

**INTERNATIONAL CRICKET STADIUM at DARIANAGAR, COX'S  
BAZAR**

By

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## **Abstract**

Bangladesh, as a cricket nation, has grown in leaps and bounce since it became the champion in the ICC Trophy back in 1997. Cricket has always been a very popular sport in the sub-continent, Bangladesh being the newest member from this region to join the big boys of cricket in the upper tier. The infrastructure necessary for the growth and development of cricket has been built gradually, and with the success of the cricketers in the world scene, Bangladesh is now a country well known for its passionate fan following and a colourful cricketing culture.

There have been two major stadiums selected for hosting the cricket world cup held on march 2011 in the sub-continent, one being the Sher- E- Bangla National stadium in Dhaka, and the other being M A Aziz stadium in Chittagong. The facilities provided in these stadiums to host a tournament of such magnitude was fascinating. But surely only two international standard stadiums are not enough for Bangladesh, who might be contenders for hosting future world cups as single host.

There have been a few proposals for building new international standard cricket stadiums at various important places of the country. One of them is the proposal of a stadium to be built at Cox's Bazar, the city which has been the main tourist attraction of Bangladesh. Cox's Bazar is yet to grow as an urban city, and the proposal of a stadium over there might boost up the urban development of that area a huge deal.

The natural beauty of the site surroundings, the potential of Cox's Bazar as the main tourist attraction of the country, the scope for development of the city, decentralization of the cricketing culture, diffusion of modern cricketing facilities to the periphery of the country- all these factors culminate in one's mind when designing a cricket stadium at that place. Also the concept of stadiums has been evolving from the very beginning, and now the attempts to make such a costly project most sustainable, and having multi-purpose usage are top priority. Designing a cricket stadium at Cox's Bazar imparts a challenge to create a balance between nature and man-made objects, the challenge to optimize tourism, the challenge to create an iconic value, and most of all, the challenge of making the most sustainable design possible.

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**TABLE OF CONTENTS****PAGE NO.**

Abstract-----01

Acknowledgement-----02

Table of contents-----03

**Chapter 01 : Introduction**

1.1 Background of the project-----06

1.2 Key aspects-----06

1.3 Choice of site-----07

1.4 Objectives-----07

1.5 Program ( tentative)-----08

**Chapter 02 : Site**

2.1 Site appraisal-----09

2.2 Site surroundings-----10

2.3 Topography-----11

2.4 Social background-----12

2.5 SWOT Analysis-----13

**Chapter 03 : Literature review**

3.1 Cricket-----14

3.2 Cricket field-----14

3.2 Cricket pitch-----15

3.3 Scoreboard-----15

3.4 Scorecard-----16

3.5 Sightscreen-----16

3.6 Umpire-----16

3.7 Umpire-----17



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3.8 Spectator viewing-----	17
3.9 Spectator seating-----	18
3.10 VIP facilities-----	19
3.11 Toilet provision-----	21
3.12 Media facilities-----	22
3.13 Pitch orientation-----	22
3.14 Shading depth and angle-----	23
3.15 Roofing materials-----	24
3.16 Security zones-----	24
3.17 Pitch composition-----	25
3.18 Entry and emergency exit timing-----	25

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#### **Chapter 04 : Case studies**

4.1.1 Sher e Bangla national stadium-----	26
4.2.1 New Beijing National Stadium-----	30
4.2.2 San Nicola Stadium-----	34
4.2.3 Braga municipal Stadium-----	38
4.3 Analysis and findings-----	41

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#### **Chapter 05: Program Development**

5.1.1 Pitch/ Central area-----	42
5.1.2 Spectator view-----	42
5.1.3 Tiolet provisions-----	44
5.1.4 VIP facilities-----	45
5.1.5 Private boxes-----	45
5.1.6 Executive suites-----	46
5.1.7 President suites-----	46

---

5.1.8 Club seating and dining-----	46
5.1.9 Player facility-----	47
5.1.10 Match control room-----	47
5.1.11 Third Umpire room-----	47
5.1.12 Media -----	48
5.1.13 Parking-----	48
5.1.14 Detail program-----	49

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**Chapter 06: Design development**

6.1.1 Phase 1 : Concept development-----	53
6.1.2 Phase 2 : Zoning and stadium placement on site-----	56
6.1.3 Phase 3 : Gallery and roof structure-----	59
6.1.4 Phase 4 : Structural detail and landscape-----	62

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**Chapter 07: Final design-----**65

---

**Conclusion-----**71

---

**References-----**72

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## **CHAPTER 01 : INTRODUCTION**

### **1.1 Background of the project**

Sports and stadiums have a well-knit relationship since the earliest times. Sports always had a heroic role to play in any civilization and what better place to showcase these heroics within a stadium. Since the gladiators of Rome left their blood at the heart of the 'Colosseum', the grandness of a sport or event has always been associated with large confinements to house the event. Stadiums since then have evolved, in its use, its impact to a nation and to the globe. The first Olympic stadiums showed the gateways into building the modern day stadiums, which is now very much associated with the latest enhancement of technology and creation of a mega-structure of iconic value.

Among many outdoor sports that require stadium facilities, cricket is one sport which has been historically very popular in the sub-continent. India and Pakistan have already stamped their authority on the cricketing world by winning world cups in the past. Cricket in Bangladesh is growing in a slow but steady rate. The catalysts that took Bangladesh into the world level were the winning of the ICC trophy in 1997, winning a world cup match against Pakistan in 1999 world cup, getting the test status in 2000, and finally successfully hosting the world cup cricket in 2011. Bangladesh has proven its potential of being a future super power of cricket in the not so distant future. The 2014 T20 cricket world cup is also going to be held in Bangladesh.

Currently Bangladesh has 5 stadiums that have hosted one day international cricket matches. But the facilities in those stadiums, (except Mirpur Sher E Bangla Stadium) are not up to the mark, thus not giving those stadiums the recognition of being a test venue. The Bangladesh Cricket Board (BCB), in collaboration with the Government has taken steps to increase the number of international standard cricket stadiums, and have strategically proposed 2 new stadium sites, one at Purbachal, Gazipur, and the other at Cox's Bazar.

### **1.2 Key aspects of the project**

Name of the project: international cricket stadium

Client: Bangladesh Cricket Board (BCB)

Site location: Darianagar, Cox's Bazar

Site area: 20,00,000 sqft

No. of spectator seating: 40,000

### **1.3 Choice of site**

The site chosen for the thesis project is located in Cox's Bazar. Out of the two proposed sites, the choice made by me is located at Darianagar, around 7 kilometers to the south of the main city of Cox's Bazar. The client of the project is the Bangladesh Cricket Board in collaboration with the Government of Bangladesh. The decision of building a stadium at the number one tourist spot in Bangladesh has many dimensions. With the major tourist attraction and the ever-increasing growth of the cricket culture, the need for more stadiums of the highest quality is paramount. The decentralization of the major centre of cricket to the beautiful coastal region has a lot of plus points and exciting prospects.

### **1.4 Objectives of the project**

The stadium to be built at Cox's Bazar has the following major objectives:

- a. The stadium will help create a new test cricket venue at a very promising location.
- b. The stadium will hold huge crowd
- c. The multi-purpose usage of a colossal structure such as a stadium will help develop the coastal area as a whole.
- d. Revenues from tourism will tend to rise and increase due to the establishment of an international sports facility.
- e. An iconic value will be added to the area where the proposed stadium will be built.
- f. An urban platform will be created which can house various native cultural festivities.
- g. A stable structure as the stadium could act as a shelter for refugees in situations of natural calamity.



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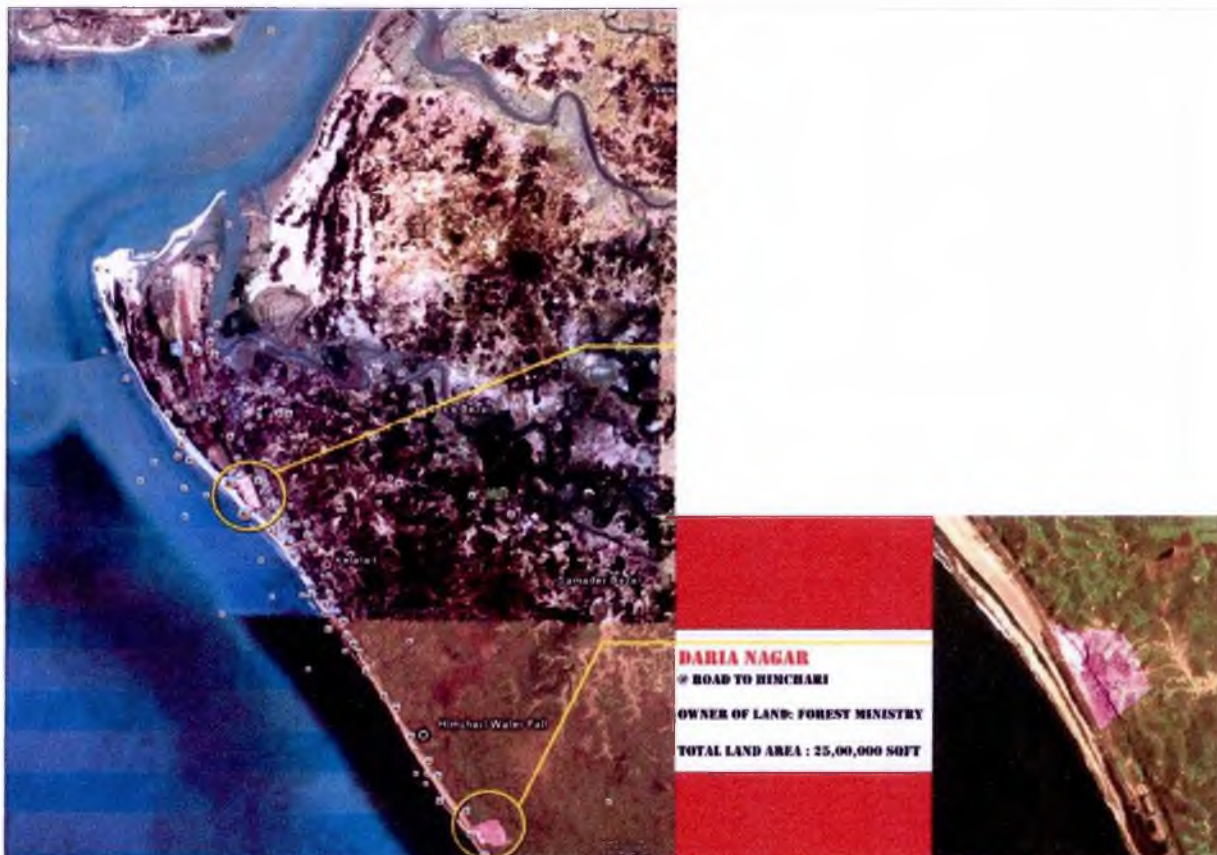
**1.5 Program of the project (as provided by the BCB)**

<b>a. Stadium premise</b>	<b>3,20,000 sqft</b>
Gallery space	
Pavilion building	
VIP facilities	
Restaurants	
Media	
Stadium administration	
Service room	
Storage	
Toilet	
<b>b. Gymnasium and indoor practice</b>	<b>50,000 sqft</b>
Main indoor net blocks	
Service	
TV room	
Toilet	
<b>c. Academy</b>	<b>40,000 sqft</b>
Lodging	
Dining space	
Hall room	
Administration	
Conference room	
Audio-visual rooms	
<b>d. Parking</b>	<b>6,50,000 sqft</b>
<b>Total area</b>	<b>10,60,000 sqft</b>

## CHAPTER 02 : SITE

### 2.1 Site appraisal

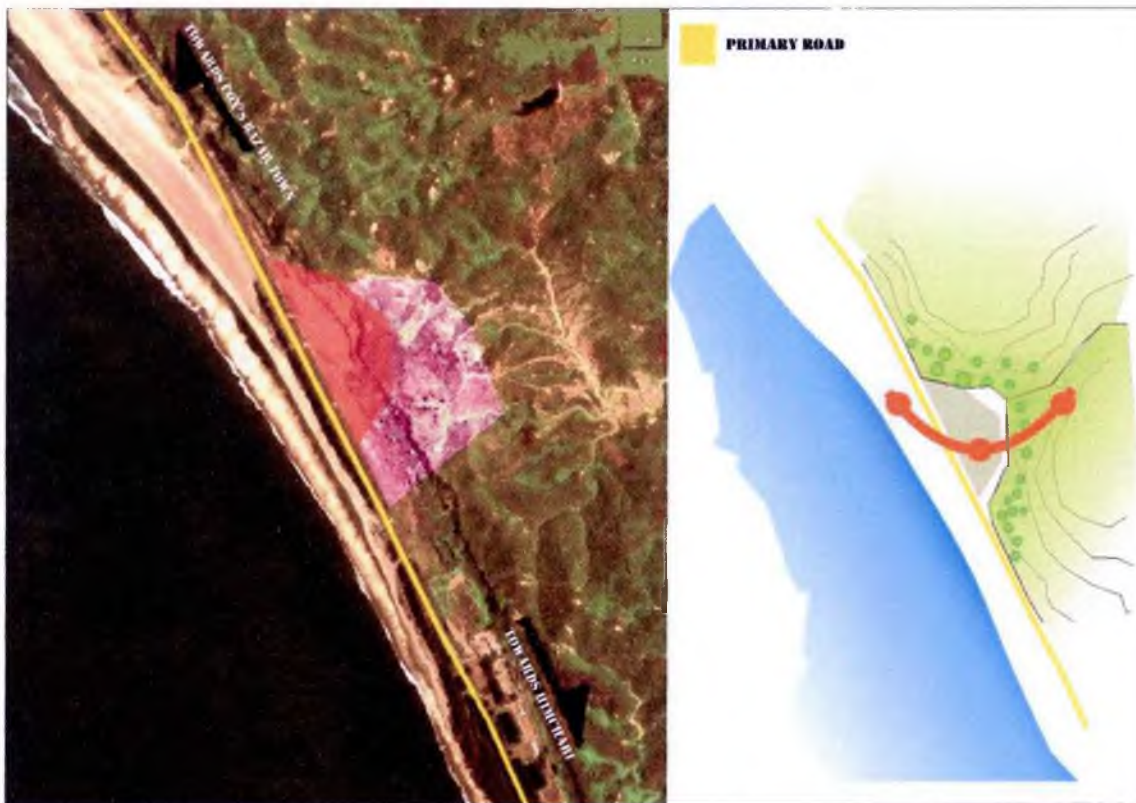
The proposed site is a 20,00,000 sqft land at Darianagar, 7 kilometers from the main town of Cox's Bazar. It falls under the Ramu Upazila. The site is located just beside the new Darianagar park project, with the sea beach on the west and a contoured mountainous landscape on the eastern side. The land is owned by the Forest Ministry of the Peoples' Republic of Bangladesh.



Map 01 : satellite image of the site  
Source : Google Earth 2011

## 2.2 Site surroundings

The site is located just beside the Darianagar park. The site only has one access route, a 50 feet road stretching from north to south going towards Himchari. The sea on the west and the mountain on the east are very prominent and dominating aspects of the site surrounding. The eastern area adjoining the site is lush green with various forms of greenery. Beside the main access road, a stretch of agricultural land joins the road to the sea beach.



Map 02: satellite image and schematic drawing of the site orientation and access route  
Source: Google Earth 2011, Parvez



Fig 01: Darianagar park cottage  
Source: Parvez, 2011



Fig 02: Darianagar park restaurants  
Source: Parvez, 2011





Fig 03: Panoramic views of site surroundings  
Source: Parvez, 2011

### 2.3 Topography

The site mostly is flat, elevated from the sea level by 30 feet. A little portion of the site falls on the contoured slope of a hill, around 150 feet. The slope has an angle of around 45 degrees. This slope is situated on the eastern portion of the site.

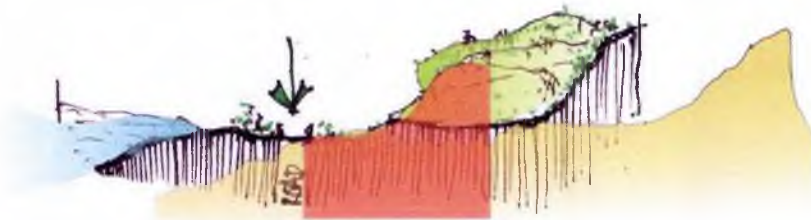


Fig 04: Sketch of the cross section along the east-west direction of the site  
Source: Parvez, 2011



## 2.4 Social background

The site at Darianagar is a new spot for urban development undertaken by the government of Bangladesh as a new zone for attracting tourists. The park leads the tourists to a nearby natural fountain after hiking up towards the peak of the hill, using a natural trail. The project is similar to the one undertaken at Himchari. This area is within close proximity to the \*'Rakhain' community, which gives a diverse trival cultural value to the area. The park project has also instigated other related supporting development such as beach-side restaurants, living cottages, and souvenir shops.



Fig 05: entry to Darianagar park  
Source: Parvez, 2011



Fig 06: Restaurant under construction  
Source: Parvez, 2011



Fig 07: View from the top of the hill  
Source: Parvez, 2011



Fig 08: Living cottage  
Source: Parvez, 2011

## **2.5 SWOT Analysis**

### **2.5.1 Strength**

- Good soil content for creating play area
- Site is adjoining the main road
- Enough land for accommodating all facilities
- Appropriate distance from the main town
- Excellent scenic beauty

### **2.5.2 Weakness**

- Lacks transportation options
- Uneven topography
- Long distance from civic amenities

### **2.5.3 Opportunity**

- Scope for extending centralized tourist attraction in Cox's Bazar
- Nucleus for new development
- Platform for display of tribal festivity
- Proper usage of existing scenic beauty in new masterplan
- Using natural resources (wind, sun, rain) to create energy efficiency

### **2.5.4 Threat**

- Danger to natural settings
- Security
- Expensive construction on contoured site

## CHAPTER 03

### LITERATURE REVIEW

#### 3.1 Cricket

The term cricket is variously thought to be derived from the target aimed at and the implement used to defend it. In the former case it is argued that the word is related to german words which mean something related to the wickets. Others believe the word has an English origin. The game had started off in England, so the inception of the word is more probable to be coming from an English background.

#### 3.2 Cricket field

The entire area of grass, marked off by a boundary line around its outer edge, on which a game of cricket is played, as distinguished from the 'pitch' or central area between the two wickets. ( Steven Lynch, Wisden 2006, p 100).

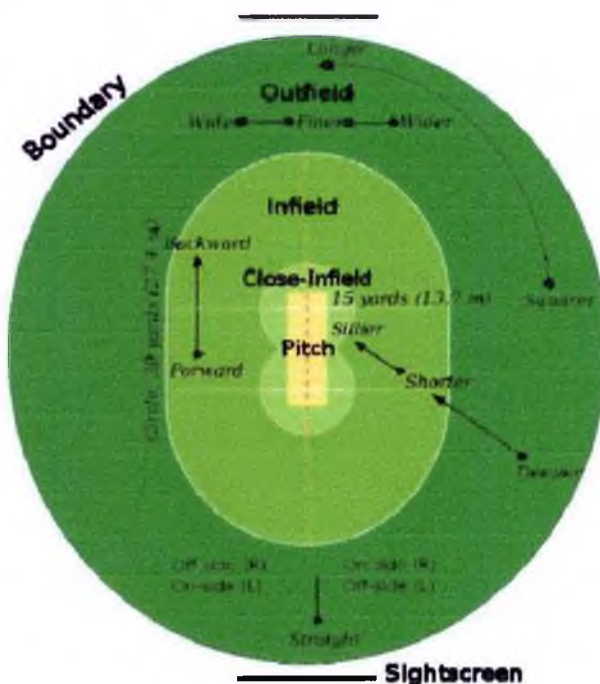


Fig : Top view of cricket field  
Source : [www.altiusdirectory.com](http://www.altiusdirectory.com)



### 3.3 Cricket pitch

The area of ground between two sets of stumps is called a cricket pitch. It has length of 22 yards. The surface of the pitch is made up of clay. It is the main play area of cricket where the batsman stands.

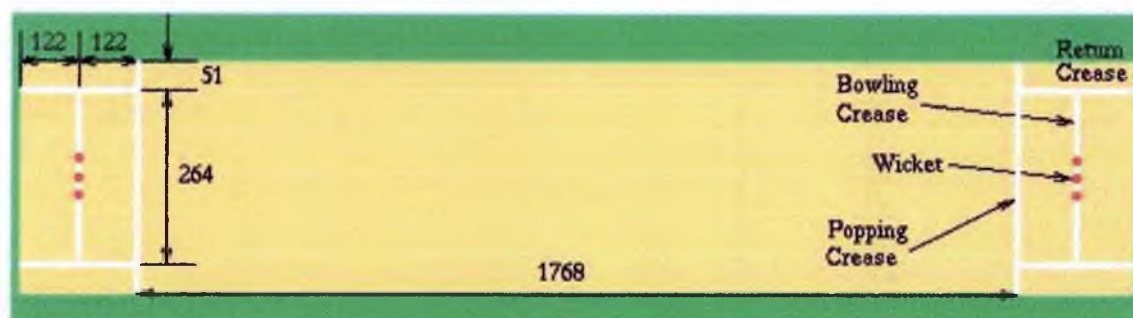


Fig: cricket pitch

Source: [www.altiusdirctory.com](http://www.altiusdirctory.com)

### 3.4 Scoreboard

A device used for displaying a concurrent record of the score of the game which will be visible to both players and spectators. In the early days of cricket, before the introduction of scoreboards, it was traditional for the scorers to stand up when the scores of the two sides drew level, as an indication to players and spectators that the batting side needed only one run to win. Scoreboards: originally known as 'telegraph boards', began to appear at the major grounds in the mid- nineteenth century.



Fig: scoreboard

Source: [www.jstedsdesign.co.uk](http://www.jstedsdesign.co.uk)



### 3.5 Scorecard

A printed card produced and issued for sale at a cricket ground, showing the names of the players on each side listed in their batting order and giving scores, dismissals, and fall of wickets up to the time at which the card was printed. Scorecards of some kind were already in existence before the end of the 18<sup>th</sup> century.

### 3.6 Sightscreen

A movable structure with a large flat surface, typically made of slatted wood but occasionally of other materials such as canvas, which is placed just outside the boundary directly behind either of the wickets in order to assist the batsman by enhancing the visibility of the bowled ball. Sightscreens are traditionally white, but black sightscreens are used for day-night games played with white balls. Some modern sightscreens have surfaces that can be changed between overs, showing advertisements when the bowler is opening from the other end.



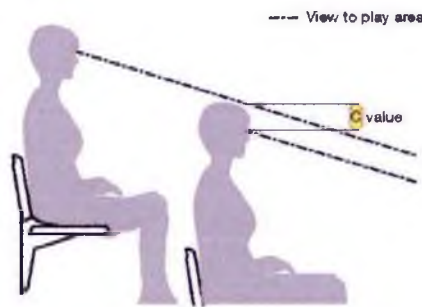
Fig: sight screen  
Source: [www.jstedesign.co.uk](http://www.jstedesign.co.uk)

### 3.7 Umpire

Either of the two ( or four in case of international matches ) whose function is to ensure that a cricket match is conducted in accordance of the laws and spirit of the game and to adjudicate on any point submitted to them by the players. There are usually two on-field umpires, a third umpire ( TV umpire) and a fourth or reserve umpire in case of emergency.

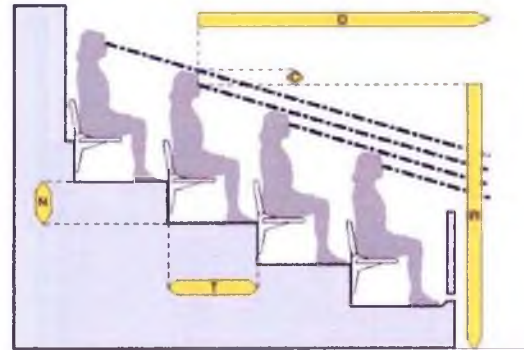
### 3.8 Spectator viewing

Spectator viewing requires specific angles which ensure best possible views of the point of focus, which is the cricket field. There is a certain 'C' value that has to be calculated in order to maximize quality of spectator viewing.



0 The term 'sightline' refers to a spectator's ability to see a critical point on the playing field over the head of the spectator below, and is measured by the 'C' value.

Fig: Spectator view  
Source: Stadia, 2007



1 Viewing angle.  $D$  = distance to focus.  
 $C$  = 'C' value,  $T$  = tread width,  $N$  = riser height and  
 $R$  = riser height from focus.

Fig: View distance  
Source: Stadia, 2007

### 3.9 Spectator seating

Having arrived at geometry which relates the spectator areas to the playing field so that the spectators can see the action clearly and without having to crane their necks, the next design task is the seats themselves. Seating design is a matter of reconciling four major factors: comfort, safety, robustness and economy.

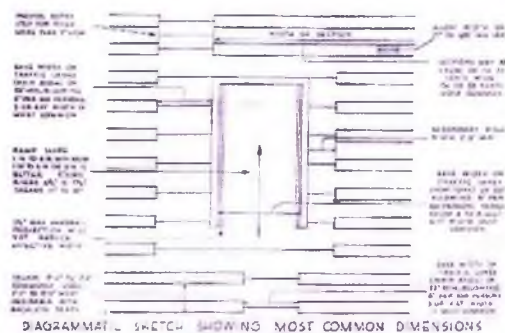


Fig: Spectator seating plan  
Source: Stadia, 2007

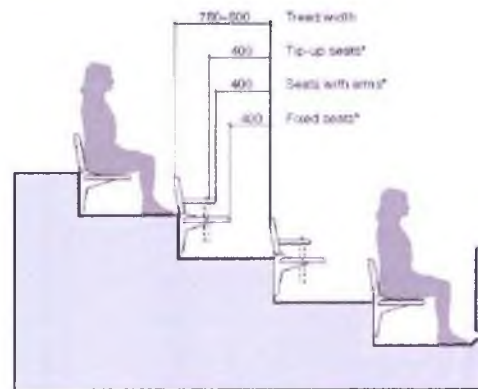
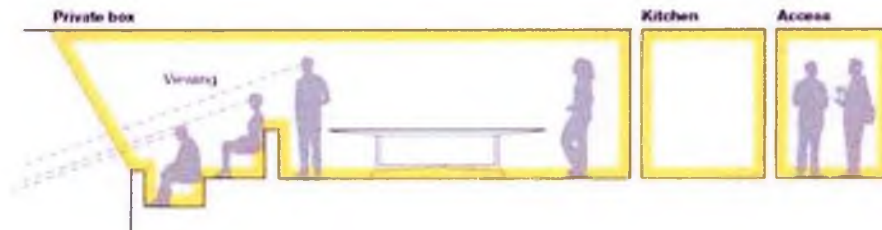


Fig: seating distances  
Source: Stadia, 2007

### 3.10 VIP facilities

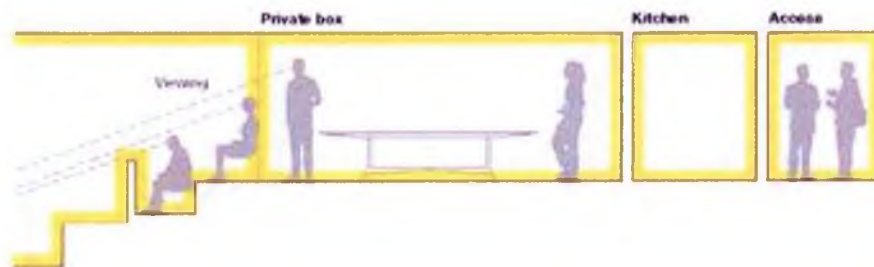
#### Type A

**Advantage:** Complete privacy and comfort  
**Disadvantage:** Separation from the atmosphere of the ground

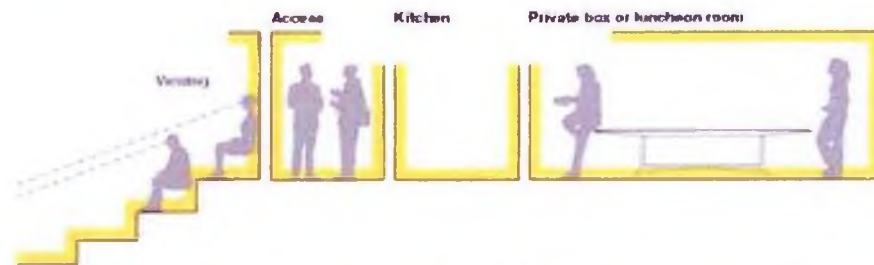


#### Type B

**Advantage:** Privacy maintained but users view event as spectators  
**Disadvantage:** Separation between viewing and dining



**Disadvantage:** Users remote from event when using facility



**Figure 13.1** Three possible arrangements for private viewing: Type A behind glass, Type B in the well of the stadium, with the private box immediately behind, and Type C in the well of the stadium with an access corridor immediately behind. Each option has its advantages and disadvantages as noted. Climatic and security aspects may also have to be taken into account when choosing which type is to be used. For type A, the Melbourne Cricket Ground (MCG) has installed a compromise solution allowing upward-opening windows, enabling the interior to be opened to the stadium bowl.

**Fig: VIP seating**  
**Source: Stadia, 2007**



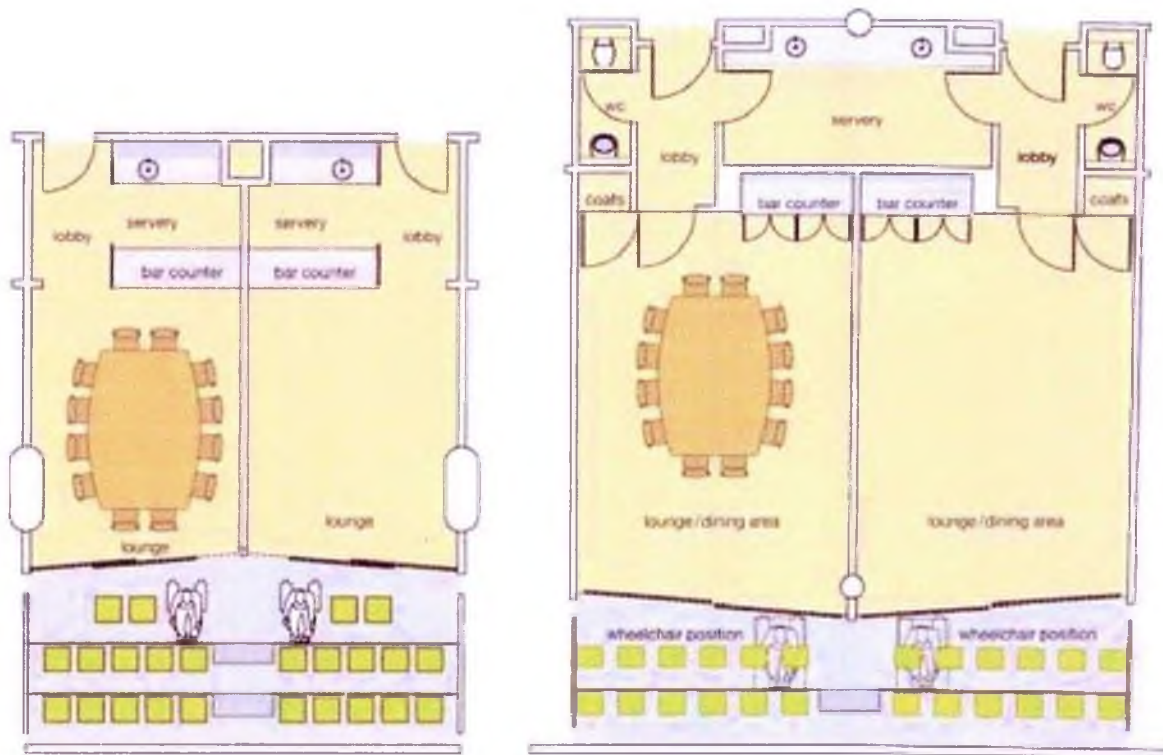


Figure 13.2 Typical private viewing box layouts

Fig: Seating plan  
Source: Stadia, 2007

### 3.11 Toilet provision

Toilets and other ablutionary facilities may be needed for several individual types of stadium users in addition to those for the mass spectators. These facilities should be thought of in conjunction with spectator toilets so as to minimize the number of sanitary appliances and drainage stacks in the stadium while still making adequate provision for all types of users.



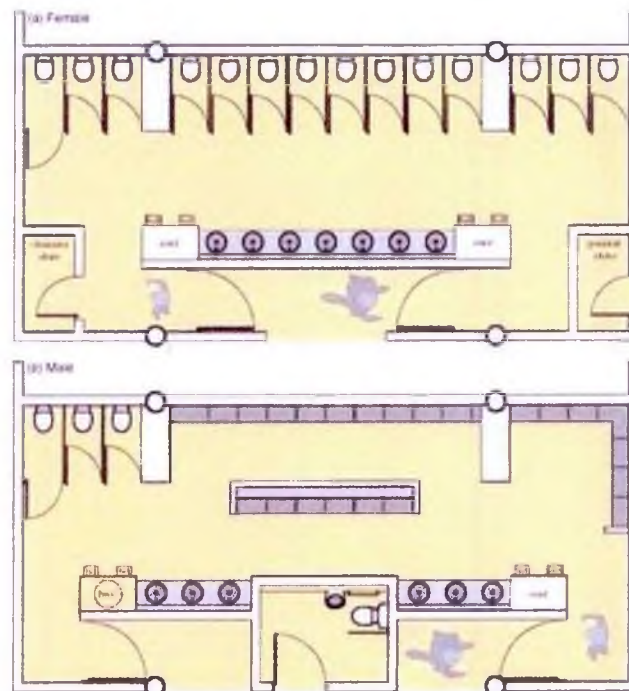


Fig: Spectator toilets  
Source: Stadia, 2007

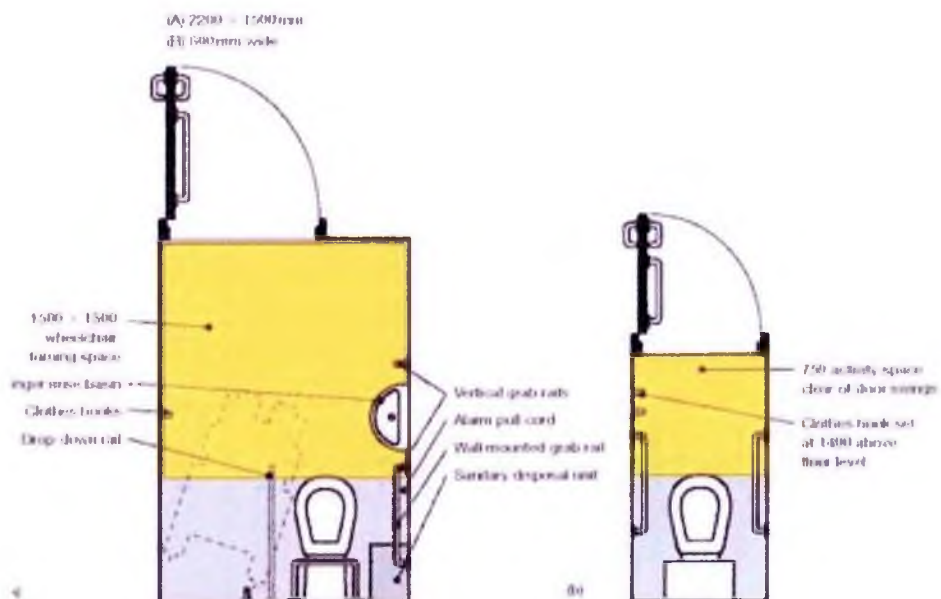


Fig: Special toilets  
Source: Stadia, 2007

### 3.12 Media facilities

Facilities for media are an integral part of stadium design, not least because of the large sums of money that are now-a-days entered from the media rights for sporting events. These facilities involve the three main categories of public information and entertainment services- the press (including newspapers and magazines), radio and television. Clubs may also have their own media requirements club TV and websites.



Fig: Media seating  
Source: Stadia, 2007

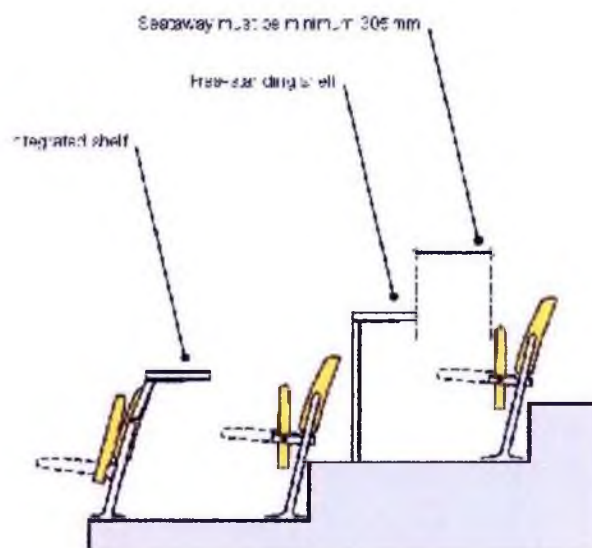


Fig: Media seating distances  
Source: Stadia, 2007

### 3.13 Pitch orientation

The cricket pitch orientation is extremely important because the game cannot be played across the direction of the wind. In order to play along the wind direction, the pitch is oriented in the north-south direction, with a maximum deviation up to 15 degrees.

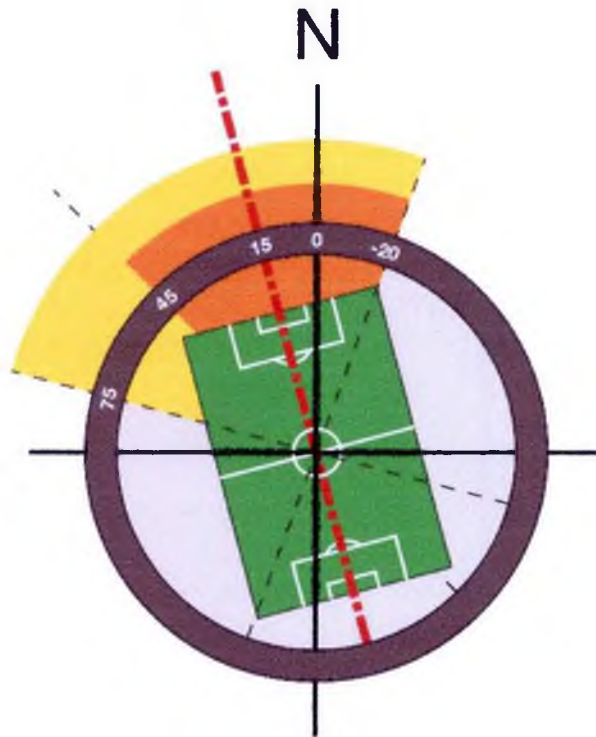


Fig: Pitch orientation  
Source: Stadia, 2007

### 3.14 Shading depth and angle

The shading depth and angle of the gallery spaces are important for comfort and quality of viewing so the spectators. The roof of the stadium provides such shading facilities to counter the direct sunlight and rainfall. For multi-tier gallery systems, the upper gallery provides shade to the lower one. The roof structure then provides shading for the upper gallery. Usually, half of the gallery must be shaded by the upper tier or the roof structure.

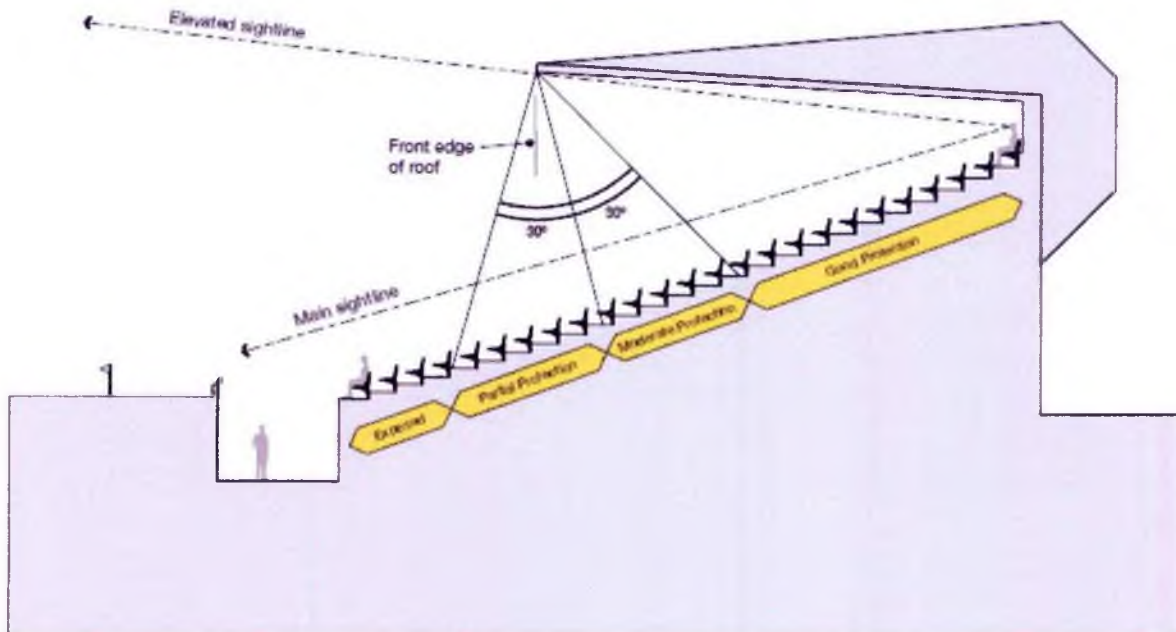


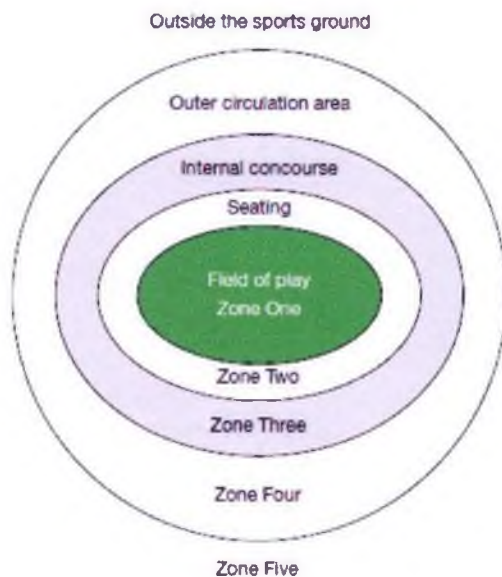
Fig: Gallery shading distance and angles  
Source: Stadia, 2007

### 3.15 Roofing materials

	Profiled metal sheeting		Concrete	PVC		Acrylic	GRP	Polycarbonate		Fabric	
	Steel	Aluminium		Single glaze	Double glaze			Single glaze	Double glaze	PVC-coated	PTFE-coated
Relative cost factor (supply and fix) as at 1992 in the UK	1.2		2.5 to 8.0	2.4 to 4.0	3.0 to 5.0	2.4 to 4.0	1.5 to 3.5	4.5 to 7.0	6.0 to 8.0	3.0 to 5.0	5.0 to 8.0
Durability	Good	Good	Good	Medium	Medium	Medium	Medium	Good	Good	Medium	Good
Flame retardancy	Incombustible		Incombustible	Self-extinguishing		Class 1 (when edges are protected)	Class 1	Self-extinguishing		Approx Class 1 equiv.	Class 0
Transparency	Opaque		Opaque	Transparent: 70% to 85% light transmission, which lessens markedly with time.		Translucent or transparent: 50% to 70% possible light transmission, which lessens moderately with time.	Opaque	Transparent: 80% to 90% visible light transmission, which lessens slightly with time.		Translucent	



### 3.16 Security zones



**Zone one:** The playing field.

**Zone two:** The spectator seating and standing areas.

**Zone three:** The internal concourses, restaurants, bars, and other social areas.

**Zone four:** The circulation area between the stadium structure and the perimeter fence.

**Zone five:** The open space outside the perimeter fence

Fig: Zones of control  
Source: Stadia, 2007

### 3.17 Pitch composition

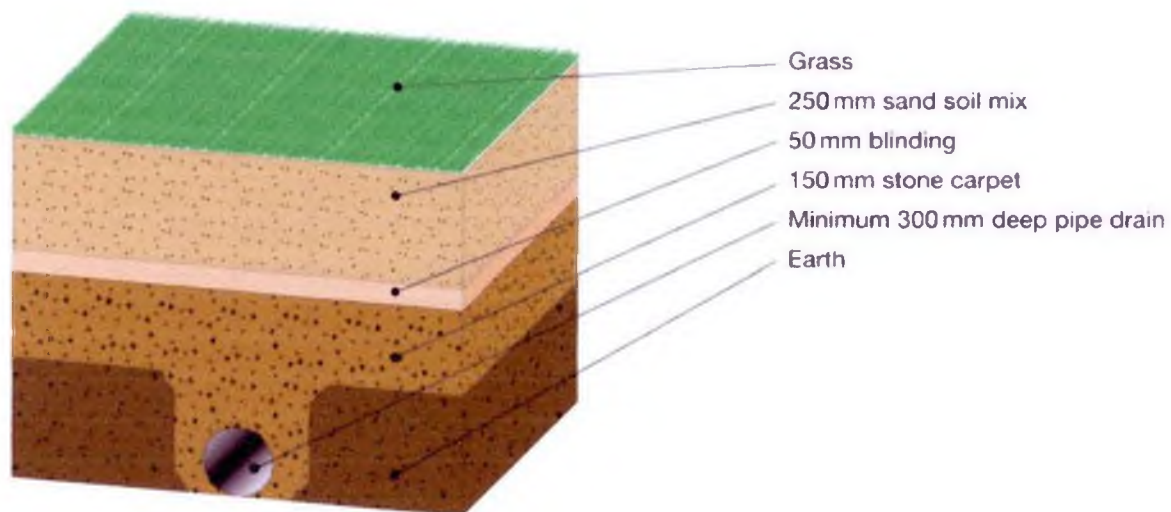


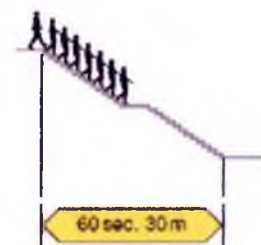
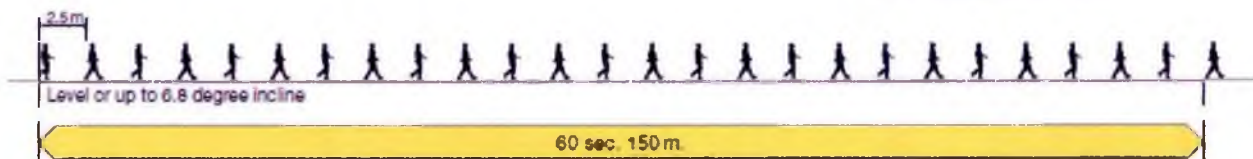
Fig: Layers of the playing field  
Source: Stadia, 2007

### 3.18 Entry and emergency exit timing

The entry and exit timing has to be strictly controlled so that the spectators and all other people can be evacuated from the stadium within a limited given time. The standard timing for emergency exit to safety zones, i.e the ground level opening is a maximum of 8 minutes. This measurement is made from the basic walking velocities of the people through various modes of circulations such as horizontal and vertical circulation. This velocity, together with the unit width of the exit routes are calculated to form the efficient circulation system where the evacuation time of maximum 8 minutes is designed.

Average unobstructed walking velocity is 150 m per minute.  
A person exits every second or every 2.5 metres. (9 km/h)

One line exit width allows 60 people to pass through it in 1 minute



Average unobstructed walking on staircase 30 m per minute (1.8 km/h).  
Spacing between people is 0.75 m.

Timed exit analysis

Safe exit time is regulation period minus exit time to place of safety

Fig: walking speed diagram  
Source: Stadia, 2007

## CHAPTER 04

### CASE STUDIES

#### 4.1 Local project

##### 4.1.1 SHER E BANGLA NATIONAL STADIUM, MIRPUR, DHAKA, BANGLADEH

###### 4.1.1.1 Concept

The Sher E Bangla National Stadium, named after A K Fazlul Haque, one of the country's most renowned leaders and freedom fighters of the 1940's, is situated about 10 kilometers outside the centre of Dhaka. The move from the Bangabandhu National Stadium in Dhaka to Mirpur was met with much resistance, but the BCB had decided that they needed a stadium dedicated exclusively to cricket, and carried on despite criticism.



Fig. 3D aerial view  
Source: [www.banglacricket.com](http://www.banglacricket.com)

The site of this venue is a total of 58 'Bighas', which translates into about 8,35,200 square feet of area. The stadium was originally built for soccer and athletics, so it is rectangular in shape. The designers had to commit a substantial amount of demolition and reconstruction to make a typically round cricket ground to fit in this rectangular space. They have done it successfully and with grace.



#### 4.1.1.2 Plan

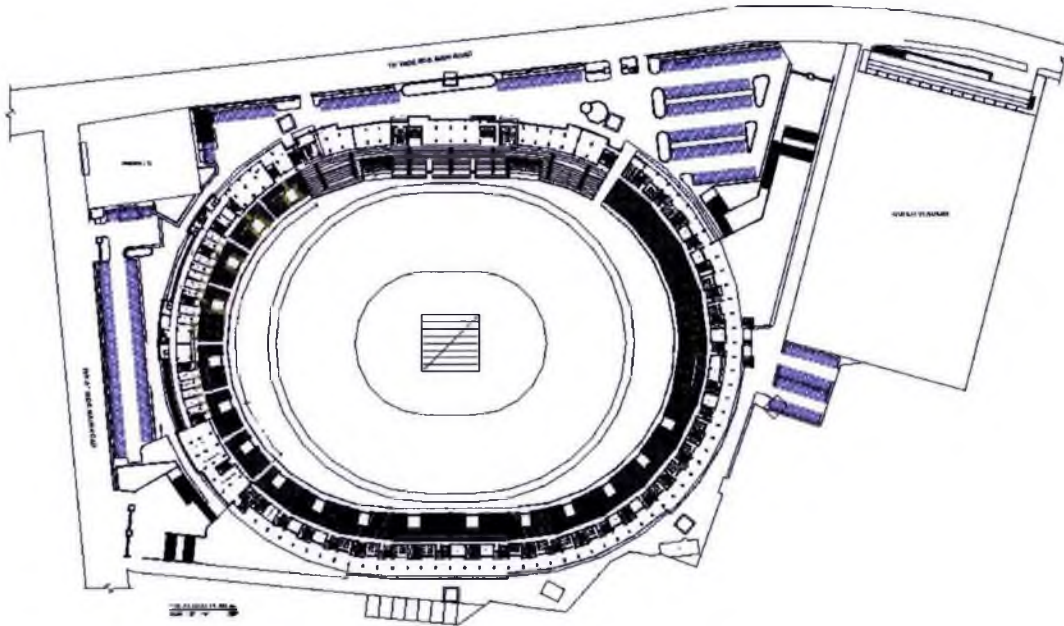


Fig: Masterplan  
Source: Bashat Architects Engineers

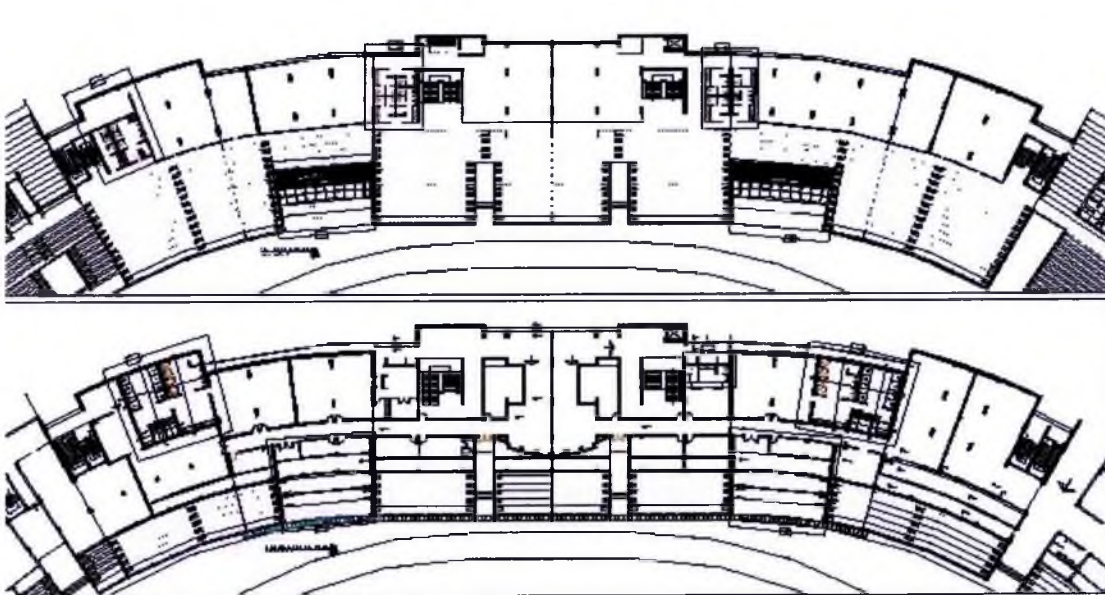


Fig: Detail pavilion plan  
Source: Bashat Architects Engineers

#### 4.1.1.3 Structure



Fig: Sectional perspective of the media zone  
Source: [www.banglacricket.com](http://www.banglacricket.com)

The galleries are held by typical sections of concrete piers. The newly added roofing for the VIP galleries is made up of polycarbonate sheeting suspended by steel tension cables. The player's viewing area, the media centre and the presidency boxes have a glass bubble –like look. The glass bubble has a seamless, topless glass top and front.



Fig: Roof 3D perspective  
Source: [www.banglacricket.com](http://www.banglacricket.com)



Fig: View from media centre  
Source: Hasun, 2009





Fig: Player's entry  
Source: Hasun, 2009

#### **4.1.1.4 Special features**

The most striking feature of the ground is the drainage facility, which is probably the best in the sub-continent. To bring the play area into shape for cricket, a lot of demolition had to be done, and the athletics tracks had to be dug up. About three feet of soil was excavated to remove all the red clay. PVC pipes were fit in before filling it up with rock chips, then sand and lastly grass. The slope is nice and even, a difference of 29 inches from the wicket to the boundary. The tubular flood light poles are a new edition to the cricket stadium.



## 4.2 International projects

### 4.2.1 NEW BEIJING NATIONAL STADIUM

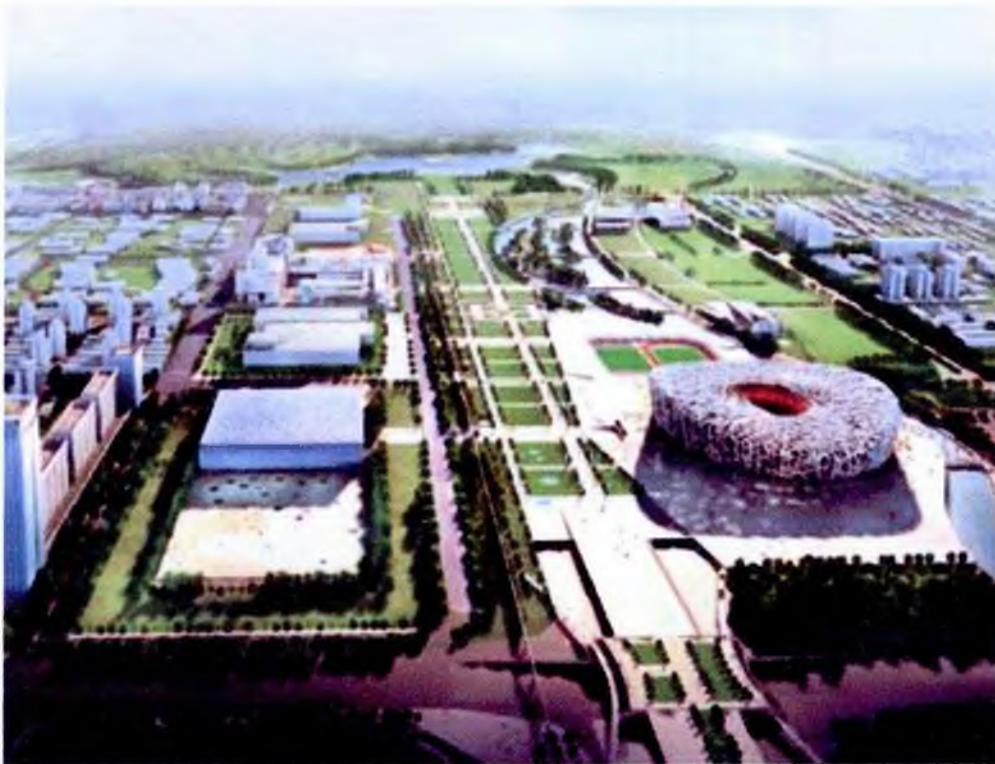


Fig: 3D Areal view of stadium surroundings  
Source: National Stadium, 2008

#### 4.2.1.1 *Basic information*

- Year of completion: 2008
- Location: Beijing, Republic of China
- Architects: Jacques Herzog and Pierre de Meuron

#### 4.2.1.2 *Concept of the project*

The new National Stadium is located on a gentle rise in the center of Olympic green like a large colossal vessel. The stadium's appearance is a pure image with its façade and structure mutually supporting each other and converging into a grid-like formation- almost like a bird's nest with its interwoven branches. This produces dramatic effect on the stadium. The spatial effect of the stadium is simple and of an almost archaic immediacy.

#### 4.2.1.3 Plan

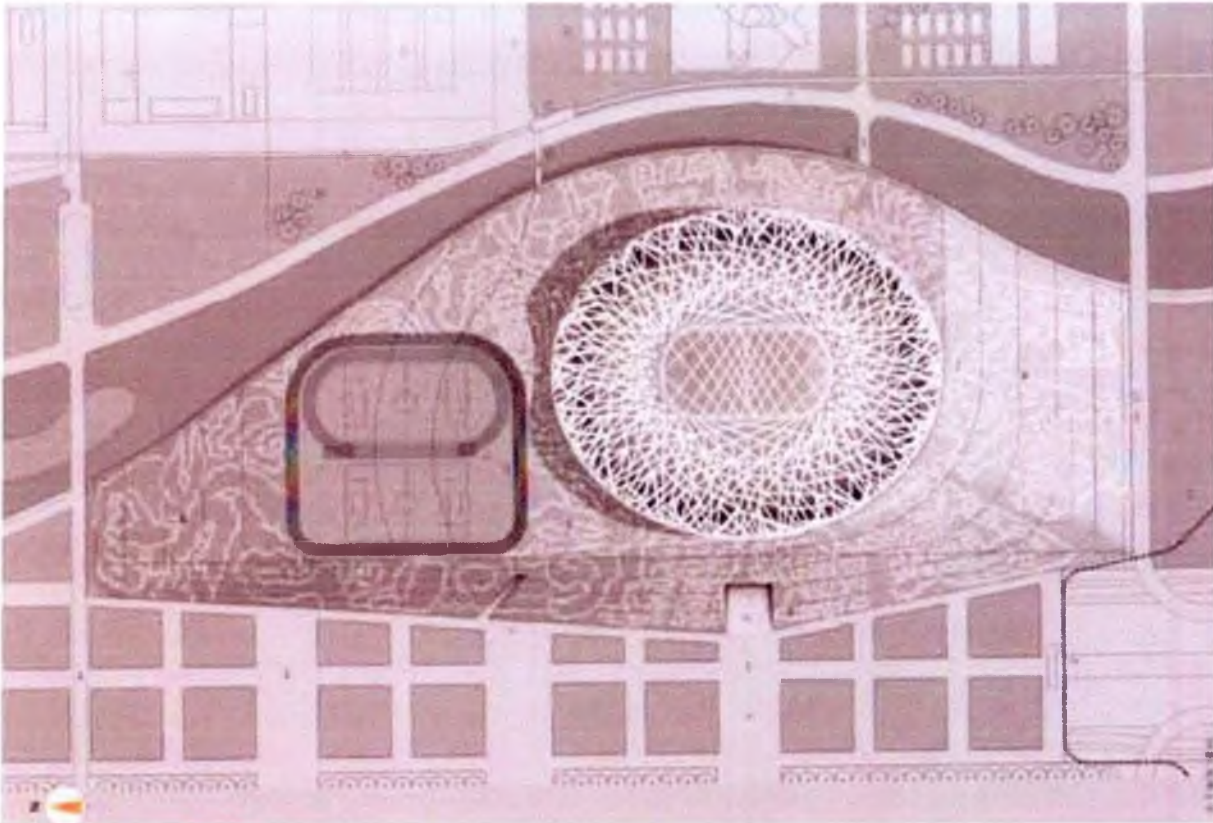


Fig: Master plan  
Source: National Stadium, 2008



Fig: Plan at various levels  
Source: National Stadium, 2008



#### 4.2.1.4 Structure

Just as the birds stuff the spaces between the woven twigs of their nest with soft filler, the space in the structure of the stadium is filled with inflated ETFE cushions. The cushions mounted on the outer side of the structure makes the roof completely weatherproof. Whist the rain is collected, the sunlight filters through the translucent roof providing the lawn with the necessary UV-radiation.

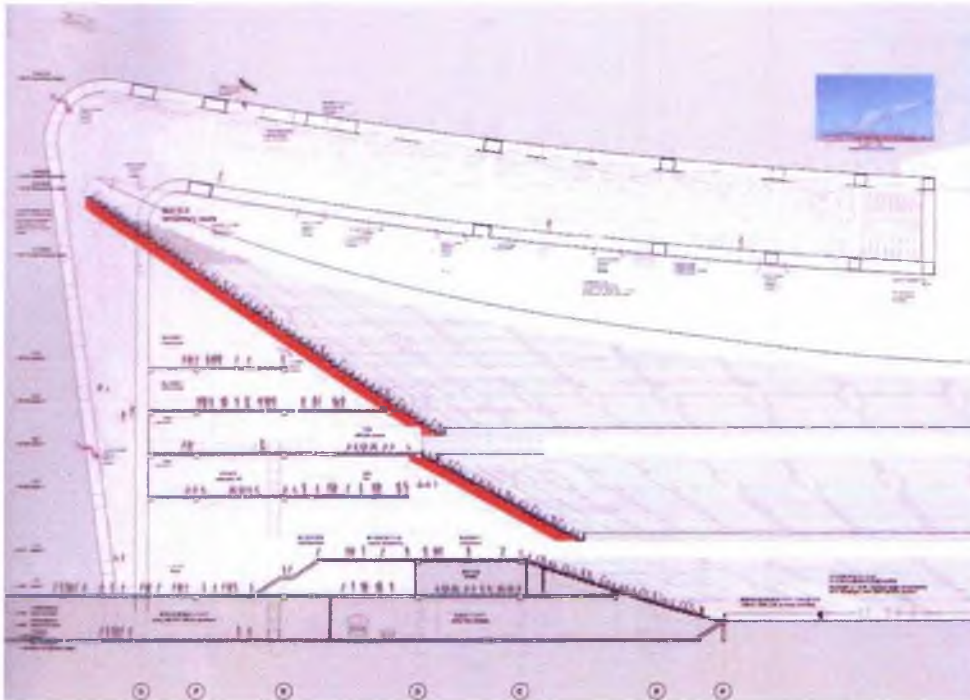


Fig: Section showing structural system  
Source: National Stadium, 2008



Fig: Image during construction  
Source: [www.chinatown.org](http://www.chinatown.org)



Fig: 3D view at night  
Source: National Stadium, 2008



#### **4.2.1.5    *Functional layout***

During the Olympic Games, the stadium accommodated 100,000 people. The functional layout is as follows:

- Parking area
- Field of play
- Venue operation area
- Spectator area
- Event management area
- Athletics and team staff area
- VIP and office area
- Official sponsor area
- Media area
- Safety and security area

## 4.2.2 SAN NICOLA STADIUM



Fig: Perspective view of the stadium  
Source: Renzo Piano building workshop, 2006

### 4.2.2.1 Basic information

- Location: Italy
- Architect: Renzo Piano

### 4.2.2.2 Concept of the project

The stadium opens up hospitably to the Apulian landscape. It looks like a huge monumental landed spacecraft. The spacecraft has been imploded, and the remnants form the basis of the stadium's overall aura and grandeur.



Fig: Site section  
Source: Renzo Piano Building workshop, 2006

#### 4.4.4.3 Plan

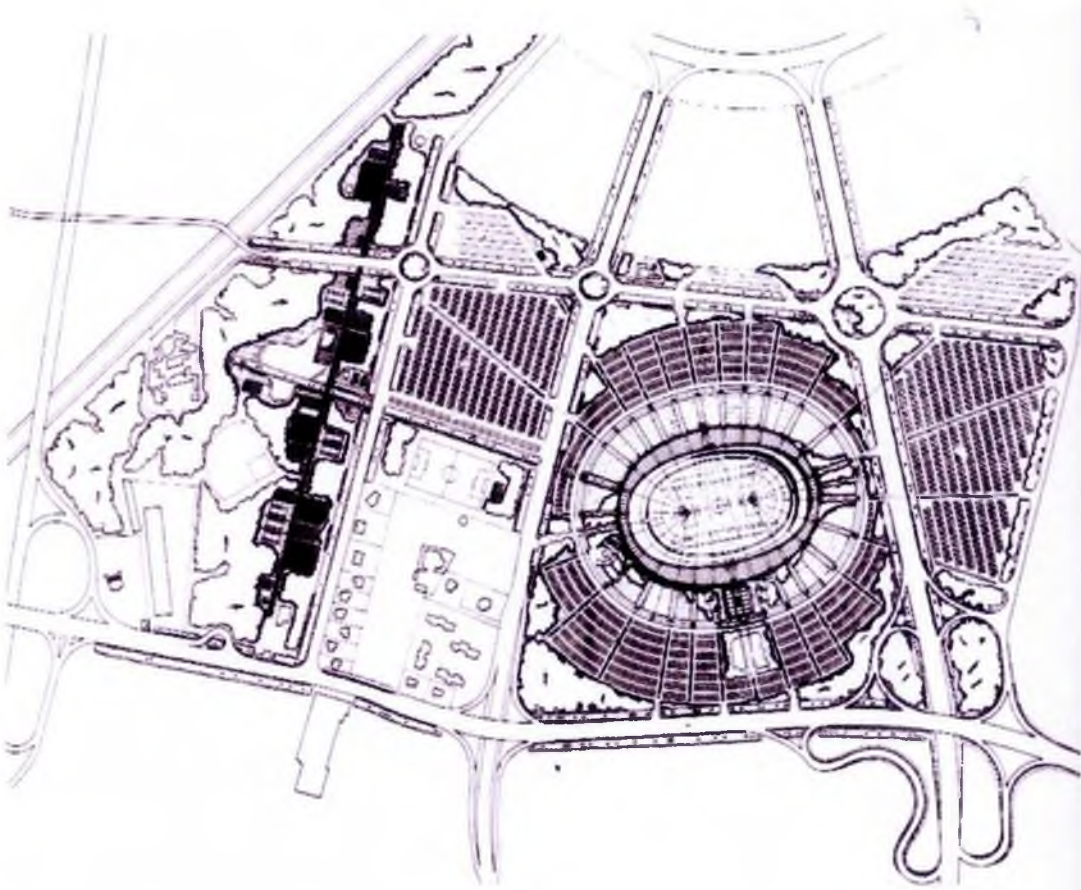


Fig. Master plan  
Source: Renzo Piano building workshop, 2006



#### 4.2.2.4 Structure

The stadium is mostly made of a single material, concrete. The steel and fabric canopy is only a partial lid to the dominant structure below. The characteristic repetitive structure pieces of the stadium are the 312 banana-shaped and inverted T-section, precast concrete beams that support the upper tiers, and the 28 huge petals-like stands they form. Together, the stands separated by slots and the double-curved lower flanges of the beams clearly reveal the modularity of the stadium.

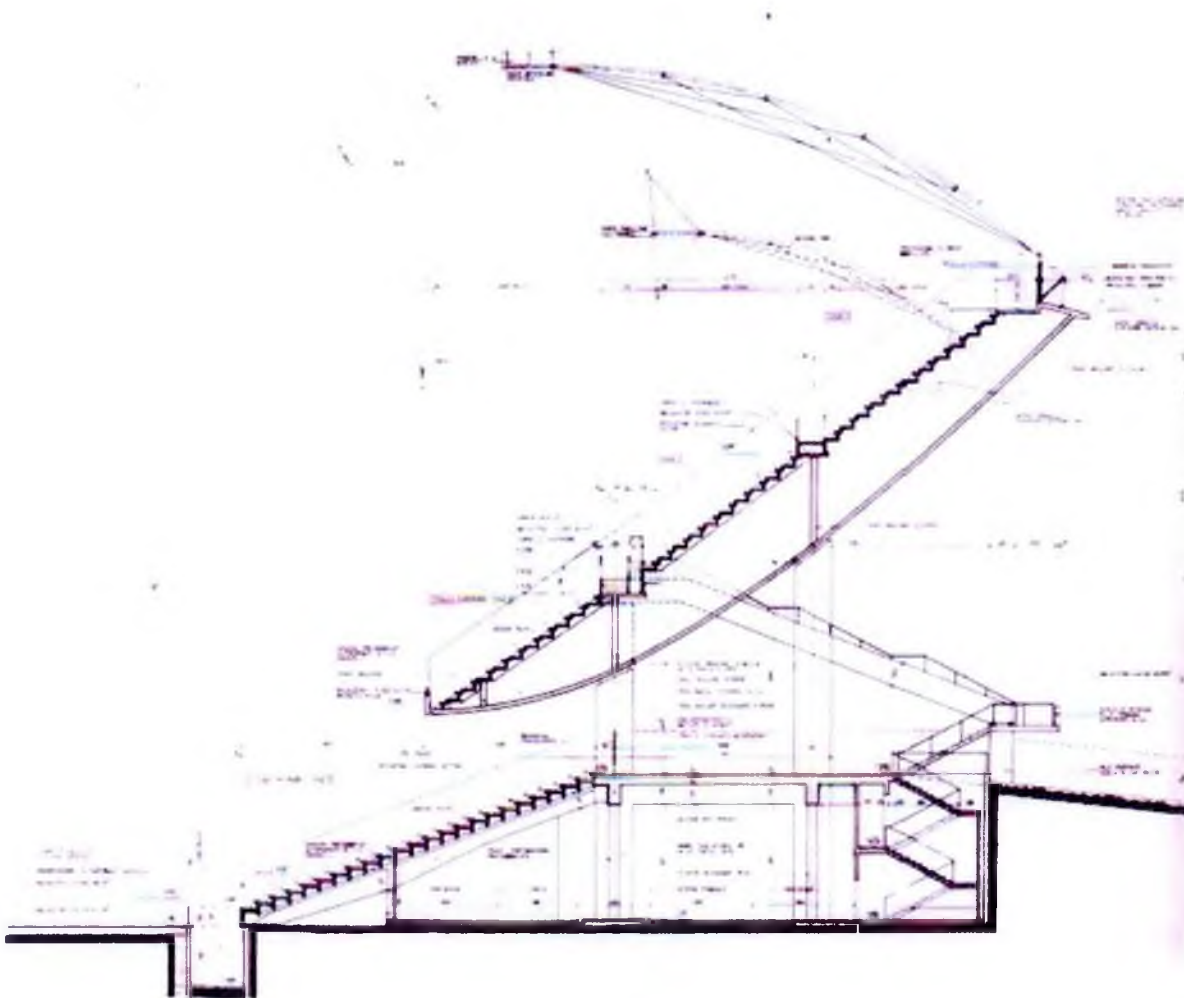


Fig: Section of structure

Source: Renzo Piano building workshop, 2006



Fig: Gallery stands and seating  
Source: Renzo Piano building workshop, 2006



Fig: Entry stairs to upper tier gallery  
Source: Renzo Piano building workshop, 2006

#### **4.2.2.5 Functional layout**

It has a capacity of 60,000 spectators, having the state of the art media and player facilities. The various concourses have been maintained to ensure security and ease of access.

### 4.2.3 BRAGA MUNICIPAL STADIUM



Fig: Night view  
Source: [www.arcdaily.net](http://www.arcdaily.net)

#### 4.2.3.1 Basic information

- Year of completion: 2003
- Location: Braga, Portugal
- Architect: Eduardo Souto de Moura

#### 4.2.3.2 Concept of the project

A very raw and rudimentary idea of excavating a quarry was applied for this project. The mountainous region and the sharp edgey formation of the gallery gives an extraordinarily masculine look to the stadium. The sharpness of the edges of every element of the stadium only translates the adjacent environment- rough and edgy and undulated.



#### 4.2.3.3 Plan

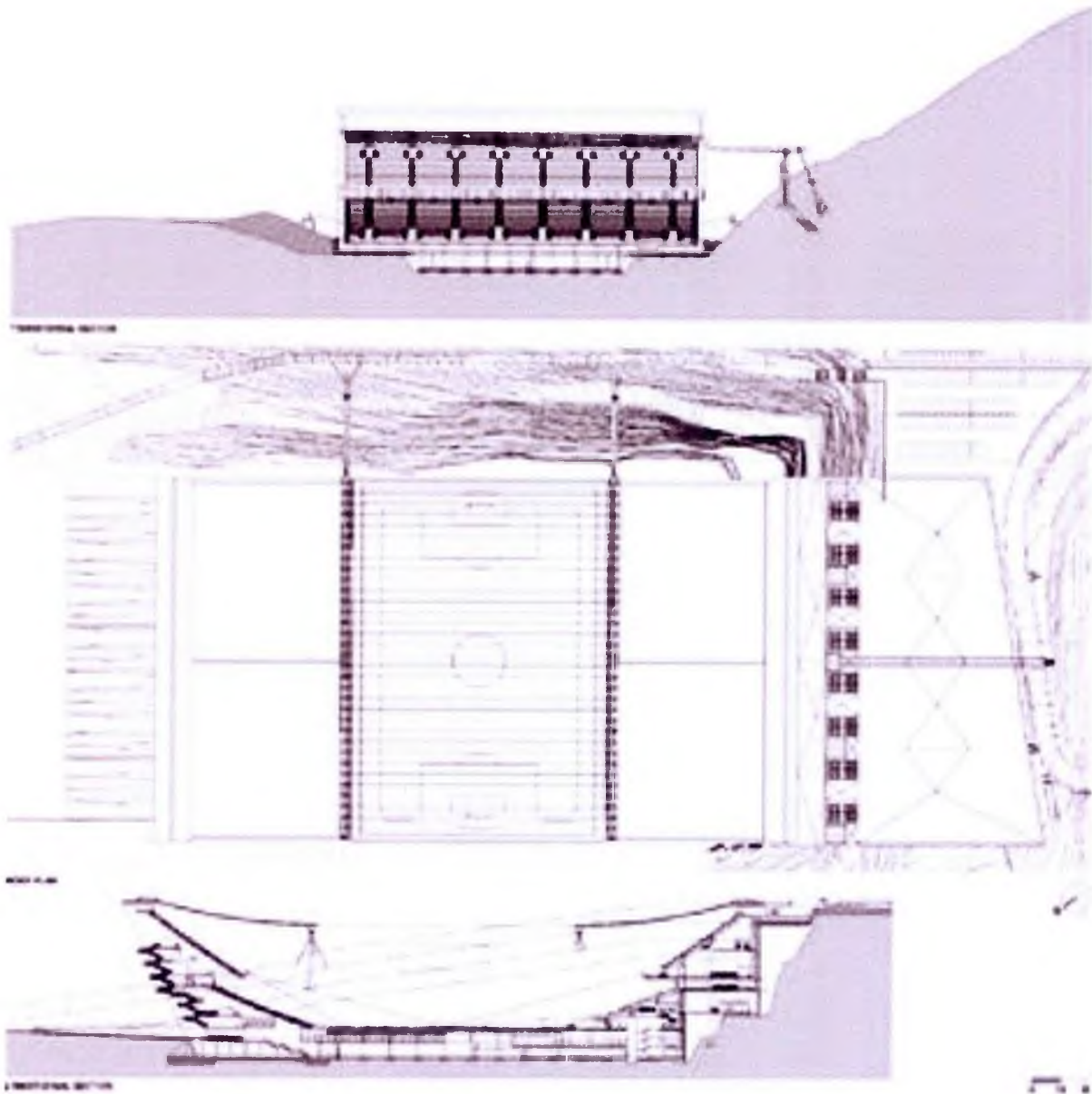


Fig: Masterplan and section  
Source: [www.arcdaily.net](http://www.arcdaily.net)

#### 4.2.3.4 Structure

Each stand is covered with a canopy-style roof, and both are connected to each other across the pitch by dozens of steel strings, a design inspired by ancient South American Inca bridges. Once inside the stadium, moving from one stand to the other is done through a 5,000 sq.m plaza under the pitch.



Fig: view of exposed staircase  
Source: [www.arcdaily.net](http://www.arcdaily.net)



Fig: View of merging of structure and mountain  
Source: [www.arcdaily.net](http://www.arcdaily.net)



Fig: View from gallery  
Source: [www.arcdaily.net](http://www.arcdaily.net)



Fig: Aerial view of site  
Source: [www.arcdaily.net](http://www.arcdaily.net)

#### **4.2.3.5 Functional layout**

The stadium has gallery tiers only on two sides, having a spectator capacity of 30,000. The latest functional layout for the flow of media and player facilities has been aptly addressed. The circulation spine has been shaped like a tunnel with interlocking staircases.

#### **4.3 Analysis and findings**

- The stadiums are mega-structures which efficiently hold a huge crowd with efficient accessibility.
- The iconic values of stadiums are extremely important, as they reflect the place, sport, and culture of an area.
- The pitch orientation is vital for proper functioning of the play area.
- The media centers have to face south and the VIP areas has to face north.
- Shading and structural innovation is vastly integrated with the proper functionality of the player and media facilities.
- Drainage is a very important factor to consider while designing the stadiums.
- Making the stadiums more energy efficient is always positive.
- Revenue generation while the stadium's play area is not functioning is important.
- The master plan of a stadium complex has integrated landscaping and open spaces to welcome and dissipate crowd.
- Stadiums could be designed as repetitive modules, or as a monolithic shell.



## CHAPTER 05

### 5.1 Program Development

#### 5.1.1 Pitch /Central area

Ground area for Cricket taking a circle of 46 meter radius Minimum.

151 feet as standard;

210 feet maximum standard.

Area of field;  $A = \pi r^2$

151 feet as standard =  $\pi \times 151^2 = 71631$  sft

210 feet maximum standard =  $\pi \times 210^2 = 138544$  sft

#### 5.1.2 Spectator View

Calculation of maximum viewing distance is based on the fact that the human eye finds it difficult to perceive anything clearly that subtends an angle of less than about 0.4 degrees – particularly if the object is moving rapidly. In the case of a cricket, this is approximately 100 mm in diameter.

A worked example showing the calculation of  $N$ , the riser height is given below:

$$N = \frac{(R + C) \times (D - T)}{D} - R$$

Where:

$N$  \_ riser height;

$R$  \_ height between eyes on 'point of focus' on the playing field;

$D$  \_ distance from eye to 'point of focus' on the playing field;

$C$  \_ 'C' value <sup>1</sup>

$T$  \_ Depth of seating row.

If we analyze a spectator position where

$R$  \_ 6.5m,  $D$  \_ 18m,  $T$  \_ 0.8m and we want a 'C' value of 120mm, then the height of the riser must be:

$$N = \frac{(6.5 - 0.12) \times (18 - 0.8)}{18} - 6.5$$

$$N = \frac{6.512 \times 18.8}{18} - 6.5$$

$$N = 6.8014 - 6.5$$

$$N = 0.3014 \text{ m} \approx 12 \text{ inch}$$

Tread \_ General dimension \_ 21" - 36"

Riser \_ Dimension \_ 12 "

Longitudinal aisles are given 22-32 seats in between, **26-28** seats is most common standards

Cross over aisles are given 18-20 rows of seat in between.

One person required \_ 4 sft

So, each aisle required \_ 32  $\times$  4 = 128 sft

So, each tier people amount \_ 32  $\times$  20 = 640 persons

---

<sup>1</sup> C= 150 mm Spectator with hats : C=120 mm good viewing standard : C=90 mm head tied backwards  
:C=60 mm between heads in front

Total tier area required \_  $(640 \times 4) + 30\% \text{ circulation} \geq 3330 \text{ sft}$

Total Spectator amount \_ **40000**

Normal Spectator amount \_ 32000

Normal tier amount \_  $(32000 \div 640) = 50 \text{ tiers}$

Total tier area \_  $(50 \times 3330) = 166500 \text{ sft}$

### 5.1.3 Toilet provisions

One sector total people 1280 no's

	Urinals	WCs	Wash basins
Male	Minimum of 2 for up to 100, plus 1 for every other 80 males or part thereof	Minimum of 1 for up to 250, plus 1 for every other 500 males or part thereof	1 per WC and 1 per 5 urinals or part thereof
Female	No recommendations	Minimum of 2 for up to 50, 3 for 51 to 100, plus 1 for every other 40 females or part thereof	Minimum of 1, plus 1 per 2 WCs
<i>Note:</i> There are no official UK recommendations specifically for sports stadia, and the above figures for places of entertainment are the closest approximation. If applied to sports stadia the balance of provision is unlikely to be right, and Table 11.2 should be followed. But if the stadium is to be used also for non-sporting events, then WC and wash basin provision should satisfy the above formula rather than the lower figures in Table 16.2.			

Fig: 56: Toilet Provision in stadium

Source: stadia, 2007

Male \_

Female \_

W.C. = 3; Basins = 5 Urinal = 10

W.C. = 6; Basins = 10 Urinal = nil

Area \_  $20' \times 12' = 240 \text{ sft}$

Area \_  $12' \times 15' = 180 \text{ sft}$



### 5.1.4 VIP FACILITIES

The Lists ten basic categories of seating/standing accommodation in descending order of luxury and price. These are not the only possibilities: other variations such as upper and lower tier, or front and rear positioning.

1 Private boxes	Self-contained private dining and bar facilities	10 to 20 person boxes 1-2% spectators 3 year contract Tread 850 mm padded and arms
2 Executive suites	Group private dining and shared bar	4-20 person suites 1-2% spectators 1-3 year contract Tread 850 mm padded and arms
3 Club seating and dining	Group seating and group dining with shared bar and lounge	Tables of 2-6 in restaurant 1-2% spectators 1-3 year contract Tread 800 mm padded and arms
4 Club seating	Group seating with shared bar and lounge facilities	Lounge self-contained 2-4% spectators 1-3 year contract Tread 800 mm padded and arms
5 Members seating and dining	Group seating with shared dining and bar facilities	Dining and bar self-contained 1-2% spectators season ticket plus dining Tread 760 mm with arm rests
6 Members seating	Group seating with shared bar facilities	Bar part of 5 above 2-5% spectators season ticket plus Tread 760 mm with arm rests
7 Public seating (several standards)	Seating with public bars and concession areas	Wide range of concessions 50% spectators match or season ticket Tread 760 mm with backs
8 General seating	Bench seating with public bars and concession areas	Range of concessions 5-15% spectators match or season ticket Tread 700 mm no backs
9 'Tennis' boxes	Groups of seats (say 8-12) in self-contained areas	Used in the Telstra Stadium Equipped with cool box and refreshments delivered
10 Standing terrace (some stadia)	Standing areas with public facilities (more stewarding might be needed)	Range of facilities 5-15% spectators match or season ticket Tread 360 mm

Fig: 57: VIP Provision in stadium

Source: stadia, 2007

### 5.1.5 Privet box

Privet box \_2%

Total amount of people in privet box =  $\frac{2 \times 40000}{100} = 800$  no's

Total box =  $\frac{800}{20} = 40$  (per box \_20 person)

Per box size \_  $(20 \times 8)$  sft + 64 sft circulation + 76 sft kitchen = 300 sft

Total Privet box area \_  $300 \times 40 = 12000$  sft

### 5.1.6 Executive suites

Executive suites \_ 1%

Total amount of people in Executive suites \_  $\frac{1 \times 40000}{100} = 400$  no's

Total box =  $\frac{500}{16} = 25$  (per box \_ 16 person)

Per box size \_  $(16 \times 20)$  sft + 128 sft circulation + 52 sft other = 500 sft

Total Executive suites area \_  $500 \times 25 = 12500$  sft

### 5.1.7 President suites

President suites \_ 1%

Total amount of people in President Suites \_  $\frac{1 \times 40000}{100} = 400$  no's

Total box =  $\frac{500}{16} = 25$  (per box \_ 16 person)

Per box size \_  $(16 \times 20)$  sft + 128 sft circulation + 52 sft other = 500 sft

Total President Suites area \_  $500 \times 25 = 12500$  sft

### 5.1.8 Club seating and Dining

Club seating people =  $\frac{2 \times 40000}{100} = 800$  no's

Table user people =  $\frac{600 \times 8}{160} = 270$  no's; per table \_6 person; so table no's = 45

Restaurant =  $45 \times 81 = 3645$  sft; kitchen =  $3645/3 = 1215$  sft

So; total area =  $3645 + 1215 = 4860 \cong 5000$  sft

### 5.1.9 Player Facility

Changing room \_ 2 no's

Hanging space for each player =  $3\text{ft} \times 4\text{ft} = 12$  sft

Total player \_ 28 no's  $\therefore 28 \times 12 = 336$  sft  $\cong 400$  sft

Massage room \_ 1-2 (25 sft massage table)

Washing and toilet facilities \_  $1.5\text{ m}^2$  per player; standard \_min - $9' \times 8' = 72$  sft

1 shower for 2 players \_ so need 12 showers

Toilet + toweling Room\_

Toilet need\_ 1 position per three players

W.C. = 4; Basins = 5; Urinal =6 (each team)

### 5.1.10 Match control Room

$20' \times 10' = 200$  sft / per 3 people

### 5.1.11 Third Umpire Room

$20' \times 20' = 400$  sft / for 5 people



### 5.1.12 Media

Total people no's 150 person

15 sft for each person

Total area of media\_  $(150 \times 15) = 2150 + 675 = 3000$  sft

### 5.1.13 Parking

A minimum of one parking space for every 10 to 15 spectator.

FIFA recommendations are to be followed one space to every six spectators.

FAR recommendations are to be followed one space to every 20 spectators.

For 40000 spectator;  $P_n = 40000 \div 20 = 2000$  cars

*Area required*

For 90 parking

CAR required area

$$= \frac{[n \text{ rows} \times A + n \text{ drive way} \times B] \times C}{n \text{ rows}}$$

$$= \frac{[2 \times 16 + 1 \times 11] \times 8}{2} = 216 \text{ sft / per car.}$$

$$\text{Bus required area} = \frac{[2 \times 40 + 1 \times 11] \times 16}{2} = 663 \text{ sft/ bus}$$

$$\text{Total car parking area} = 216 \times 2000 = 432000 \text{ sft}$$

$$\text{Total car parking area} = 663 \times 10 = 6630 \text{ sft}$$

### 5.1.14 Detail program

#### International Cricket Stadium at Cox's Bazar

#### Required Area

<b>Play ground</b>			
Play area ( Ground area for Cricket )		<b>71518-138545</b>	sft
[Taking a circle of 46 meter radius minimum i.e. 151' as standard or # 210' maximum]			
Gallery space(40,000 Spectators)			
Space occupied /person is 3'-0" x 1'-6" = 4.5 sft (Including circulation area)			
Total area needed for 40,000 spectators		<b>180,000</b>	sft
Ticket Room (40 Nos. ) approximate		<b>10,000</b>	sft
Public toilet (60 M + 20 F ) approximate		<b>17,000</b>	sft
( Male (20'x12') Female (12'x10') as a rough estimate			
40% circulation		<b>82,800</b>	sft
		<b>289,800</b>	sft
		<b>290,000</b>	sft
Pavilion Building Adjoined with Gallery			

player lounge (25x2) x 15 sft		750	sft
umpires + other officials' (10 x 2 ) x 15 sft		300	sft
Store		250	sft
dressing room + lockers ( 25 x2 ) x 20 sft		1,000	sft
Shower room		450	sft
Toweling room		450	sft
Toilet		400	sft
Medical examination room		300	sft
x-Ray room		300	sft
Resident Doctors room		200	sft
		4,350	sft
40 % Circulation		1,740	sft
		6,100	sft
		22,680	
<b>VIP FACILITIES</b>			
Private box ( 20 nos )	300 sft per box		
Total private box 40	(300 x 40)	12,000	sft
(including toilet)			
restaurant		2,600	sft
Kitchen		600	sft
Toilets 10nos (6 men + 4 woman)			
Executive suites (16 nose )	500 sft		
Total Executive suites 25	( 500 x 25 )	12,500	sft
President suites (10 nose )	500 sft		
Total president suites 10	( 500 x 10 )	5,000	sft



Restaurants overlooking the pitch		5,000	sft
(200 nose)			
Kitchen		800	sft
		38,500	
Media			
Written Press seats	150 nose x 6 sft	900	sft
TV commentary room including phone /fax /telex facilities /internet			
( at least 4 booth holding 50 person )		4,000	sft
( mechanical / Electrical room )	(500 x 4)	2,000	sft
Radio commentary room including phone /fax /telex facilities /internet			
( at least 2 booth holding 30 person )		1,600	sft
Interview room 2 nose	(600 x2)	1,200	sft
Restaurant		2,600	sft
Kitchen		600	sft
Toilet		400	sft
		13,300	sft
Service Room			
Video electronic screen control room		1,200	sft
Ground man Room		800	sft

Equipment Room		1,500	sft
Generator Room		2,000	sft
		5,500	
<b>Stadium administration</b>			
President's room		200	sft
Gs Room		200	sft
Staff room		500	sft
Meeting room		200	sft
Waiting room		1,500	sft
Event organizer Room		300	sft
Board Room		200	sft
Stadium Control room		500	sft
Computer/ record archive		500	sft
Toilet (2 nos )		400	sft
		4,500	
<b>Parking</b>			
Stadium complex _ 40000 spectator		2,600	sft
( Taking 1 car per 20 person )			
Space required for 90 parking for	(700 x 216)	151,200	sft

## CHAPTER 06

### 6.1 Design development

#### 6.1.1 Concept development

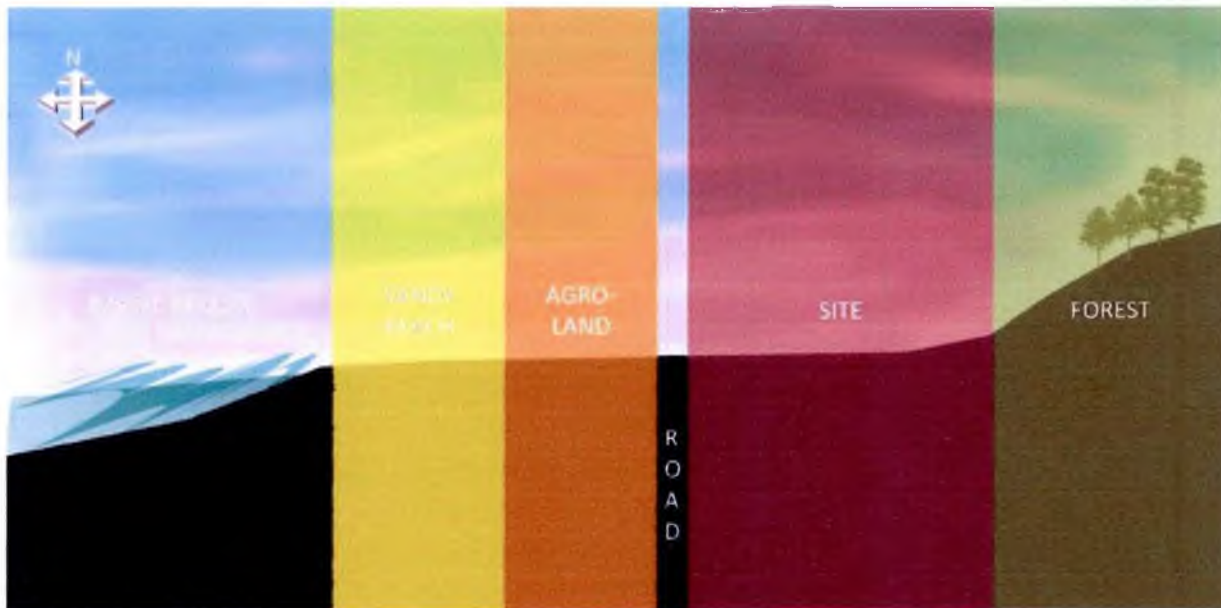
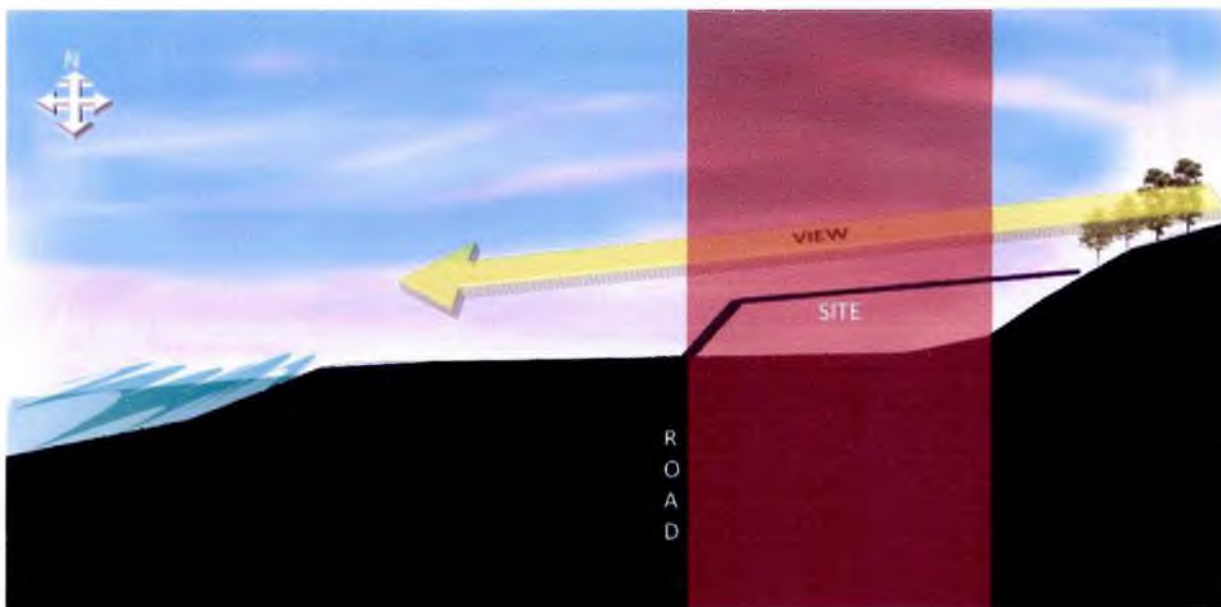


Fig. Sectional segregation





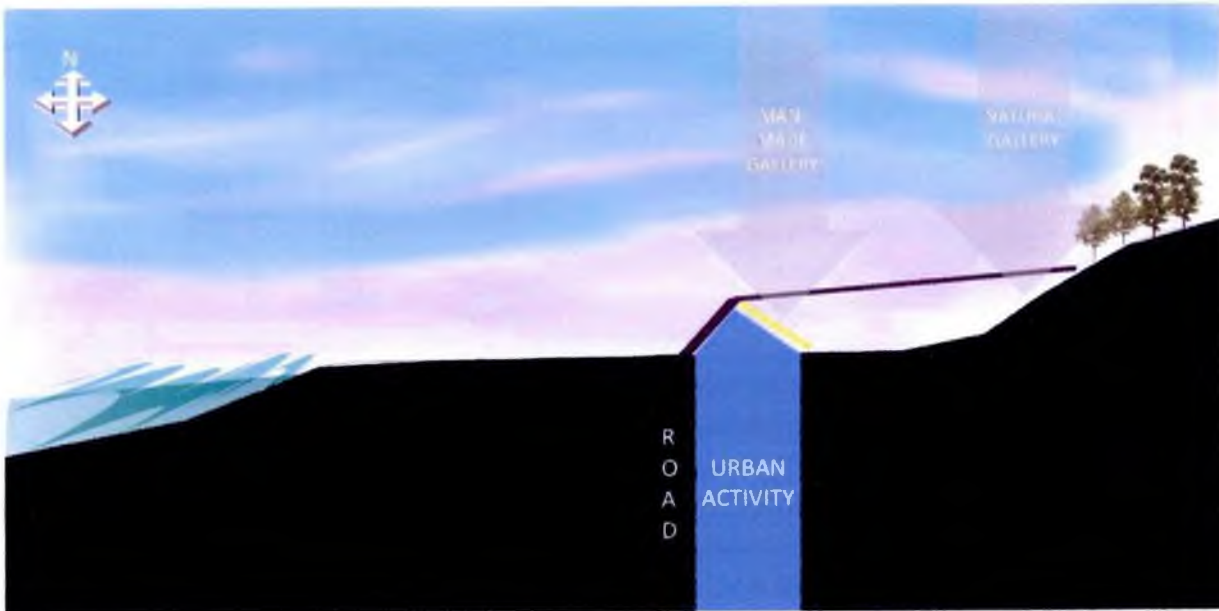


Fig. Man-made and urban gallery

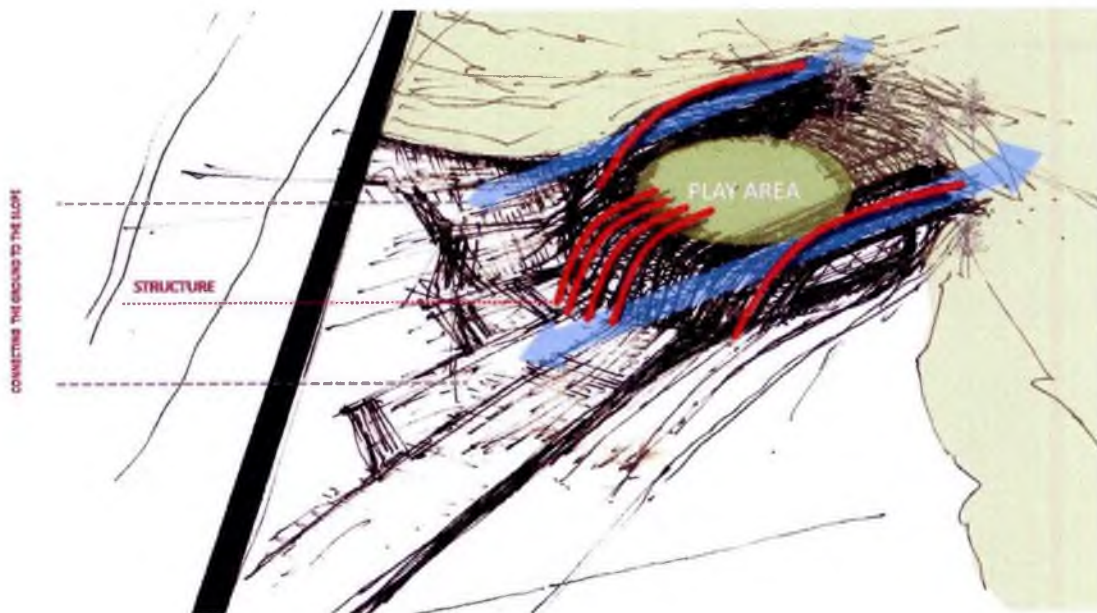


Fig. Direction of structural elements

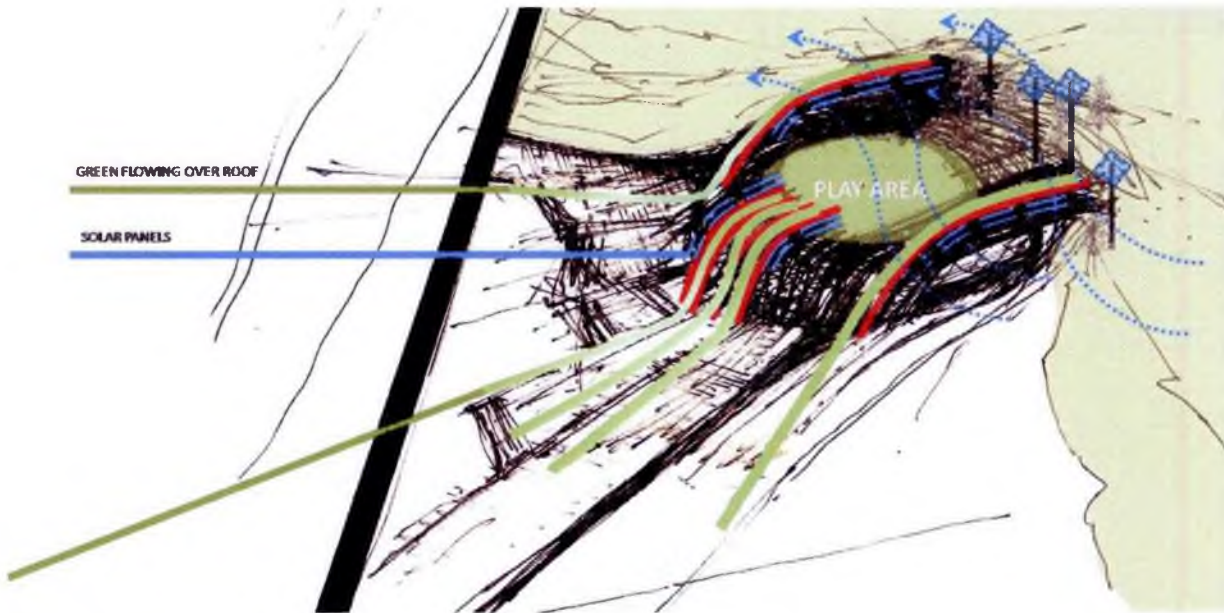


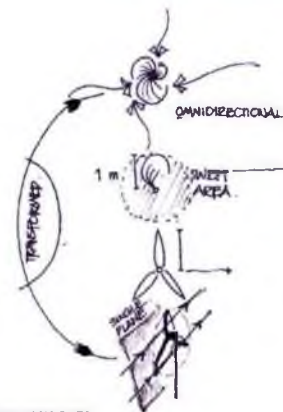
Fig. Solar panels and green on roof

## SOLAR PANELS

PANEL SIZE 10' X 20' PRODUCING 1.8 KW EACH  
 AVERAGE WORKING SOLAR HOURS PER DAY-5  
 YEARLY ENERGY PRODUCTION- 1.8 X 5 X 365 = 3,285 kwh  
 EFFICIENCY - 80%  
 ANNUAL ENERGY PRODUCTION = 2,628 kwh per panel



## WIND TURBINE



PARAMETERS:  
 1 m BLADE WITH EFFICIENCY 20%  
 AVERAGE WIND SPEED OF COX'S BAZAR- 6 m/s  
 SWEEP AREA-  $\pi r^2 = \pi (0.5)^2 = .785 \text{ m}^2$   
 AVAILABLE POWER IN THE WIND = air density x swept area x  $r^3/2 = 101.7 \text{ w}$   
 POWER GENERATED WITH 20% EFFICIENCY = 20.3 w  
 ANNUAL POWER GENERATION = 20.3 X 8750 hours = 1,77,625 kwh



Fig. Solar panel and wind turbine energy calculation

### 6.1.2 Phase 2: Zoning and placement of the stadium on site

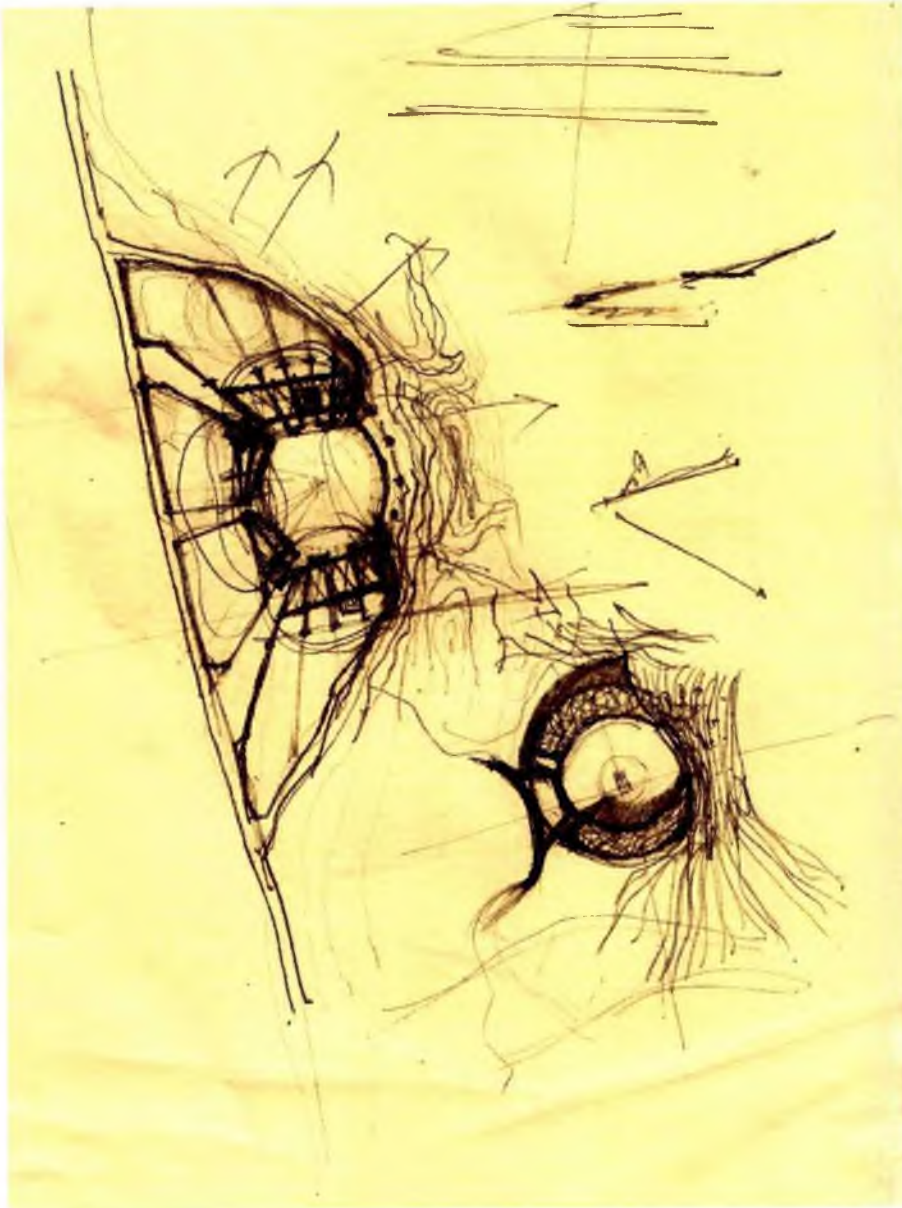


Fig: Initial idea of placement of stadium considering natural gallery



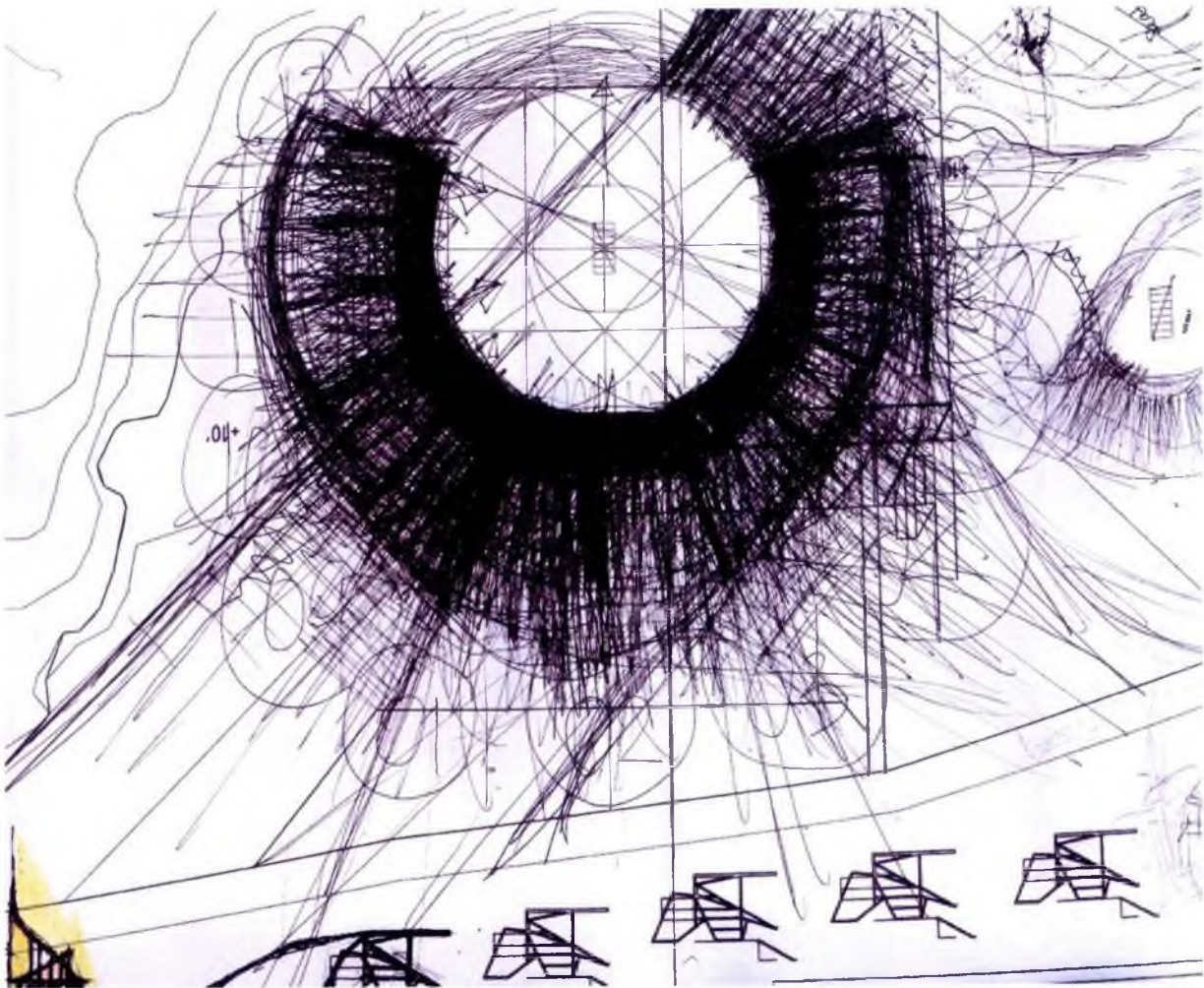


Fig. Deriving the shape

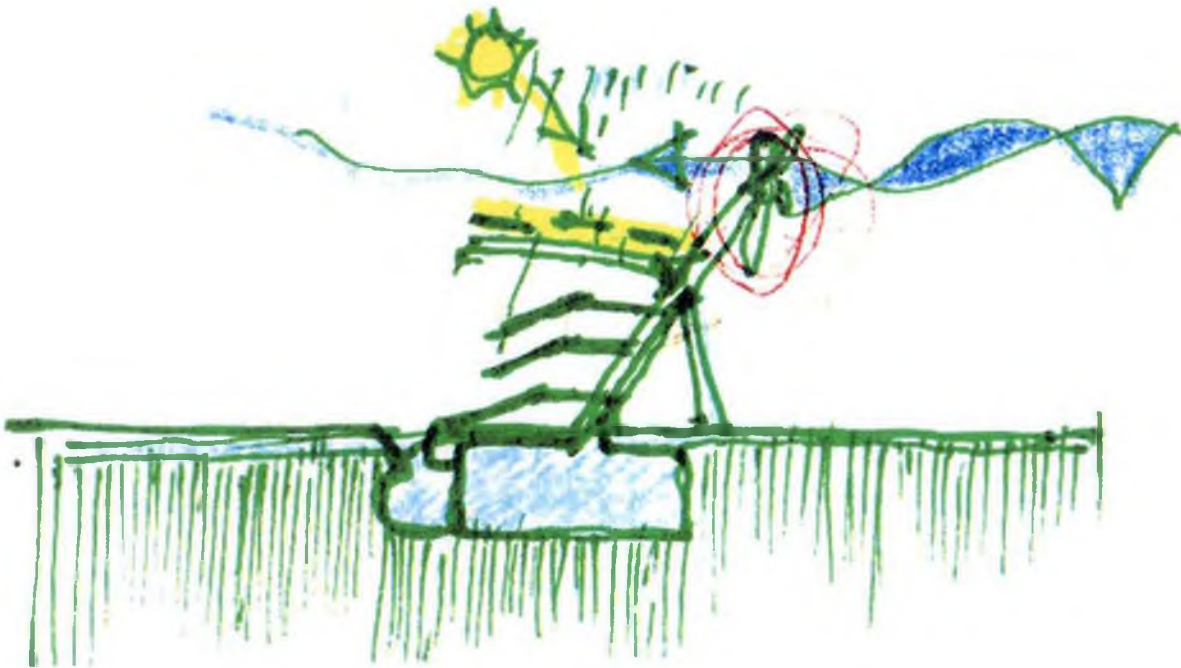


Fig. Section describing the sustainable issues

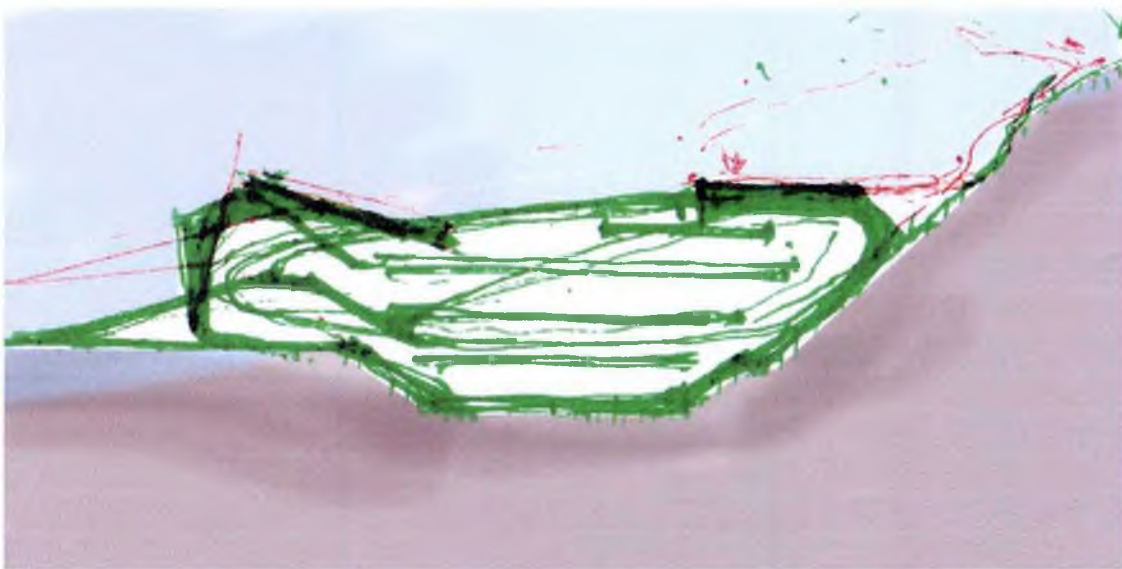


Fig. Idea section of the natural and man-made gallery



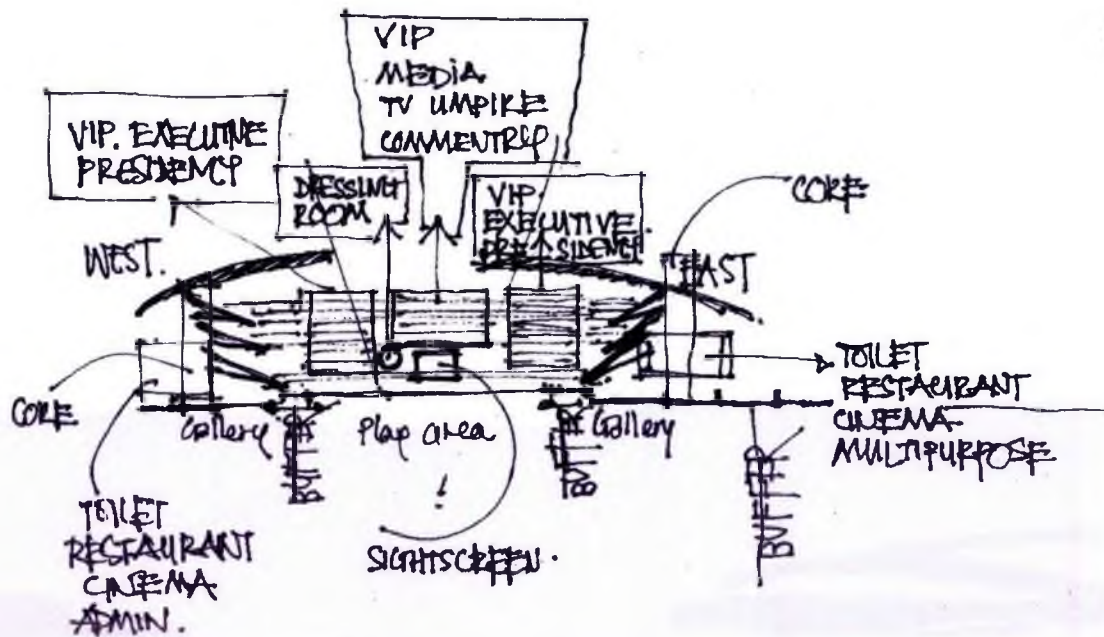


Fig: Section depicting the zoning of functions

### 6.1.3 Phase 3 : Gallery and roof structure



Fig: Entry to upper tier galleries



Fig: Idea section



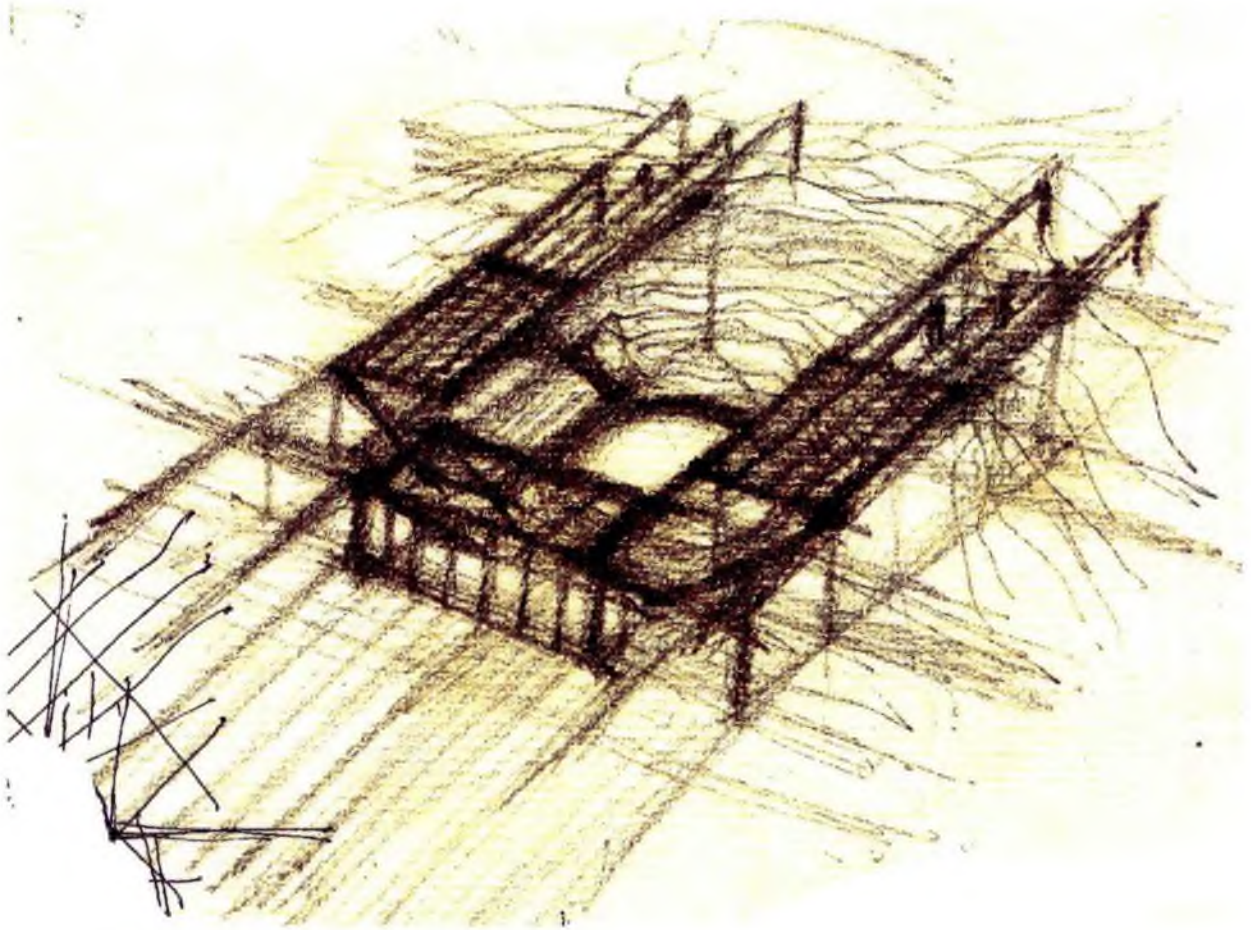


Fig: Idea of the structural framework

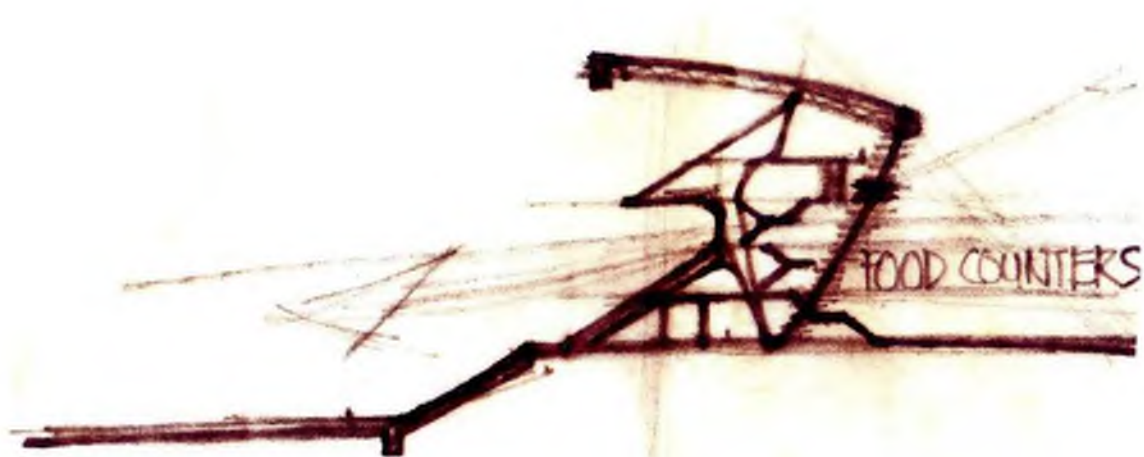


Fig: Idea section

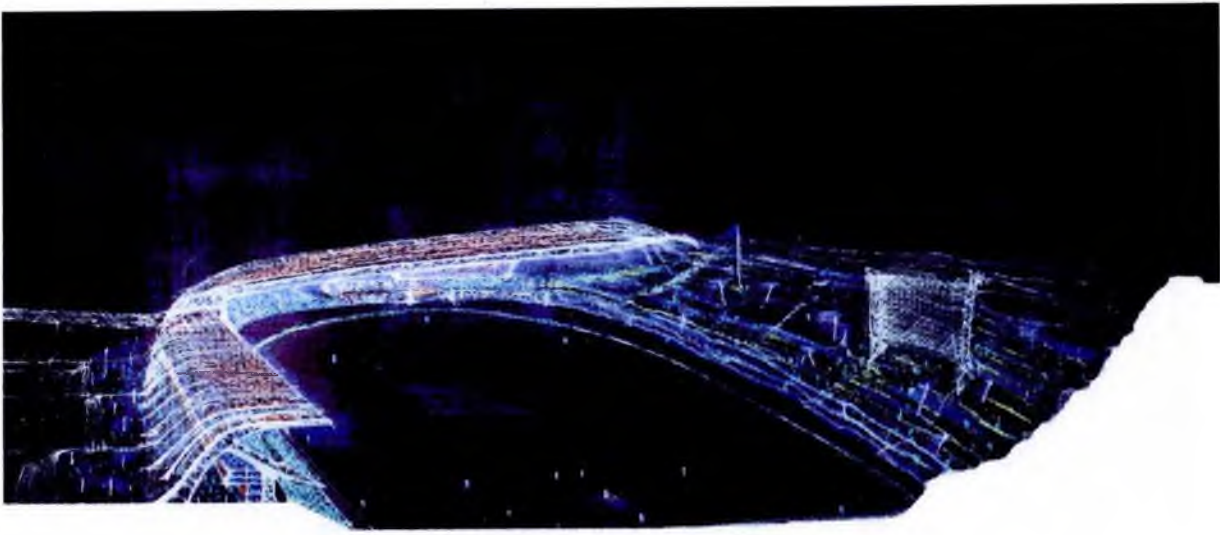


Fig: Sectional perspective

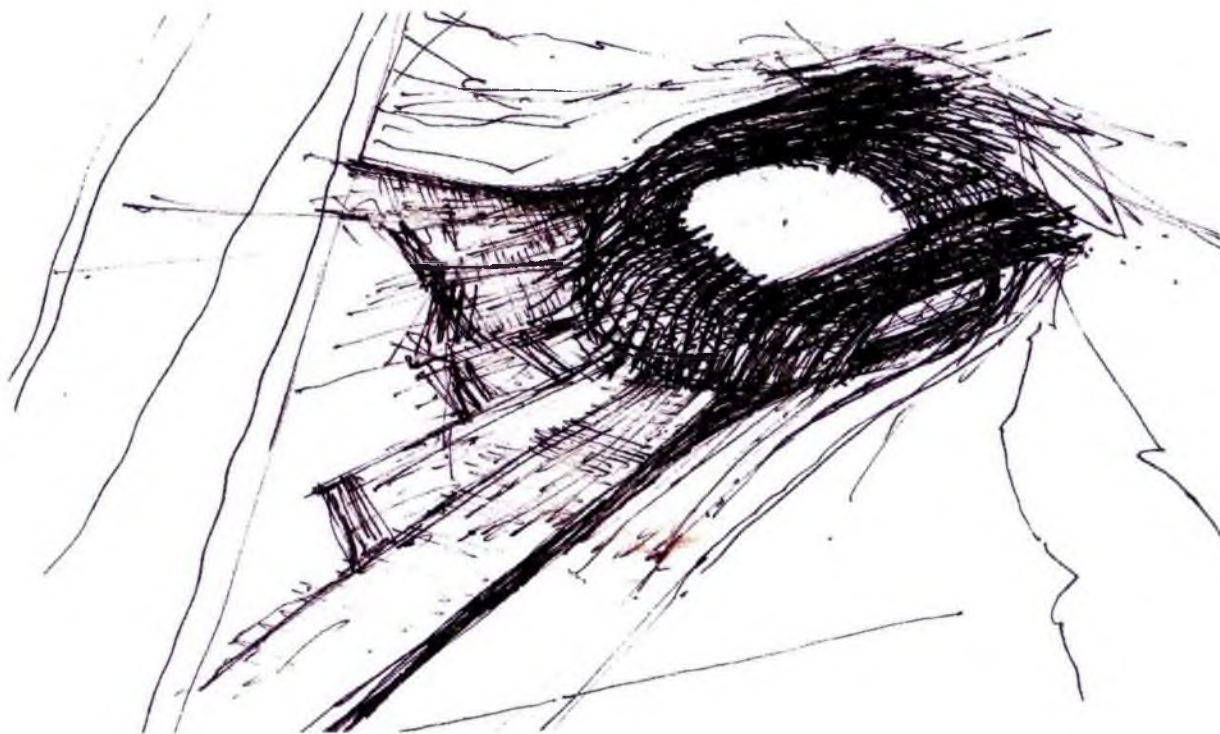


Fig: Idea sketch



#### 6.1.4 Phase 4: Structural detail and landscape

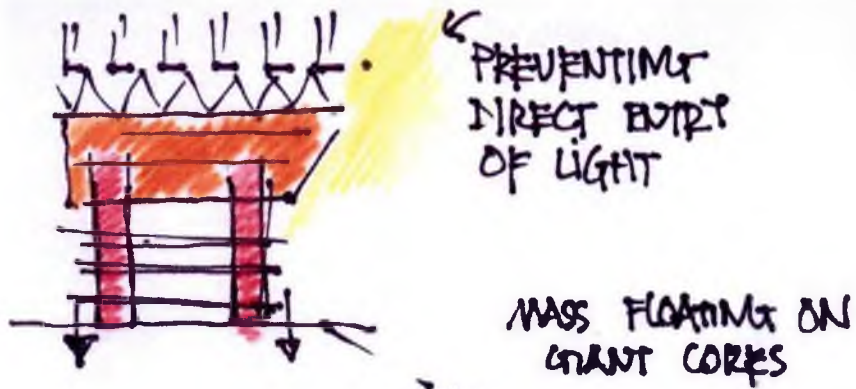


Fig: Structure of the media centre

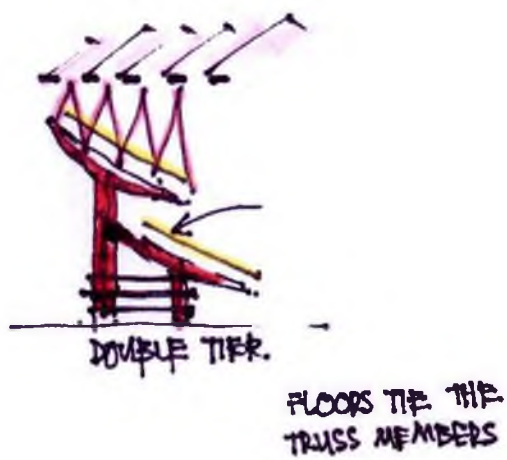


Fig: Structure of three tier gallery

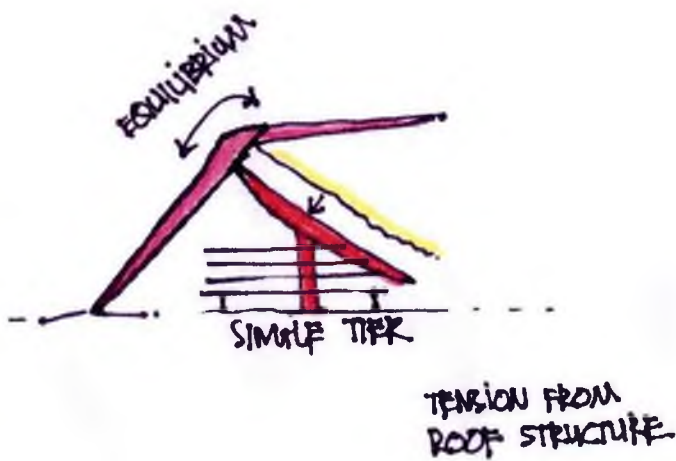


Fig: Structure of the Two-tier gallery



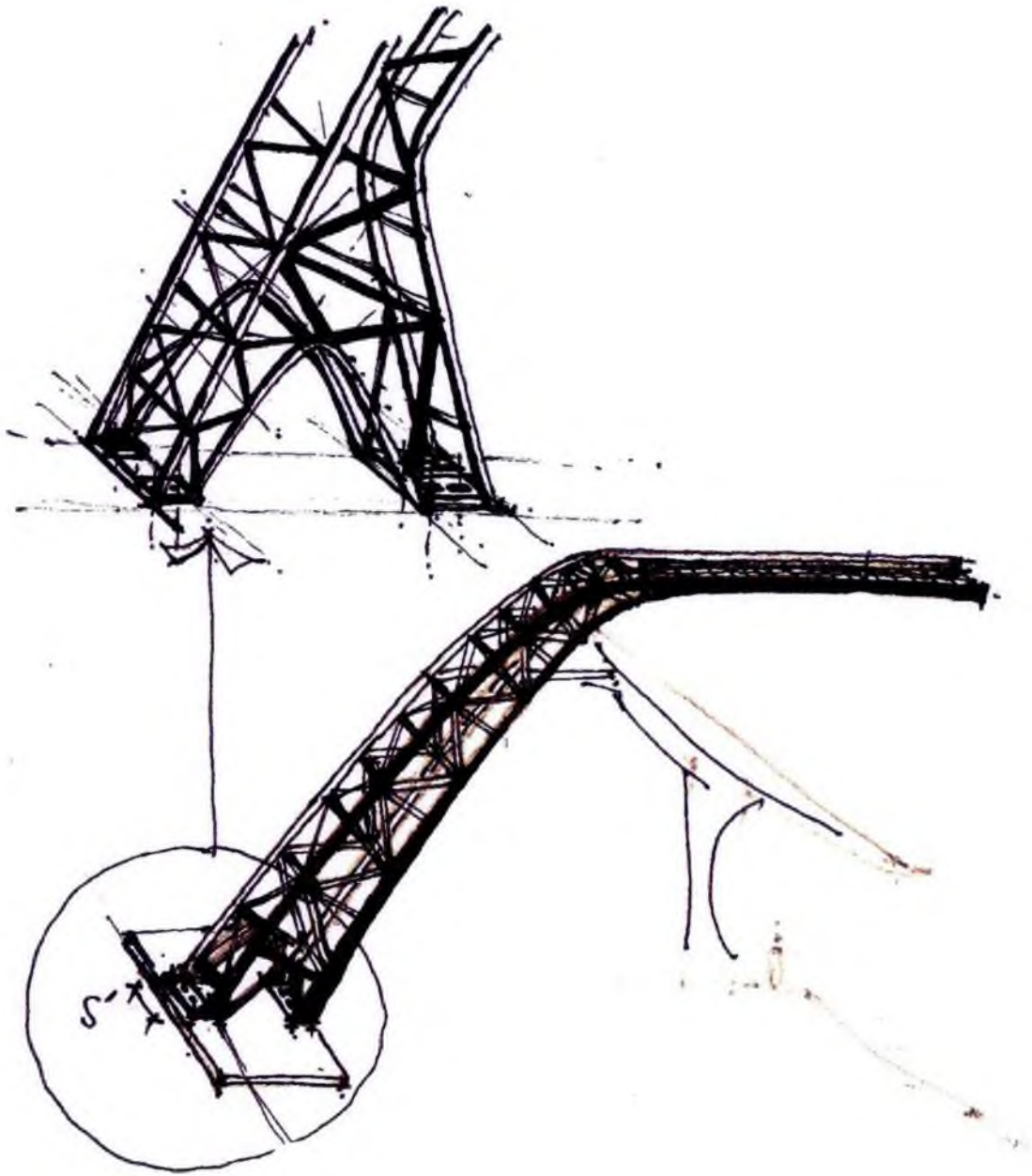


Fig: Structural detail of space-frame members

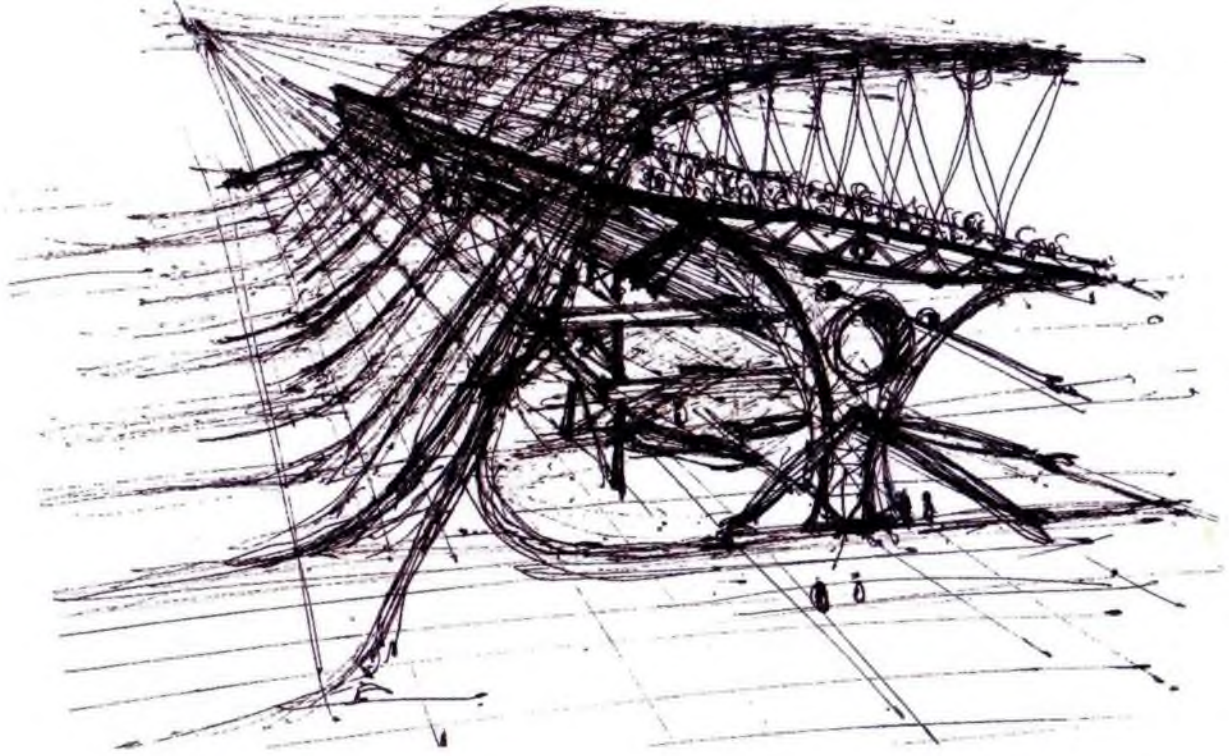


Fig: Multiplication of the Structural space frames

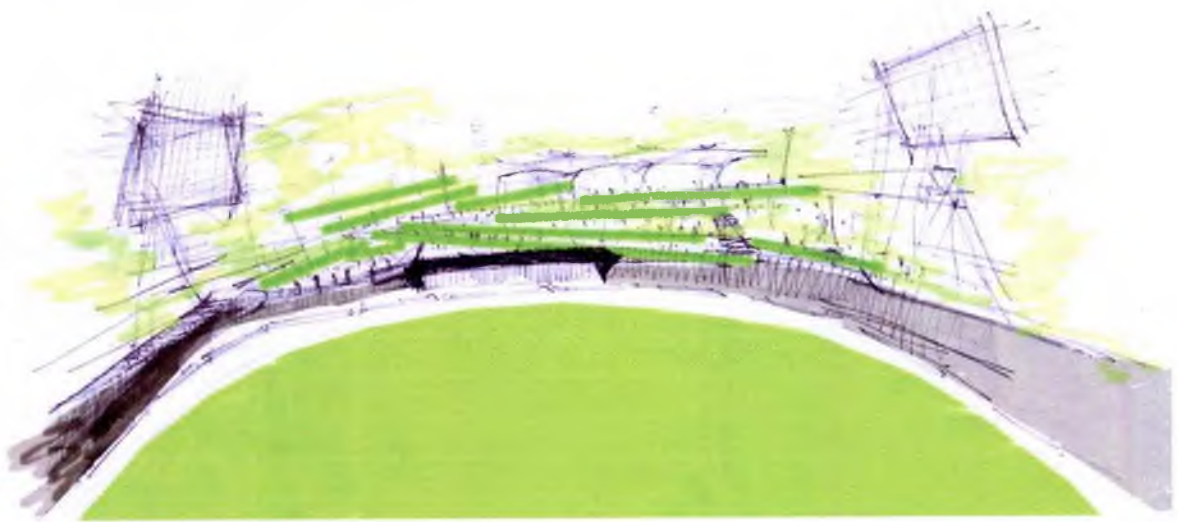


Fig. Natural gallery created by excavating natural slope



## 7.1 Final design



Fig. Master plan



Fig: Section of Restaurant and natural gallery



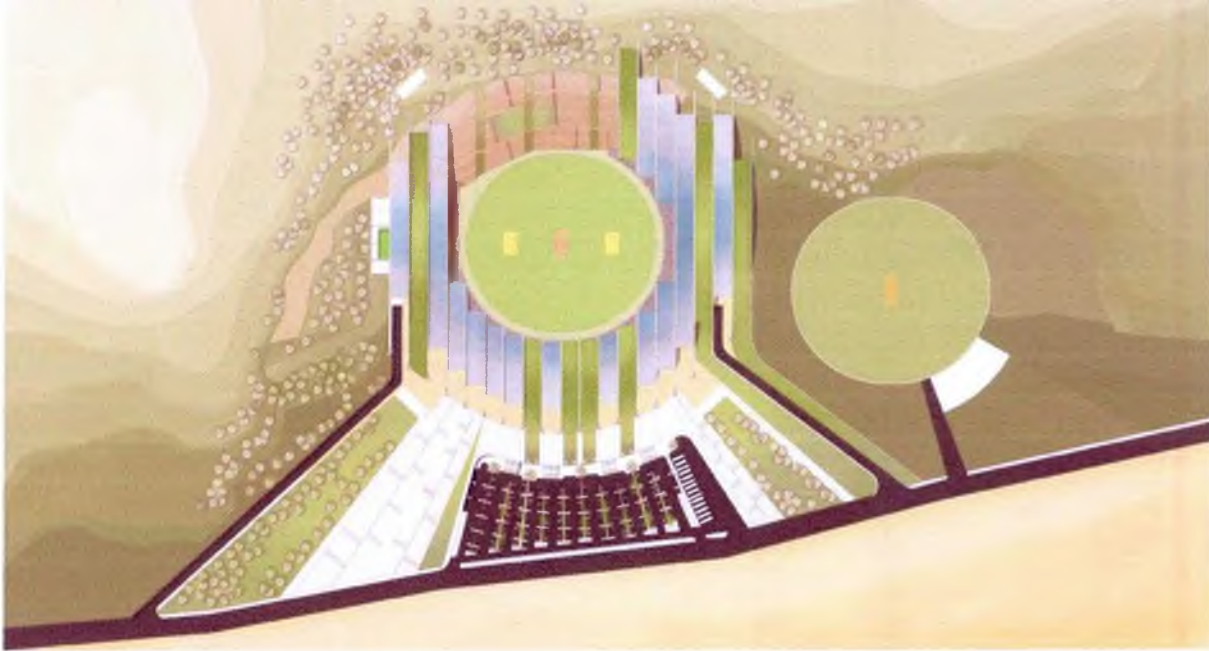


Fig. Roof plan

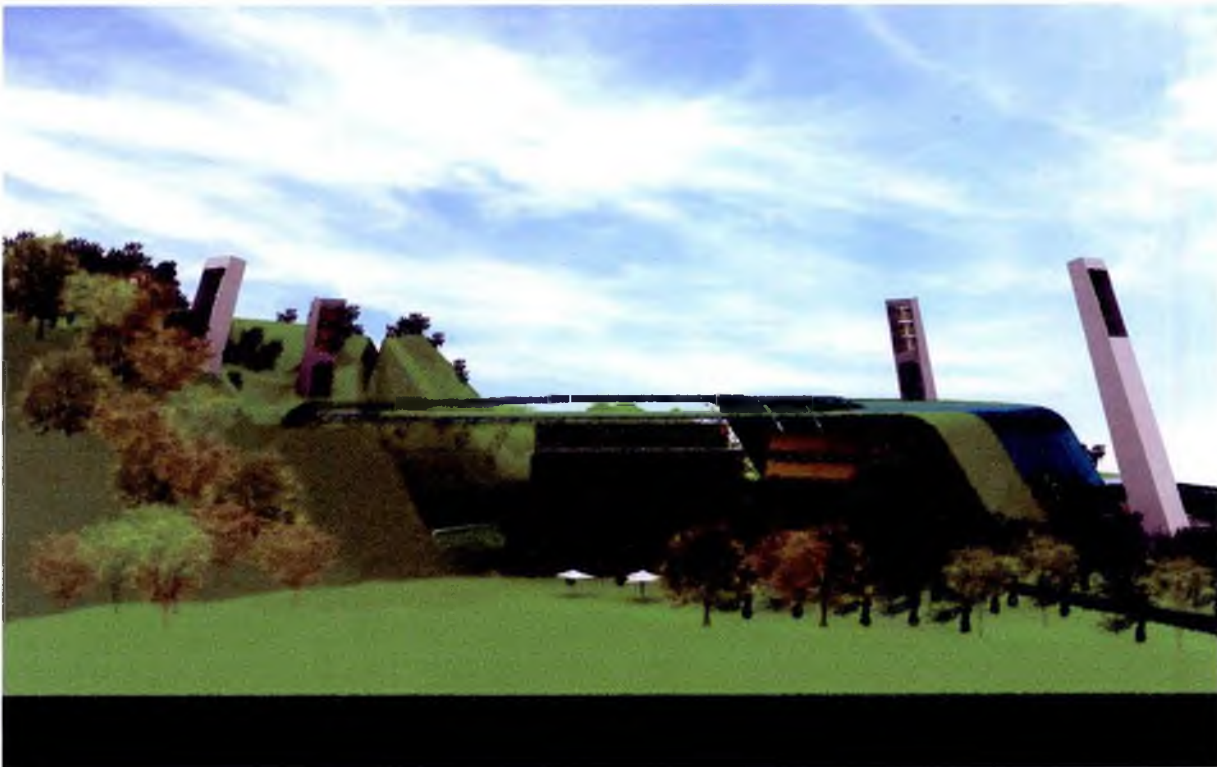
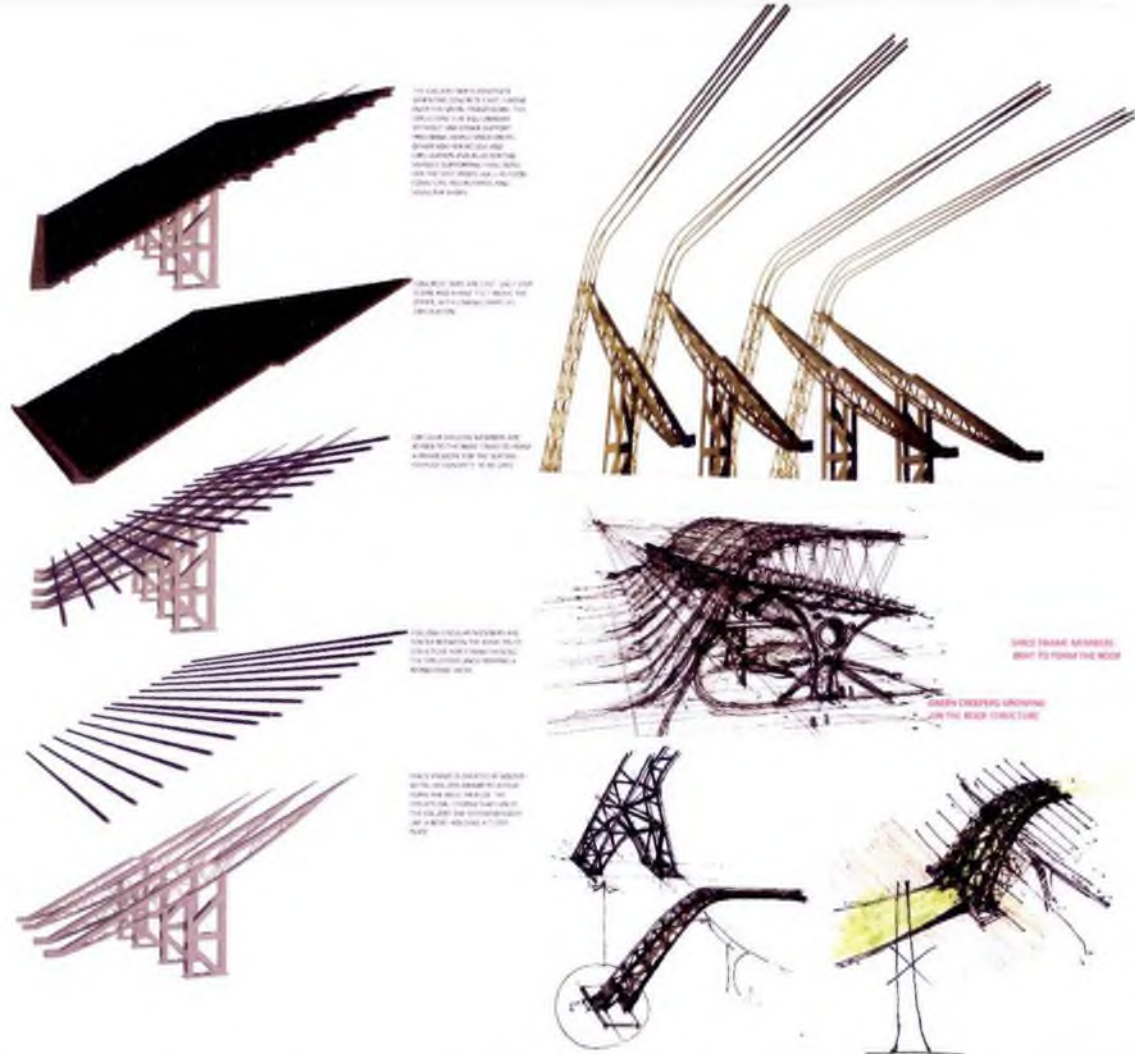


Fig. Media centre elevation



**Fig. Structural skeleton and skin**



**Fig. Section of Media centre and VIP seating**



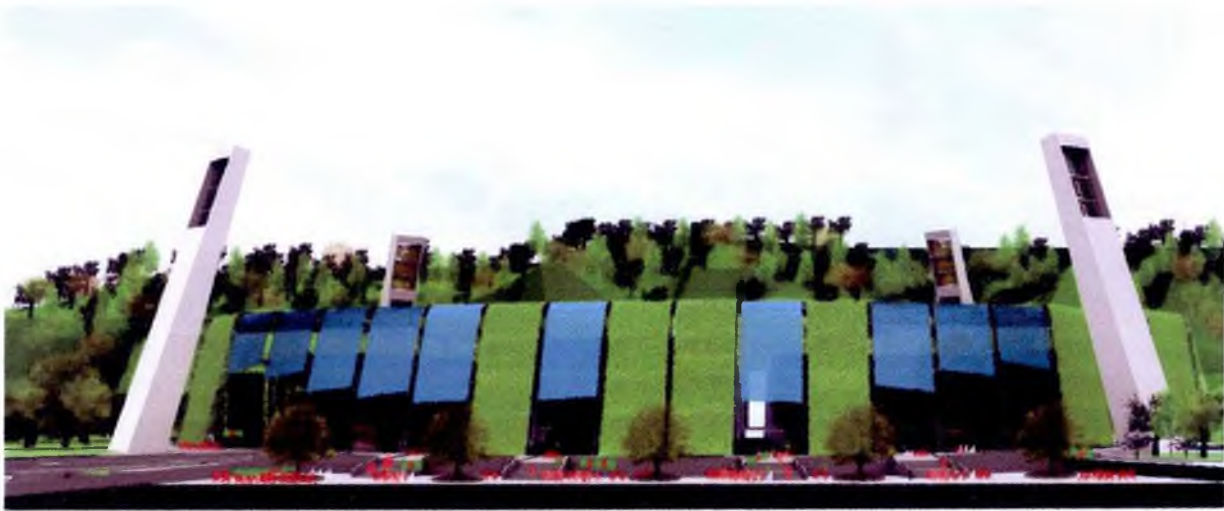


Fig. Entry elevation

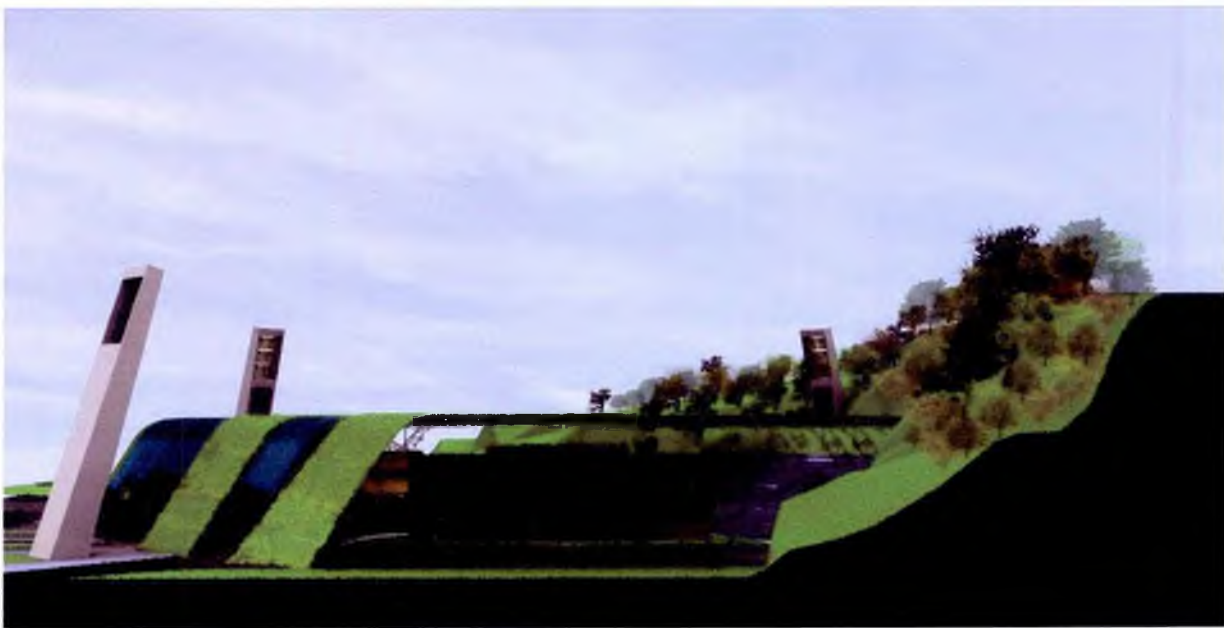


Fig. VIP centre elevation





Fig. 3D perspectives



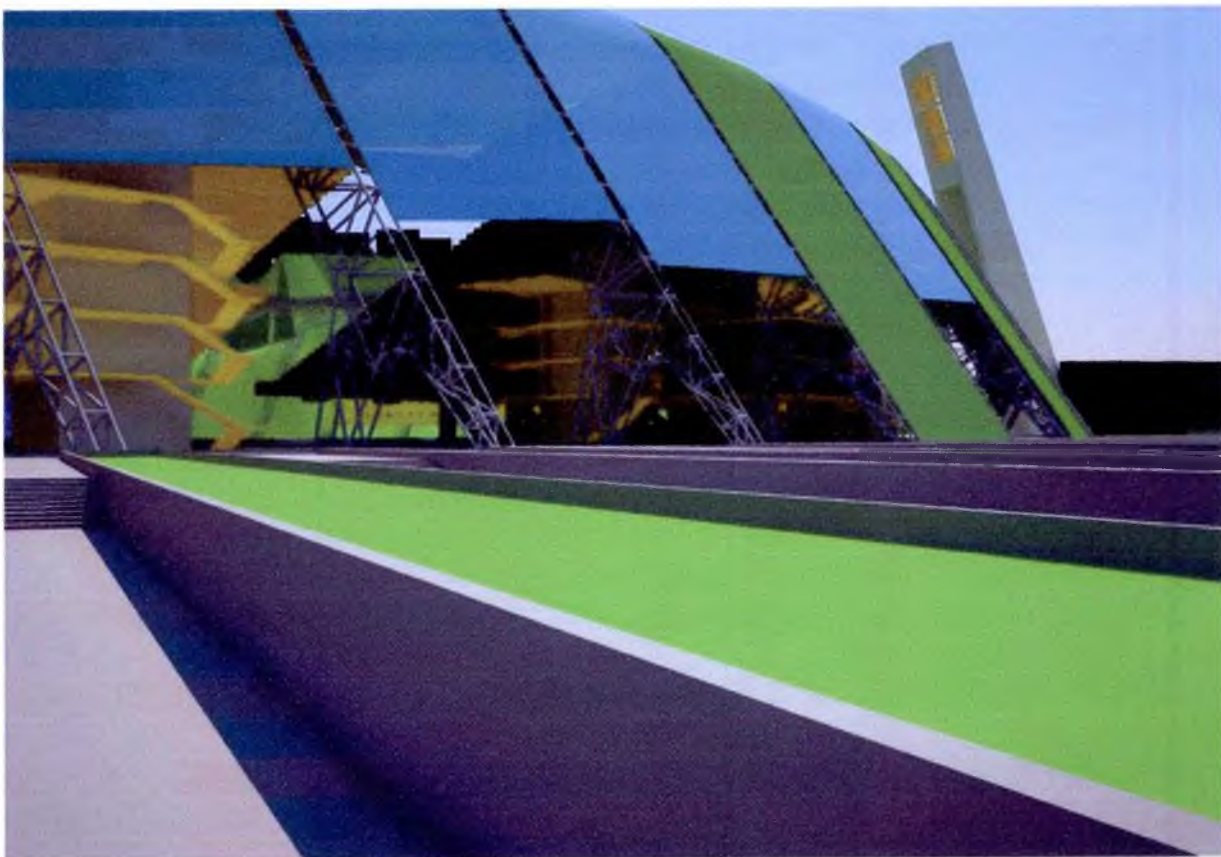
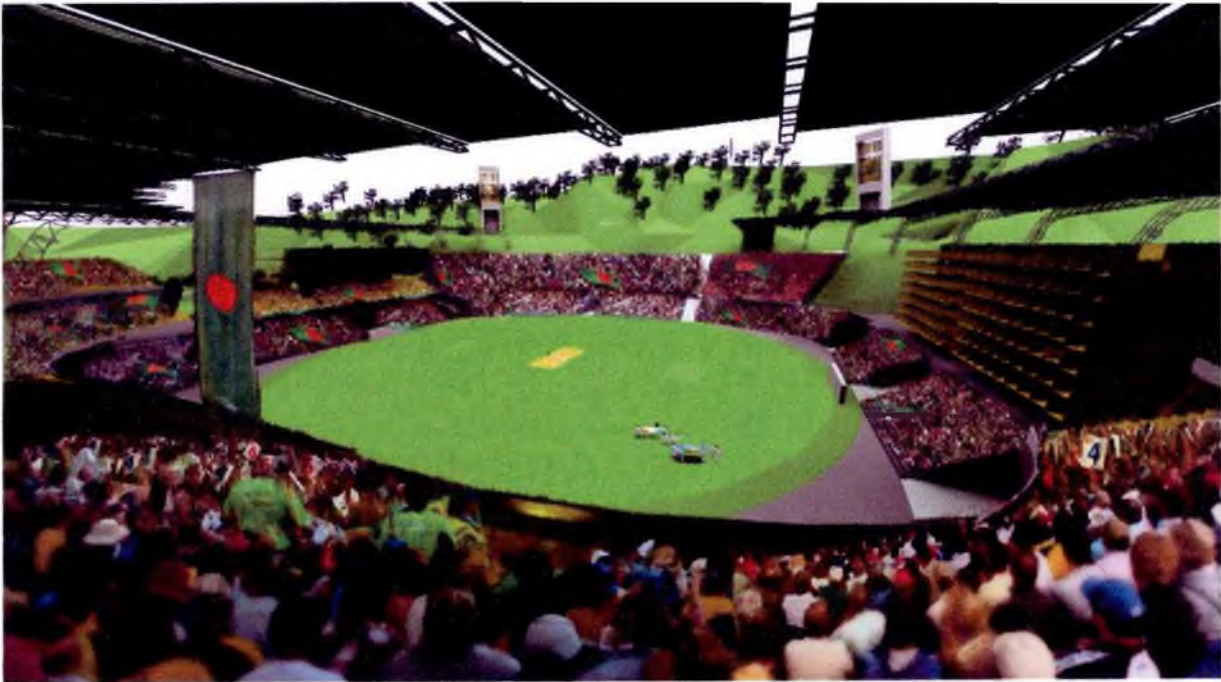


Fig. 3D perspectives

## **Conclusion**

It is always a challenge to design a mega-structure such as a stadium, especially a cricket stadium which requires a large space for play and other facilities. The challenges also focus on the structural innovation and the sustainability issues. Throughout the design of the cricket stadium at Cox's Bazar, there was a constant strive to meet the challenges and create an iconic, sustainable architecture which has multiple functions and will remain active for all days of the year, even when the stadium is not holding cricket matches.

The urban development factor is majorly considered, and the restaurants and community centers have been placed so as to serve the public, while also maintaining security. The road network system had been analysed and segmented to three major routes to enter the stadium.

The stadium in the end has the capability to be an iconic feature in the landscape of Cox's Bazar, and in turn be an iconic feature in the context of global recognition of cricket in Bangladesh.



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