



**OPTION 01**



# MODEL DESIGNS FOR MULTIPURPOSE INDOOR SPORTS HALLS

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MODEL DESIGNS FOR  
MULTIPURPOSE INDOOR SPORTS HALLS

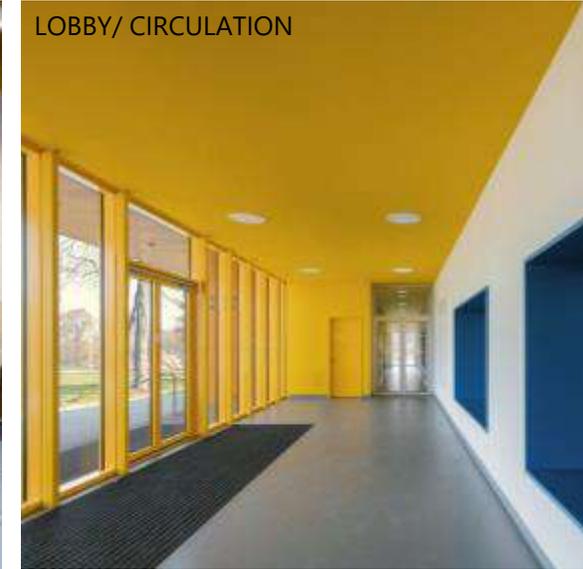
# OBJECTIVE

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- Sports Authority of India has been establishing Multipurpose Indoor Halls at various Locations across the Country to meet the Sports and Recreation needs of the citizens
- To create a Standardized Program and Specification meeting the needs of the community, the following document provides the guidelines for the following key aspects of the Project
  - **Essential Requirements**
  - **Layout Options based on the Geometry of the Plot**
  - **Minimum Internal Dimensions for Sports Halls**
  - **Flooring Specification**
  - **Locker Room Guidelines**
  - **Sports Lighting Guidelines**
  - **Ventilation and Air Conditioning Guidelines**
  - **Safety Guidelines**
  - **Accessibility Guidelines**
  - **Outline Estimates**

# ESSENTIAL REQUIREMENTS

1. MAIN INDOOR HALL (40M X 20M)
2. SECONDARY INDOOR HALL
3. YOGA / MEDITATION HALL
4. CHANGING ROOMS-  
MALE & FEMALE
5. EQUIPMENT STORE
6. FIRST AID/ PHYSIOTHERAPY ROOM
7. LOBBIES & CIRCULATION SPACES
8. FITNESS CENTRE
9. ADMIN AREA
10. JUICE BAR





# OPTION 01 A

MODEL DESIGNS FOR  
MULTIPURPOSE INDOOR SPORTS HALLS

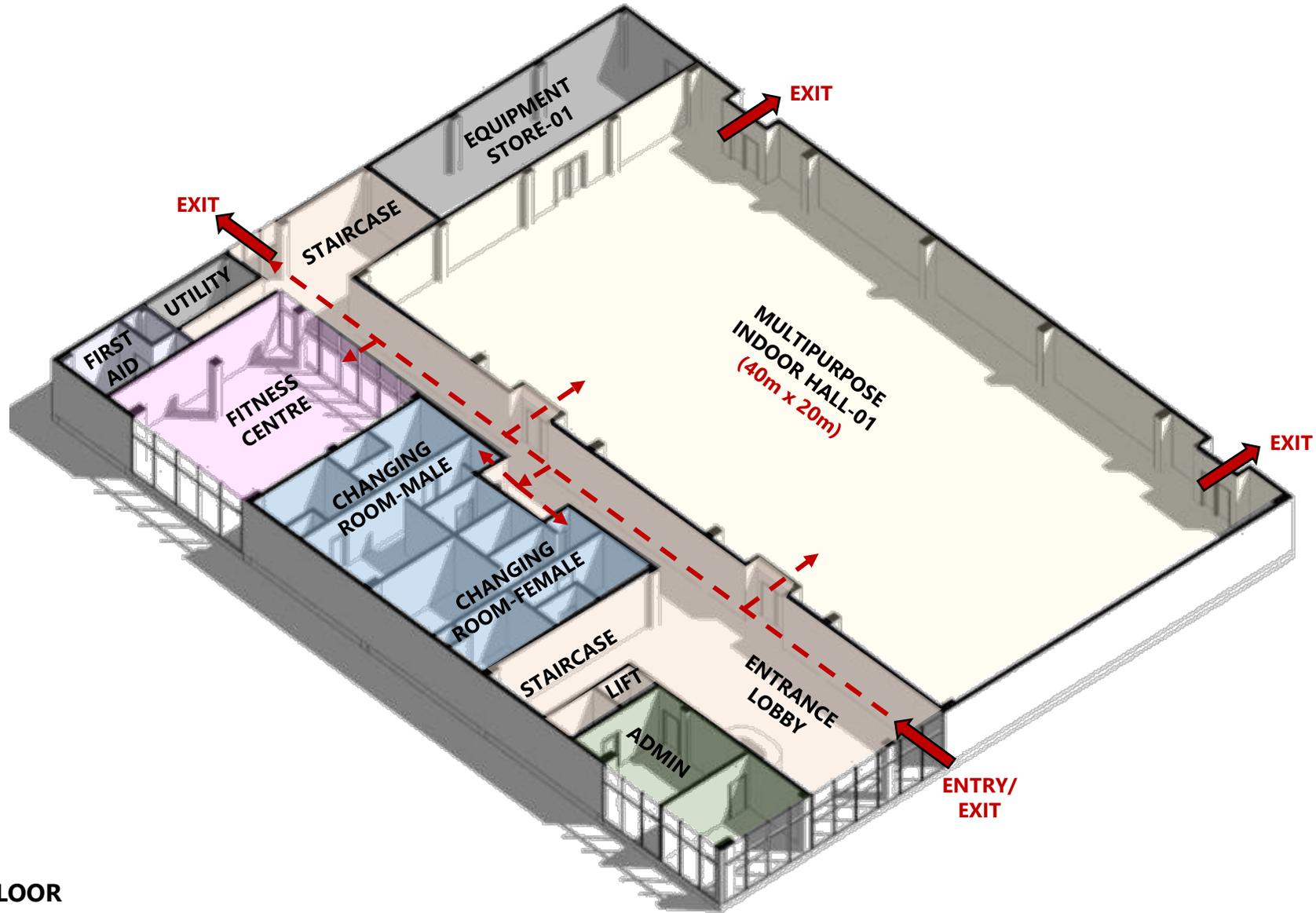






# MULTIPURPOSE INDOOR HALL – OPTION 1a

## CUT VIEWS

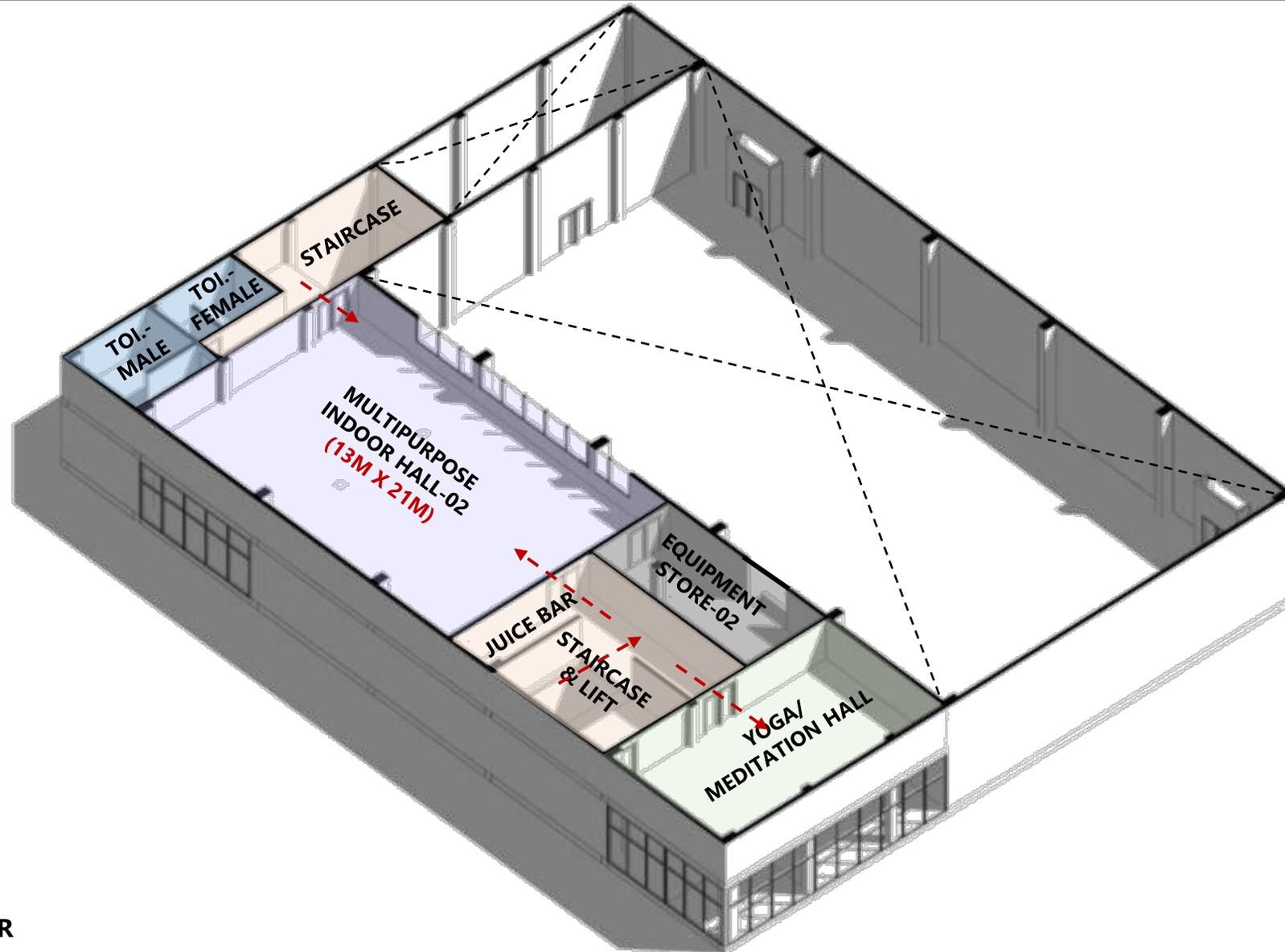


GROUND FLOOR



# MULTIPURPOSE INDOOR HALL – OPTION 1a

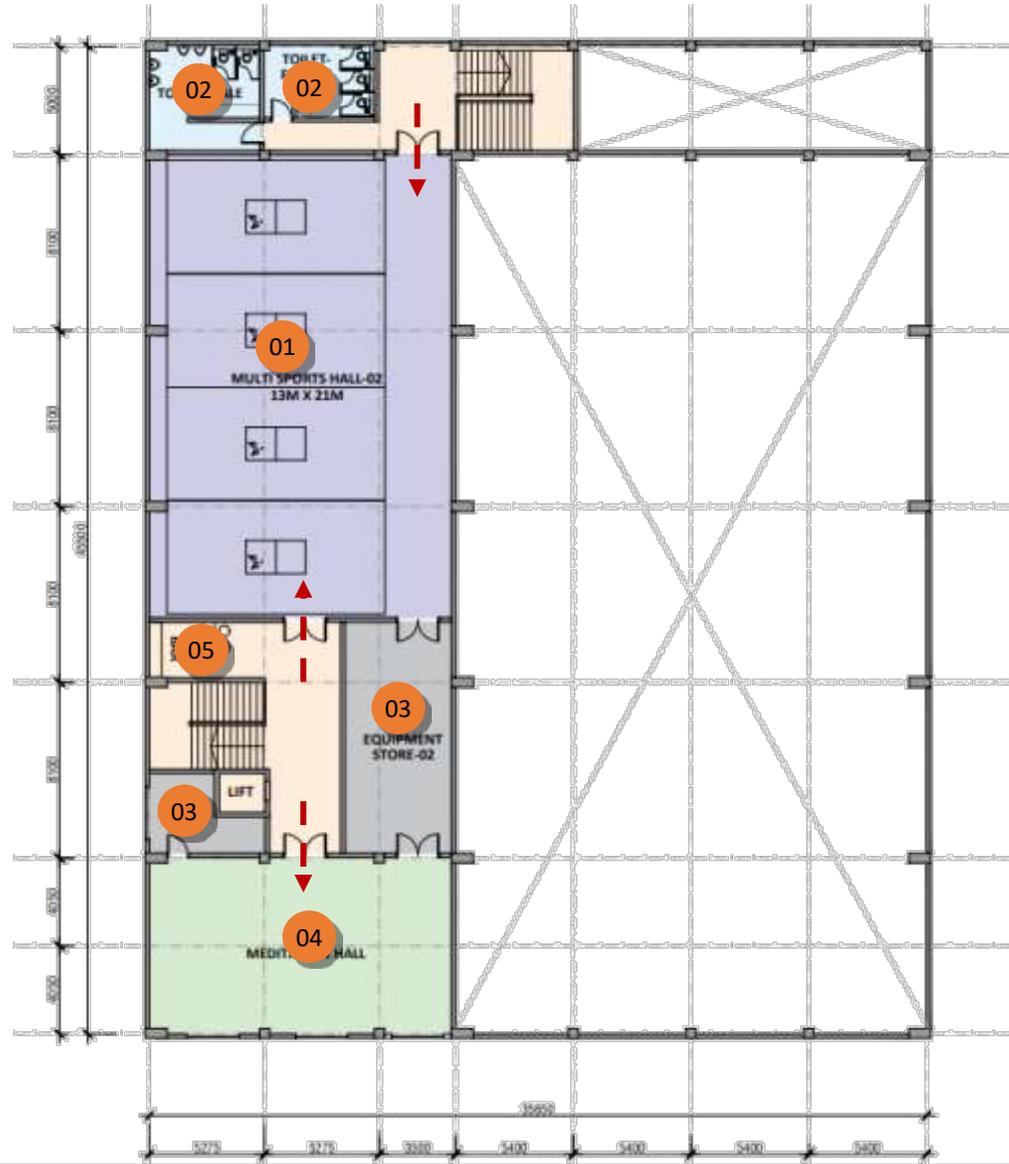
## CUT VIEWS



FIRST FLOOR

# MULTIPURPOSE INDOOR HALL – OPTION 1a

## LAYOUTS



FIRST FLOOR

- 01 MULTIPURPOSE HAL-02  
13M X 21M
- 02 TOILET-MALE & FEMALE
- 03 EQUIPMENT STORE
- 04 YOGA/ MEDITATION HALL
- 05 JUCIE BAR

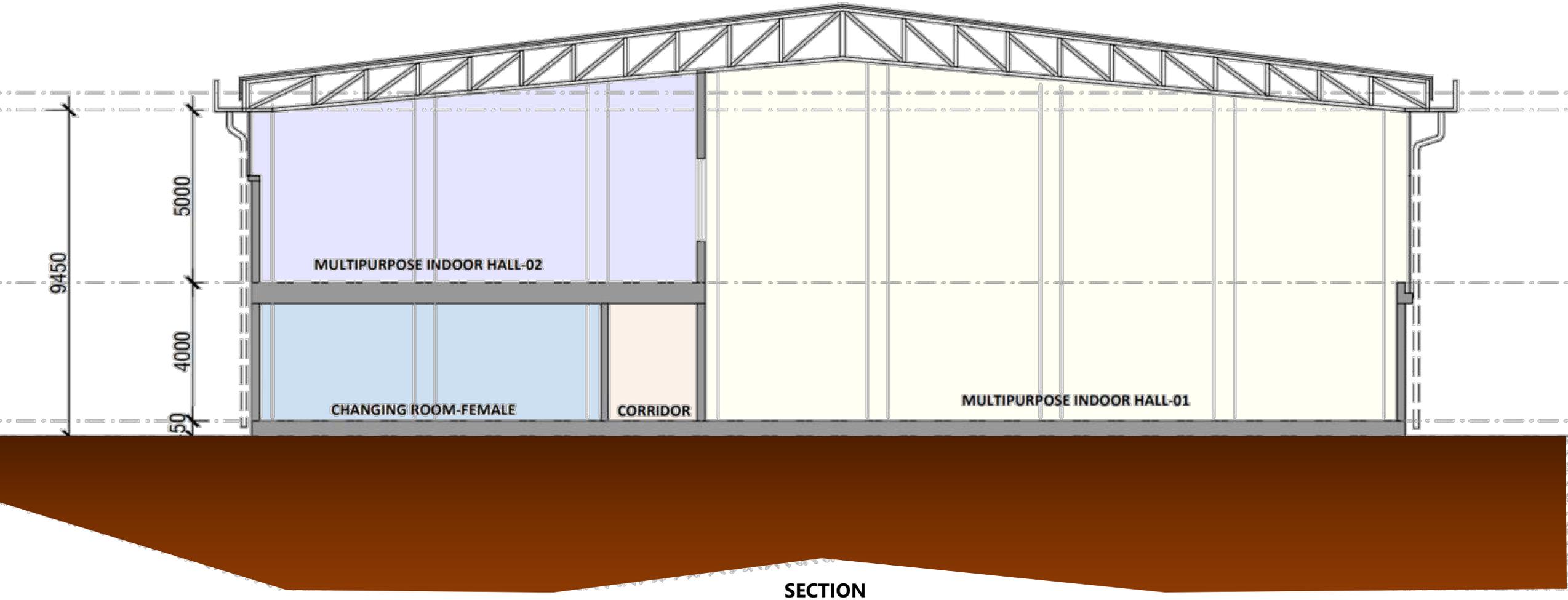
**B.U.A- 735 SQ.M**

### TOTAL BUILT UP AREA

GROUND FLOOR	1650
FIRST FLOOR	685
<b>TOTAL</b>	<b>2335</b>

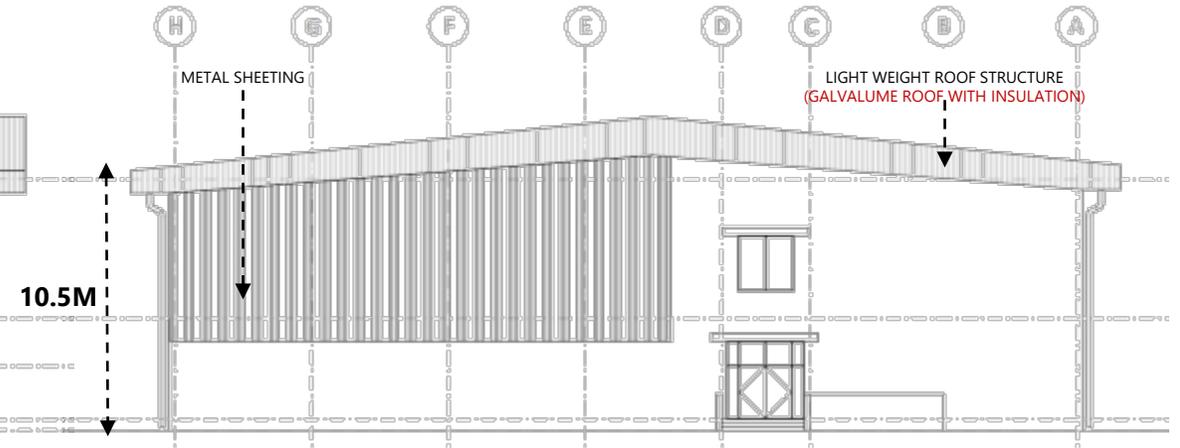
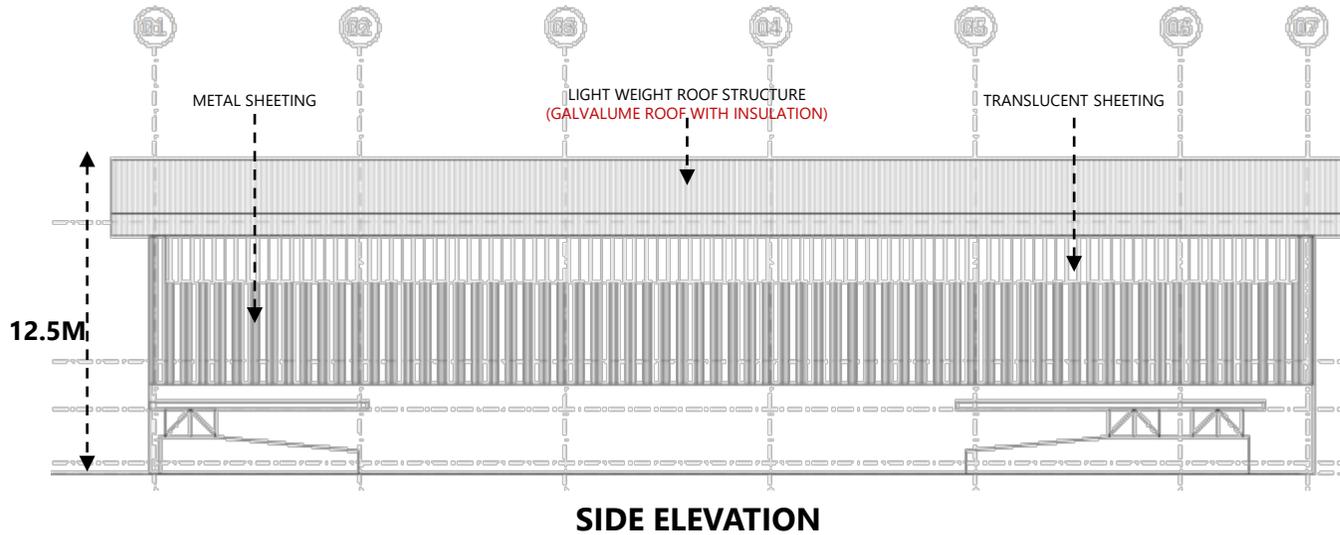
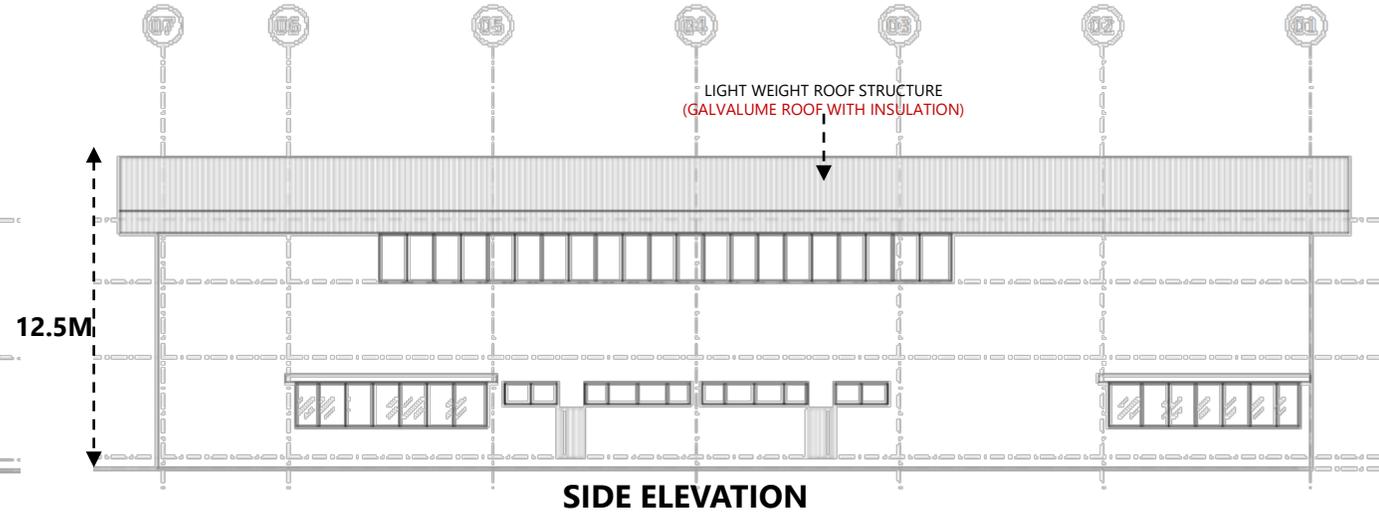
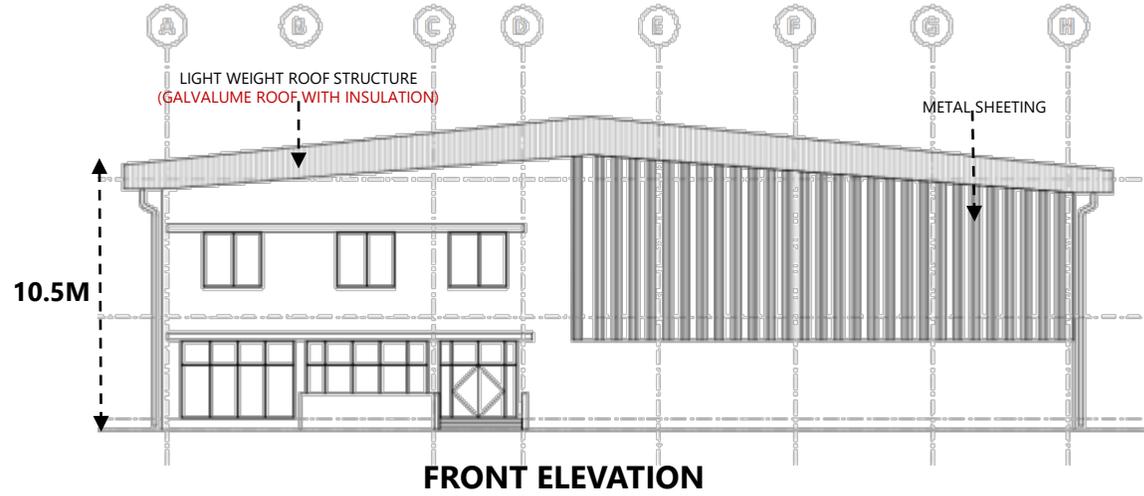
# MULTIPURPOSE INDOOR HALL – OPTION 1a

## LAYOUTS



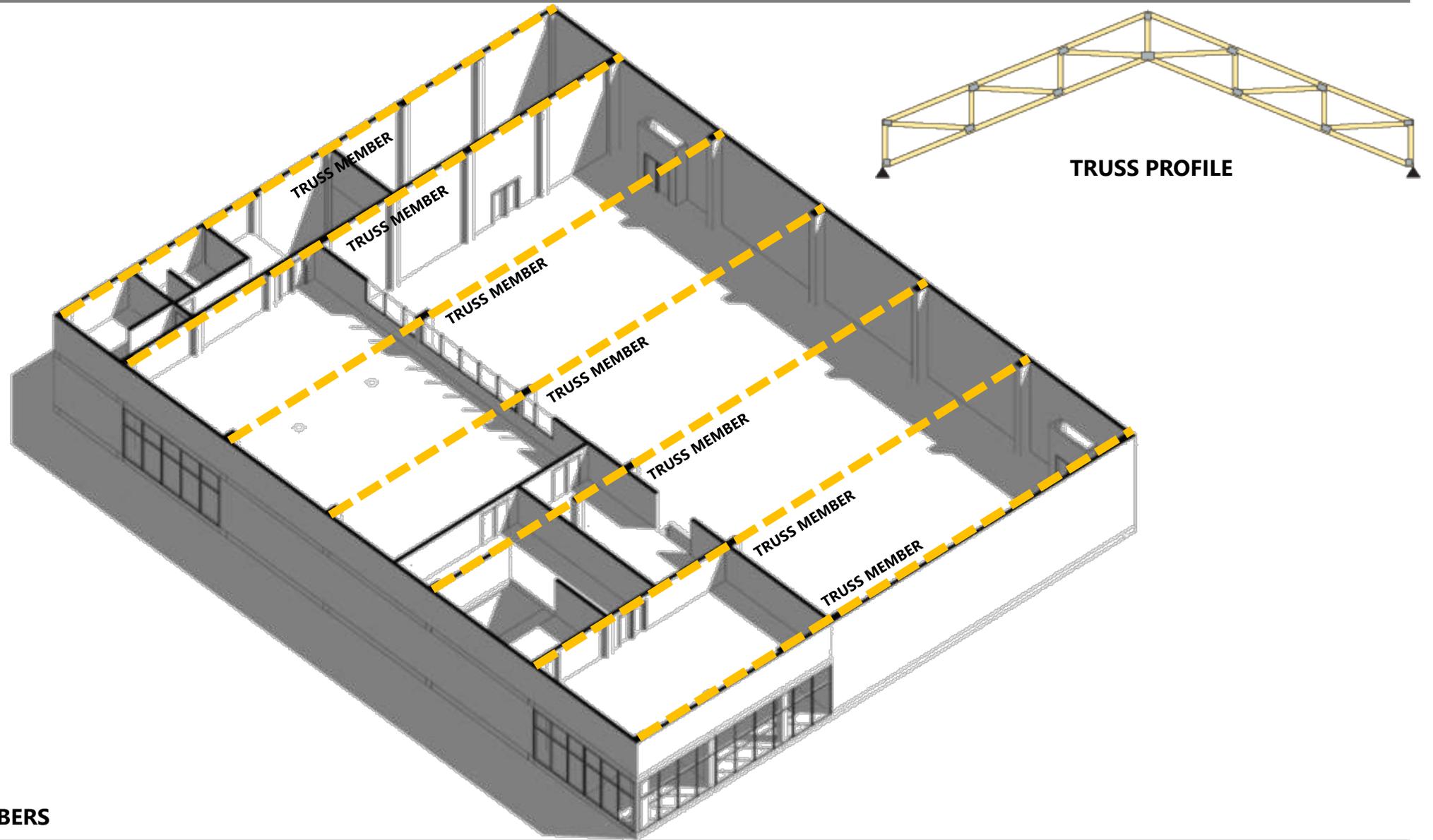
# MULTIPURPOSE INDOOR HALL – OPTION 1a

## ELEVATIONS



# MULTIPURPOSE INDOOR HALL – OPTION 1a

## CUT VIEWS



# MULTIPURPOSE INDOOR HALL – OPTION 1a

## AREA STATEMENT

Sr. No	Space	Area(sq.m)
<b>GROUND FLOOR</b>		
1.	Multipurpose Hall-01 (40M x 20M)	800
2.	Equipment store-01	100
3.	Changing Room- Male(for 30 changing spaces)	75
4.	Changing Room- Female(for 30 changing spaces)	75
5.	Admin Office	50
6.	Circulation	275
7.	Fitness Centre	100
8.	First Aid	20
9.	Utility/ Services	10
<b>FIRST FLOOR</b>		
1.	Multipurpose Hall-02 (13M x 21M)	312
2.	Equipment Store-02	65
3.	Toilet- Male & Female	40
4.	Yoga/ Meditation hall	110
5.	Juice Bar	15
6.	Circulation	115

### TOTAL BUILT UP AREA

GROUND FLOOR	1650
FIRST FLOOR	685
<b>TOTAL</b>	<b>2335</b>

### Cost Estimates : Rs. 3.90 Cr.

The Cost estimate is based on Market Rate Analysis and CPWD Plinth Area Rate for Delhi NCR region. The Cost will vary based on the location from 1 to 1.5 times based on the quarterly cost index circular released by CPWD

The above cost excludes the following:

- Sports and Fitness Equipment
- Scoreboards / AV System
- Back-up Generators
- Air Conditioning

**Additional Cost of Rs. 30 Lakhs to Rs. 50 Lakhs can be considered for equipment's based on the selected sports**

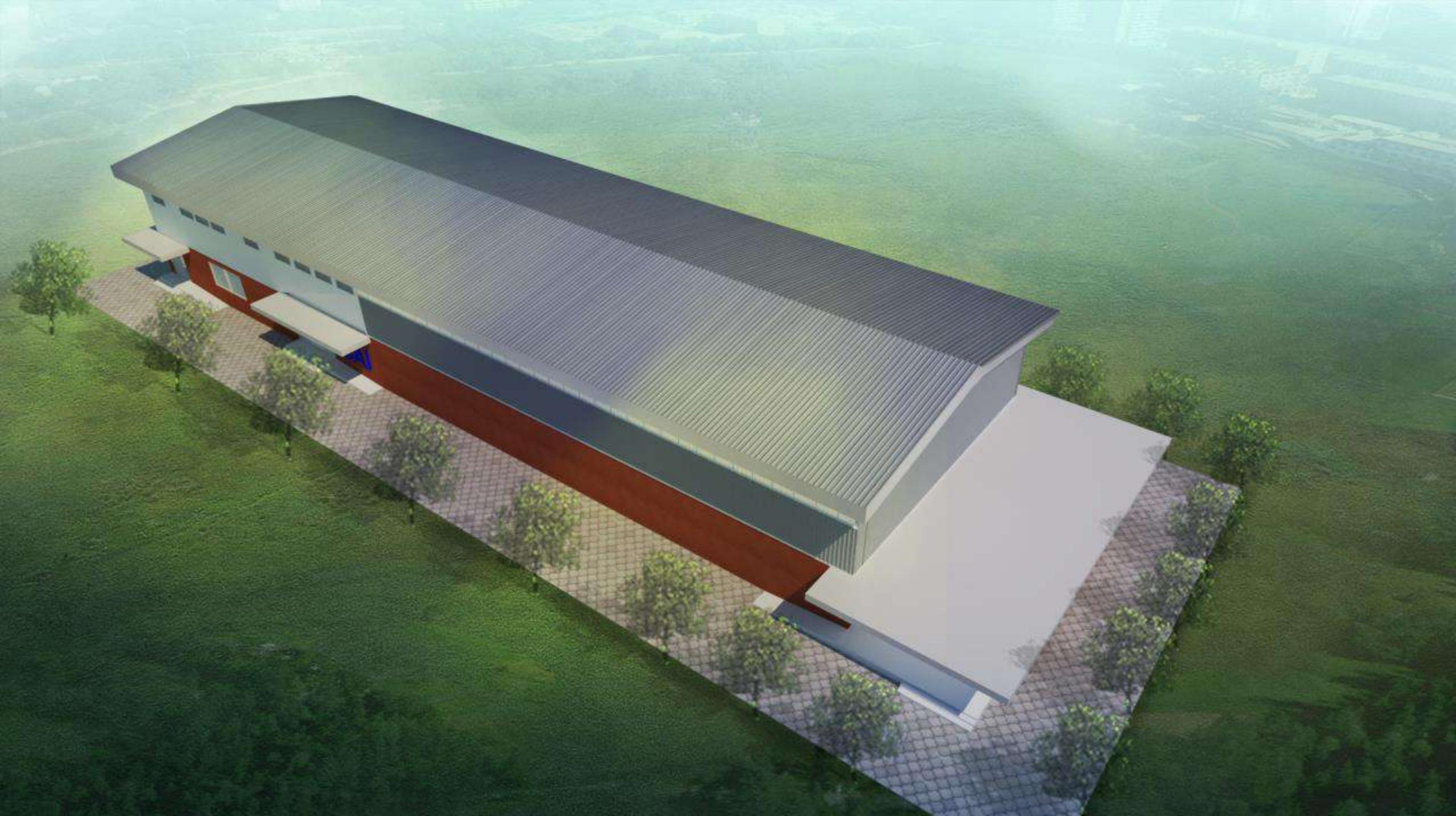


## OPTION 01 B

MODEL DESIGNS FOR  
MULTIPURPOSE INDOOR SPORTS HALLS

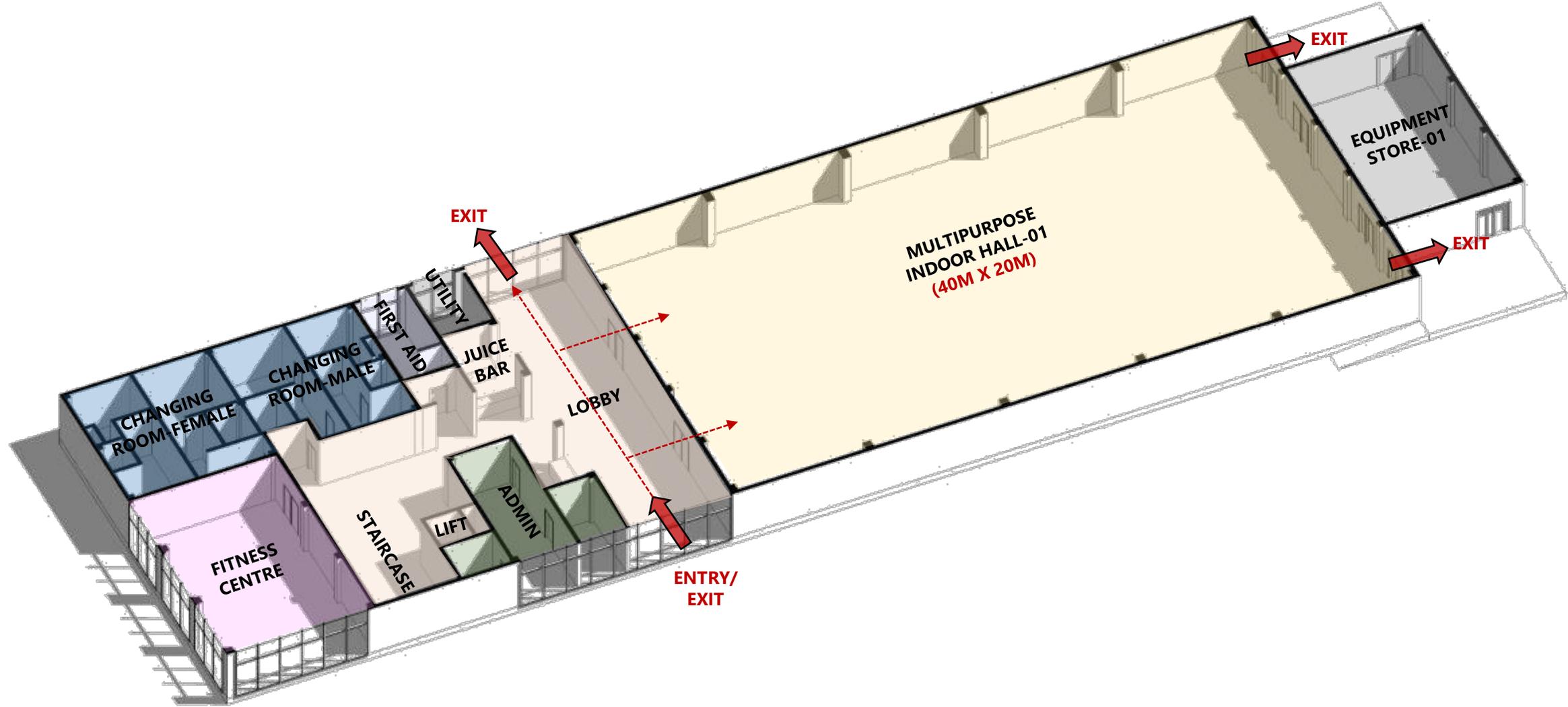






# MULTIPURPOSE INDOOR HALL – OPTION 1b

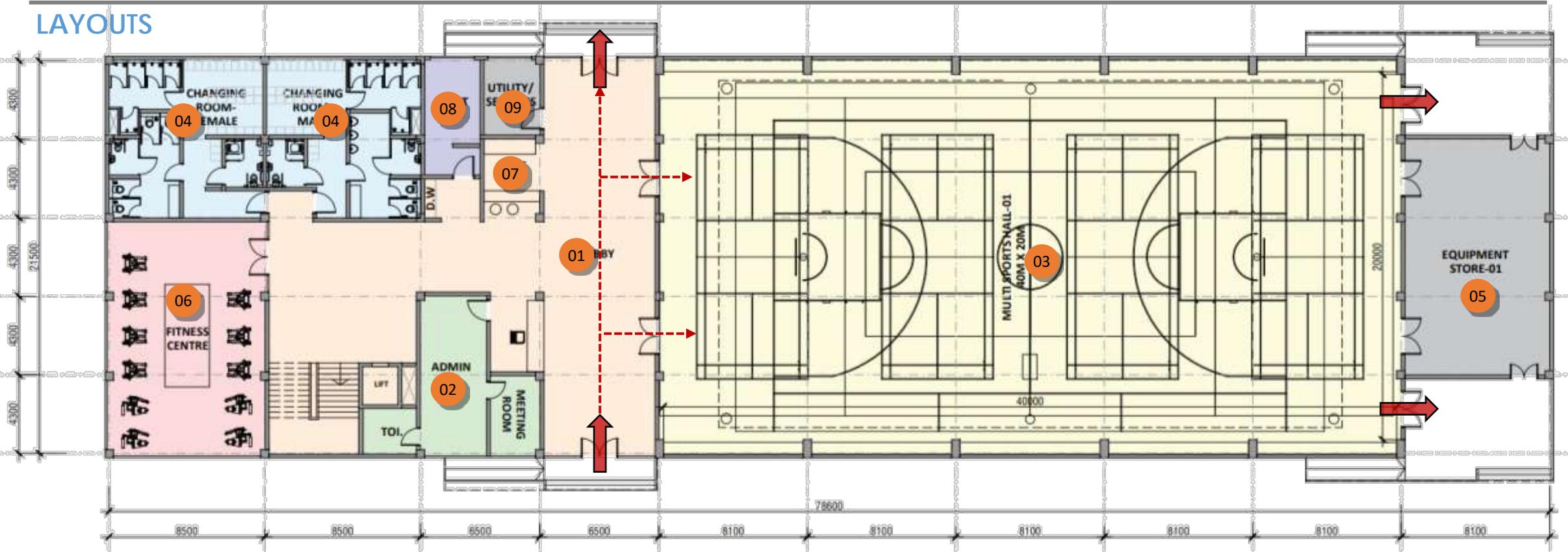
## CUT VIEWS



GROUND FLOOR

# MULTIPURPOSE INDOOR HALL - OPTION 1b

## LAYOUTS



### GROUND FLOOR

- 01 ENTRANCE LOBBY
- 04 CHANGING ROOMS-  
MALE & FEMALE
- 07 JUICE BAR
- 02 ADMIN
- 05 EQUIPMENT STORE
- 08 FIRST AID
- 03 MULTIPURPOSE HALL  
20M X 40M
- 06 FITNESS CENTRE
- 09 UTILITY/ SERVICES

**B.U.A- 1670 SQ.M**

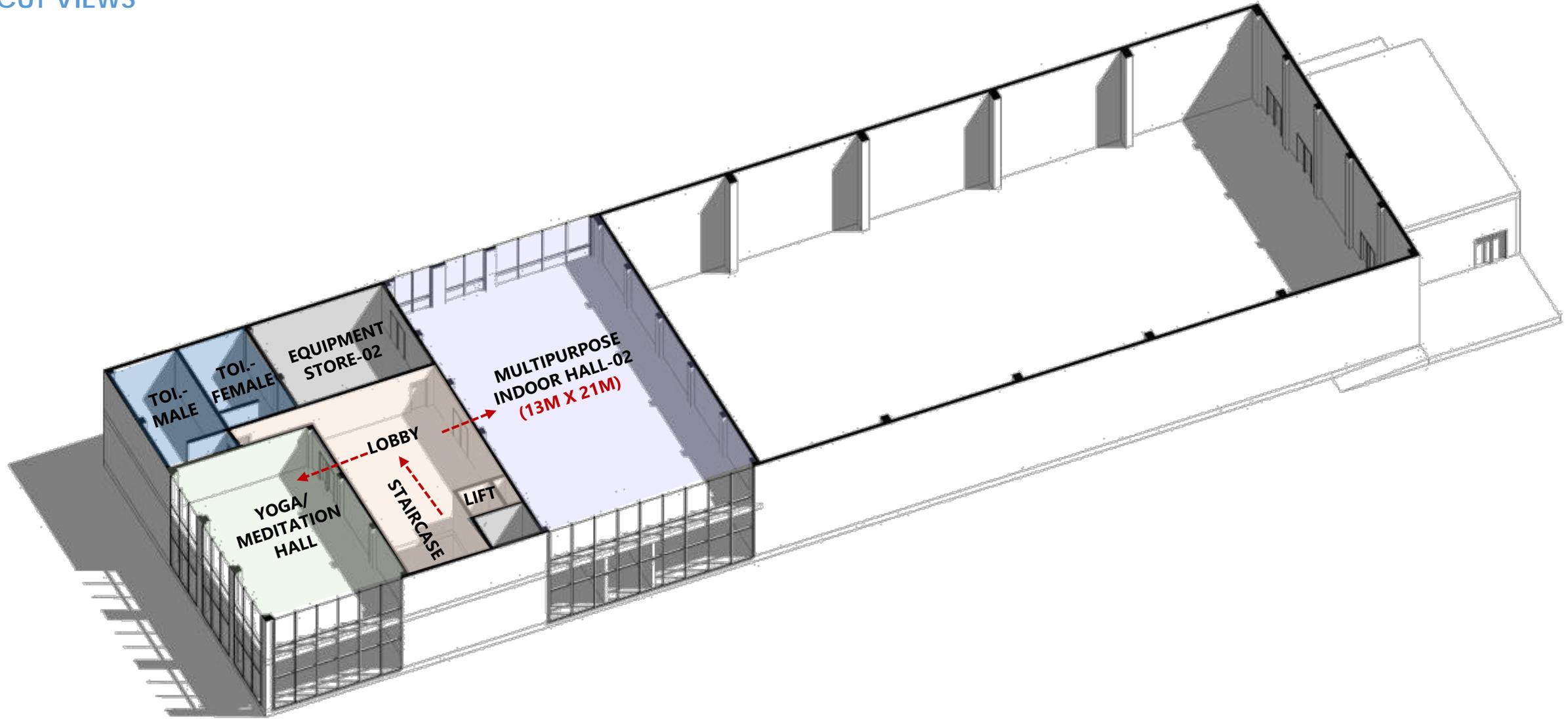
#### FOR CHANGING ROOM CALCULATION

OCCUPANCY  
CONSIDERED

4 Courts x 4 players per court x 2  
(change over)  
(Also considering single sex  
activities),  
**30 capacity per each changing room**

# MULTIPURPOSE INDOOR HALL – OPTION 1b

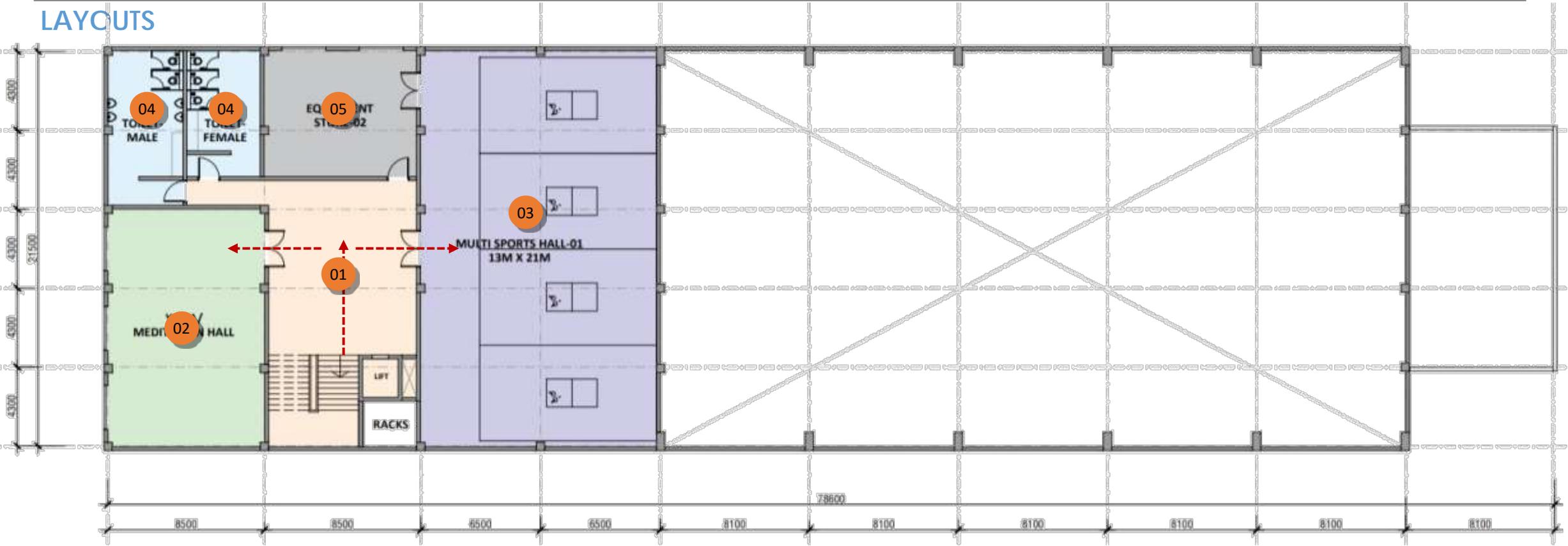
## CUT VIEWS



FIRST FLOOR

# MULTIPURPOSE INDOOR HALL – OPTION 1b

## LAYOUTS



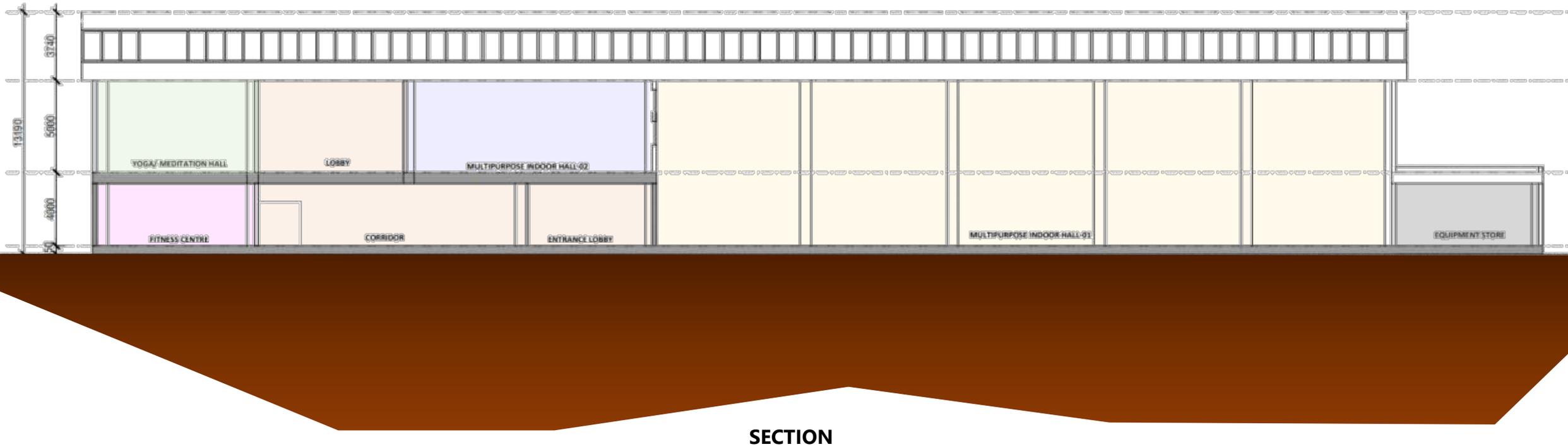
FIRST FLOOR

B.U.A- 665 SQ.M

- 01 LOBBY
- 02 YOGA/ MEDITATION HALL
- 03 MULTIPURPOSE HALL-02  
13M X 21M
- 04 TOILETS
- 05 EQUIPMENT STORE-02

# MULTIPURPOSE INDOOR HALL – OPTION 1b

## LAYOUTS



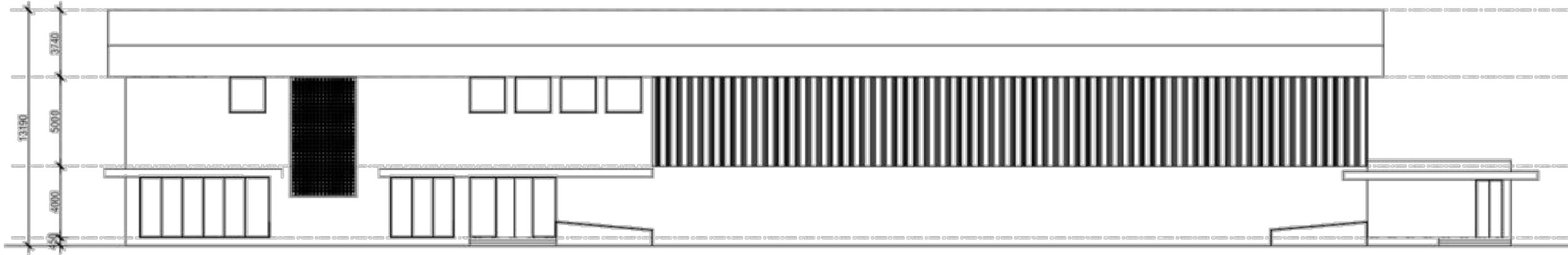
SECTION



MODEL DESIGNS FOR  
MULTIPURPOSE INDOOR SPORTS HALLS

# MULTIPURPOSE INDOOR HALL

## LAYOUTS



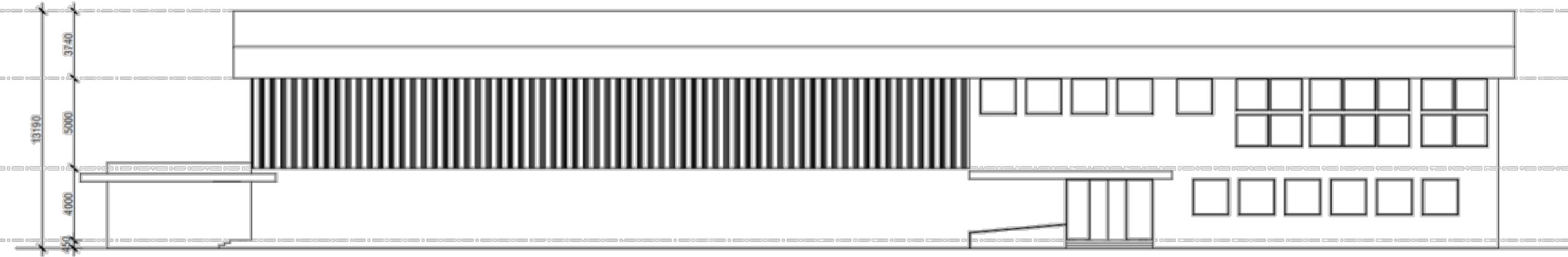
FRONT ELEVATION



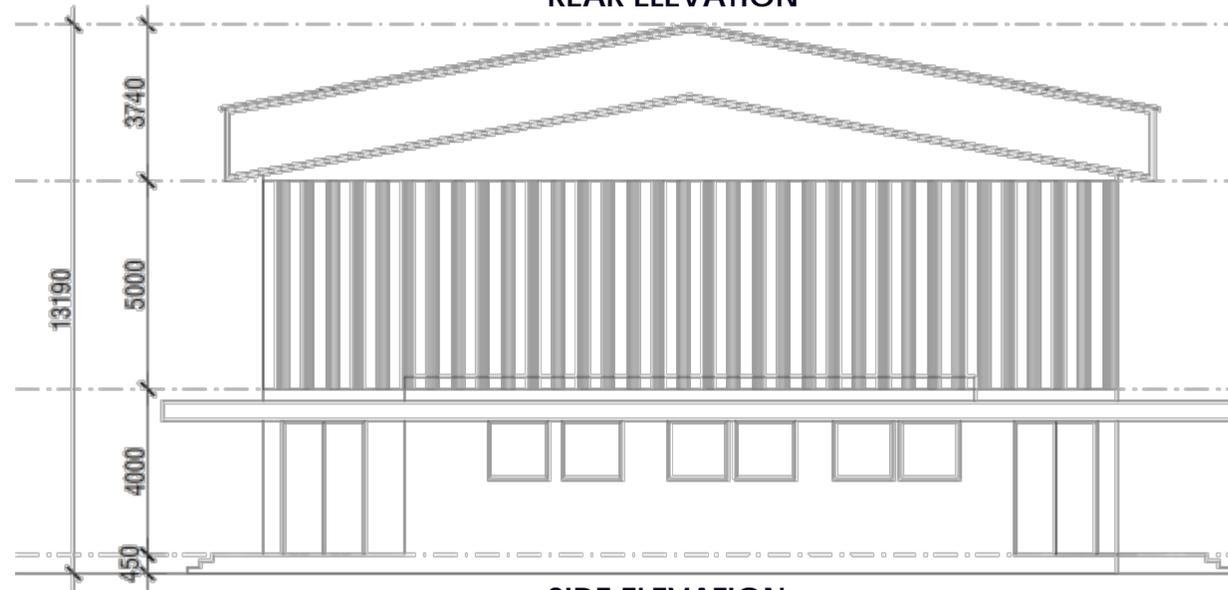
SIDE ELEVATION

# MULTIPURPOSE INDOOR HALL

## LAYOUTS



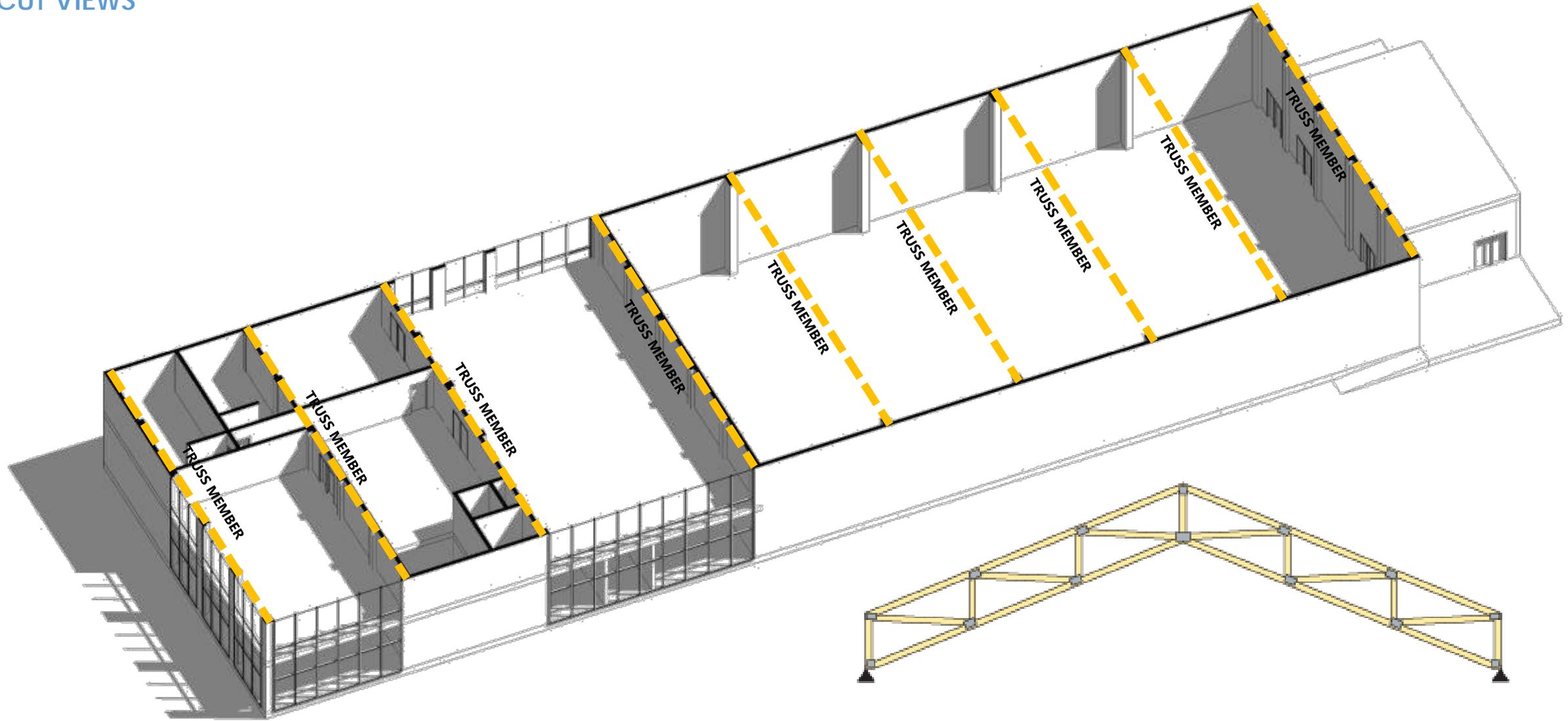
REAR ELEVATION



SIDE ELEVATION

# MULTIPURPOSE INDOOR HALL – OPTION 1b

## CUT VIEWS



ROOF MEMBERS

TRUSS PROFILE

# MULTIPURPOSE INDOOR HALL – OPTION 1b

## AREA STATEMENT

Sr. No	Space	Area(sq.m)
<b>GROUND FLOOR</b>		
1.	Multipurpose Hall-01 (40M x 20M)	800
2.	Equipment store-01	100
3.	Changing Room- Male(for 30 changing spaces)	75
4.	Changing Room- Female(for 30 changing spaces)	75
5.	Admin Office	55
6.	Circulation	270
7.	Fitness Centre	100
8.	Juice Bar	15
9.	Frist Aid	20
10.	Utility/ Services	15
<b>FIRST FLOOR</b>		
1.	Multipurpose Hall-02 (13M x 21M)	312
2.	Equipment Store-02	55
3.	Toilet- Male & Female	60
4.	Yoga/ Meditation hall	110
5.	Circulation	105

### TOTAL BUILT UP AREA

GROUND FLOOR	1670
FIRST FLOOR	665
<b>TOTAL</b>	<b>2335</b>

### Cost Estimates : Rs. 3.90 Cr.

The Cost estimate is based on Market Rate Analysis and CPWD Plinth Area Rate for Delhi NCR region. The Cost will vary based on the location from 1 to 1.5 times based on the quarterly cost index circular released by CPWD

The above cost excludes the following:

- Sports and Fitness Equipment
- Scoreboards / AV System
- Back-up Generators
- Air Conditioning

**Additional Cost of Rs. 30 Lakhs to Rs. 50 Lakhs can be considered for equipment's based on the selected sports**



# TECHNICAL SPECIFICATIONS

MODEL DESIGNS FOR  
MULTIPURPOSE INDOOR SPORTS HALLS

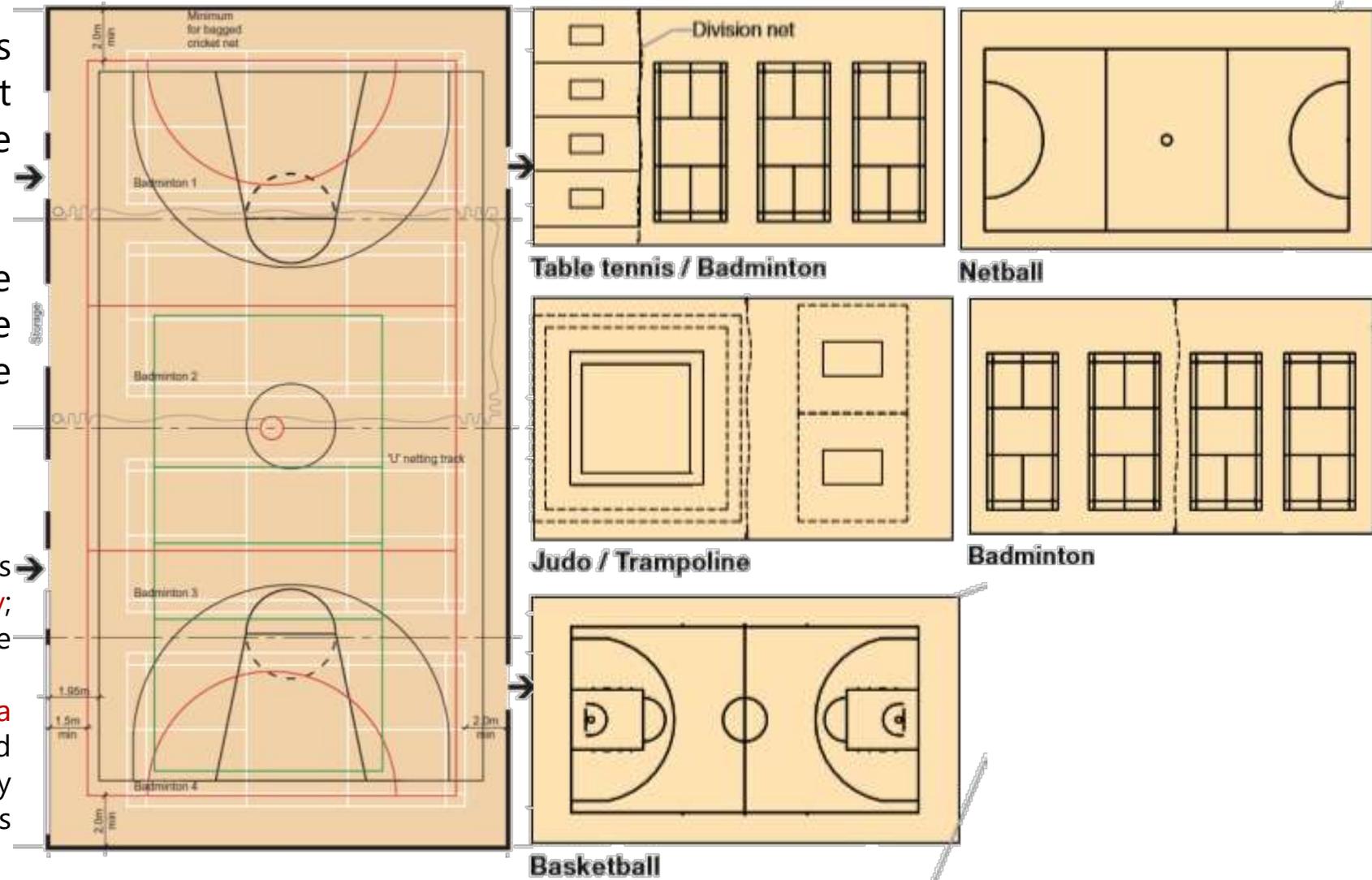
# MULTIPURPOSE INDOOR HALL – MAIN HALL

## Four Court Hall

- The optimum dimensions considered for this most popular size of sports hall are **40m x 20m x 9m**.
- Main structure must always be aligned between the badminton courts to create four bays.

## Additional Points

- The space required for most games depends on the **standard of play**; generally, the higher the standard the larger the space.
- For most competition play an **extra zone** is required for team benches and an officials' table and a further security zone between teams and spectators may be required for major events.



## Sports to be played: Main Hall

Different sports to be considered for a 40m x 20m size Hall with clear height of 9m.

Sr.No.	Sport	No of Courts
1.	Badminton	4 Courts
2.	Basketball	1 Court
3.	Volleyball	1 Court
4.	Netball	1 Court
5.	Handball	1 Court (mini)
6.	Gymnastics	

## Sports to be played: Secondary Hall

Different sports to be considered for a Secondary Hall with clear height of 5m.

Sr.No.	Sport	No of Courts
1.	Table Tennis	4 -6 Tables
2.	Judo	1 Mat
3.	Taekwondo	1 Mat
4.	Fencing	4-6 pistes
5.	Boxing	2 Rings
6.	Wrestling	2 Mats
7.	Weightlifting	

The sports to be played needs to be finalized on the basis of below factors

1. Type of flooring
2. Field of Play Sizes
3. Clear height requirements
4. Popularity of a particular sport in respective regions/ areas.

## Changing Room Facility

Calculations should take into account:

Number of Courts x Maximum number of players per court x 2 ( for changeover)

### Toilet Calculations

Male	1 wc, 1 urinal, 1 washbasin per 15-20 users 1 shower per 6 changing spaces
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Female	1 wc per 7-10 users, 1 washbasin per 15-20 users 1 shower per 6 changing spaces
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Min. changing room area should allow for 1.6 sq.m per person

For **4 Court Badminton Hall**- 30 changing spaces (each) + Multipurpose Hall-02

	Male	Female
WC	4	8
Urinals	5	-
Wash Basin	4	5
Showers	5	5

For **2 Court Badminton Hall**- 16 changing spaces (each)

	Male	Female
WC	1	2
Urinals	1	-
Wash Basin	1	1
Showers	3	3

# MULTIPURPOSE INDOOR HALL

## Equipment Store

- A total of **12.5% of the hall floor area** is required as a minimum for sports equipment.

## First Aid Room/Physiotherapy Room

- A clear space of **2.0 x 1.6 m** is recommended as a minimum.
- A supply of drinking water should be available and there should be an adjacent **accessible toilet facility**.

## Fitness Centre

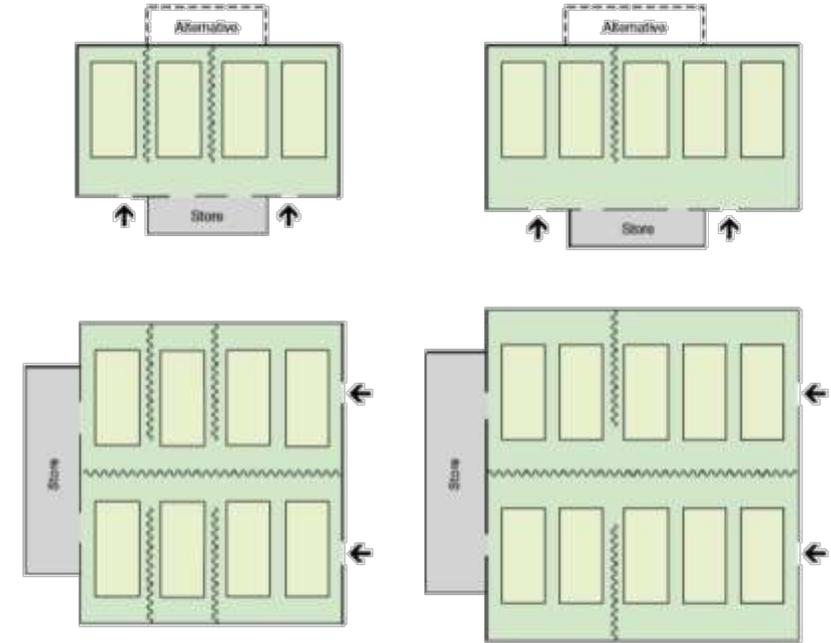
- The minimum practical floor area is **100 sq.m** is the norm for sports center's.

## Admin

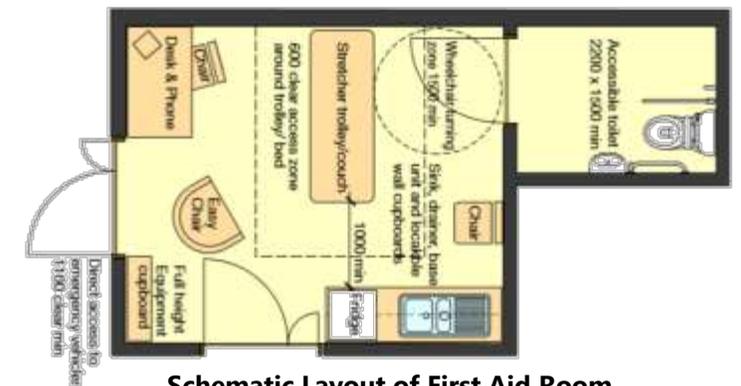
- The minimum area to provide for **1 cabin and 3 nos. Workstations**.

## Additional Multipurpose Hall

- Ancillary halls can **range upwards from a size of 10m x 20m x 5m high** for a range of physical and social activities.



The location of the equipment store should allow easy access to various subdivisions of hall



Schematic Layout of First Aid Room

# TECHNICAL SPECIFICATIONS

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## Flooring

- **Maple wood** with the flooring system and manufacturer approved by FIVB/FIBA/BWF to be provided in the Large Multipurpose Indoor hall is to be used by badminton etc.
- Flooring should generally be **seamless synthetic Polyurethane flooring** over shock absorbing layer as approved by FIVB / FIBA / BWF for longer life and less maintenance can be used in the Fitness and smaller Multipurpose Hall

## Court Markings

- Court marking lines are **painted** on most sports floors.
- PVC tape is not usually used, except for temporary courts, whilst inlaid lines are an option for a limited number of sports floor products.
- For multi-sports halls a range of colours is required to avoid confusion.



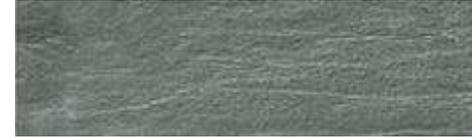
## Support Areas

Space	Flooring Type
1. Rooms	Vitrified Tiles
2. Corridor	Vitrified Tiles
3. Common Areas	Vitrified Tiles
4. Store Rooms	Kota Stone
5. Toilet	Anti Skid Ceramic Tiles
6. Staircase	Kota Stone
7. Entrance Lobby	Vitrified Tiles/ Granite

MAPLE WOOD FLOORING



VITRIFIED TILES



VITRIFIED TILES



SYNTHETIC POLYURETHANE FLOORING



GRANITE FLOORING



# TECHNICAL SPECIFICATIONS

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## Height

- The clear height of the Indoor hall should be minimum required for the training purpose specific to the sports discipline for which it is intended to be used.
- Clear height for Combat sports should generally not be more 4.5 to 5 mt depending on the floor area of the hall, for ball games/badminton provide minimum clear height as under.
- In case the Indoor hall is likely to hold National/International level completions of ball games, the clear height should be provided as per International federation guidelines.
- Clear height requirements considered for different spaces in the facility is mentioned in below table;

Space	Height
1. Multipurpose Indoor hall-01	<b>9m (min.)</b>
2. Multipurpose Indoor Hall-02	<b>5m (min.)</b>
3. Common Areas	<b>3m</b>
4. Equipment Store	<b>3m</b>
5. Toilet	<b>3m</b>
6. Entrance Lobby	<b>3m</b>
7. Admin	<b>3m</b>
8. Fitness centre	<b>3m</b>

# TECHNICAL SPECIFICATIONS

- Clear height for various sports discipline has been compiled for different level of sports discipline in below table.

Sr. No.	Indoor Sports	Class	Clear Height required (m)
1.	Badminton	Class I Class II Class III	9 7.5 7.5
2.	Basketball	Class I Class II Class III	9 7.5 7.5
3.	Boxing		5
4.	Fencing		5
5.	Gymnastics		8 (preferably 10-12)
6.	Handball		7.5
7.	Judo		5

Sr. No.	Indoor Sports	Class	Clear Height required 9m)
8.	Kabaddi		5
9.	Netball		7.5
10.	Squash		5.64
11.	Taekwondo		5
12.	Table Tennis		5
13.	Volleyball	Class I Class II Class III	12.5 9 9
14.	Wrestling		5
15.	Weightlifting		7

# TECHNICAL SPECIFICATIONS

## Internal Walls

- The internal walls should be **flush-faced and impact resistant**.
- It is preferable if it runs full height and with a consistent colour as horizontal changes in material cause visual obstruction to players
- The **reflectance value** should be generally around **40-50%** to give sufficient contrast.
- The wall colour should contrast with the floor and be uniform across the wall plane. Preferred Darker colour as shown in contrast to the shuttle / TT ball
- Include a 0.15 m skirting designed for easy replacement.
- **Doors and door frames should be flush with the internal surfaces, and should open outwards away from the sports hall.**



Space	Flooring Type
Rooms, Lobbies, Common Areas & Corridors	Oil Bound Distemper
Store Rooms	Dry Distemper
Toilet and Locker Rooms	Ceramic tile up to 2.1m height



- Powder Coated Aluminum window
- Wooden Flush Door or Powder Coated Metal Door
- **FLUSH DOORS WITH FLUSH VIEWING PANEL OPENING OUTWARDS OF SPORTS HALL**

## Ceiling

The roof soffit and structure should:

- Be uniform, preferably white with **more than 90% reflectance value**
- Where unavoidable, internal linings or suspended ceilings must be impact-resistant
- **Suspended ceilings are generally inappropriate for sports halls.**

## Fittings

The hall should be equipped with a range of fixed equipment depending on the chosen priority sports. Typically this might be:

- Wall- or roof structure -mounted basketball goals with additional practice goals fixed directly to the wall
- **Floor and possibly wall sockets with flush fitted cover plates will be required for specific items of equipment**
- Wall Protection Cushions at impact points upto 2.1M (Behind Basketball nets etc.)

## Acoustics

- The internal acoustic conditions within a sports hall should be appropriate for its intended use.
- Acoustic design is a complex and specialist subject that can be influenced by many factors such as
  - **Reverberation times:** The hard surfaces required to withstand impact damage within the sports hall tend not to have good sound absorbency properties and results in sound being repeatedly reflected from the various surfaces. **Should be between 1.5 and 2.0 sec at mid-frequency**
  - **Sound insulation:** The level of sound insulation within the building fabric to prevent distracting sound from external sources being transmitted into the hall should also be considered. **A standard of NR40 would normally be specified.**
- The problem can be avoided through acoustic design that integrates sound **absorbent materials into the ceiling and/or upper wall levels.**

## Ventilation

- **No Multipurpose hall will be Air-conditioned unless it is proposed for holding National level competitions.**
- The ventilation of a sports hall will be required throughout the year.
- The **fresh air requirement** will generally depend on the number of occupants, unless dependent on the cooling needs.
- A **ventilation rate** of approx. **1.5 air changes per hour** is adequate for most **4 court sports halls** of between 7.0-8.0 m high assuming heat gain or large occupancies are not an issue and that there is good air distribution.
- **Air velocities** should generally be kept **below 0.1 m/s** with the sports activity volume. This is particularly important for badminton where the flight of the shuttle cocks is likely to be up to 6.0-7.0 m over the court.
- A **ducted air system** has generally been seen as the preferred method of ventilation. It can give a good degree of control of air quality throughout the year and achieve good distribution and efficiency.

## Lighting

### Natural Lighting

- Day lighting in sports halls **can cause technical issues** that needs to be weighed against the perceived benefits. These include - **Controlling glare, Stable & uniform levels of lighting and Heat Gain**
- Some sports such as badminton have strict advice **against daylight in sports halls.**

### Artificial Sports Lighting

- **Adequate artificial lighting** is an essential element of the sports hall and should be integrated into the design
- Many sports halls have to cater for a range of activities and some simultaneously where the sports hall can be divided into sections.
- The key issues for lighting design can be summarized as:
  - **Illumination value ( Eave) – minimum maintained average:** The system should be designed with a higher initial value and for planned replacement of lamps when output falls below the Eave level
  - **Uniformity ratio (E<sub>min</sub>/ Eave):** The ration of minimum to average illuminance over the playing area
  - **Colour rendering (Ra)** an indication of the quality /distortion when compared to natural light.

# TECHNICAL SPECIFICATIONS

## Even Illumination

The full volume of the field of play should be **illuminated evenly** to create equal playing conditions for all players and to create a consistent level of visibility.

## Lamp Types

- There is a variety of different lamp types used for sports lighting.
- Selection is often made on the basis of **colour of light emitted, energy consumption and life expectancy.**

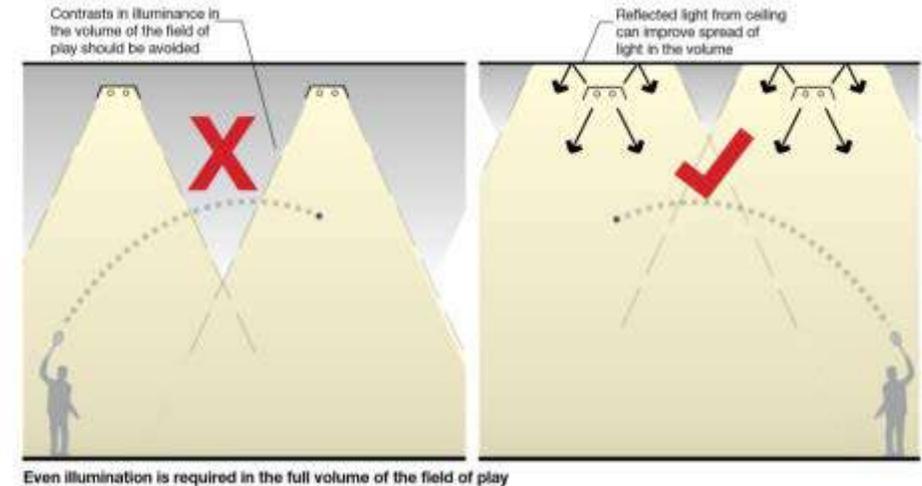
## Levels of Illumination

- The level of illumination that is appropriate for a particular sport should be checked with the **requirements of the International Standards.**

## Glare

Design considerations to be followed to minimize the glare;

- Selection of luminaires designed with attention to the **avoidance of glare.**
- The **locations of the luminaires.**



## Types of lamps

Indoor Sports	<ul style="list-style-type: none"><li>- Tubular Fluorescent</li><li>- Compact Fluorescent</li><li>- Metal Halide</li><li>- High Pressure Sodium</li><li>- Light Emitting Diode (LED)</li></ul>
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## Artificial Lighting Requirements

Minimum lux level requirements for different spaces in the facility is mentioned below;

<b>Space</b>	<b>Lux Level</b>
1. Multipurpose Indoor hall-01	<b>300</b>
2. Multipurpose Indoor Hall-02	<b>200</b>
3. Fitness Centre	<b>200</b>
4. Entrance Lobby	<b>150</b>
5. Changing Rooms	<b>150</b>
6. First Aid	<b>150</b>
7. Admin	<b>150</b>

## Structure: Combination of RCC & Steel Structure

### Foundation

- Foundations will need to be designed on a site specific basis as the design will depend on the ground conditions found at the site and the imposed wind loadings.

### Floors

- The ground floor for the sports hall and ancillary elements of the buildings should be formed of **reinforced concrete**.
- A **damp proof membrane** will be required.

### Slab thickening and ground beams

- Some **sports equipment** such as volleyball posts require **deep support sockets** within the floor slab.
- These are to enable the sports equipment to be put up and taken down as required and to provide a **flush floor surface** when they are not in use.
- This is typically achieved by **casting sockets or connection plates into the ground floor slab**.
- The floor slab will require **localized thickenings under these connection points**.
- These will need to be designed on a project specific basis as it will depend on the type of sports included and the type of equipment selected.

# TECHNICAL SPECIFICATIONS

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## Superstructure

- Continuation of RCC structure till **3m height** and mounting of steel columns above for roof truss.
- Light weight steel structure for multipurpose hall is ideal.
- For Roof, **steel truss or portals covered with Insulated Galvalume Roofing sheets** are used.
- Supporting areas can be designed in rcc or in steel structure depending on site and other factors.

STEEL STRUCTURE



COMBINATION OF STEEL & RCC STRUCTURE



# TECHNICAL SPECIFICATIONS

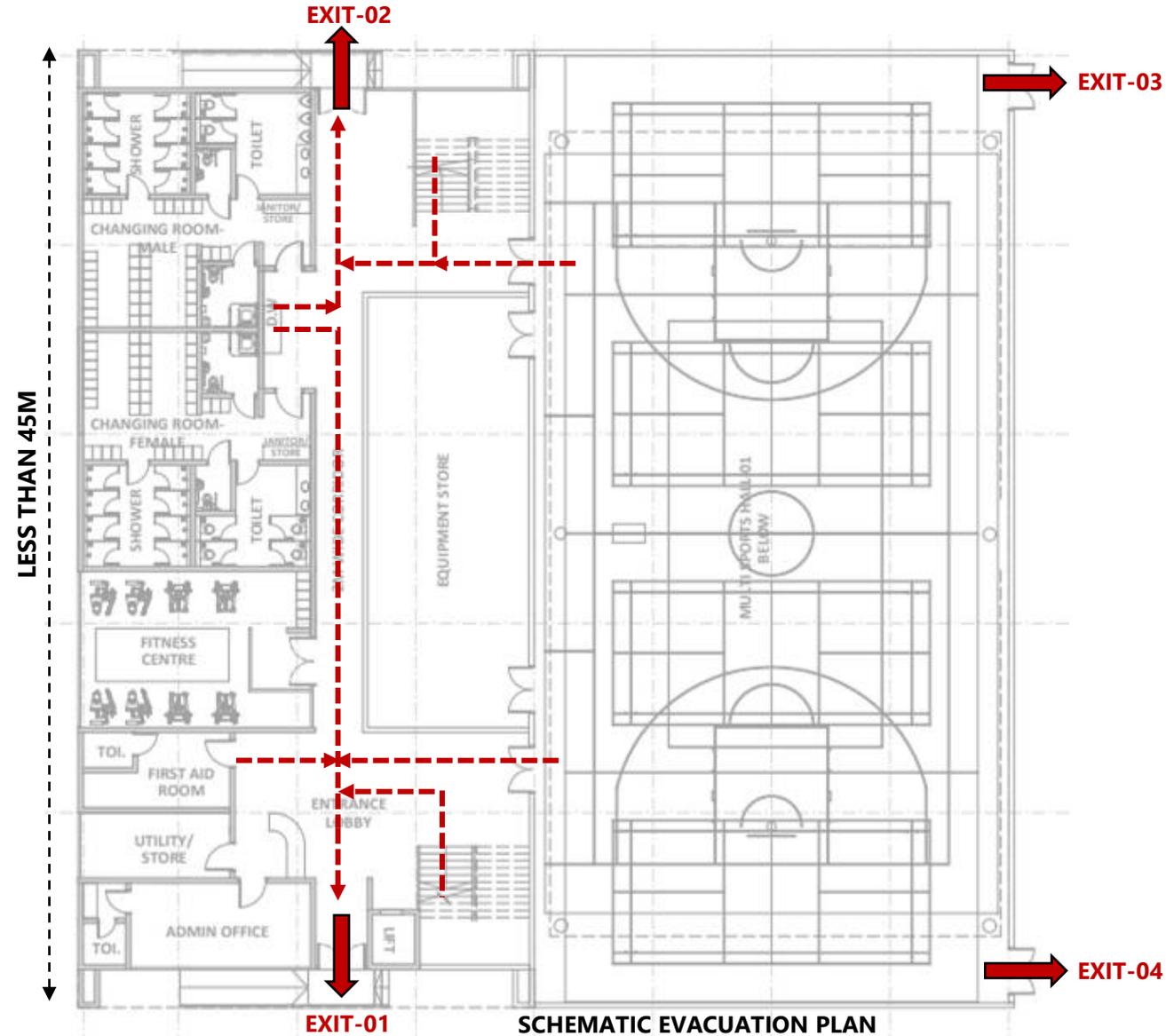
## Safety and Accessibility

### Exit Routes

- The **safe evacuation** of all people is an essential element of sports facility design and management.
- Provide **accessible exit routes** and final points of exit.

### Egress

- **Clear signage** is essential for identification and wayfinding in relation to egress.
- **Visual and audible communication** is required internally and externally to **assist people with disabilities**.





# MODEL DESIGNS FOR MULTIPURPOSE INDOOR SPORTS HALLS



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