



## SECTION 2 STADIUM DESIGN

### Introduction

#### 2.1

This Section sets out our design vision for the National Stadium and its associated site development. The Section is presented under the following headings:

1. Stadium Design
2. Stadium Footprint
3. Stadium Structure
4. Pitch & Playing Surface
5. Stadium Lighting & Sound
6. House Reduction / Down Sizing
7. Spectator Facilities
8. Campus Development

#### 2.2

Further information relating to the following is provided in Appendix 2.1:

- public facilities;
- visitor attractions on non-event days;
- team and press facilities;
- catering and merchandising;
- support/service facilities;
- utility requirements.

#### 2.3

In the Executive Summary an illustration of the design vision is set out. In this section we include various architectural drawings and site layout plans (Appendix 2.2).

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# 1. Stadium Design Criteria

## 2.4

Our brief stipulated that the National Stadium should be a national flagship facility capable of hosting all Stadium based field games played in Ireland to the highest international standards. Providing a focal point of national pride, it should also act as a catalyst for the development of sport in Ireland.

## 2.5

The Stadium building itself should be a memorable landmark like many of the architectural achievements of previous eras. Its intention is, therefore, to create a unique venue to reflect the image of Ireland as we enter the new millenium. Using an innovative and exciting design, it will provide a special 80,000 seat spectator experience with the capacity to downsize to accommodate smaller attendances through the imaginative use of light and sound. As a state-of-the-art facility, it will provide an inspirational venue for both players and spectators alike. It will be capable of hosting gaelic games, rugby union, association football and major national and international sporting events while providing unsurpassed spectator viewing facilities combined with comfort and safety.

## 2.6

The conceptual design for the National Stadium was undertaken with a number of goals in mind: accommodation of all major field games; creation of the best possible spectator experience; development of a Stadium which meets all requirements of the business and marketing plan; and the creation of a landmark design for Ireland.

## 2.7

The major sporting events which are accommodated in the Stadium include gaelic games, rugby union and association football, being the large attendance Stadium based sports currently played in Ireland. The Stadium is designed to accommodate the pitch requirements and safety areas of each of these sports. The player and other accommodations are equal to, or better than those in other major international facilities. The Stadium has also been designed to allow other major events, such as concerts or other major public assembly activities to be accommodated.

## 2.8

The circulation flow of spectators, participants, press and officials has been separated to provide maximum security and operational efficiency. Service access to the Stadium and onto the pitch area has also been designed to increase the usage and efficiency of the Stadium.

## 2.9

To create an intimate atmosphere for both players and spectators, the design and geometry of the seating bowl was studied in depth. As a National Stadium rather than a purely commercially driven facility, it was considered important that the seating bowl of the Stadium should be cohesive. While some distinction of levels in the Stadium (such as premium seating and corporate suites) is desirable, the national nature of the Stadium meant the visual distinction should be minimised. Therefore, rather than creating a number of distinct levels in the seating bowl through the use of vertical breaks, the levels are distinguished by subtle elevation changes in the seating bowl. The other advantage sought was to place the seating in the upper deck of the Stadium as close to the pitch surface as possible.

## 2.10

After analysis of several seating bowl geometric options, (which included four distinct stands; four lower bowl and two upper deck stands; and a contiguous lower bowl with two distinct

upper deck stands) the form of a contiguous lower and upper deck was considered most appropriate. The enclosed bowl shape of the stands creates an intimate facility for both spectators and players, and ensures that all spectators are as close to the pitch as possible. The ultimate form of the seating bowl created also includes a subtle curvature to the stands along the sideline and endzone areas of the Stadium. This curvature enhances the spectators visual linkage to the pitch and provides enhanced safety zones at the midline and behind goal areas. In addition, the upper deck of the Stadium has been sculpted to provide a greater number of seats along the side lines than in the endzones to place a greater number of spectators in premium viewing positions.

## **2.11**

The 80,000 seat capacity of the Stadium was determined to accommodate major national and international matches. Since events will require less than maximum capacity, the ability to create an intimate environment for less than full capacity events is necessary. By closing some or all of the upper deck (which accommodates 40,000) the Stadium can be downsized to 60,000 or 40,000. In addition the Stadium can also be downsized to 25,000 by closing the end stands of the lower level and yet maintain an intimate atmosphere for spectators and participants.

## **2.12**

In addition to the study of the geometry and capacity of the seating bowl, the bowl was designed to provide spectators with lines of sight on a par with the best international facilities. During the analysis of lines of sight and the overall sectional studies it was decided that the slope of the upper deck should not exceed 30 degrees. The maximum slope on many international stadia is 34 degrees or steeper, but, this level of slope was rejected in order to create a more spectator friendly atmosphere.

## **2.13**

Spectator amenities in the Stadium have been maximised. They include wide concourses and circulation areas, large circular ramps, elevators and escalators for vertical circulation; numerous retail and merchandising facilities; ample toilet facilities and accommodation for spectators with disabilities. All of these amenities are designed to ensure that spectator comfort and enjoyment of events will be maximised.

## **2.14**

Premium seating and corporate facilities including, private suites, corporate lounges, and dining facilities are included in the Stadium. These are provided with separate entry and circulation areas.

## **2.15**

The final goal of the design was to produce a design which would be a landmark and iconic building for Ireland. The National Stadium will be a focal point of national pride and will provide an image of Ireland on a national and international stage. The design reflects the dynamic and confident nature of Ireland as it enters the new century.

## **2.16**

The final and most dramatic design element of the Stadium is the roof and the roof structure. A key decision is to provide vertical coverage of 100 percent of the seating, and this has been accommodated. This had a number of consequences, the most important of which was how to cover maximum seating with minimum impact on the turf conditions of the pitch. To minimise its shading impact, the roof has been designed with 40% of its leading edge being transparent. The other desired element was to provide a roof at as low an elevation as possible. This was required for a number of reasons: the reduction of shading, the provision of maximum protection from the elements, and the creation of as intimate an atmosphere as possible as well as presenting a more pleasing aspect when viewed as part of the overall landscape.

## 2.17

This led to a design solution of suspending the roof plane below the structural support system of the roof. A number of methods of suspending the roof were studied. These included the use of fixed trusses, use of a series of cantilevered trusses, and the use of 32 masts with roof cable supports. The final and recommended design is to provide four major suspension elements for the roof. Two elements run the length of the Stadium and two run across the end of the Stadium. The suspension elements comprise suspension cables with vertical support cables carrying the roof plane. The suspension cables are supported on a series of eight towers. The towers each consist of paired tubes located on the corners of the Stadium. The longitudinal support system also includes a pair of cables along the top plane of the roof which resist the uplift forces of the roof.

## 2.18

The overall impact of the roof design creates a dramatic skyline element. The towers and suspension elements are visible from a distance. The soaring elements of the towers and the suspension systems enhance, and mirror the excitement level and anticipation of events. Illustrations of the design are set out in Appendix 2.2.

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## 2. Stadium Footprint

### 2.19

Under this and subsequent headings we set out the various technical considerations which underline our design. The overall area occupied by the Stadium building is some 20 acres. This area is made up as follows:

- |                      |            |
|----------------------|------------|
| a. Playing Zone:     | 3.5 acres  |
| b. Spectator Zone:   | 12.0 acres |
| c. Circulation Zone: | 5.0 acres  |

Each of these zones is described below.

### (a) Playing Zone

#### 2.20

Because of the curved design of the seating areas, the playing zone is not rectangular, but the dimensions are greater at the centre points. The dimensions at the mid points of the sidelines and endzones are 160 metres x 105 metres. This is presented in drawings in Appendix 2.2.

#### 2.21

The area of grassed surface provided within the Stadium is 150 metres x 88 metres. This area provides for a maximum pitch size of 145 metres x 85 metres including the provision for goal line and touch line zones. The size of the playing zone selected for the Stadium was governed by the requirement of the Terms of Reference to cater for all field sports played in Ireland.

#### 2.22

Generally there is a reasonable correlation between the playing spaces required for the various field games. The games assessed for the purpose of this study were :

- Gaelic Games
- Association Football
- Rugby Union Football
- Field Hockey
- American Football
- Rugby League Football

In each instance, the net playing space was extended to gross area to provide margins for umpiring and safety.

### 2.23

Details of the playing areas for three of the sports i.e. association football, gaelic football and rugby union football are presented in Figures 2.1 to 2.4. Details of the playing spaces for all six field sports are set out in Table 2A. The table shows that a gross playing space of 150m x 88m with an area of 3.5 acres is adequate to cater for all six sports.

### 2.24

It will also be noted from Table 2A that the overall length of the grassed surface is governed by gaelic and rugby union football (150 metres) and the overall width by gaelic football (88 metres).

**Table 2A  
Playing Spaces**

Sport	Playing Spaces	
	Net	Gross
Rugby Union	144m x 70m	150m x 84m
Gaelic Games	145m x 85m (1)	148m x 88m
Association Football	110m x 75m (2)	118m x 81m
Field Hockey	92m x 55m	102m x 61m
American Football	110m x 49m	118m x 56m (3)
Rugby League	122m x 68m	134m x 80m
Athletics (8 lane)	177m x 92m	186m x 117m (4)

**Note**

- (1) Maximum width of pitch for Gaelic Football specified in The Rules of Football is 90m. Average width of a G.A.A. pitch in current use is 80m. Width selected for Stadium is 85 m.  
 (2) Width of 75m for international matches (FIFA Laws of the Game 1998)  
 (3) Excludes 10m wide side line

areas on each touchline.  
(4) Internal size of athletics tracks is 158m x 73m. Space excludes jump and vault pits.

## 2.25

Details of an eight lane athletics track including 110m straights and areas for field sports are presented in Fig. 2.5

## 2.26

The total playing surface space for all Stadium based games and the athletics track are superimposed in Fig. 2.6 which shows that the provision of an eight lane running track with an integral 8 lane sprint straight and space for field events within the gross playing zone requires an area of 186m x 117m and is some 36m longer and 29m wider than the area required for the six field sports.

## 2.27

The primary option available to accommodate a full track and field facility would be to remove up to 16 rows of seats from each of the side stands and up to 24 rows of seats from each of the end stands. Provision for such temporary removals should be considered at the detailed design stage.

## 2.28

An alternative option is to install retractable seating at the front of the lower deck around the full perimeter of the Stadium as at the Stade de France in Paris. This option is extremely costly. Each of these options would result in a drop in capacity of approximately 8,000 spectators.

## (b) Spectator Zone

### 2.29

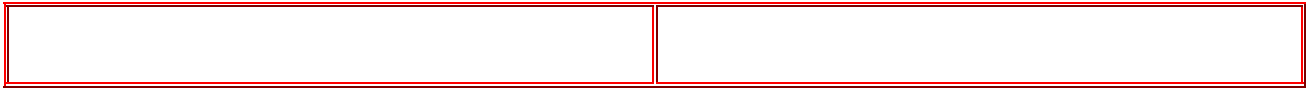
The size of the spectator zone within a Stadium building is determined by the number of spectators, the arrangement and slope of tiers, seating and viewing standards, access and egress arrangements and vertical circulation. The spectator zone adopted for this Stadium is some 70 metres deep and the overall area occupied by the spectator zone is 12.0 acres.

## (c) Circulation Zone

### 2.30

Subject to detailed design at a later stage a circulation area with a width of 20 metres has been provided outside the turnstile/ exit gate perimeter. The area occupied by this zone is some 5.0 acres.

Click on any image to enlarge	
<b>Figure 2.1</b>	<b>Figure 2.2</b>
<b>Figure 2.3</b>	<b>Figure 2.4</b>
<b>Figure 2.5</b>	<b>Figure 2.6</b>



## Site Area

### 2.31

The size of the site area required for an 80,000 seat Stadium can vary considerably depending on a number of factors which include:

- The size of the playing zone;
- The size of the spectator zone;
- Amount of on-site parking provided;
- The external circulation around the Stadium.

The extent of site area required for the National Stadium is a minimum of 81 acres made up as follows:

• Playing Zone	:	4 acres
• Spectator Zone	:	12 acres
• Circulation Zone	:	5 acres
• Parking - Car	:	45 acres
- Coach	:	<u>15 acres</u>
Total	:	<u>81 acres</u>

### 2.32

This site area provides for some 50% of car parking demand and for 100% of coach parking demand. This area is net and does not include space for access roads, retained buildings or other sporting facilities. These are dealt with in Section 3.

### 2.33

In contrast the seating capacity and site areas of some comparable stadia both existing and proposed are:

• Croke Park	: 79,500 spectators	14 acres
• Cardiff Arms Park	: 72,500 spectators	12 acres
• Wembley Stadium	: 80,000 spectators	75 acres
• Twickenham	: 75,000 spectators	33 acres

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## 3. Stadium Structure

### 2.34

The Stadium structure should create a sheltered seating bowl with the required standard of spectator viewing and accommodation. To achieve this, the structural engineering issues to be addressed include safety, stability, serviceability and economy.

## **Seating Decks**

### **2.35**

The geometric requirements for the seating deck are determined by the sightline requirements of the individual sport with the overall height, depth and rake being optimised to give each seat the best possible view. From this geometry the internal floor levels, layout and primary grid are established. The circumferential grid defined by the seating geometry is then translated into a faceted grid for the structural elements based on aisle locations.

### **2.36**

Against these constraints, the preliminary seating deck design is based on a reinforced concrete primary structure, precast concrete seating units and slab to the various floors.

## **Roof**

### **2.37**

The structural form of the roof was developed in response to the plan form and elevation of the seating bowl. A low roof plane provides maximum protection for the spectators, reduces shadowing of the pitch and enhances the intimacy and atmosphere of the Stadium. To achieve this, two alternative mast options have been considered as part of this study:

- a. 32 no. perimeter masts, representing the 32 counties of Ireland
- b. 4 no. pairs of corner supports (main masts), representing the four provinces of Ireland.

### **2.38**

The recommended design of the roof structure is (b) which allows for the provision of four major suspension elements for the roof – two running the length of the Stadium and two across at either end. The suspension elements comprise suspension cables spanning between the twin masts, which are located at each corner of the Stadium, with vertical support cables to the roof plane under.

## **Overall Stability**

### **2.39**

In the case of stadia with large cantilevered roofs, the dominant forces to be resisted by the structure are from the roof.

### **2.40**

The options for resisting these forces and providing stability are twofold, either a braced frame or a moment frame. The adaption of a reinforced concrete structure to the seating level allows a moment frame to be achieved economically whereby the applied loads are resisted at each primary frame and transferred through the frame to the ground.

### **2.41**

From the masts, the main roof will be supported at regular intervals by cables attached to the masts via the suspension cable. In addition to the normal downward load generated by the weight of the roof (and possibly by a layer of snow during winter conditions), roof structures on stadia are required to resist wind loads which can create a net uplift on cantilevered roofs.

## 2.42

In the case of the National Stadium roof, wind uplift will be resisted by a combination of factors. These factors are roof weight, and a perimeter tension ring at the outer ends of the roof cantilever. The masts will support the major portion of the roof and their design will require extensive study and development at the detailed design stage.

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## 4. Pitch and Playing Surface

### 2.43

There is general acceptance that the optimum playing surface for most field sports is traditional natural turf grass on a drained sand base. In northern European climates, perennial rye grass is the preferred grass species on the basis of its wear tolerance, superior establishment and all year round growth. Natural turf with perennial rye grass is equally suitable for gaelic games, rugby union and association football, with grass height being the one variable for the different games.

### 2.44

In the partially shaded environment of a Stadium with a capacity of 80,000 persons and a high level of shelter, natural turf is particularly dependent for its growth and renewal on the microclimate within the Stadium. The microclimate factor of particular importance is the provision of an essential amount of natural light at a suitable temperature. Secondary factors include drainage, usage, inadequate air movement, relative humidity and frost.

### 2.45

In recent years, pitch problems have been experienced at a number of enclosed stadia with restricted openings at roof level over the playing area. These stadia include:

- Astrodome, Houston.
- Ajax Arena, Amsterdam.
- Stade de France, Paris.
- Old Trafford, Manchester.
- Stamford Bridge, Chelsea.

In many of these stadia, part of the pitch does not receive adequate sunlight for good growth particularly at the south east corner. The area of pitch with inadequate sunlight can vary from 10 - 20 % in summer, through 30 - 40 % at the equinox to 50 % or more during the winter months.

### 2.46

Solutions adopted by stadia to reduce this shading effect have included translucent sheeting at roof level and cutting back the length of the roof cantilever. The latter however reduces the sheltering effect of the roof on spectators, and as such is not considered further in the proposed Stadium design. In reality, the issue of pitch maintenance is a function of a trade off between spectator protection from the elements, and the level of turf replacement required in affected areas.

### 2.47

For example, a feature of the roof of the Stade de France in Paris is the sheeting at the front of the roof cantilever which is opaque rather than translucent. As a result, the south end of the pitch at Stade de France is in shadow even in mid- summer.

## 2.48

To overcome these issues an assessment of the environmental effects of the Stadium on the pitch design and playing surface is required at the detailed design stage. This assessment undertaken by a team of specialists, would incorporate:

- a. A simulation modelling of the internal grass growth environment within the Stadium including sunlight and temperature contours.
- b. A case history analysis of the turf experience in other stadia.
- c. A review of advanced grass pitch technology and best current practice.
- d. Consideration of pitch options for the new stadia.

## 2.49

The following are among the aspects of playing surface installation to be detailed by the specialists.

- |   |                |   |   |
|---|----------------|---|---|
| ○ | Turf species   | ○ | Under pitch heating (including blowing hot air) |
| ○ | Rootzone layer | ○ | Under pitch ventilation                         |
| ○ | Drainage       | ○ | Protection                                      |
| ○ | Reinforcement  | ○ | Construction/replacement                        |
| ○ | Irrigation     | ○ | Maintenance Regime                              |

## 2.50

The development of playing surface options for new stadia is ongoing and a number of solutions have been identified to date. These solutions generally involve either the provision of adequate light for growth or the removal of the grassed surface to a location where adequate light is available. The specific solutions, some of which are still at the proving stage, include:

### (a) Turf Exchange/ Replacement

#### 2.51

This provides for the exchange of turf areas internally within the Stadium or externally to a nursery. The rate of exchange could vary up to 4 times per season in areas of normal wear and up to 9 times per season in areas of high wear and inadequate growth. Each area of the playing surface is coded and a computer record maintained of the areas of turf exchanged or replaced. The areas of turf can vary in size up to 6 – 8 metres long and up to 2 – 3 metres wide. This system is currently in use at the Olympic Stadium in Sydney and has been selected for the proposed Docklands/ Colonial Stadium in Melbourne.

### (b) Turf Modules

#### 2.52

This involves the use of 1.2m x 1.2m removable integrated turf modules on a drained concrete or tarmac base. Modules are placed by forklift and transported to and from the pitch, two high, in loads of 50, on an articulated truck. Some 200 truck trips are needed to transport the full complement of 10,000 modules which would be required to cover the 150 metre x 93 metre playing area at the National Stadium.

## **2.53**

This system was used successfully at the rebuilt Cardiff Arms Stadium in June 1999 when the pitch for the Wales -v- South Africa rugby match was installed in a short period using turf modules grown in an external nursery.

### **(c) Sliding Pitch**

## **2.54**

This involves sliding the entire playing area longitudinally under the south end stand to a location immediately outside the Stadium where the turf is not shaded by the Stadium. A sliding pitch has been installed at Arnhem, Holland and similar facilities are proposed at the Coventry City Stadium and at the FAI Arena in Dublin. All three stadia incorporate retractable roofs over soccer size pitches and because of the extent of shading generated by the sliding roof, require the installation of sliding pitches. A sliding pitch is extremely expensive in terms of its initial capital and operating cost.

### **Conclusion**

## **2.55**

The multiplicity of playing codes and the probability that no particular area of the grassed surface will be subjected to excessive wear, suggests the best solution for the National Stadium is option (a) being a natural turf pitch on a free draining base with a restricted amount of turf exchange, mainly internal, to ensure adequate grass growth for shaded areas.

## **2.56**

The ultimate objective is a sustainable pitch which does not require excessive renewal to maintain acceptable playing qualities under normal functioning of the Stadium. The final choice of turf system for the new National Stadium should not be made until well into the detailed design stage following completion of the audit on the Stadium micro climate.

## **2.57**

In determining the capital costs of laying the turf surface and the annual operating costs associated with the on-going maintenance and replacement of the turf, comparative analysis was undertaken with a number of UK and Irish Stadiums such that the cost estimates included in our figures in subsequent sections are in keeping with the costs associated with a best-in-class pitch.

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## **5. Stadium Lighting and Sound**

### **Stadium Flood Lighting**

## **2.58**

Flood lighting to suit both Standard and High Definition Television Broadcast will be provided to include:

- 2,000 lux at goal lines and 2,000 lux at mid pitch.
- Lighting to be located at an angle of 25° to 30° above the centre line of the pitch.
- Switching for three levels of illumination to suit practice game and television requirements will be provided.

### **Sound System**

## **2.59**

A complete computer controlled sound system serving the entire Stadium, including all public areas, offices, team facilities which can be zoned by seating section and level is to be provided. The system will also be suitable for crowd control.

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# **6. House Reduction / Down Sizing**

## **2.60**

Several options are available for reducing the look and feel of the Stadium from 80,000 to 60,000 or 40,000 spectators. The Stadium seating bowl has been sized so that a capacity of approximately 60,000 can be achieved by closing the upper deck at both ends and a capacity of approximately 40,000 by closing the upper deck all around. The methods of achieving this closing are discussed below.

### **Drop Curtains**

#### **2.61**

This is a simple method whereby a curtain is dropped from the structure above to conceal the unoccupied seats. The extent of the curtain can be adjusted to conceal part or all of the upper level. This is not likely to be suitable in Ireland because of wind conditions. A form of rigid curtain may be suitable which can be considered at the detailed design stage.

### **Seat Covering**

#### **2.62**

In this system, unoccupied seats are covered by tarpaulins. The space over the seats is still visible. This space may be used for advertising purposes which may cover the systems capital and operating costs. The costs involved are not significant in the overall context.

### **Lighting**

#### **2.63**

The zoning of lighting whereby unoccupied areas are left in darkness is an inexpensive option. Again, however, the openness of the unoccupied space is visible. There is no additional cost beyond the lighting installation.

### **Sound Attenuation**

#### **2.64**

In addition, the sound system can be utilised to make the sound more intimate, and to enhance the crowd's reaction to the event. This is achieved through the use of zoned speakers where crowd noise is fed back through the speakers located in the unoccupied areas. Again there is no additional cost.

#### **2.65**

All of these methods will be looked at in more detail at the detailed design stage. It is likely that a final solution will be a combination of seat covering, lighting and sound attenuation.

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# **7. Spectator Facilities**

## **Seating Bowl**

## 2.66

The design for the seating bowl is for 80,000 seats designed and built to the highest international standards. The general seating area has a capacity of 70,706 (29,702 in the lower bowl and 41,004 at the higher level). The seating configuration is:

- Self rising seats with back and arm rest.
- Sightline clearance will be a minimum of 90mm above the eye level of the spectator in the preceding row.
- Minimum thread depth of 840mm will be provided with the first row of seating being approximately 300mm below pitch level.
- The riser height will vary in 10mm increments from 210mm minimum to 470mm maximum, with the maximum slope of any deck being 300.
- Seat width will be a minimum of 540mm.
- Wheelchair seating will be provided at points throughout the Stadium.

These specifications are in line with international standards.

## Premium Seating

### 2.67

Premium seating for 8,200 spectators will be provided behind the general seating on the lower tier, along both sides of the playing field as follows:

- Seat width will be a minimum of 550mm, with a platform depth of 900mm.
- Seats will be accessed from a private separate seat concourse.
- Seats will be separated from the general seats in front by a 1200mm bulkhead, so maintaining sightlines.
- Seating area will be designed to accommodate in-seat food service.

## Corporate Boxes

### 2.68

96 corporate boxes, each with 12 seats, giving a capacity of 1152, will be provided. These will be located on a single level above the lower bowl and will be accessed by a private concourse. Each of the boxes will contain:

- 12 cushioned theatre style seats in front of the suite.
- Provision will be made for facilities such as interactive TV to be provided.
- An enclosed lounge area.
- Individually controlled air conditioning.
- Two closed circuit television, with house controlled power overrides.
- Suite controlled lighting with house overrides.
- Counter space for liquor and food setups including power.
- Lockable liquor storage area.

- Undercounter refrigerator.
- Private telephone line.
- Speakers (PA).
- Coat closet.
- Glass partition system to divide seating area from lounge area.
- Upscale finishes.
- A drinks bar behind the fixed seating.
- Ice storage unit.

The design of the boxes will accommodate the option of consolidation of more than one box into a single unit.

## **Party Suites**

### **2.69**

Four party suites will be provided. The party suites will accommodate up to 100 spectators and will be located on the corporate box level at the four corners of the bowl. Each party suite will contain the same features and those included in the corporate boxes (outlined above).

## **VIP Box**

### **2.70**

An area will be provided in the grandstand adjacent to the premium seat area for a VIP box which will have a capacity of 200 and will contain:

- Cushioned seats.
- Trophy presentation capabilities.
- Access to the premium seat concourse.
- Separate reception and dining suites, with associated facilities, for 200 people.

## **Viewing Standards**

### **2.71**

The provision of safe and comfortable seating within a Stadium requires spectators to enjoy good sightlines. The traditional response by spectators to bad sightlines is to stand up and lean forward in the hope of obtaining a better view.

### **2.72**

Ideally all spectators should be able to see over the head of the person seated in the row in front. This is often compromised by the relative stature of the persons involved. There is little advantage to be gained by staggering or off-setting alternate rows of seats for football where the action on the pitch ebbs and flows from end to end. The focal point for sightlines in football stadia is governed primarily by the locations where the important sequences occur.

### **2.73**

In gaelic games and association football, the primary focus of spectator interest is the goal mouth area with touchline activities of lesser importance. In the case of rugby union, the primary areas of interest are the try lines, the four corner flags and adjacent touchlines. These areas are the most difficult areas to provide good sightlines.

#### **2.74**

For stadia which will be used for a number of different codes of football, it is important that the sightlines be good for all codes. Where the pitches are of different width and the areas of greatest interests also different, some compromise on both will be necessary. The maximum pitch widths of the three major codes played in Ireland are :

Rugby Union : 70 metres

Association Football : 90 metres

Gaelic Games : 90 metres

The widths in general use for major matches in Ireland including internationals and All Ireland Finals are as follows :

Rugby Union : 70 metres

Association Football : 75 metres (International Matches)

Gaelic Games : 80 metres (Croke Park)

#### **2.75**

Therefore with a full width pitch of 90 metres (with good sightlines for Gaelic Football) spectators watching other codes will be at a distance from the touchlines of these narrower pitches. By adopting a width of 85 metres for Gaelic Football, a more balanced spectator environment with good sightlines can be achieved. The viewing standards adopted for the resulting 144 metres x 85 metres playing area are based on the following criteria:

- a. All seated spectators will have a clear unobstructed view of the pitch area;
- b. A minimum C value (C-value is defined as the extent to which you can see over the head of the person in the seat in front) of 90 mm will be provided at a point of focus based on the touchlines and goal lines of an area 150 metres x 88 metres except at the four corners where the minimum C-value may reduce to 60mm.
- c. Highball view for all spectators to a minimum height of 30 metres above the centre of the field of play.

#### **2.76**

The maximum rake adopted for the upper seating deck is 300. It should be noted that the design work undertaken to date has been as part of a feasibility study. It is expected that the viewing standards and distances will be improved by further development during the detailed design stage.

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## **8. Campus of Sporting Excellence**

#### **2.77**

In Section 9 of this report, the concept of a Campus of Sporting Excellence is discussed and various international models detailed. While this concept, proposed by the sporting organisations, has been briefly outlined, the study schedule has not allowed us to look in any detail at accommodation or facilities other than for the Stadium itself.

## 2.78

A site map for the location showing possible positioning of the National Stadium and other key components of the Campus of Sporting Excellence is provided in Section 1.

## 2.79

The site selected (see Section 3) allows for certain development of the layout of the Campus of Sporting Excellence. The access points to the site, combined with the physical features and historic structures, as well as the desire for the Stadium to be highly visible from public vantage points, have determined the approach taken in preparing the site Masterplan included in the Executive Summary.

## 2.80

The Stadium dominates the layout. Radical access lines link the Stadium to the various zones, reflected by the circular form to the parking corrals to the north, and circulation routes through the Campus leading to the main site entrance and public transport nodes at the southern end of the site.

## 2.81

The Campus, as proposed, would include several facilities, as follows:

Indoor Event Centre	A domed structure with seating capacity of 15,000 and facilities for athletics, including a running track, basketball, tennis, badminton, boxing and other indoor sports.
Multi-purpose Hall	A training area for gymnastics, judo and many other sporting activities.
Medical and Sports Science Facilities	A facility which could house the sciences of psychology, biochemistry, biomechanics and physiology as well as a physiotherapy department and a medical treatment area.
Indoor Tennis Facility	To include 6 indoor courts with associated facilities, and access to 12 outdoor all weather courts.
Outdoor Training Pitches	Pitches for gaelic, rugby and association football, with associated changing facilities.

## 2.82

Space is available for the development of other facilities and requirements, the brief for which should be considered as the overall project proceeds.