Netball NSW

Netball Central

Planning Application - Structure

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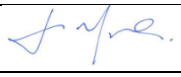
		Signature			
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Contents

1 Introduction

This report is written to accompany the Planning Application submission of Netball Central (the Project) to the Department of Planning and Sydney Olympic Park Authority.

The intent of this report is to describe the structural system intended for the Project.

The design and documentation of the building and associated works shall comply with all relevant Australian Standards and the Building Code of Australia. Standard Specifications or Codes of the British Standards Institute (BS) or the American Society for Testing and Materials (ASTM) are referenced only when a relevant Standards Australia publication does not exist. Current editions of all codes and standards shall apply.

2 General Description

Netball Central consists of a new state-of-the-art Netball Centre of Excellence for Netball NSW at Sydney Olympic Park.

From a structural perspective, the complex consists of 3 main components:

- Standard Courts Building – single storey building containing 5 sprung netball courts (40m x 130m approx).
- Show Court Building – single storey building containing an elite netball show court and seating for 800 spectators (40m x 40m approx).
- Hub Building – four storey building containing reception, Netball NSW administrative functions, hall of fame, change rooms, training facilities etc. (30 x 30 m approx)

The structural solution for each of these buildings has been developed with the rest of the design to suit the particular constraints and requirements of each building. The structural form of each building is described herein.

3 The Site

The site is located at the southern end of Olympic Boulevard at Sydney Olympic Park, immediately in front of the State Sports Centre. The site is bounded by Sarah Durack Avenue to the north, Olympic Boulevard to the east, State Sport Centre to the west and Shirley Strickland Avenue to the south.

The site generally falls from Sarah Durack Avenue towards the south-east. The surface of the site is covered with a mixture of concrete pavement, trees, grass, gardens and footpaths.

The site in approximately 80m wide and 130m long.

Geotechnical investigations have been completed for the site by Coffey in early 2012. The following reports have been referred to:

- Coffey Geotechnics, [Rev 1] 29 Feb 2012, Geotechnical Investigation, Netball Central, Sydney Olympic Park NSW, Prepared for Netball NSW
- Coffey Geotechnics, 6 March 2012, Preliminary Vibration Assessment, Netball Central, Sydney Olympic Park NSW, Prepared for Netball NSW

Previous information relating to the site that has also been taken into consideration:

- Douglas Partners, February 2007, Report on Geotechnical Investigation, Proposed Office Development – Site 13 Cnr Sarah Durack Ave & Olympic Boulevard Homebush, Project 44559, Prepared for AV Jennings Ltd
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- Douglas Partners, February 2007, Report on Phase 1 Contamination Assessment, State Sports Centre Development Site 13 Cnr Sarah Durack

Avenue and Olympic Boulevard Sydney Olympic Park, Project 44559A, Prepared for AV Jennings Ltd

- The existing State Sports Centre structural drawings show the weak and medium shale contours on that site.
- Information from the Tennis Centre geotechnical investigation (a previous Arup project located to the south of the site).

The contamination investigations for adjacent sites have identified contaminants in the fill and groundwater. Phase 1 contamination assessment has also been commissioned.

3.1 Geology and ground conditions

The 1:100,000 scale Sydney Geological Map indicates that the site is underlain by man-made fill overlying Ashfield Shale of the Wianamatta Group.

Geotechnical investigations indicate there is a variable thickness of uncontrolled fill that overlays horizontal layers of alluvium and residual soils, overlying shale bedrock. There is an increase in the thickness of fill from the southern car park boundary toward the northern extent of the site.

3.2 Adjacent Structures

3.2.1 State Sports Centre

The State Sports Centre is located immediately to the west of the Netball site. The structure consists of a reinforced concrete frame with a steel roof. The foundations consist of shallow foundations onto weak shale or piers into either weak or medium shale. The building is partially underground according to the existing drawings. Concrete retaining walls retain the ground where necessary.

4 The Structural Concept

4.1 Standard Courts Building

The Standard Courts Building is a single storey structure containing 5 standard netball courts. It is approximately 40m x 130m on plan.

4.1.1 Superstructure

The superstructure consists of Laminated Veneer Lumber (LVL) portal frames at equal centres spanning approximately 38.2 m (37m clear span) running East West. The LVL beams are 1200 mm deep x 180 mm wide. The apex of the portal is located approximately 3 m above the centreline of the eaves. The roofing consists of deep decking (Aramax or similar) spanning between portals without the need for purlins. Timber purlins provide restraint to the bottom flange of the portal beam for the uplift case. The metal deck roofing provides lateral restraint to the portal beam top flange.

4.1.2 Portal Frame Foundations

Subject to further detailed geotechnical investigation, the LVL Portal Frame foundations will consist of either:

- Shallow foundations (pad footings); or
- Single pile foundations.

4.1.3 Court Slabs

4.1.3.1 Ground Preparation

The existing ground material is deemed to be uncontrolled fill. Dynamic compaction of a 1.5-2m zone will be completed to make suitable for founding the Level 1 slab for the courts.

Court 5 to the south will be founded on new compacted fill. Preparation of the existing ground will not be required in this area.

4.1.3.2 Structure

The level 1 slab steps to follow the general slope of the site to the south (three steps of 900 mm each). Blockwork retaining walls will be required at the steps in the slab, with back fill used to bring the ground to the required level.

Level 1 slab will be a 150 mm thick ground bearing slab on approximately 250mm of appropriate sub grade (i.e. recycled concrete). Additional reinforcement or post tensioning will be required to avoid the need for joints in the court playing area.

4.1.4 Stability

Portal frame action provides stability in the short east/west direction. Bracing bays provide stability in the north/south direction.

4.2 Show Court Building

The Show Court Building is a single storey structure containing 1 standard netball court and seating for approximately 800 spectators. It is approximately 40m x 40m on plan.

4.2.1 Superstructure

The superstructure consists of Laminated Veneer Lumber (LVL) portal frames at equal centres spanning approximately 38.2 m (37m clear span) running East West. The LVL beams are 1200 mm deep x 180 mm wide. The apex of the portal is located approximately 3 m above the centreline of the eaves. The roofing consists of deep decking (Aramax or similar) spanning between portals without the need for purlins. Timber purlins provide restraint to the bottom flange of the portal beam for the uplift case. The metal deck roofing provides lateral restraint to the portal beam top flange.

4.2.2 Foundations

The foundations will consist of shallow pad foundations. If the depth of fill is too great to make this solution economical, then short piles/piers will be required.

4.2.3 Level 1 Slab (Slab on Grade)

4.2.3.1 Ground Preparation

The excavation of the Show Court area will leave relatively little fill below the bulk excavation levels and re-compaction of all fill is required.

4.2.3.2 Structure

The Level 1 slab is at RL 106.4 m which is below the existing ground level. Retaining walls will be required around the edges of the building.

The Level 1 slab will be a 150 mm thick ground bearing slab. Additional reinforcement or post tensioning will be required to avoid the need for joints in the court playing surface.

4.2.4 Stability

Portal frame action provides stability in the short east/west direction. Bracing bays provide stability in the north/south direction.

4.3 The Hub Building

The Hub is a four storey building containing reception, Netball NSW administrative functions, change rooms and training facilities etc.

4.3.1 Superstructure

The superstructure consists of a post-tensioned banded slabs with concrete columns. The roof of the building is concrete construction.

4.3.2 Foundations

The loads from the Hub building columns are much greater than the single storey buildings. Shallow foundations to rock are not possible and piles will be required. A group of 4 piles and pile cap will be required per column however further geotechnical investigations will be completed to rationalise this solution with the intent to achieve a single pile per column.

4.3.3 Level 1 Slab

Due to the conditions of the existing fill it is anticipated that the Level 1 slab will be a suspended structure.

Retaining walls may be required around the external edges of the building.

4.3.4 Stability

Stability will be provided by a combination of shear walls around the lift and frame action. The two main stairs in the building are open in nature and therefore will not contribute to the stability system.

4.4 Sustainability

Arup employ a number of strategies to provide more environmentally and sustainable structures. These strategies align with a number of the environmental objectives set out in SOPA's Environmental Guidelines 2008, namely materials selection and waste management in relation to the structural system for the project. A number of initiatives are discussed below.

4.4.1 Rating Tool

It is not proposed that the project will adopt a formal rating tool; however sustainable principles will be used to guide the design where possible.

4.4.2 General

In addition to the rating tool requirements discussed above, there are other ways of improving the sustainability of the structural materials used in the project. These can be summarised as:

4.4.3 Materials

- Use Local Materials: Minimise transportation, encourage local business, local workforce.
- Embodied Energy: Consider the whole life embodied energy when choosing between materials. During the next phase the embodied carbon of the structure will be calculated.
- Use Materials from managed sources: For example ensure that all timber used in formwork is from an FSC/AFCS accredited sources.
- Recycled Materials: There are a number of ways in which concrete can be made more sustainable by using recycled or secondary materials (i.e. those waste products from other processes)
    1. Use secondary aggregates: e.g. Blast furnace slag aggregate from Port Kembla.
    2. Use cement replacements: e.g. Ground Granulated Blast Furnace Slag (GGBS) or Pulverised Fuel Ash (PFA) instead of cement.
    3. Use recycled concrete aggregates: Recycle the concrete from the demolition of existing ground bearing slab on the site. Recycled concrete cannot typically be used for structural concrete but may be used for less critical applications such as road base etc.

- Reduce the quantity of materials used: Maximise the efficient use of materials - this will reduce the costs, waste, resource depletion and embodied energy.
- Pollution: Consider pollution produced at all stages in materials life e.g. production, in use, disposal/recycling.
- Minimise finishes and applied systems: Only use where really necessary. For example some areas do not have ceilings; this reduces finishes required but also activates the thermal mass of the structure for the cooling strategy of the building.
- Durability: Specifying more durable materials, with a longer design life is also a sustainable approach.

4.4.4 Minimise Waste

Prefabrication: Reduces waste and also reduces construction time with its associated noise, dust etc.

Waste Management on Site:

- Consider the available modules of materials: For example grids that match standard fabricated modules.
- Simplicity/Repetition on Site: Minimise waste and construction time

4.4.5 Flexibility

- Prolong the Active life of the building.
- Loading allowances that are appropriate/allow for flexibility
- Clear spans for future flexibility
- Columns and piles with capacity for additional loading
- Allowance for additional openings

4.4.6 Loading

Reduce the use of materials by ensuring that correct loading is used.

- Loading allowances that are appropriate/allow for flexibility. A lighter structure weighs less and will minimise foundations
- Ensure that loads are not over specified e.g. wind loading

4.4.7 Design for Reuse/Disassembly

This will principally apply to the single storey court buildings and any steelwork on the project. There are a number of ways in which reuse/recycling of the structure can be maximised:

- Use bolted connections so that the portal frames can be disassembled in the future to be either reused or recycled.
- Standardise connections where possible for ease of erection and disassembly.
- Retain as built drawing information.
- Permanently mark the elements with their grade and section size.

4.4.8 Specification

Incorporate sustainability principles as mentioned herein into the structural specifications.