

THE ORCHIDS

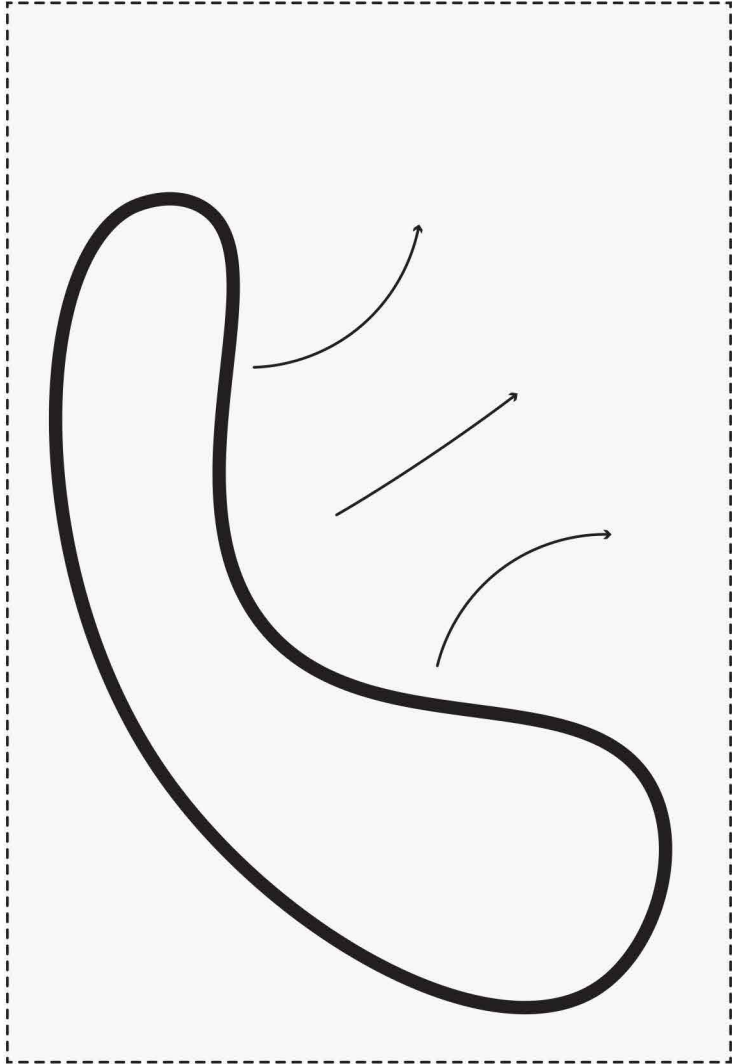
INTERNATIONAL RESIDENTIAL SCHOOL

Site Location : Gurgaon
Site Area : 73 Acres

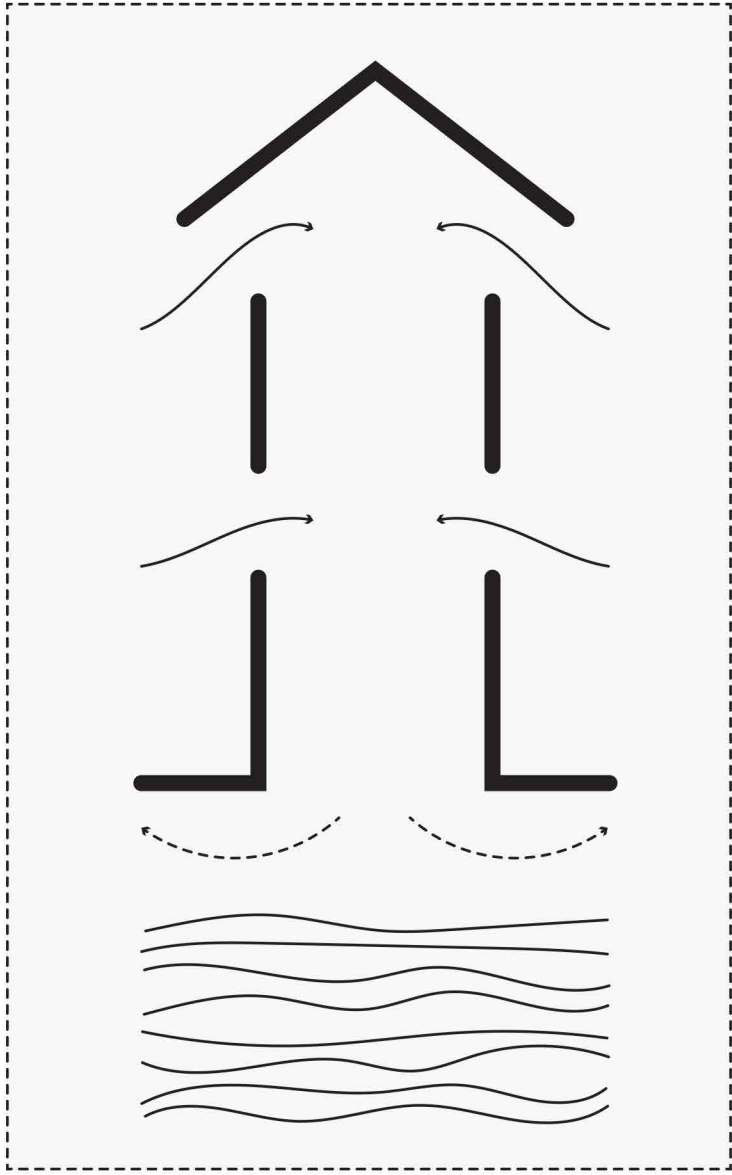
Client : Orchid International School

Project Brief
The aim is to design an international school that promotes international education, in an international environment and making sustainable and environment friendly design, looking into local climatic conditions. Many studies have been done to come up with an innovative use of steel and the core idea was to experiment steel as a building material.

Planning Strategy
The core idea was to plan along the whole site rather than just placing buildings at the front end of the site. Using this we were able to provide future expansion at building level rather than site level.

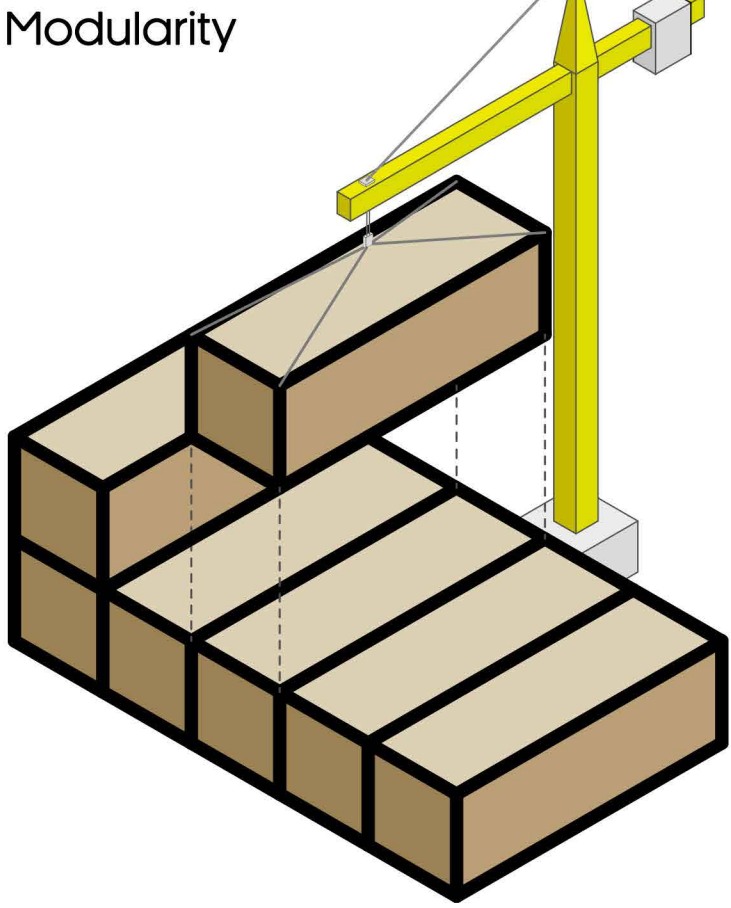


Wind Tower
Wind towers are highly important in hot and dry climate because it humidifies air and provides comfort. Wind tower is placed at the centre in proximity to mess and used to circulate air thus improving outdoor air quality

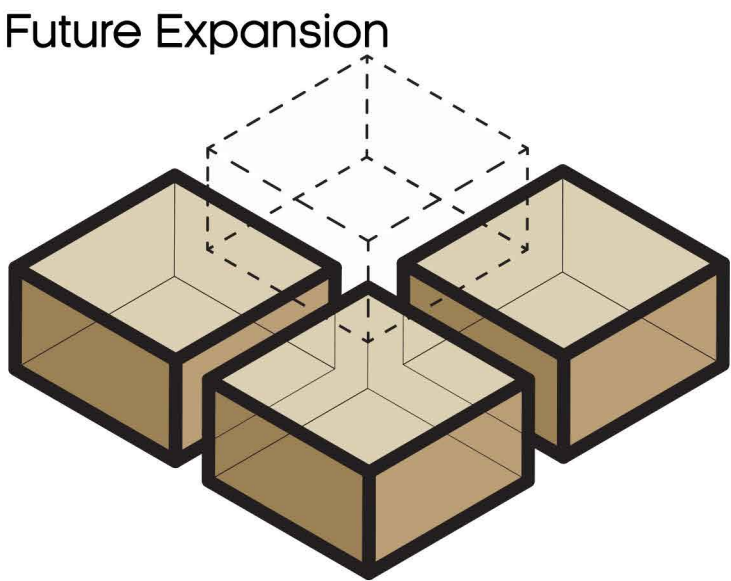


Expression of Steel
Roofing of swimming pool mess and Badminton is done with the use of truss and space frames to achieve longer span between the columns. Auditoriums have been designed with steel beams and web openings. Shading devices have provided as canopy to the Auditorium entrance and Administration entry, which is made of rectangular steel pipes. School and Hostels

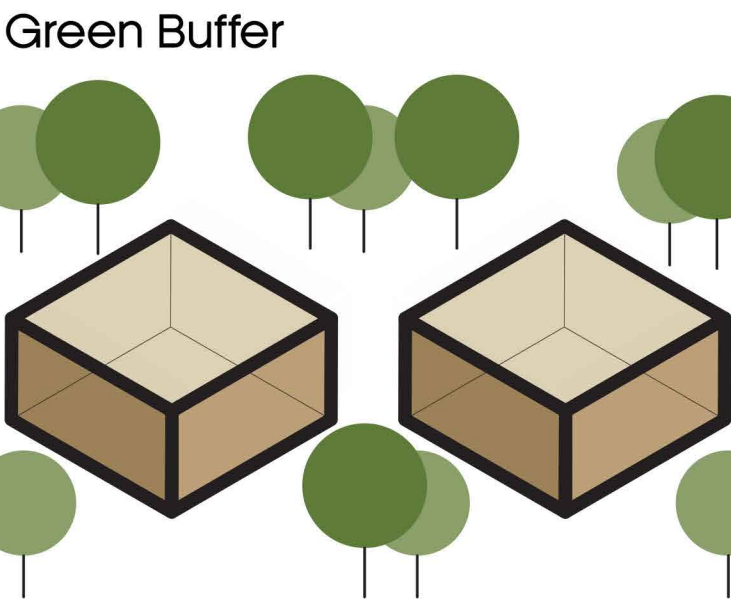
are modular buildings made of open sided module/ Corner supported module. The structure is hybrid RCC foundation is laid with a platform. These steel modular blocks are placed on the platform and connected to each other. As the building has only two floors, no extra structure is required to support them. The corridors and balconies are cantilevered from the module. Open sided module was chosen because they have columns only at the end and there is no restriction on placement of windows or other openings. Partition material is chosen to be Combi EPS (Wood Wool+EPS) as it is fire resistant and also can provide high thermal and sound insulation.



Each building can be developed as a module and these modules can be repeated in future thus preserving uniformity of buildings in the campus.



Modularity makes future expansion easier. Building units can be replicated in the future.



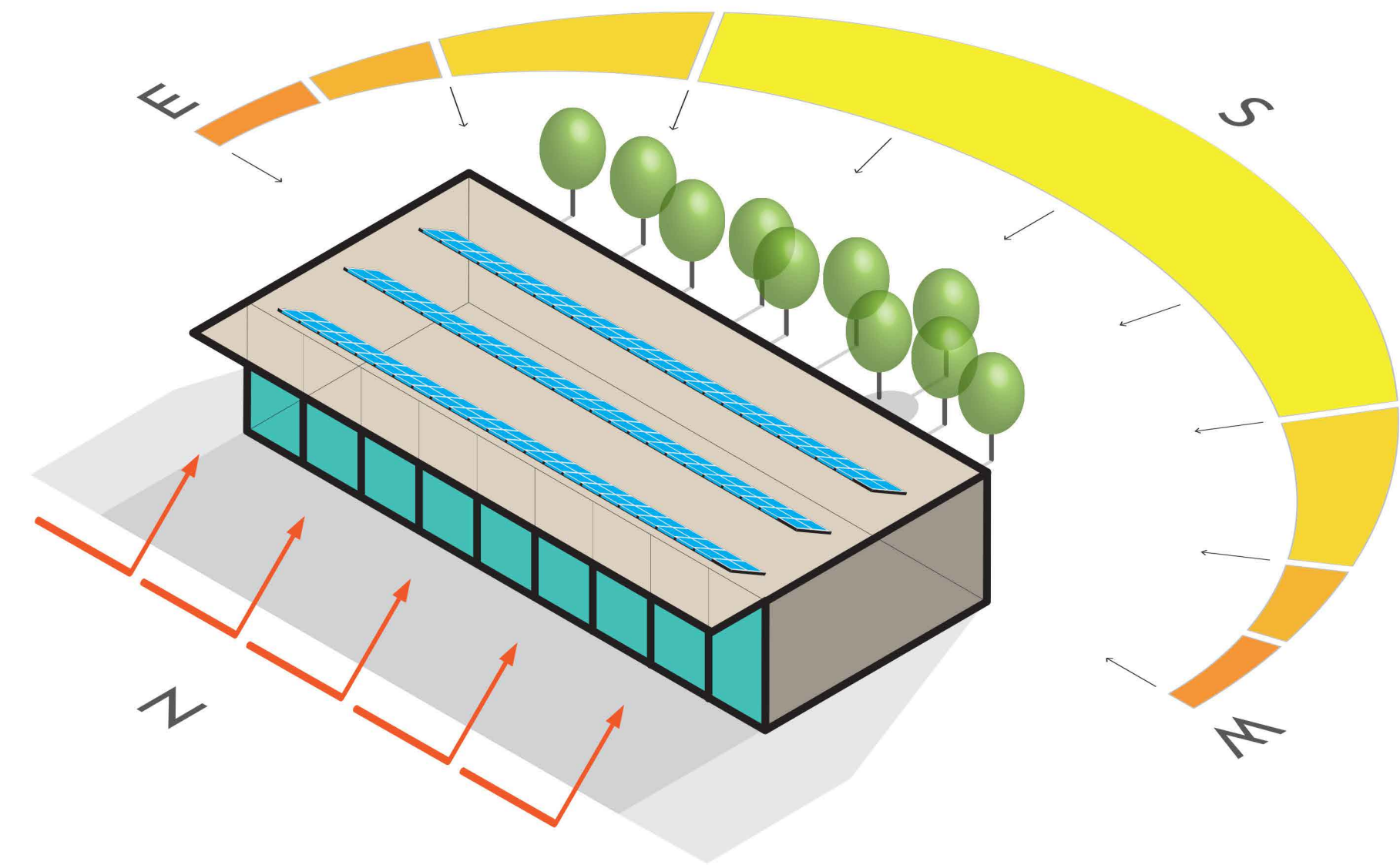
Though spread-out plan is not preferred in hot and dry climate, this was done as the building height and size of the building is very small and green buffers can be used to provide shading.



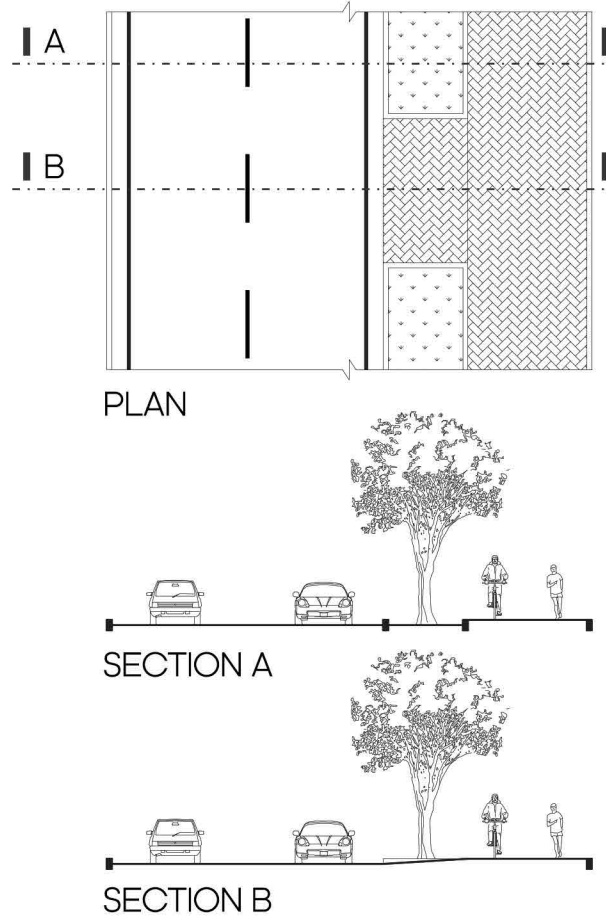
This image shows the entry porch of swimming pool. The roof is cantilevered using steel structures and the elevation is developed with the extensive use of aluminium composite panels and perforated metal sheets.

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Building Orientation
The buildings in the site are oriented with their longer side facing the North and South direction. The buildings are aided with vegetation on the southern side to block the heat. This gives a longer opening towards the northern side and opportunity to keep maximum fenestrations. The orientation also ensures passage of winds to other buildings behind without creating a wind shadow region. As the building heights are restricted to 10m, taller trees could almost cover till the top of every buildings with their shadows.



North Light Utilization
Buildings were oriented in such a way that they receive more northern light. Glazings are provided in northern side of the building to receive more of natural light.

Site Level Circulation
Road network has been designed in such a way that there is only minimal interaction between vehicles and pedestrians. Fig. 1. shows user vehicle movement which includes all users of the school complex. Auditorium, football, and cricket grounds are designed and positioned in such a way that they can be rented for public seminars, awareness programs and sports events. They are planned in such a way that they do not disturb the normal functioning of school. Fig. 2. shows service vehicular movement. In case of emergency vehicles like fire engine, ambulances can reach the interior portions of the site as the pedestrian paths are made more wider so that it can allow them. Fig. 3. shows dedicated cycle track for the cycle users however they can move around using vehicular roads. Fig. 4. shows the pedestrian movement. Adjacent figure shows the plan and section of the roads designed in the site. Green buffer is used to separate the vehicular movement from cycles /pedestrian movement.

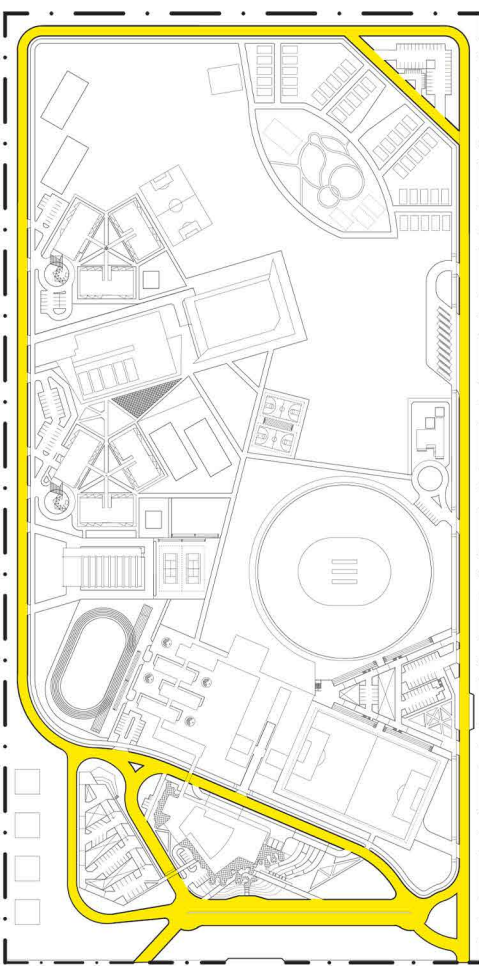


Fig. 1. User Vehicle Movement

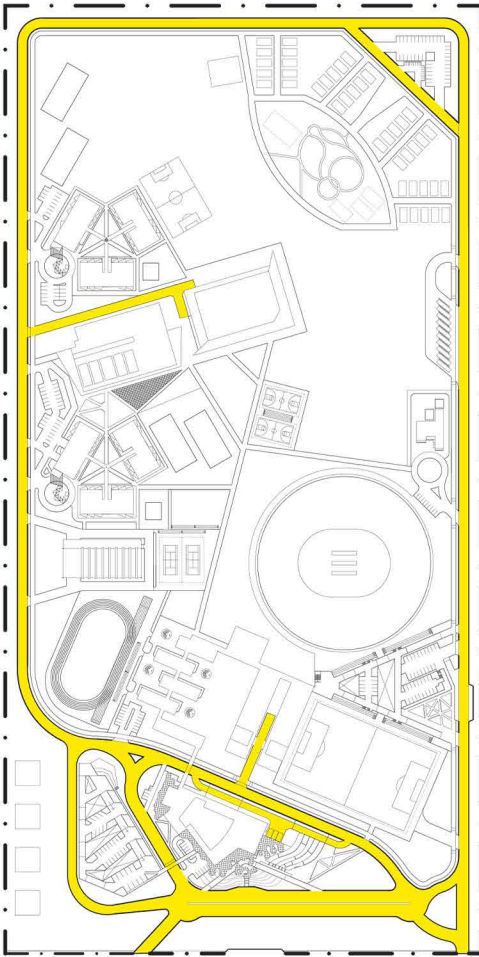


Fig. 2. Service Vehicle Movement

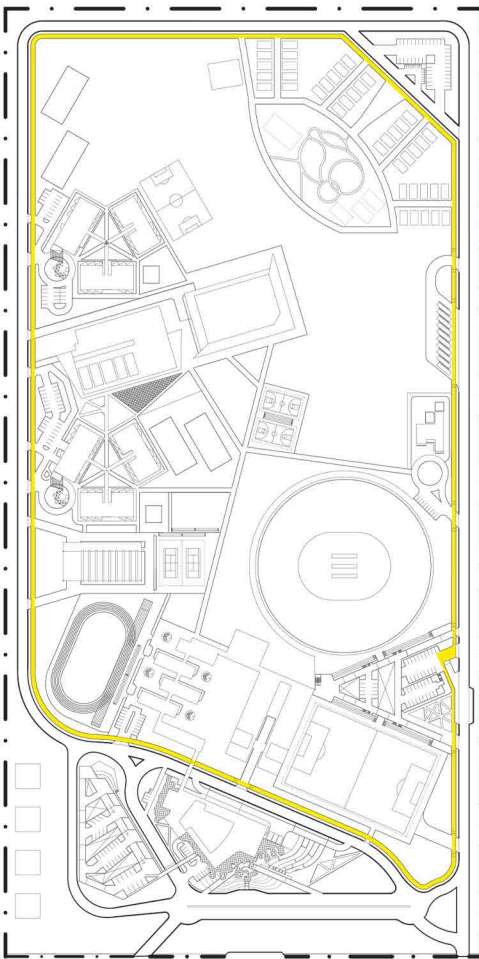


Fig. 3. Cycle Movement

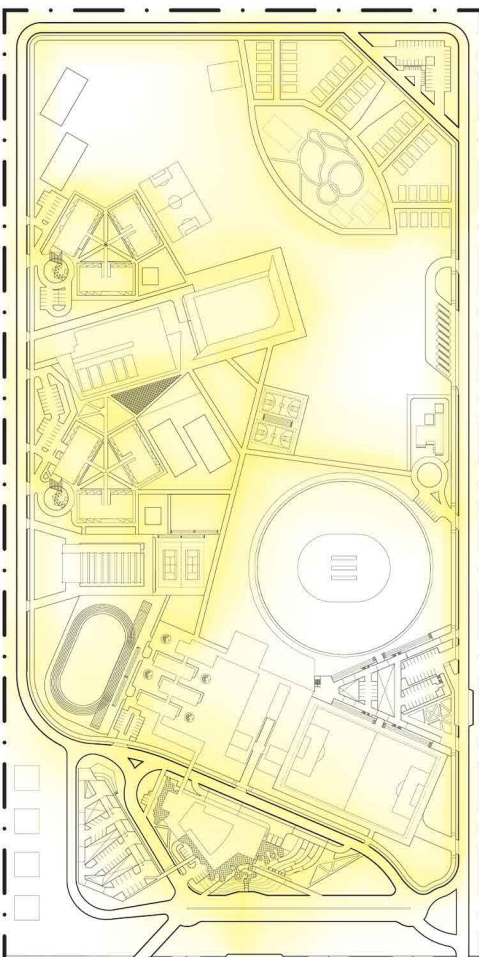
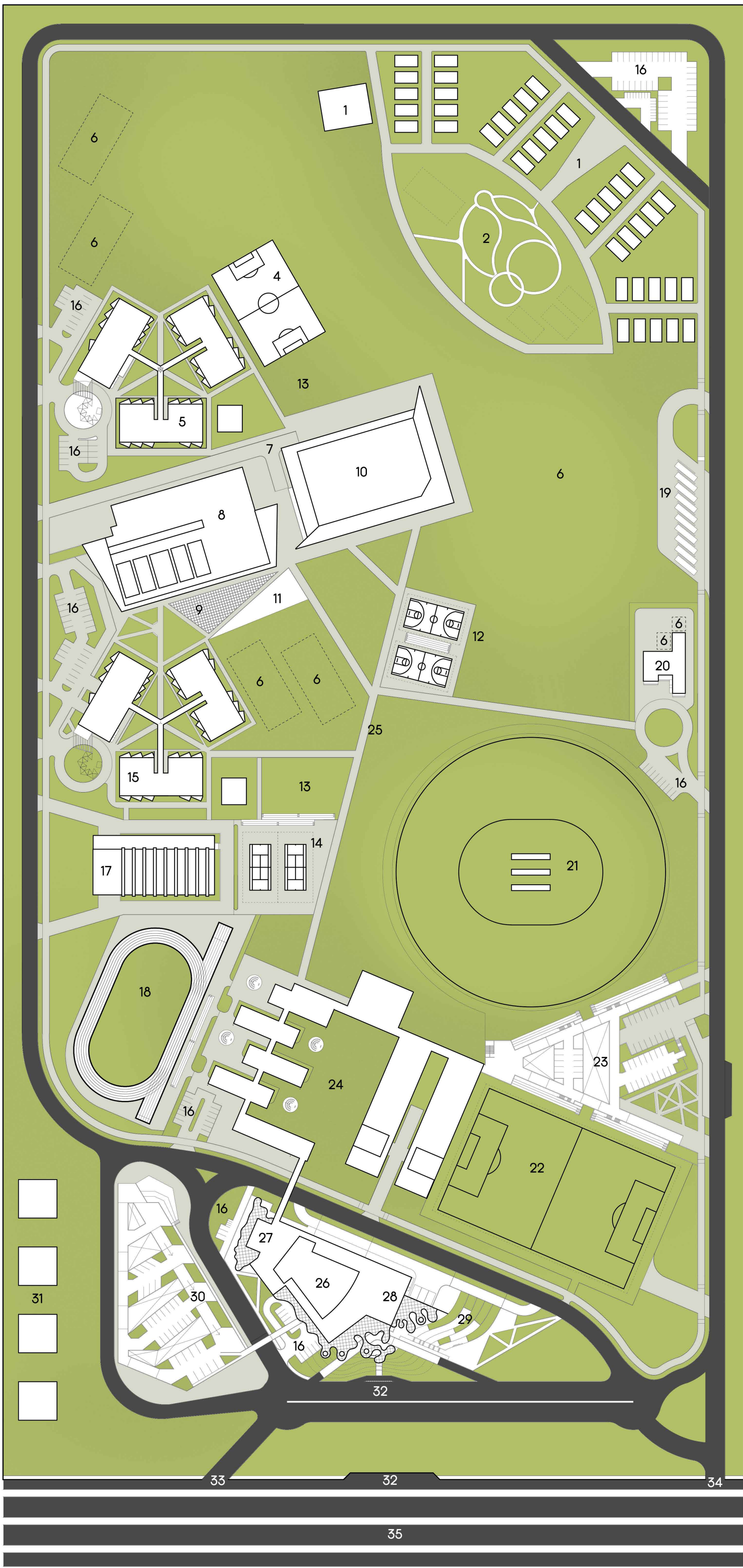
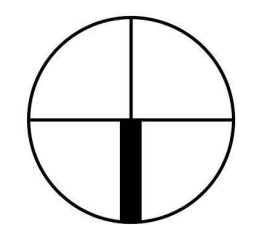


Fig. 4. Pedestrian Movement



EA-10

1. Residence Zone
2. Outdoor Plaza for Residence
3. Departmental Store
4. Outdoor Games (Football)
5. Boys Hostel
6. Future Expansion
7. Service Road
8. Swimming Pool/ Gymnasium/ Yoga Room
9. Interaction Zone
Hostel students can gather here for any celebration or discussion during night.
10. Mess
11. Water body
Wind tower is placed here to create a micro climate.
12. Outdoor Games (Basketball)
13. Outdoor games (Volleyball/ Kabaddi)
14. Outdoor Games (Tennis)
15. Girls Hostel
16. Parking
17. Badminton court/ Table Tennis Court
18. Athletics Field
19. Bus Parking
20. Infirmary
21. Cricket Ground
22. Football Ground
Also have 200+ car parking facility during events at auditorium
23. Stadium Seating/ Parking
24. School Block
25. Pedestrian Path
26. Auditorium
27. School Admin Block
28. Cafeteria
29. Outdoor Plaza
30. Stepped Parking for Admin
Top of the structure goes for parking and connected to auditorium block via bridge. Below space contains site level service, security rooms with toilet facilities and parking space for emergency vehicles.
31. STP
32. Bus Drop-off
33. Site Entry
34. Site Exit
35. Main Road



NORTH

SITE PLAN

SCALE 1 : 1500

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Auditorium Block is located north of the site facing the main road. It included Auditorium Hall, cafeteria, and the school admin office. Cafeteria with outdoor plaza is open to public any time and doesn't depend on the events happening in the auditorium hall. Service region is hidden from the front by means of a brick textured wall in the outdoor plaza. Auditorium has a capacity of 600. Auditorium entry and drop-off come at a higher level than the ground level to match with top level of auditorium seating. Non-ambulatory can be dropped at main entry or can utilize the parking allocated for VIPs and performers which is below the foyer. Stair lift will be used for the wheelchair people to reach Stage front from the foyer level. School admin office is

designed on the first floor of auditorium backstage. Movement between school and admin office is made possible with a bridge over the road. Admin entry is designed with space to exhibit students' achievements. Canopy made of steel pipes are use in the front entry to reduce heating. North side of building is provided with glass facade. Auditorium hall is long span structure made of steel beams with web openings to accommodate a duct through it. Building use light colours to minimise heat absorption. Benefit of the fan shaped form followed for hall is that it maximises capacity for a relatively short distance to the rear of the stage while maintaining an appropriate angle of view.

The school building comes behind the Auditorium. The built form is offset from the main road, thus provides a peaceful environment for the students to study. The school is divided into 4 major regions, which surrounds the Assembly area. The first building during approach houses activities like music room, art room, dance room, etc. which showcases the talents that the school has other than academics. The west region of the schoolhouses the classroom blocks. These blocks are modular steel structures made using combinations of corner supported modules. Having 4 classrooms in each block, a total of 12 classrooms are built in 3 such blocks. These blocks are arranged in a zig zag manner to provide green outdoor spaces at diagonally opposite directions. These green spaces can act as outdoor classrooms during pleasant weather.

This could also encourage social distancing during pandemic times. The upper region of school has a modern library block which has a double height ceiling. The east region of the school is covered by the lab buildings. These blocks have their own service road to allow service vehicles to access the lab storage anytime without disturbing the school activities. The lab regions have a steel facade to provide shade to the labs and protect the windows from any possible damage from the football ground side by. The future expansion regions are kept vacant above the existing school region. The classroom blocks can further extend towards the South following similar pattern. The lab regions can expand in south direction on other side of the corridor (that is closer to cricket ground).

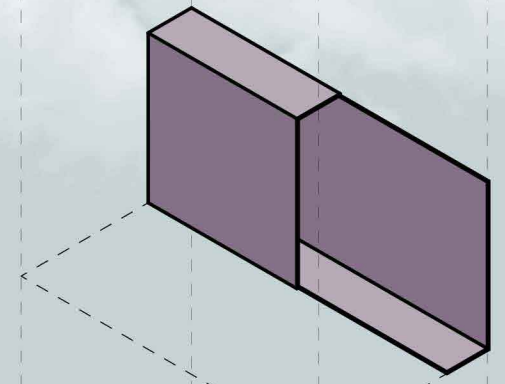


Figure 5. Aluminium Composite Panel, will be supported over frame showed in Figure 3.

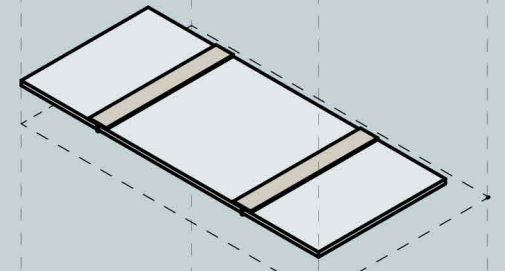


Figure 4. Transparent Poly carbonate Sheet for rain cover.

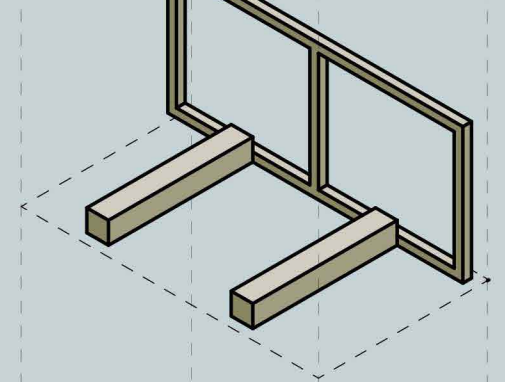


Figure 3. 75x75mm Square GI pipes used as beam grid to support entire structure. 30x30 mm square pipe frame is jointed to the grid to support ACP.

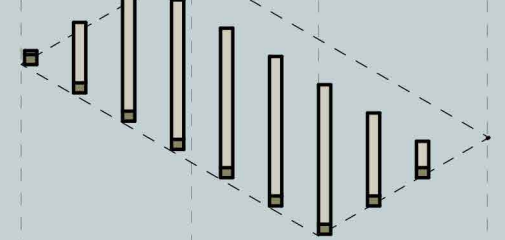


Figure 2. 75x75mm Square GI pipes.

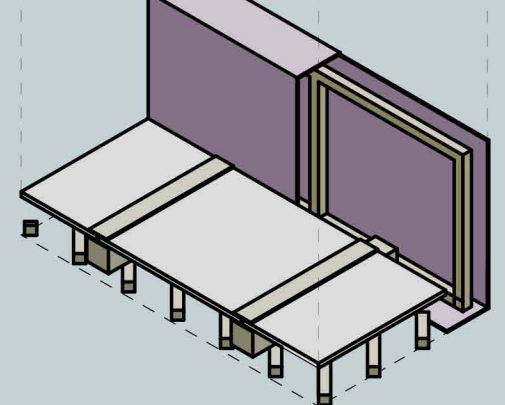
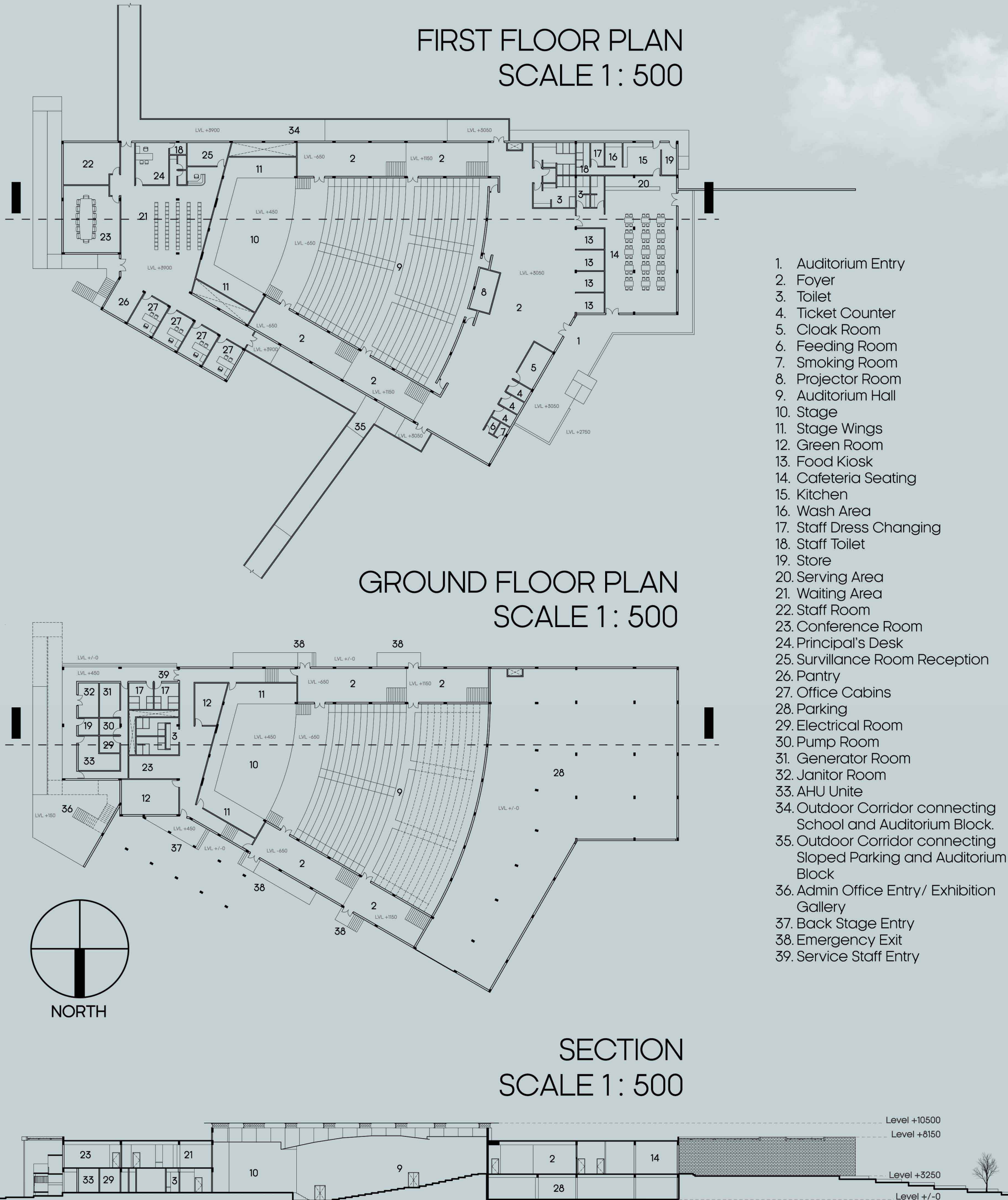
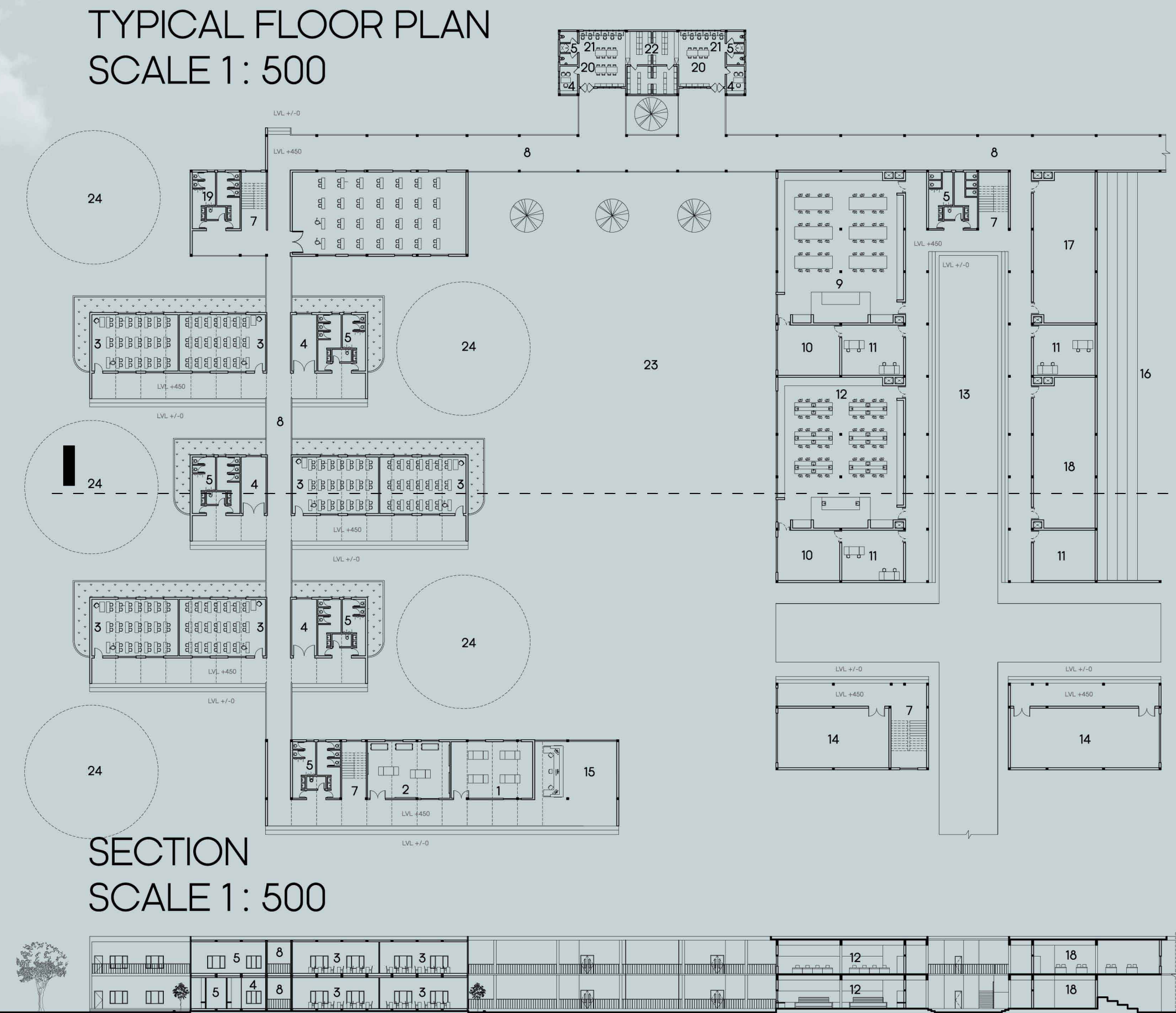


Figure 1. Sectional detail of portion of Canopy used in front of auditorium. Exploded views are provided above with elements in the order, it is supported over steel pillars



AUDITORIUM/ADMINISTRATION OFFICE



1. Waiting Room (GF)
2. Dance Room (FF)
3. First Aid Room (GF)
4. Music Room (FF)
5. Classrooms
6. Storage
7. Toilets (GF)
8. Staff Room (FF)
9. Audio and Visual Room (GF)
10. Indoor Games (FF)
11. Staircases
12. Corridor
13. Physics Lab (GF)
14. Computer Lab (FF)
15. Storage Rooms (Labs)
16. Lab Staff Rooms
17. Chemistry Lab (GF)
18. English Lab (FF)
19. Service Road
20. Storage
21. Reception/Waiting Area
22. Seating Area (Football Ground)
23. Storage (GF)
24. Biology Lab (FF)
25. Storage (GF)
26. Mathematics Lab (FF)
27. Toilet (GF)
28. Servent Room (FF)
29. Reading Area
30. Book Issue Section
31. Book Racks
32. Assembly Area

GF- Ground Floor
FF- First Floor



LIBRARY BLOCK

SCHOOL/LIBRARY

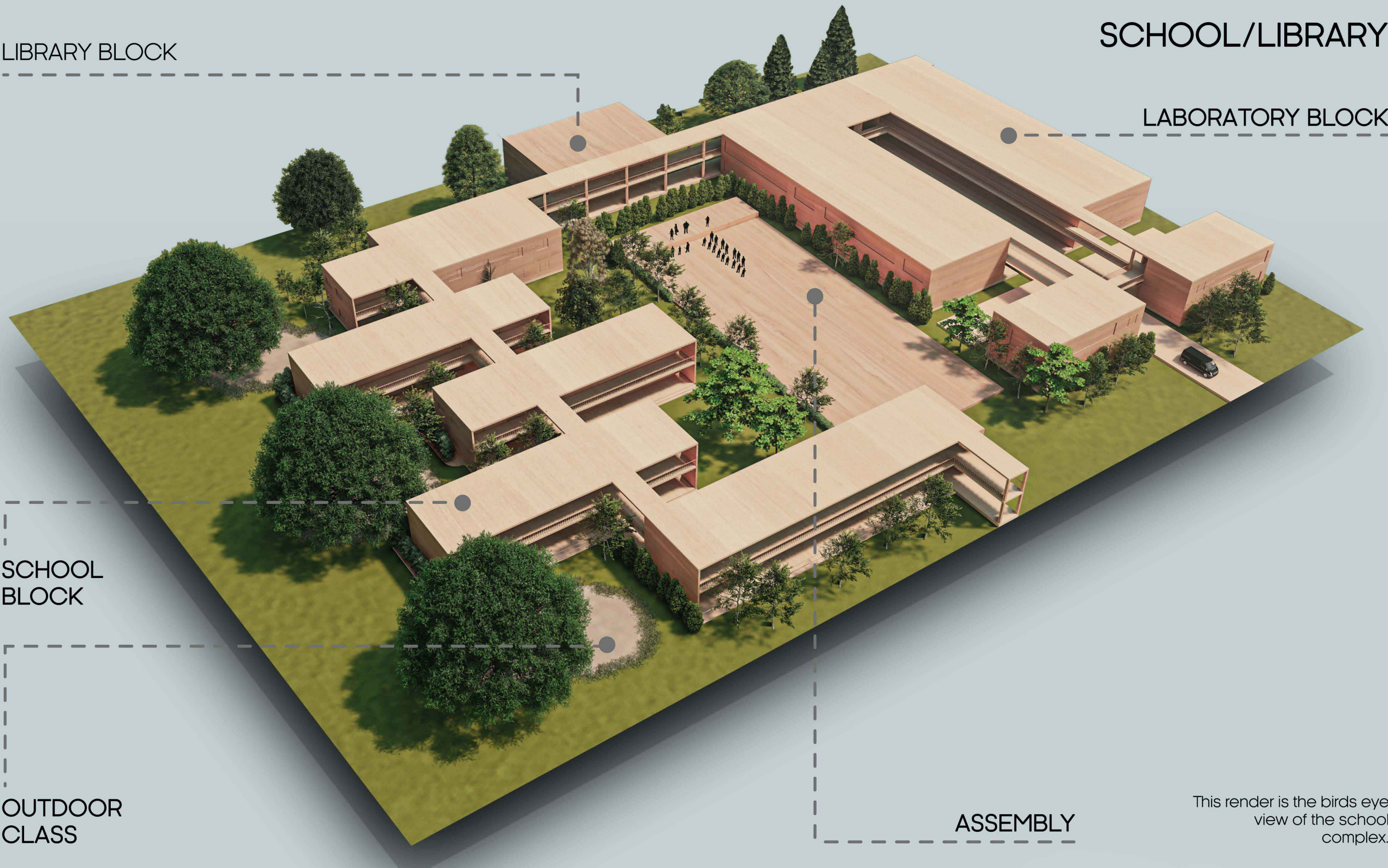
LABORATORY BLOCK

SCHOOL BLOCK

OUTDOOR CLASS

ASSEMBLY

This render is the birds eye view of the school complex.



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Hostel blocks are made up of corner supported steel module. It has a traditional foundation with RCC till ground level making a platform where these modular blocks are placed and connected together. As there are only two floors they do not require any supporting structure and they can support themselves. Corner supported member is chosen as it gives freedom for window placements having columns only at the corners. Two sizes of modular blocks are used they are 8m x 3m (for 4 member blocks) and 7m x 3m (for 2 member blocks). Modularity is also followed in building level i.e. each building is modular and they can be repeated in case of future expansion. Buildings are connected with steel bridges to integrate spaces. The blocks are placed in an equilateral triangle and connected with bridges at an angle of 120°. Combi EPS (Wood wool+ EPS) is the proposed partition material as it is fire resistant and also provides good thermal insulation.

Infirmary is placed in such a way that it is accessible from all the buildings of the site easily. Exposed brickwork with RCC was used for the structure of the building. Brick jalis were used to provide shade as it is a hot and dry climate. It is designed to accommodate nurses considering the first aid rooms in various blocks in the site (Hostels, Schools, etc.). Changing rooms and showers are provided here assuming that nurses gather here and disperse to their respective blocks in the site. A pharmacy is provided with the infirmary. The infirmary can accommodate 8 inpatients and some space is provided for future expansions. Special emergency roads are provided during planning giving easy access for the ambulance.

1. Reception/Waiting

4. Dressing

7. Lift

10. Drinking water
2. Doctor's chamber

5. Pharmacy

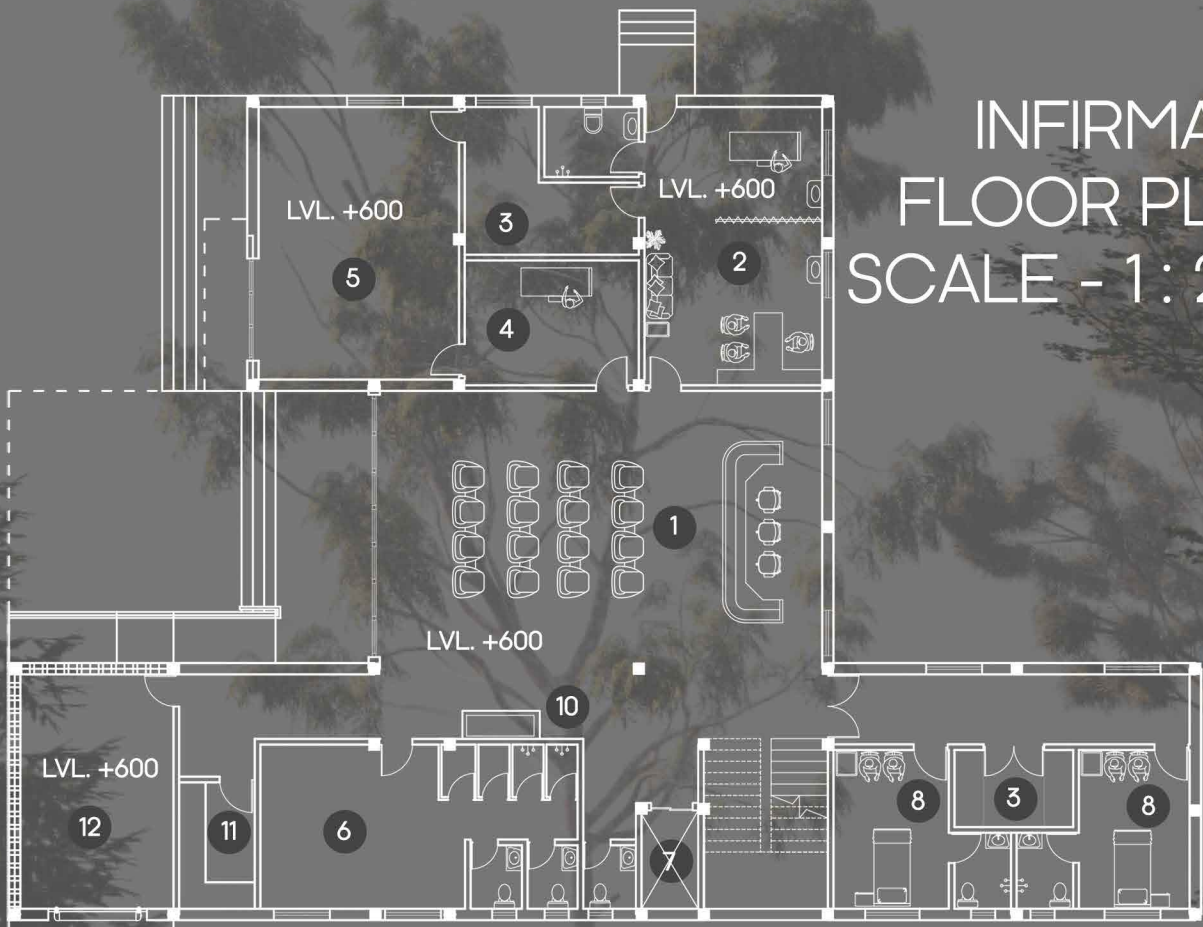
8. One member ward

11. Pantry
3. Storage

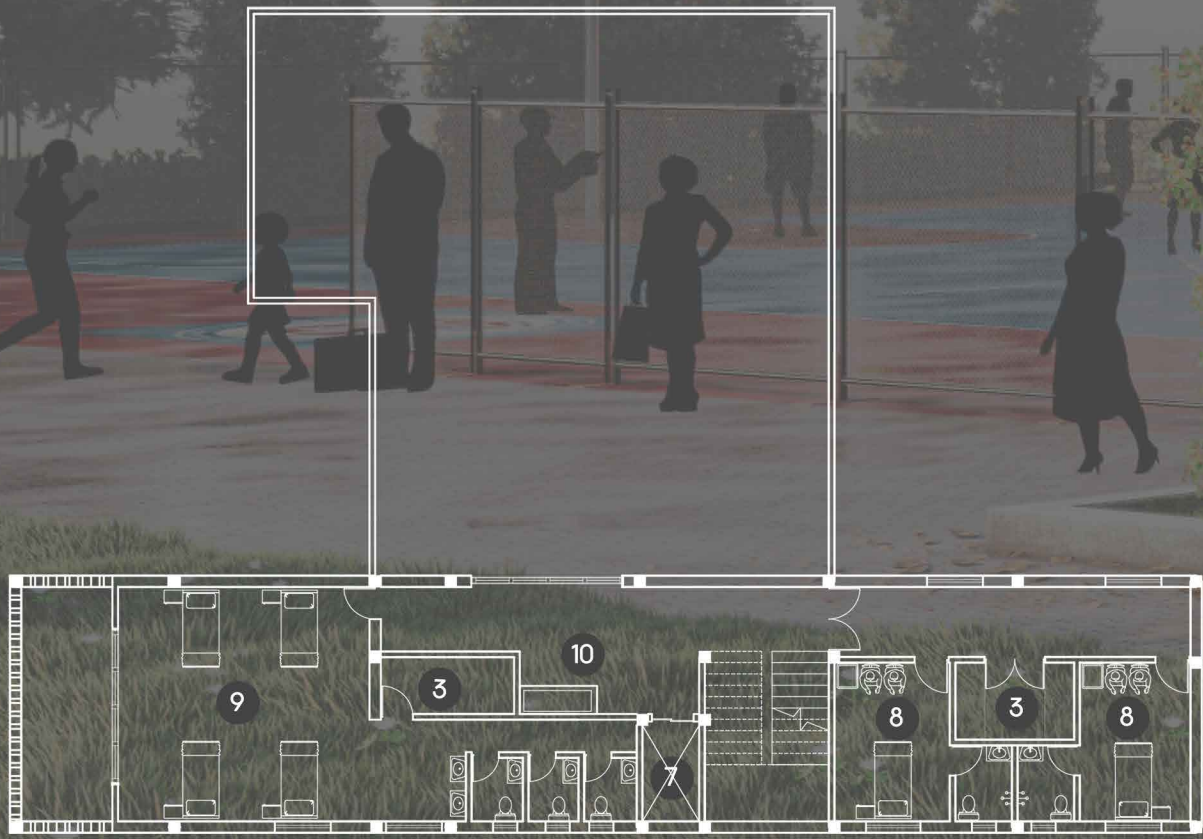
6. Nurse changing/Resting

9. General Ward

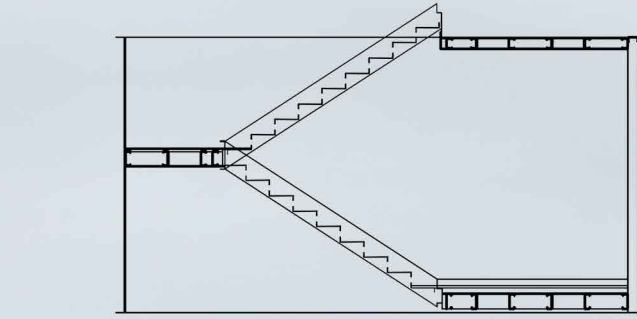
12. Electrical/ Generator Room



INFIRMARY
FLOOR PLAN
SCALE - 1 : 200



FIRST FLOOR



Staircase Module



Corner Supported Module



Combi EPS(Wood Wool + EPS)

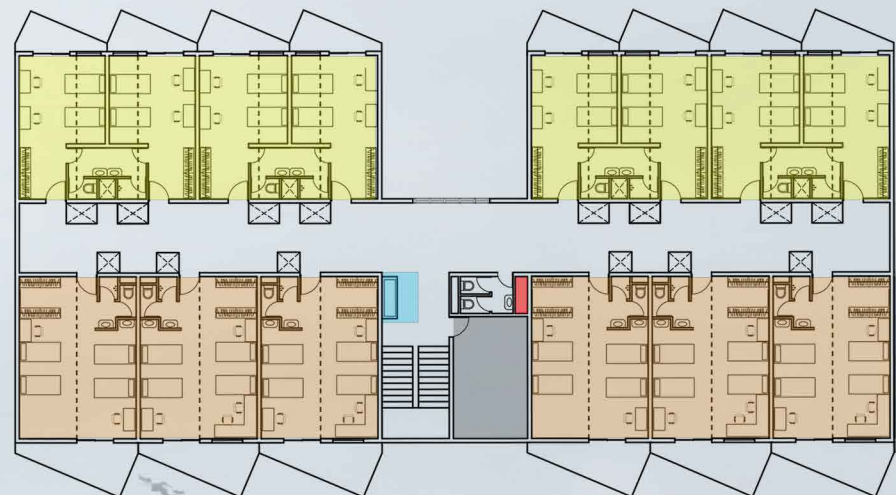


Bridge connecting the blocks

4 MEMBER + 2 MEMBER MODULAR BLOCK
(WITH ADMINISTRATION)

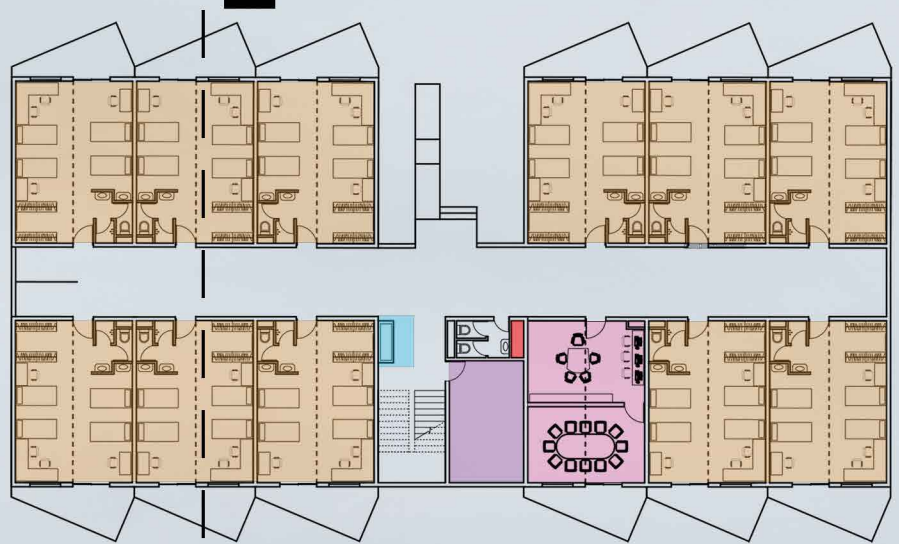


GROUND FLOOR

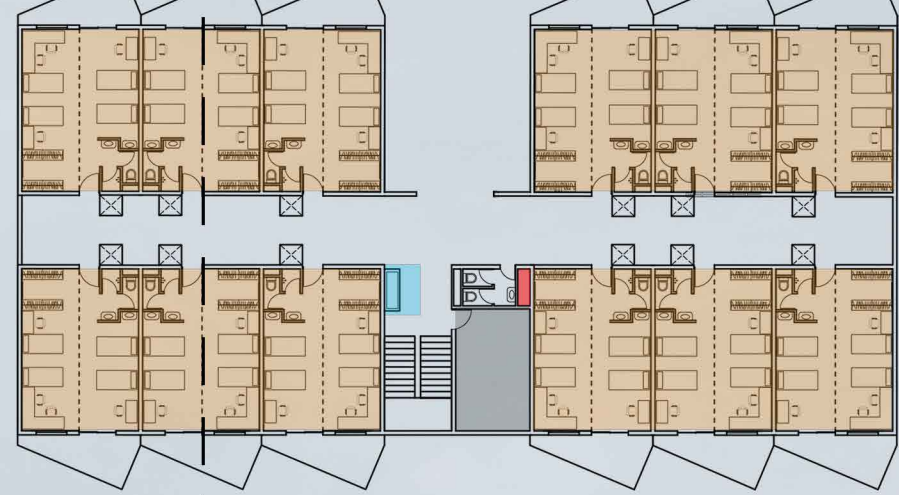


FIRST FLOOR

4 MEMBER MODULAR BLOCK



GROUND FLOOR



FIRST FLOOR

- Waiting Room

Hall Office

Warden's Room

First Aid Room

2 Member Room
- 4 Member Room

Study Room

Pump Room

Janitor Room

Water Points
- Stationary shop

Pantry

Storage

Generator Room

Fire Duct

SCALE - 1 : 400
HOSTEL FLOOR PLAN

Modular construction has been followed in the hostels. Corner supported module is used throughout the structure as it has no restrictions on window placements and steel staircase modules are used for vertical circulation. Combi EPS has been used as the partition material as it provides good thermal insulation and has good acoustic property. Steel Bridge is used to connect the hostel blocks together.

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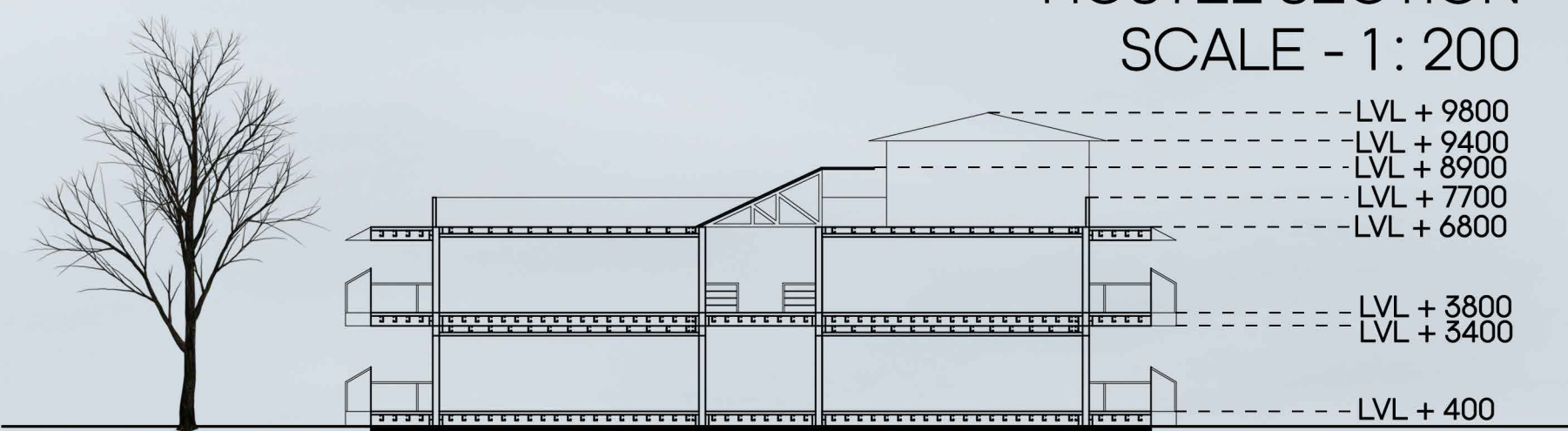
2 MEMBER ROOM



4 MEMBER ROOM



HOSTEL SECTION
SCALE - 1 : 200



HOSTEL ELEVATION
SCALE - 1 : 200



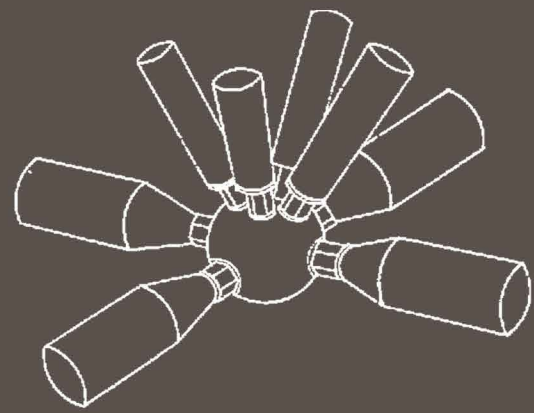


figure 1

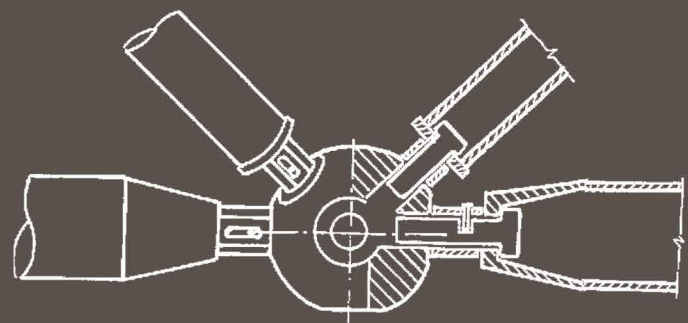


figure 2

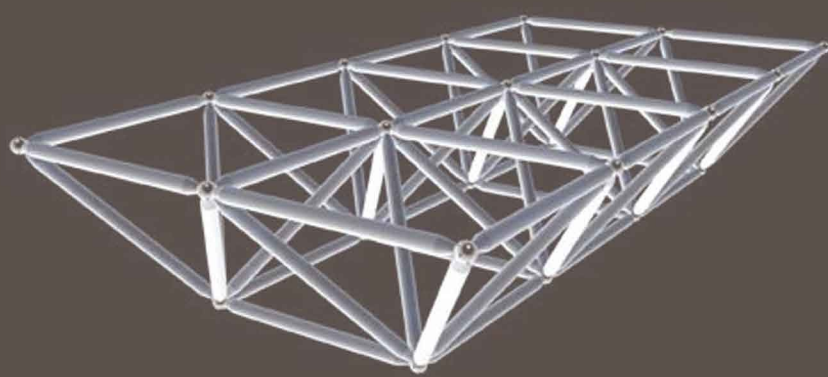


figure 3

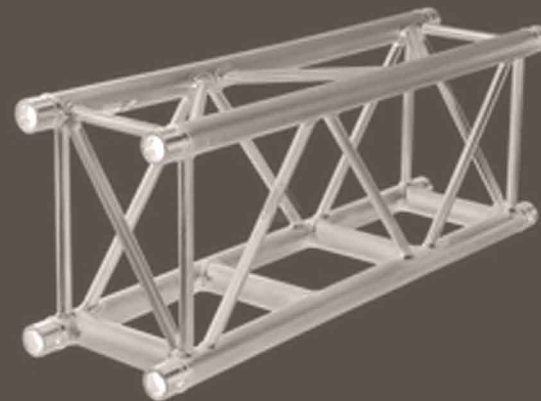


figure 4

Different type of connectors can be used for joining the space frame members. MERO joint is mostly used and it has wide applications. The joinery details in a space frame is shown in figure 2. A typical space frame is joined as shown in figure 1. Repeating the pattern, a stable rigid framework (figure 3) can be obtained over which roofing can be done to cover the built form. The long span roofs are supported by Spigot truss (figure 4) too. These truss systems have smaller straight steel members weld directly to larger steel members supporting the roof. At the ends, these members will be connected to steel columns using end plate and stiffener plates and joined using bolts or weld together.

The swimming pool and Dining hall structures come next to each other. The elevations look similar and structural systems used are also the same. The swimming pool block has gym and yoga hall attached along with. The restrooms and changing area for swimming pool is separate from the common restrooms for audiences, yoga hall and gym users. The bare foot area for the swimmers do not interfere with the common walkways accessed by spectators. Additional layer of gypsum ceiling is provided for protection from heat. Both the buildings are mechanically ventilated using exhaust fans. The dining halls would have separate ventilation ducts for dining and kitchen areas. These buildings are

oriented with their longer sides facing North West and South East direction approximately. This orientation is to be avoided in hot areas (longer side exposed to sun) but, this orientation provides scope for large openings on Northern side. The southern side can be covered with dense vegetation as the building heights are restricted to a height of 10 meters. Allowing more of day light can reduce energy used in day time of the building. The roofs provide an excellent opportunity to use Solar panels and harvest solar energy. The dining hall has flexibility for future expansion in seating areas and kitchen size too (the temporary storage near to the existing kitchen can be converted into kitchen).

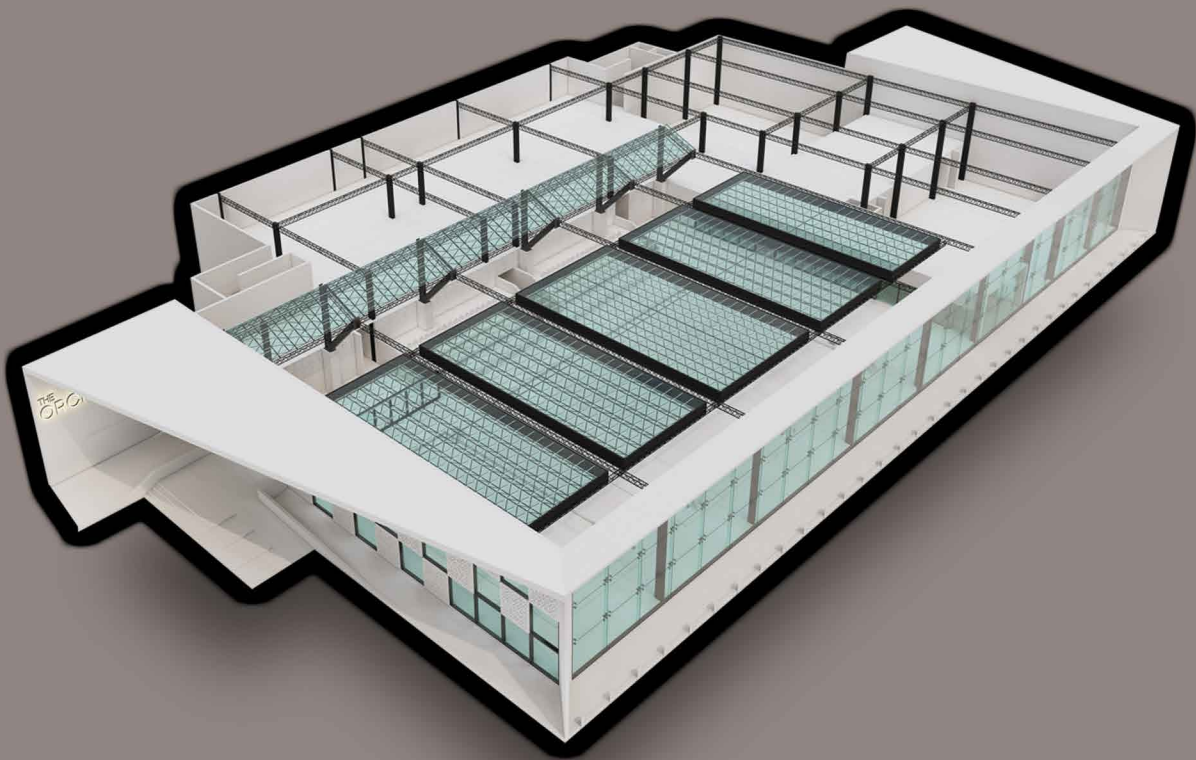
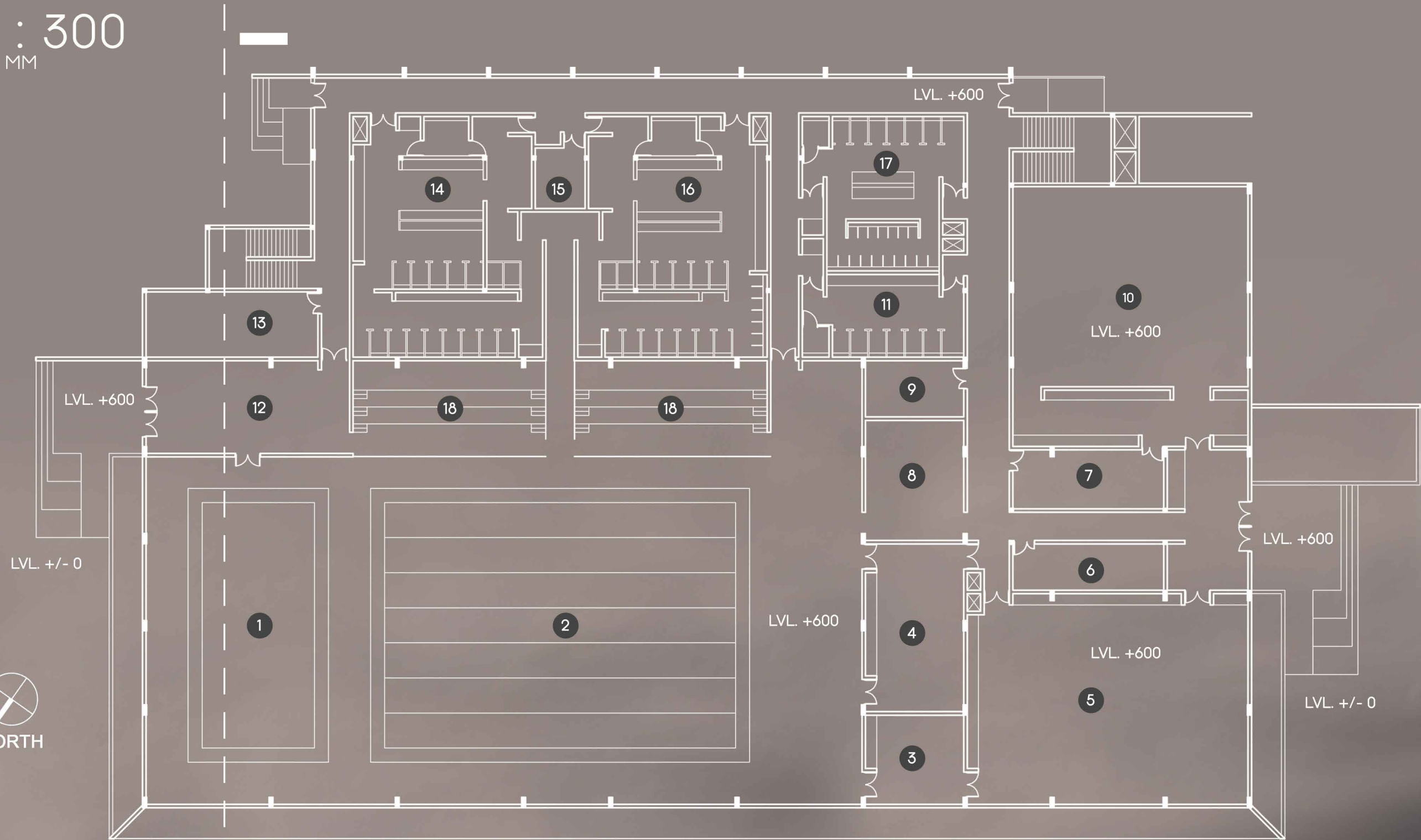


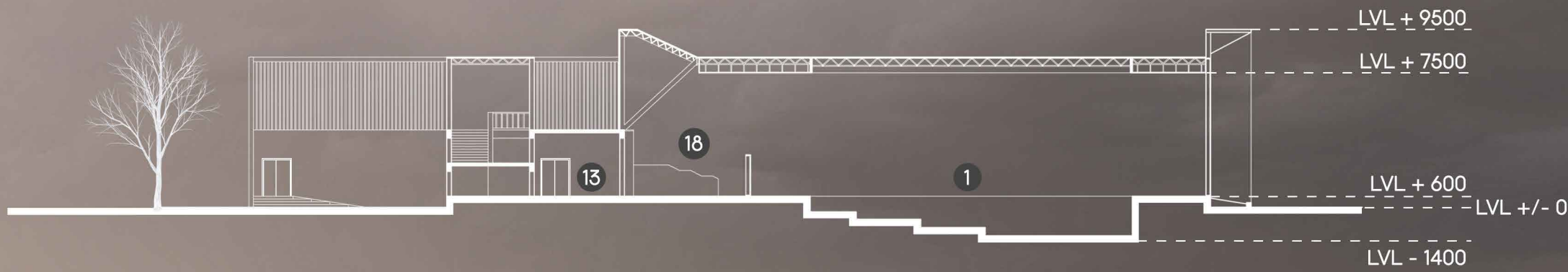
figure 5
3D view showing skeletal frame work with steel

SWIMMING POOL FLOOR PLAN SCALE - 1 : 300 ALL DIMENSIONS ARE IN MM

1. Beginner Pool
2. Sprint pool
3. Storage
4. Pool Storage
5. Yoga Hall
6. Storage
7. Gym storage
8. sitting area
9. Cafeteria
10. Gym
11. Common Girls toilet
12. Entrance lobby
13. Office / first aid
14. Boys Toilet / changing area
15. Common room
16. Girls Toilet / changing area
17. Common boys toilet
18. Spectator



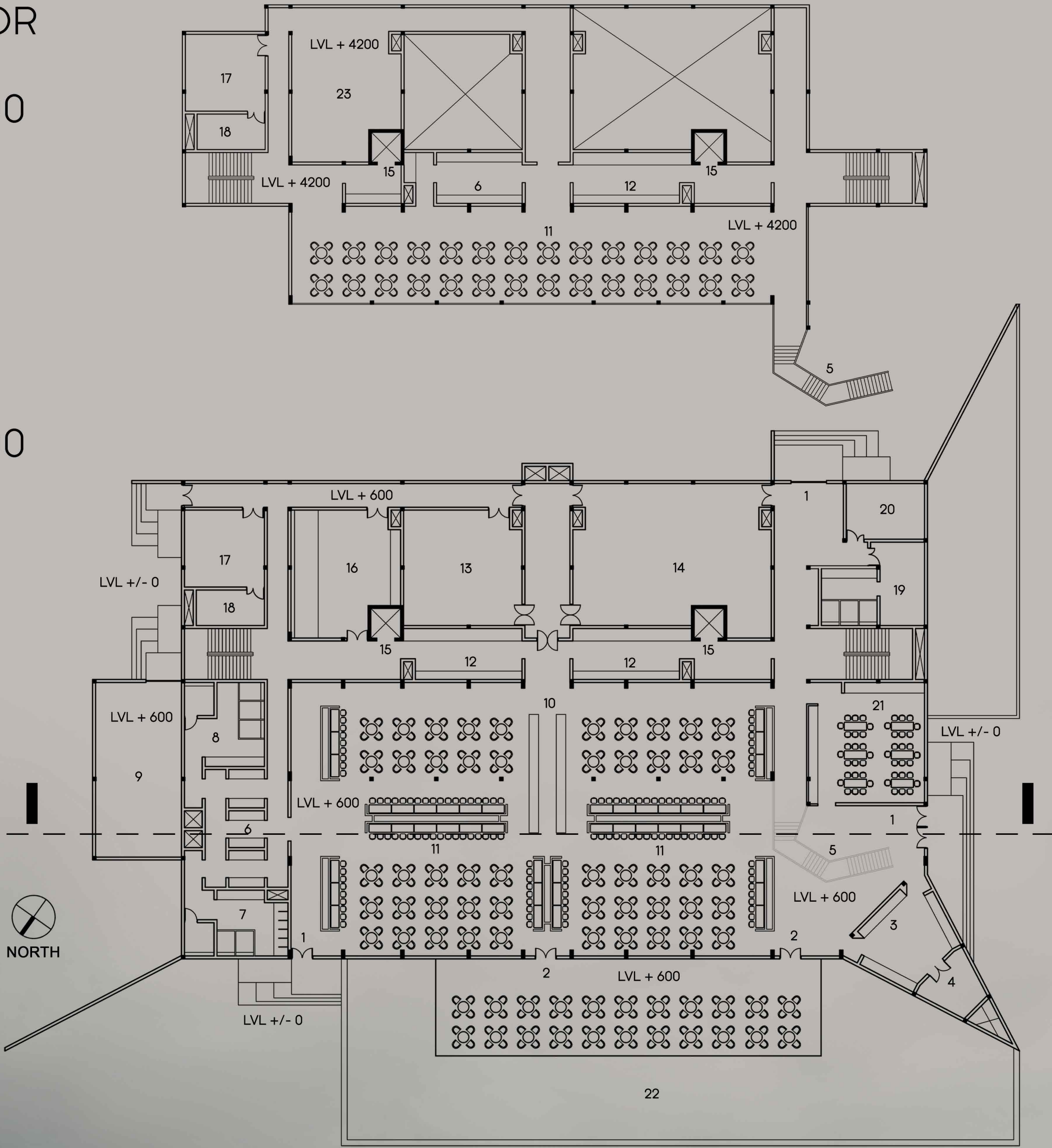
SECTION SCALE - 1 : 300 ALL DIMENSIONS ARE IN MM



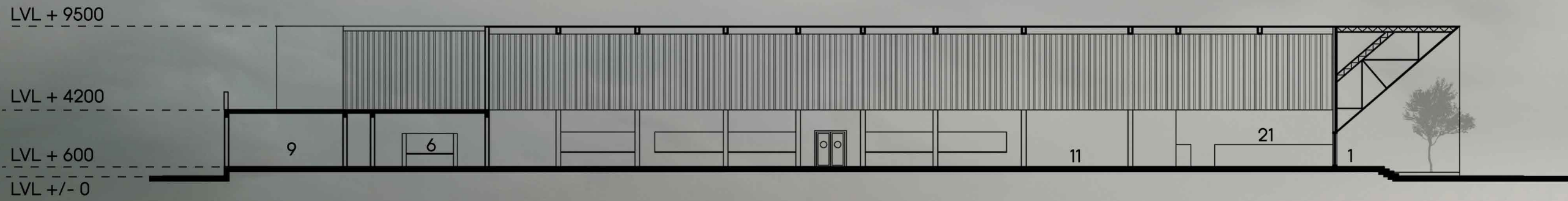
FUTURE FLOOR EXPANSION SCALE - 1 : 300 ALL DIMENSIONS ARE IN MM

DINING HALL FLOOR PLAN SCALE - 1 : 300 ALL DIMENSIONS ARE IN MM

1. Entry
2. Outdoor dining
3. Handwash
4. Service room
5. Future stairs
6. Handwash
7. Boys toilet
8. Girls toilet
9. Service room
10. Common serving area
11. Dining area
12. Serving area
13. Temporary storage
14. main Kitchen
15. Service lift shaft
16. Washing area
17. Storage
18. Cold storage
19. Workers rest area with toilets
20. Office
21. Staff dining area
22. Water body
23. Service area



SECTION SCALE - 1 : 300 ALL DIMENSIONS ARE IN MM



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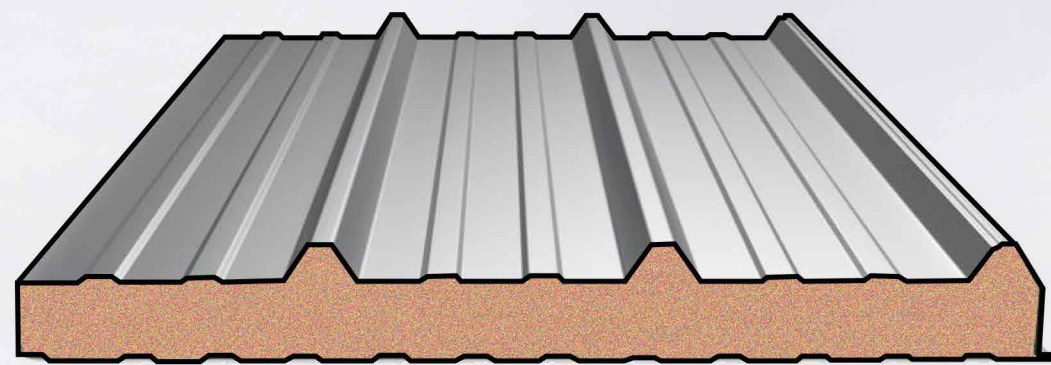


figure 1

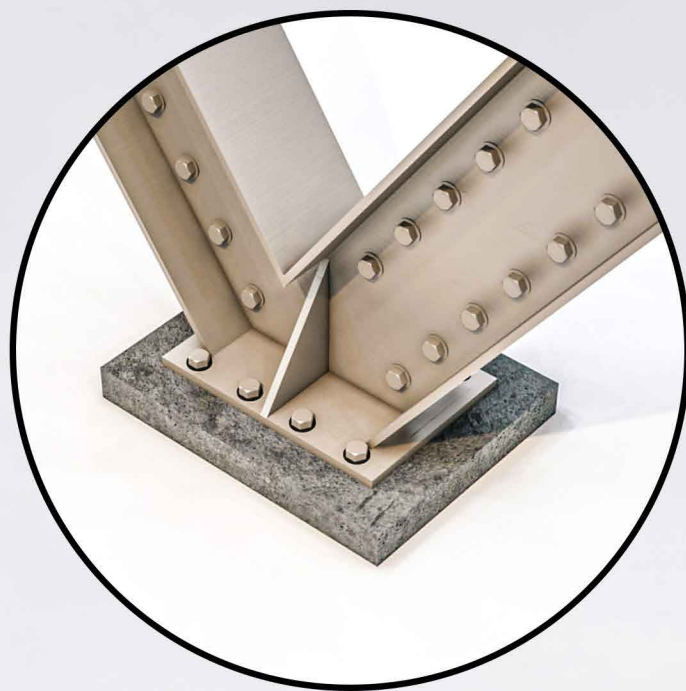


figure 2

Polyurethane Sandwich steel panels (figure 1) are used in the outer cover of Badminton court. They provide better insulation form heat. The steels columns are grouted to concrete columns which have foundation below the ground level. Steel columns are joined using end plates and bolted at the edges. Additional stiffeners can be welded on either sides to provide additional support as shown in figure 2.

The Outdoor stadium can be rented out. Each side faces either cricket or foot ball ground allowing spectators to view the game and having their vehicles within their reach. The Stadium has teams room too and can independantly function without disturbing other ongoing activities of school. The large drop off pavilion and ground entry from the audience area would give a dramatic experience for the players while moving into the ground.

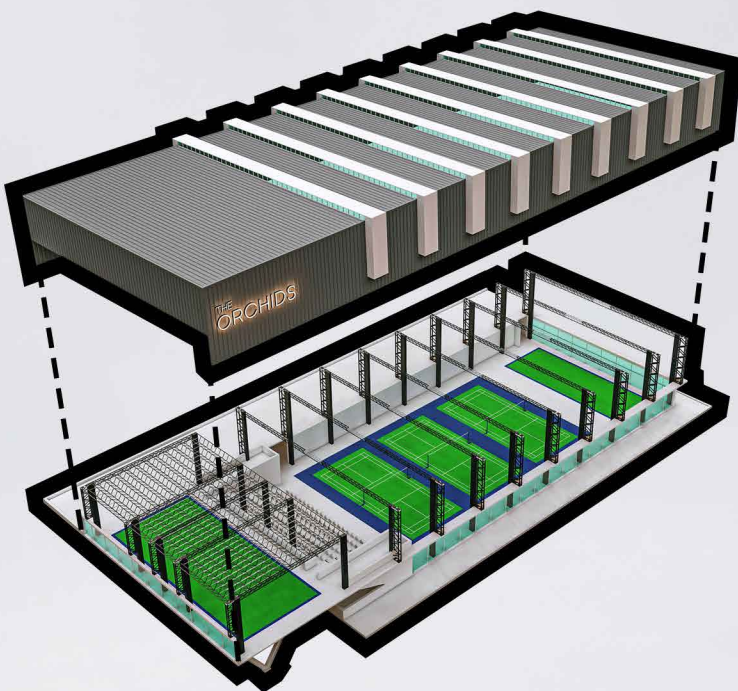
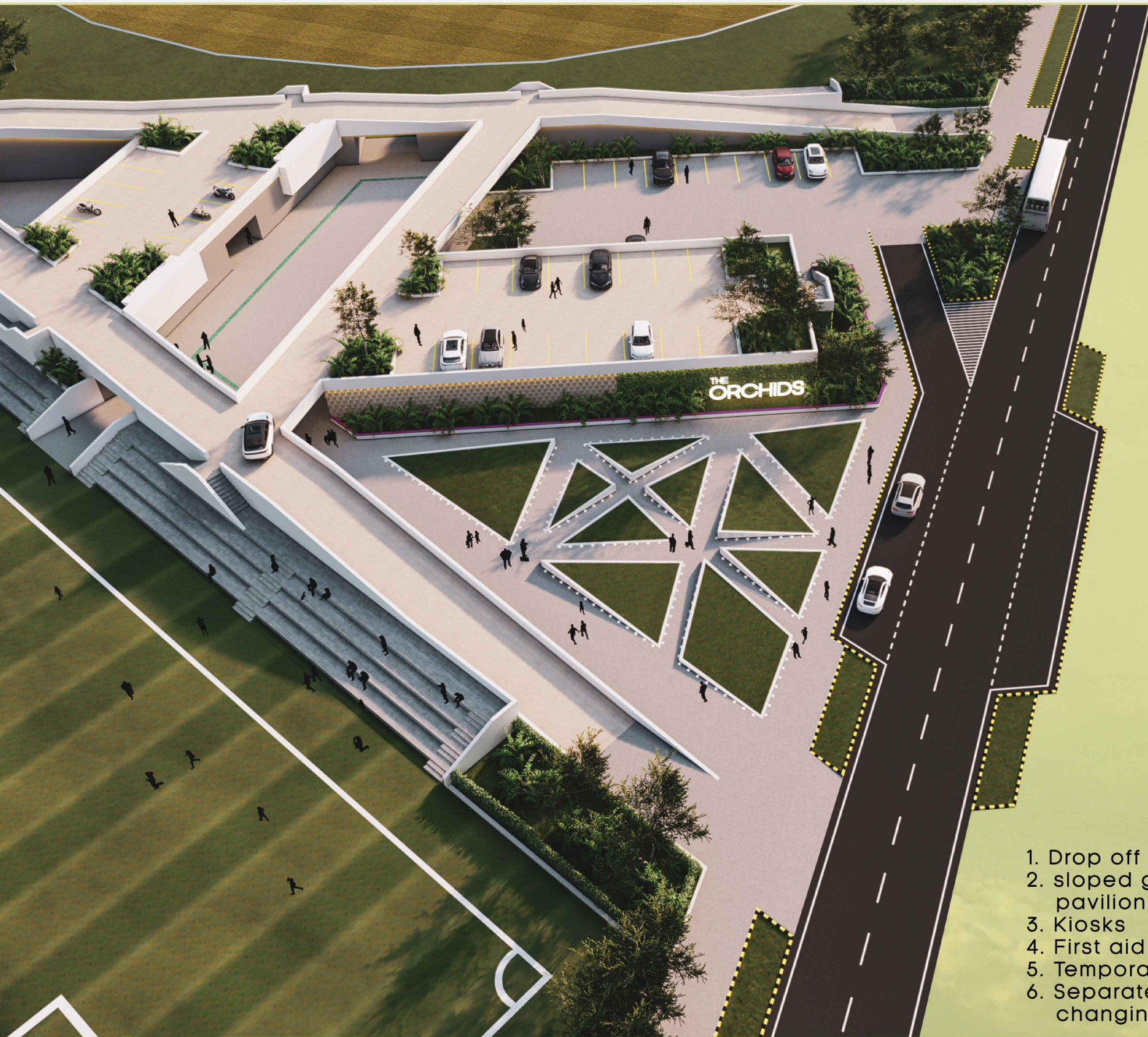


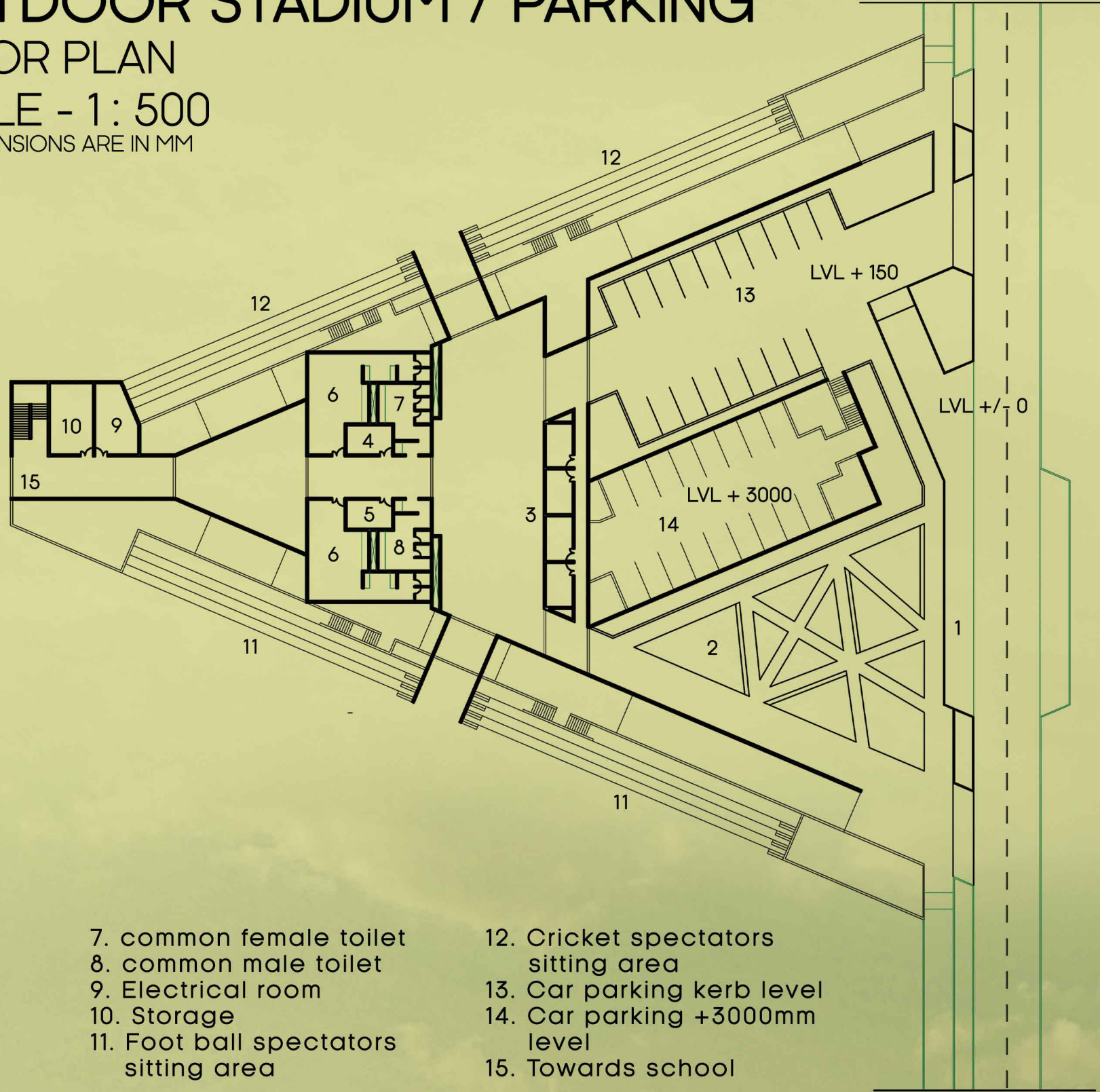
figure 3

The indoor badminton court also has space for other indoor board games as well as table tennis. The height requirement for table tennis is much lesser than that required for badminton. Thus, keeping the roof level constant, the floor level is increased for table tennis boards. This gives shaded space for car parking below the table tennis courts. Three badminton courts are available and additional space is given in plinth level for board games and additional table tennis board for differently abled users. This building is mechanically ventilated. The blowers should not be focused towards the courts as they might disturb the shuttle during play. Servicing rooms are located behind the building with a dedicated service corridor with separate entrance. The adjacent exploded view (figure 3) shows the steel plate covering used in upper half of the built form. This covering is supported using Spigot truss and space frames.



OUTDOOR STADIUM / PARKING

FLOOR PLAN
SCALE - 1 : 500
ALL DIMENSIONS ARE IN MM



- 1. Drop off area
- 2. sloped grass grid pavilion
- 3. Kiosks
- 4. First aid room
- 5. Temporary office
- 6. Separate teams changing rooms

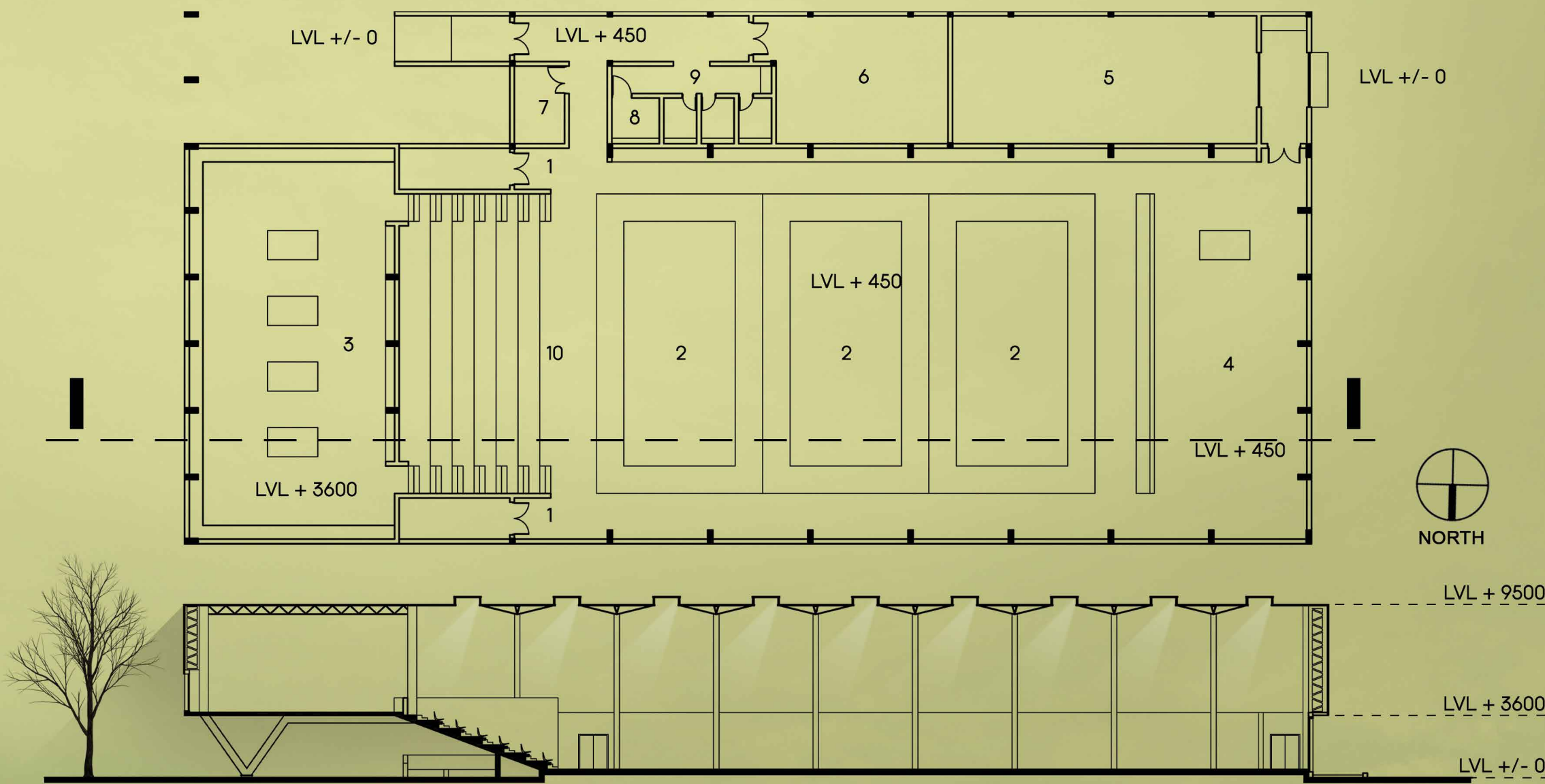
- 7. common female toilet
- 8. common male toilet
- 9. Electrical room
- 10. Storage
- 11. Foot ball spectators sitting area

- 12. Cricket spectators sitting area
- 13. Car parking kerb level
- 14. Car parking +3000mm level
- 15. Towards school

BADMINTON COURT

FLOOR PLAN / SECTION

SCALE - 1 : 200
ALL DIMENSIONS ARE IN MM



- 1. Entrance
- 2. Badminton court
- 3. Table tennis area
- 4. Indoor board games and table tennis

- 5. Storage - All sports equipments
- 6. Service room
- 7. Office
- 8. Differently abled toilet

- 9. Unisex common toilet
- 10. Spectator sitting

