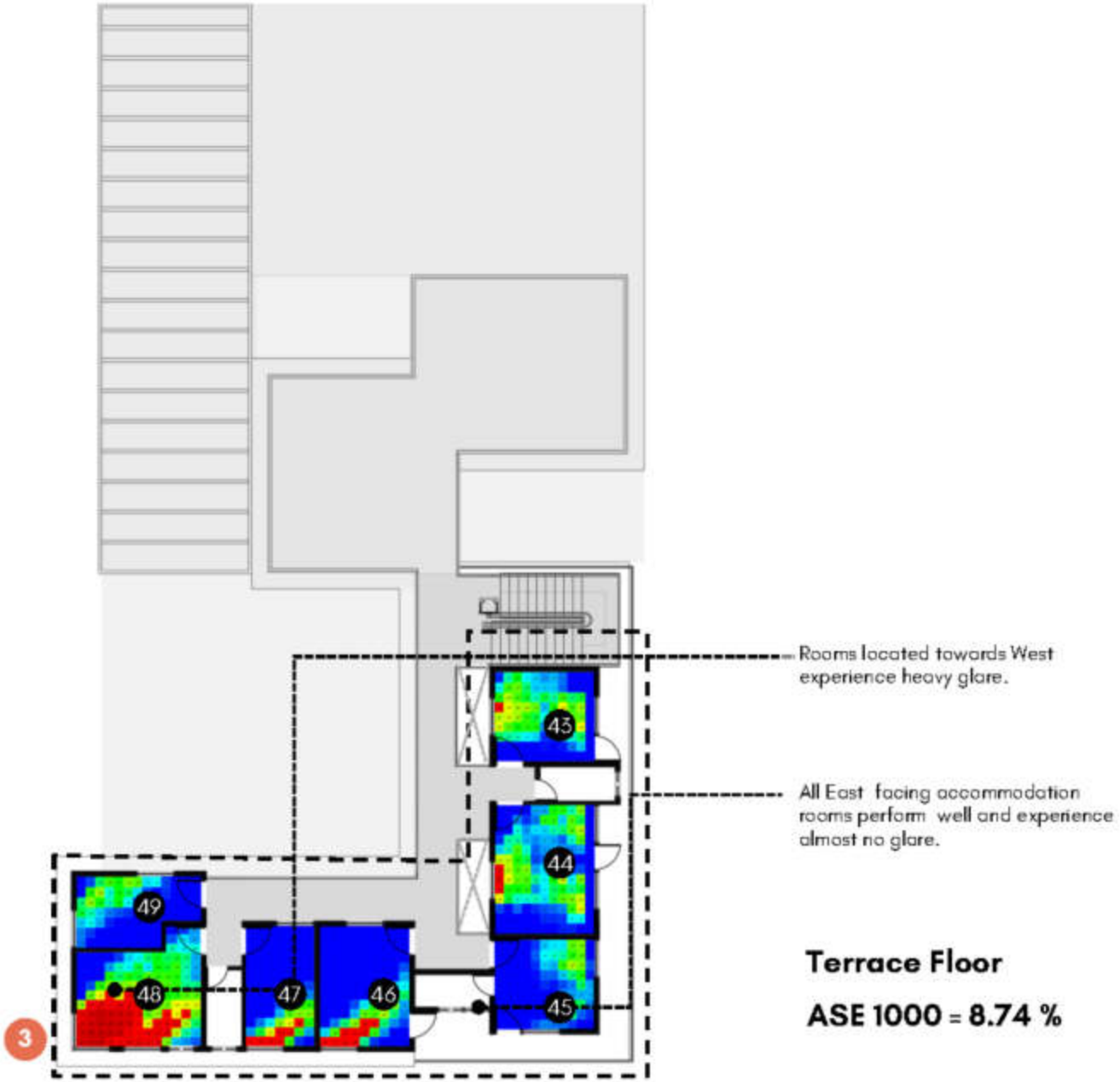
Overall percentage- 4.49 %

- **Consideration:**

  Orientation of the buildings (W-E) ensures maximum openings in N-S direction which allows maximum daylight to enter, and reduced glare through careful shading.

- **Key points/ Observation:**

  Excessive glare observed on Third Floor. While screen is effective towards East, the rooms towards West and South require shading.



Terrace Floor

ASE 1000 = 8.74 %

43. 44. Multi occupancy-5 Single room
44. Multi occupancy-5 Plus room
45. Multi occupancy-6 Single room
46. Multi-occupancy-6 Plus room
47. Multi occupancy-7 Single room
48. Multi occupancy-7 Plus room
49. Laundry

Legend

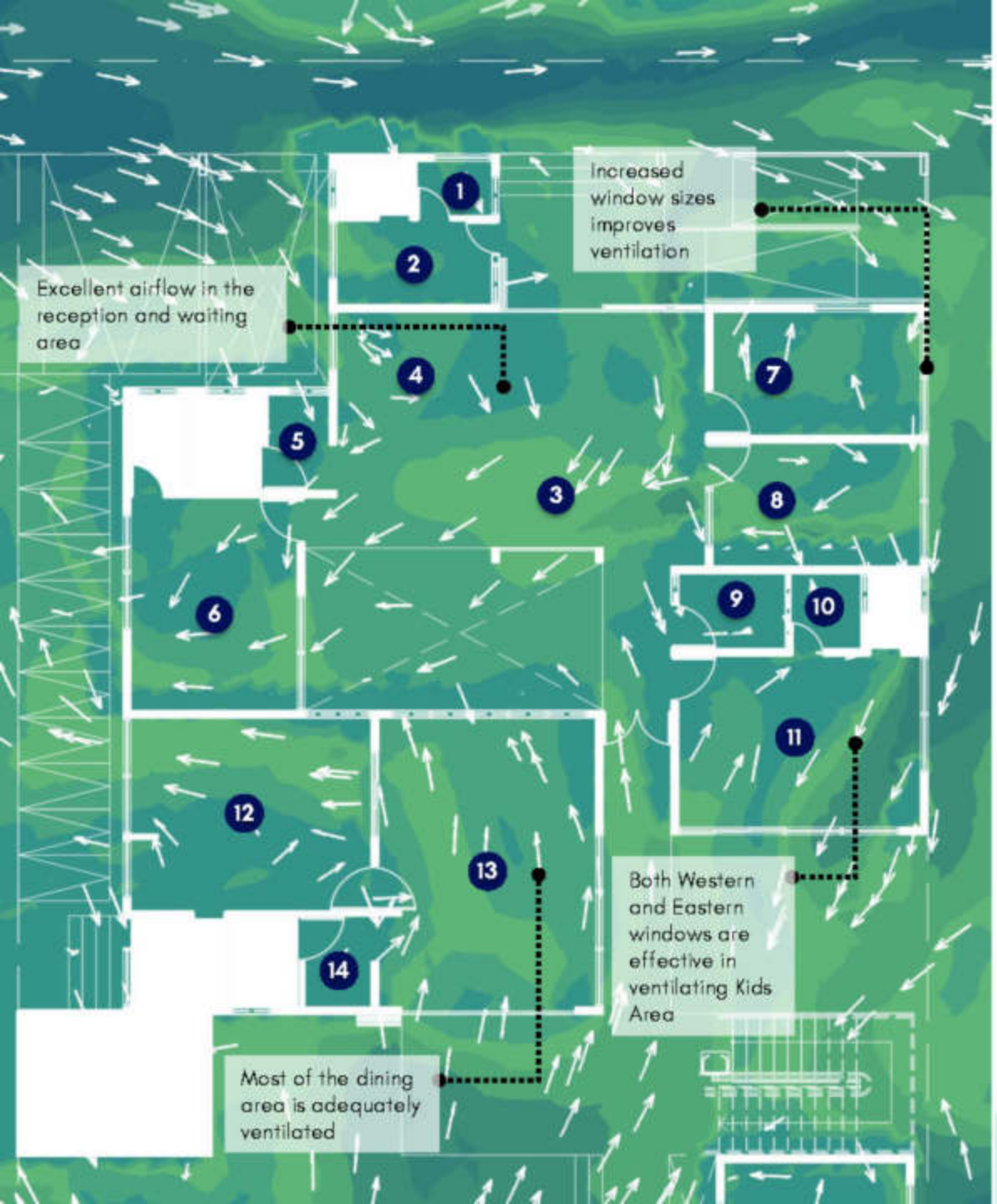
Imperceptible glare | Perceptible glare

0 hr 250 hrs

3 Zone 3 - Private Area (Accommodation Zone)

N

0 5m 10m



Interior CFD Analysis

Zone - 1, 2 | Ground Floor |Results at 2.1m ht. from the ground

- **Considerations:**
  The primary wind flow is parallel (W-E) to the built mass and thus openings and courtyards are utilized to channel the Western wind into the site and subsequently into the interior areas. The opening sizes are increased to improve overall ventilation.

- **Key points/ Observation:**
  Predominant air streams are seen from West which get deflected through built mass into the site and landscaped courts.

- **Implication on Masterplan:**
  Improved overall ventilation observed after increase in the window sizes. The wind-flow from Eastern windows is also effective, however, western openings are not efficient due to the probability of 8 floor high building being considered towards West.

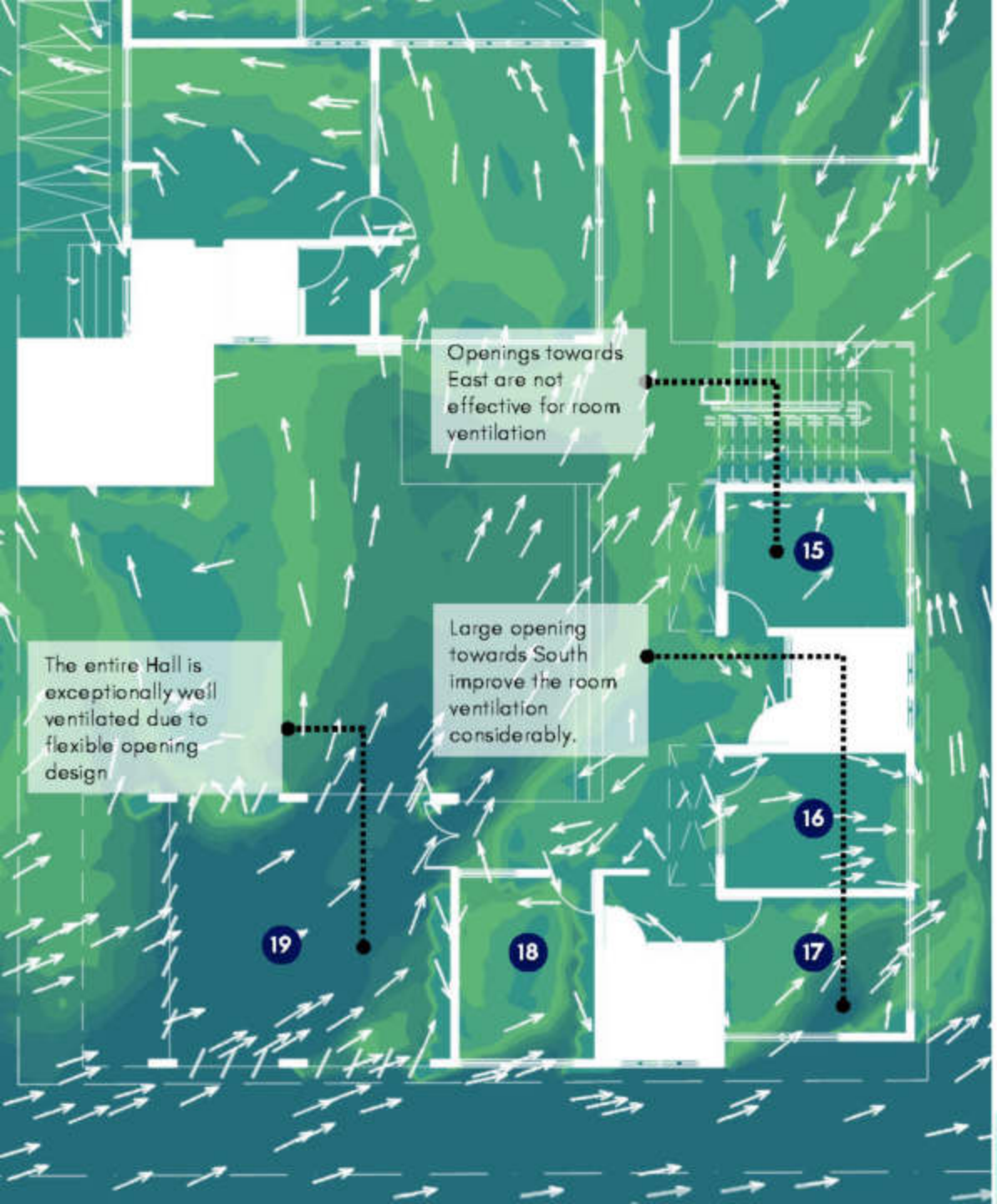
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

1. Security Room
2. Staff Rest Area
3. Reception
4. Waiting Lounge
5. Utility Area
6. Manager's Room
7. Counseling Room
8. Legal Aid Room
9. Prayer Room
10. Breast Feeding Room
11. Kids Area
12. Kitchen
13. Dining Room
14. Hand Wash and Disposal



Interior CFD Analysis

Zone - 3| Ground Floor |Results at 2.1m ht. from the ground

- **Key points/ Observation:**

  I. Large openings towards the West and South are quite effective in channelling the wind flow inside the rooms.

  II. Rooms towards East have inadequate wind flow and fans/ mechanical aids are required to improve the ventilation.

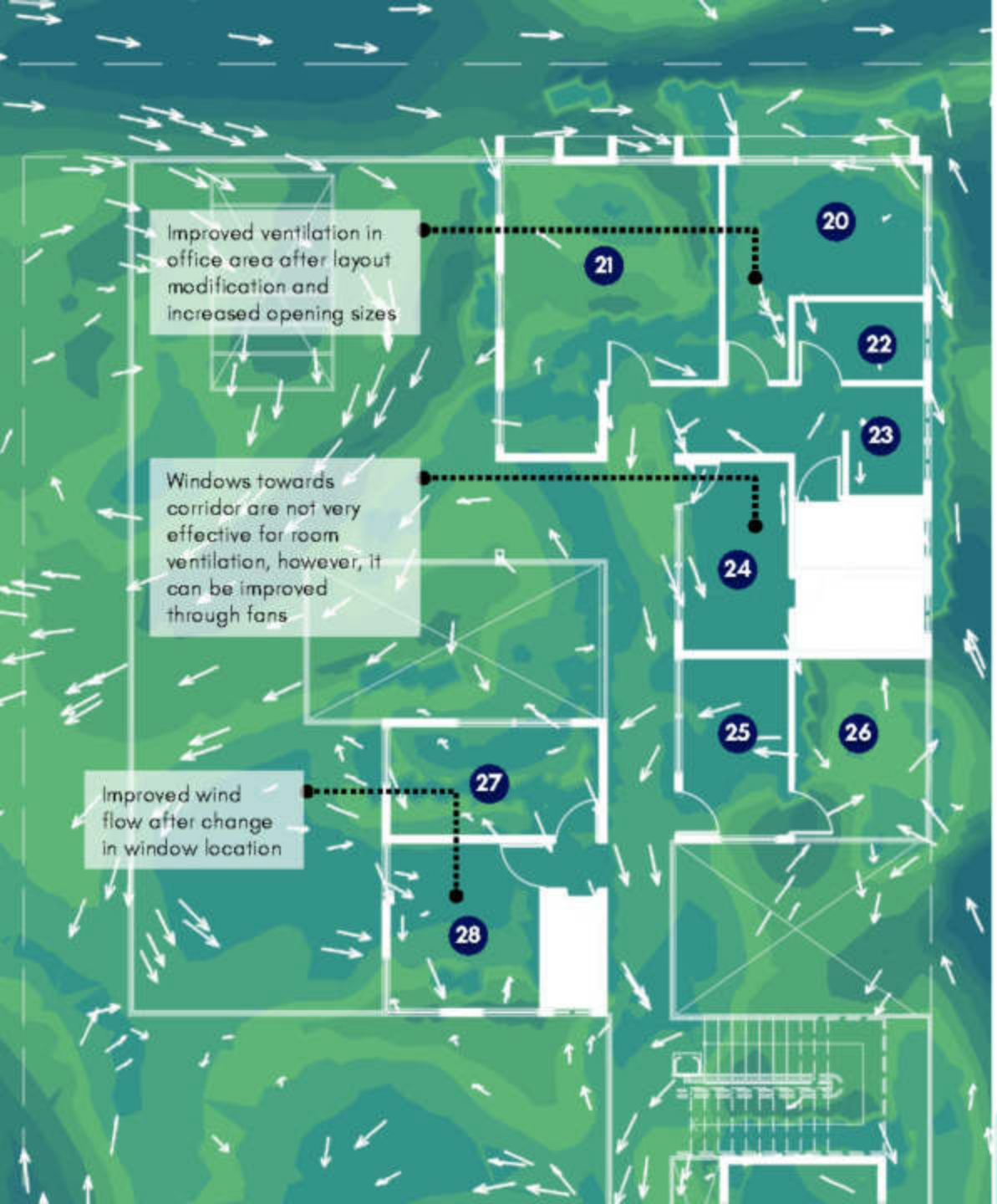
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

15 UA Unit-1
16 UA Unit-2
17 UA Unit-3
18 UA Unit-4
19 Multi-purpose Hall



Interior CFD Analysis

Zone - 3, 4| First Floor |Results at 5.3 m ht. from the ground

- **Key points/ Observation:**
  - The layout rearrangement ensures improved air flow in Office area
  - The change in window location significantly improves the ventilation of accommodation units
  - While windows towards the corridor are not very effective, comfort in the service areas can be enhanced through fans and other mechanical aid.

N

Wind Direction: 270°

Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

20 Meeting Room
21 Office staff Room
22 Records
23 Utility
24 Maintenance staff rest room
25 Laundry Room
26 Clothes drying area
27 Multi occupancy -1 Single Room
28 Multi occupancy -1 Plus Room

Interior CFD Analysis

Zone - 3| First Floor |Results at 5.3 m ht. from the ground

- **Key points/ Observation:**
  - Change in window location in various rooms is very effective in improving the ventilation of the rooms.
  - The rooms towards East will require fans or other mechanical aids to improve the ventilation and create a comfortable indoor environment.

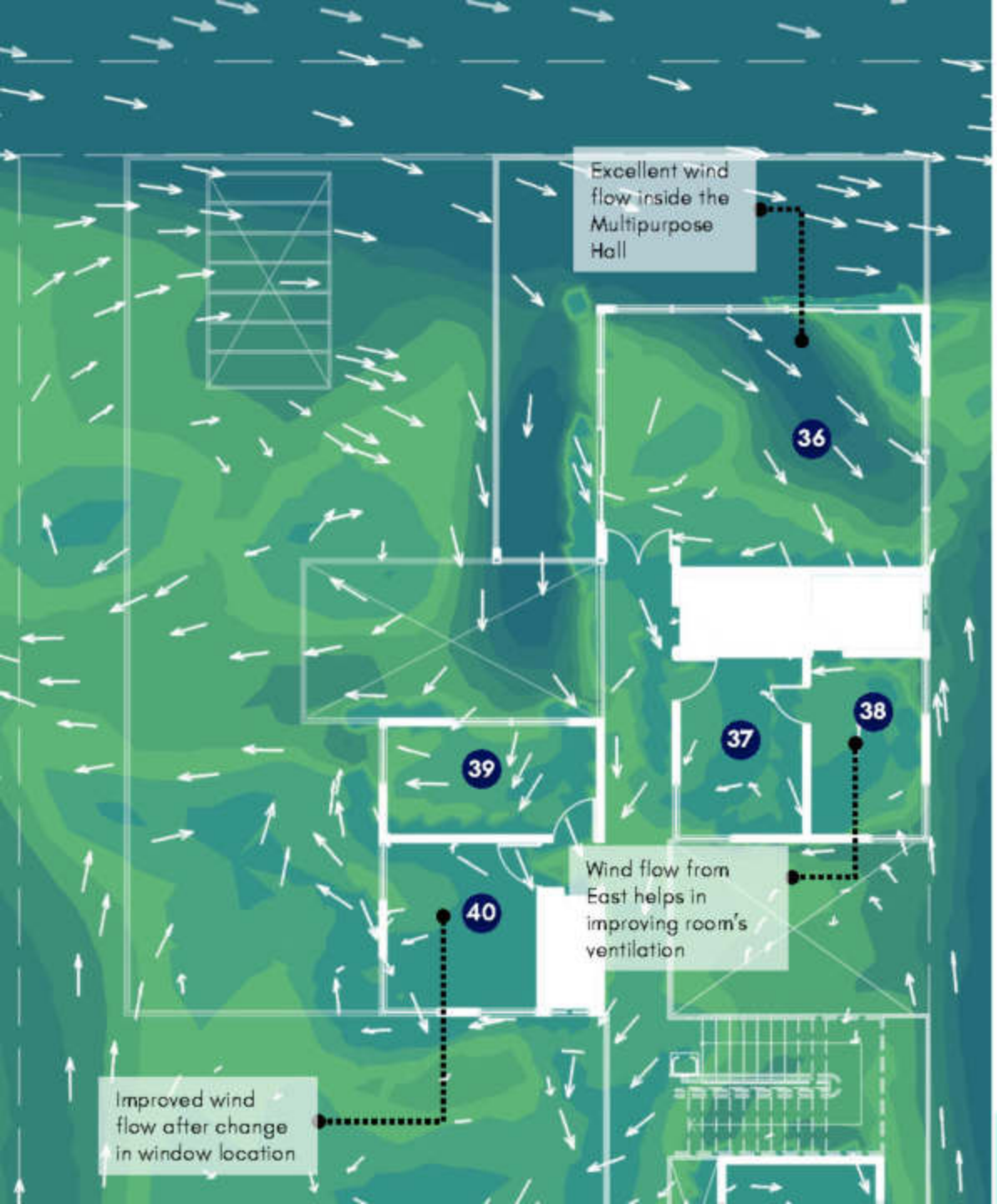
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

29 Single Room -1
30 Single Room -2
31 Multi occupancy -2 Single Room
32 Multi occupancy -2 Plus Room
33 Single Room -3
34 Family unit -1 Room -2
35 Family unit -1 Room -1



Interior CFD Analysis

Zone - 3| Second Floor |Results at 8.5m ht. from the ground

- **Key points/ Observation:**
  - Most areas observe good wind flow inside the rooms, and it can be improved further by fans/ mechanical aids to achieve a comfortable indoor environment.

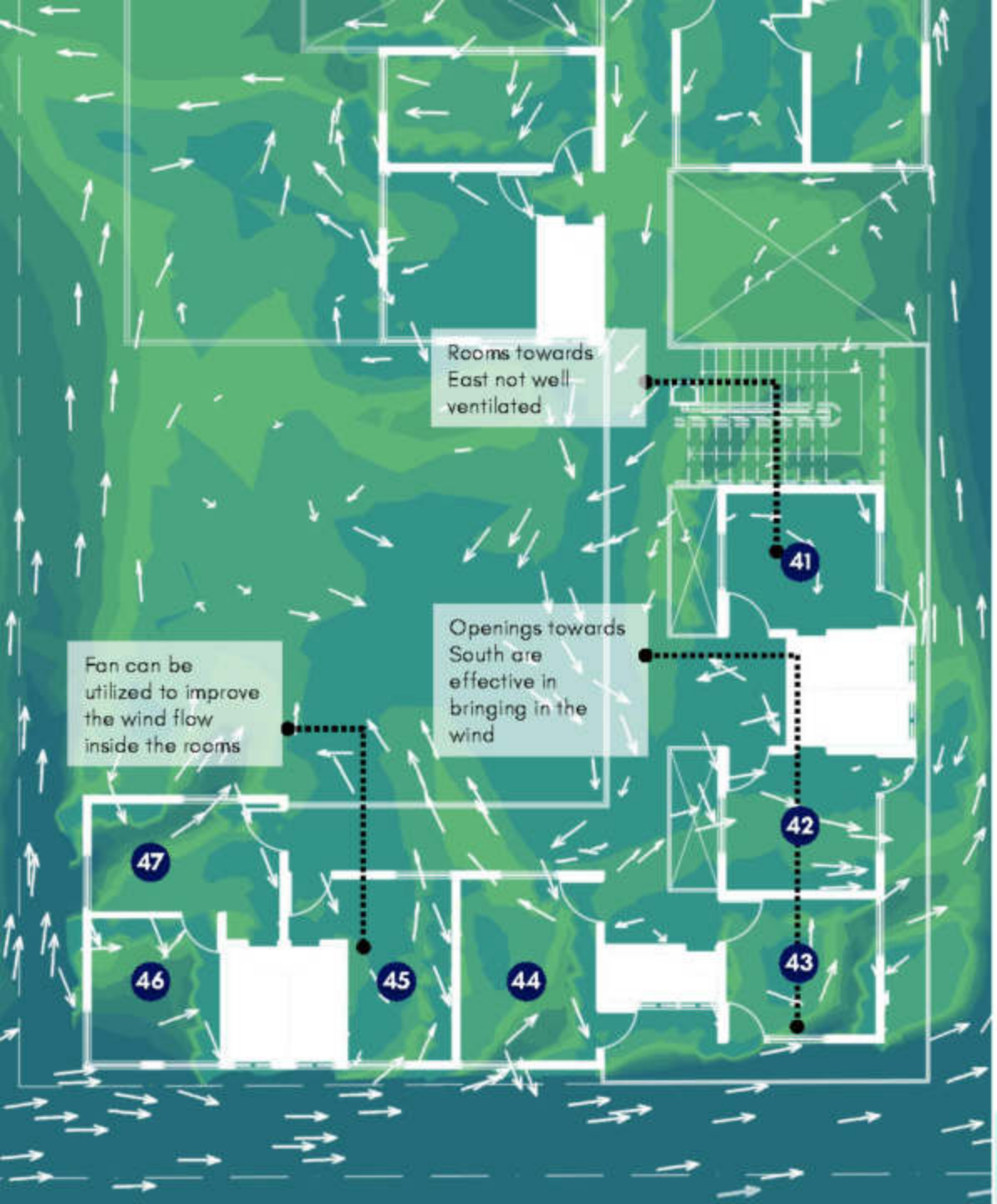
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

36 Multi Purpose Hall
37 Family Unit -2 Room -1
38 Family Unit -2 Room -2
39 Multi occupancy -3 Single Room
40 Multi occupancy -3 Plus Room



Interior CFD Analysis

Zone - 3| Second Floor |Results at 8.5m ht. from the ground

- **Key points/ Observation:**
  - Second floor experiences a similar pattern as the First floor. The openings towards the South are effective in bringing in the wind flow inside the rooms.
  - The room with openings in East-West direction are not effectively ventilated and will be dependent on fans or other devices for effective ventilation.

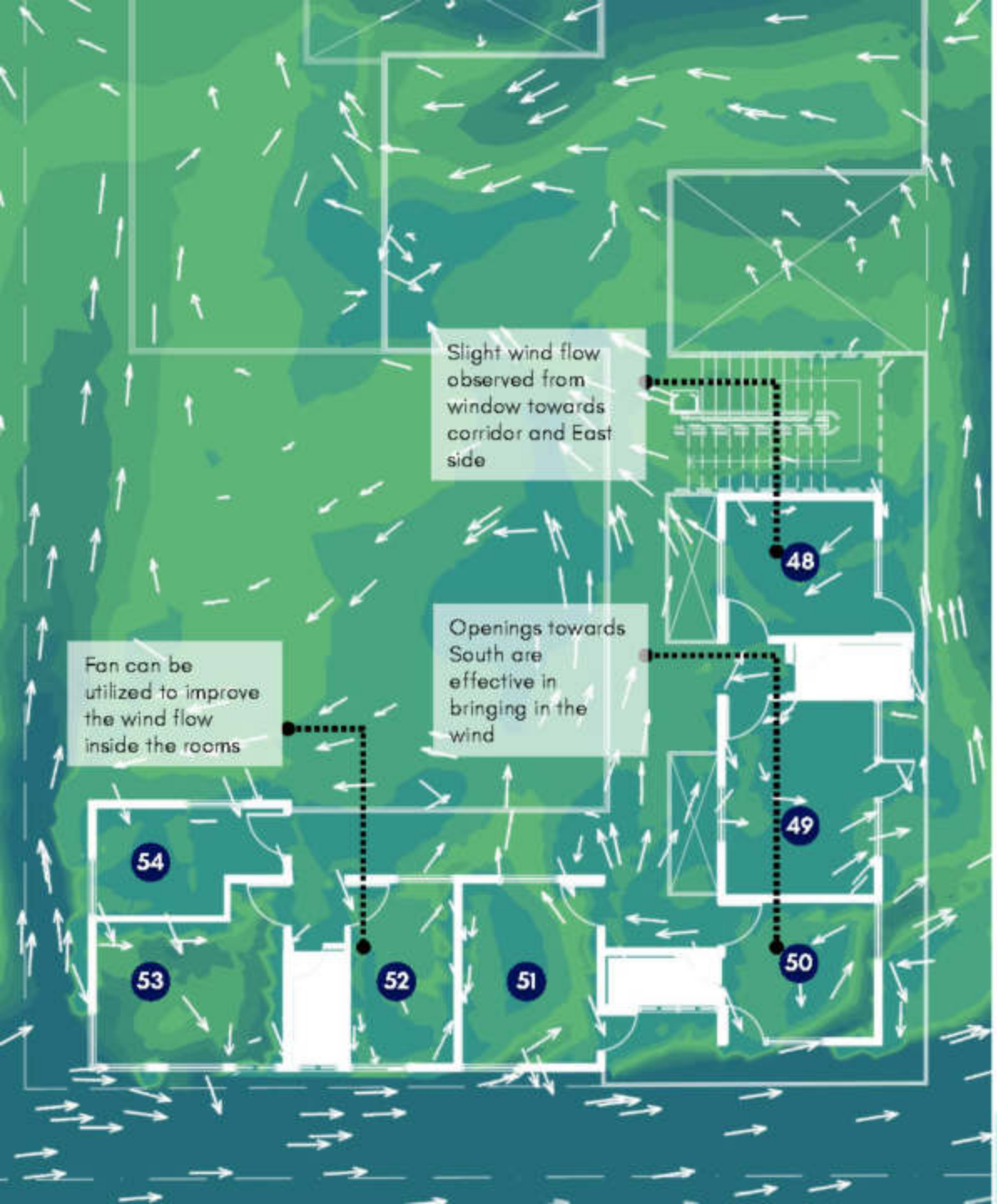
Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

41 Single Room -4
42 Single Room -5
43 Multi occupancy -4 Single Room
44 Multi occupancy -4 Plus Room
45 Single Room -6
46 Family unit -3 Room -2
47 Family unit -3 Room -1



Interior CFD Analysis

Zone - 3| Third Floor |Results at 11.6m ht. from the ground

- **Key points/ Observation:**
  - For Third Floor, rooms towards East perform better and have adequate wind flow inside rooms which can be improved by use of fans
  - Southern and western openings are effective in natural ventilation of rooms

Legend

- 1.5e+00
- 1.0
- 0.5
- 0.0e+00

N

Wind Direction: 270°

48 Multi occupancy -5 Single Room
49 Multi occupancy -5 Plus Room
50 Multi occupancy -6 Single Room
51 Multi occupancy -6 Plus Room
52 Multi occupancy -7 Single Room
53 Multi occupancy -7 Plus Room
54 Laundry

Thank You