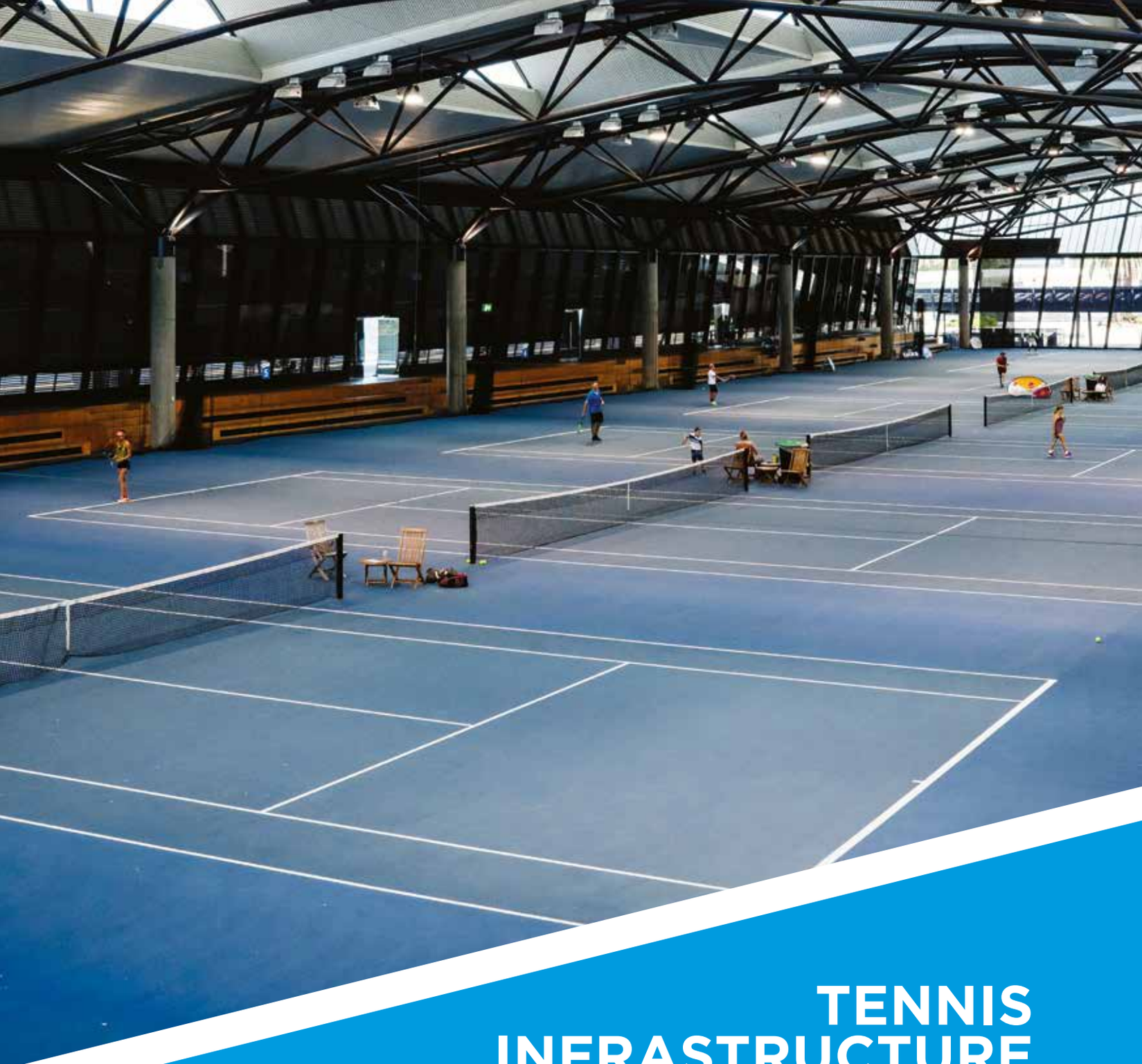
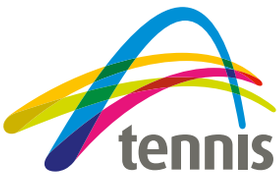


TENNIS INFRASTRUCTURE PLANNING

PLANNING, DESIGN
& DELIVERY RESOURCE

tennis



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CONTENTS

CONTENTS continued

SECTION 1
Introduction and context

SECTION 1
INTRODUCTION AND CONTEXT

1.1 INTRODUCTION AND CONTEXT

Tennis Australia's Tennis Infrastructure Planning Resource for Australian Tennis Venues provides industry planning and design considerations to support land owners, venue managers, clubs, coaches and design specialists to plan and deliver more sustainable tennis venues across Australia.

Why develop a resource?

The facility needs and operational expectations of modern tennis participants have evolved over time and are driving change in community facility needs and levels of provision. In recognition of this change, Tennis Australia has identified the need to provide consolidated facility development information to ensure tennis facilities are designed and built to meet modern participant and operational requirements. With ageing infrastructure nationally, diverse consumer needs and often limited resources, Tennis and its industry stakeholders must prioritise planning for the long-term sustainability of tennis which includes the delivery of accessible and welcoming community venues.

Tennis Australia's four pillars for successful venues Accessibility, Community Benefit, Sustainability and Accountability have guided the development of this Resource and aim to further assist in club and venue strategic planning opportunities.

About this Resource

The Resource consolidates tennis venue planning information and aligns it with Tennis Australia's strategic frameworks, principles and priorities to help deliver more welcoming, functional and sustainable tennis venues.

This Resource provides information and direction on typical tennis facility projects including:

- New facility developments
- Site planning and assessment
- Court design and development
- Court resurfacing and surface conversion
- ANZ Tennis Hot Shots courts
- Floodlight installation and retrofitting
- Fence upgrades and replacement
- Clubhouse design, refurbishment or extension
- Improving accessibility
- Environmental considerations.

How to use this Resource?

- The Resource is primarily targeted to individuals and organisations involved in the use, planning, design, funding and construction of community tennis venues, typically including:
- State and Territory Member Associations.
- Community tennis clubs, associations, venue operators and educational institutions.
- Local, State and Territory Government.
- Architects, planners, developers, designers and builders.

The Resource has been designed to educate, inform and guide tennis facility planning and development for existing facilities and new builds. The table below highlights how this Resource can help decision making about planning and delivering improved tennis infrastructure at club / venues.

SECTION 1
INTRODUCTION AND CONTEXT

TABLE 1.1.1
INDUSTRY ENGAGEMENT

Industry stakeholders	How the Resource could be used
Community tennis clubs, associations, venue operators and educational institutions	• Understand facility considerations at different venue levels • Understand the role of stakeholders in tennis project planning • Inform future tennis facility development opportunities • Inform funding proposals • Highlight considerations to plan and budget for tennis facility projects • Understand the key components of a successful tennis venue • Identify opportunities to improve venue sustainability
Local Government	• Inform local policy, strategy and municipal planning • Guide venue, site and master planning projects • Inform facility design and specification development • Highlight considerations for annual budget and capital works processes
State and Territory Government	• Identify opportunities for joint sport and community outcomes • Align funding opportunities with community facility needs • Assist in prioritising high need projects
State and Territory Member Associations	• Guide support provided to clubs and venue operators • Identify alignments between tennis and government priorities • Inform the provision of tennis specific facility requirements • Advise local stakeholders on budgeting considerations for projects
Architects, planners, developers, designers and builders	• Highlight Tennis Australia's objectives for venue provision • Understand tennis specific requirements • Inform project planning, budgeting and maintenance activities • Guide project planning and design outcomes • Inform technical design and project outcomes

Tips and helpful hints

Throughout the Resource references are made to highlight tips, key points for consideration and information sources. The following icons offer quick references to common challenges identified by Australian tennis stakeholders.

TIPS

Important information not to be missed. Reading the tips will help to quickly understand the critical elements of facility planning and design.

VALUE ADD

Important information to be considered should project site and budget allow. They are not essentials, but will add value to projects or venues.

NON-NEGOTIABLE

Key tennis infrastructure planning and design deliverables to which minimal standards must be met.

IMPORTANT INFORMATION

Identifies a link to existing Australian tennis or other industry information source relevant to the Resource.

Where, throughout this document, reference to Australian Standards are made, it is the responsibility of venue operators, owners, designers, suppliers and contractors to review and research current standards and industry guidelines before and during project stages, as they are subject to change.

SECTION 1
INTRODUCTION AND CONTEXT

Additional tennis resources

A full list of supporting documentation and industry contributors is provided in Section 4 – References and resources.

The Resource utilises relevant information from previous technical tennis guides and replaces existing Tennis Australia resources. The content also includes current, up-to-date information sourced from:

- International Tennis Federation
- Standards Australia

Resource assumptions

- The information and advice provided in this Resource is **provided as a guide only** and should not be treated as a substitute for professional advice.
- The International Tennis Federation (ITF), the governing body for tennis, is responsible for the determination of the Laws and Rules of Tennis. References to court and field of play requirements within the Resource are set by the ITF. Court specifications should ultimately be guided by ITF standards (www.itftennis.com). Additional references and recommendations relevant to the enhancement of tennis facilities in the Australia context may also be provided.
- Tennis venues and associated facilities that currently exist or have been constructed prior to the introduction of ITF standards or relevant sections of this Resource, **are not expected to be altered to meet current recommended requirements**. The introduction of new requirements and standards should be evaluated in-line with the needs of each individual venue, competition manager and land owner.
- Several components of tennis infrastructure planning are not covered within this Resource are outlined below.
- **Financial advice** – Specific financial information is not given due to the significant variances in site and location specific project costings and access to construction materials. However, case studies examples provide reference to specific cost information in context with each highlighted project.
- **Contractor advice** – Tennis Australia does not endorse specific contractors to conduct facility construction tasks. Stakeholders are encouraged to research locally completed projects and relevant contractors, as well as discussing with their State or Territory Member Association (MA).
- **Technical specifications** – As every site and project is different, the development of standard specifications that meet all applications is not possible. In many instances a range of solutions may be applied and should be evaluated using the documented planning processes identified. Where relevant, Australian Standards should be used to guide appropriate infrastructure standards and performance outcomes.
- **Management and tenure agreements** – Even though recognised as a critical component of successful venue delivery, this resource focuses on physical infrastructure guidance and does not provide management or tenure advice. For advice on those specific elements please contact your Member Association or Tennis Australia.

Legal disclaimer

- This Resource contains comments of a general nature only and is not intended to be relied upon as a substitute for professional advice. Tennis Australia Limited will not be responsible for any loss or damage suffered by any entity or person doing anything, or failing to do anything, as a result of any material in this Resource. Any opinions, findings, conclusions or recommendations expressed in this resource are guidelines only and should not be expressly relied upon.

SECTION 2

Project and site planning for tennis

SECTION 2
PROJECT AND SITE PLANNING

2.1 FACILITY PLANNING, DESIGN AND DELIVERY

A structured project planning process is essential to managing and delivering successful projects. It will assist in:

- Time management
- Highlighting potential issues or challenges (risk management)
- Allocating and prioritising resources
- Meeting budget constraints
- Stakeholder management
- Decision making for long term benefits
- Monitoring and evaluation of project outcomes.

Tennis Australia's seven stages of project planning and delivery guides the tennis facility planning process and is detailed in this section, including:

2.1.1 PROJECT PLANNING AND DELIVERY STAGES OVERVIEW

2.1.2 PROJECT PLANNING AND DELIVERY STAGES EXPLAINED

The level of project planning required will vary based on the type and scale of the project. For instance, replacing a set of net posts would not require a detailed feasibility study and engineered site drawings, however the project still needs to be scoped, planned, budgeted and delivered to achieve the desired result.

Following a planning process can be viewed as doing everything that can be conceivably thought of to minimise any surprises and risks associated with the project.

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations, venue operators and educational institutions
- Local Government
- State and Territory Government
- State and Territory Member Associations
- Architects, planners, developers, designers and builders.

Definitions

- **Accessibility** – the ability for a facility or venue to provide seamless movement between surrounding precincts to and within the venue or facility in a technically and functionally compliant manner for people with an accessibility need.
- **Architect** – Professional who designs buildings and in many cases supervises their construction.
- **Business Plan** – Written document that describes in detail how a tennis club / venue is going to achieve its goals. It should outline plans from an activity, marketing, financial and operational viewpoint.
- **Civil Engineer** – Professional engineering discipline that specialises in the design, construction, and maintenance of the physical and naturally built environment, including works such as court bases and drainage.
- **Concept Plan** – Plan prepared to scale by an Architect that shows an indicative tennis facility layout incorporating tennis courts, clubrooms, car parking, spectator and community facilities. This plan is generally sufficient for the purposes of establishing a high level preliminary budget for a proposed development.

SECTION 2
PROJECT AND SITE PLANNING

- **Defects liability period** – A set period of time after a construction project has been completed during which a contractor is required to return to the site to remedy defects. A typical defects liability period lasts for 12 months but may vary depending on type and scale of project.
- **Design Brief** – Document usually prepared by an Architect or Building Designer that presents a detailed description of the proposed accommodation elements, materials and finishes for the clubhouse. This document is sometimes included within the Project Brief or Accommodation Brief.
- **Feasibility Study** – An assessment of the practicality and financial viability of a proposed plan or development option.
- **Funding acquittal** – Provision of evidence at the completion of a project that demonstrates all requirements specified within a funding agreement have been completed. It is usually a formal documented process that requires invoices, payment receipts and photographs of completed projects.
- **Geotechnical Engineer** – Professional branch of civil engineering concerned with the behaviour of earth materials and the physical properties of soil and rock.
- **Member Association (MA)** – State or Territory peak body affiliated with Tennis Australia (TA) responsible for the administration and governance of Tennis (e.g. Tennis Victoria).
- **Master Plan** – A comprehensive document that clearly articulates a full plan of action for a particular site or venue, inclusive of concept design, priorities for delivery and identification of resources required to deliver.
- **National Court Rebate (NCR)** - Tennis Australia's facility funding program assisting affiliated venues, local councils and schools to create positive environments for the long term success of tennis in Australia.
- **Operational Health Check (OHC)** – Tennis Australia's annual national survey of tennis facility operations assessing venue management, usage and sustainability.
- **Planning Authorities** – Public Authority whose duty it is to carry out specific planning functions for a particular area (e.g. Local Council) and issue planning and other related permits where required.
- **Planning Consultants** – Professionals that offer a wide range of advice on all matters concerned with planning, development and environmental issues which surround a site or facility planning project.
- **Project brief** – Also commonly referred to as a scope of works, the project brief is the process of defining the requirements of the facility project. The project brief is the key document upon which the design will be based.
- **Project Manager** – A suitably qualified expert who is engaged by a Client to oversee the design and / or the construction phases of a project.
- **Project Plan** – A formal, approved document used to guide both project execution and project control. The plan should be agreed and approved by the Project Manager, project team and all key stakeholders.
- **Structural Engineer** – Professional branch of civil engineering that deals primarily with the design and construction of structures (i.e. buildings, fences, floodlighting).
- **Specification** – Specifications are an exact statement of the particular needs to be satisfied, or essential characteristics that the client requires from its project and which the Contractor must deliver. It can include specific materials, methods, processes, services, systems or outcomes.
- **Universal Design** – to create a sustainable design that reflects the ability for the community to fully participate in the venues and facilities

KEY HIGHLIGHTS

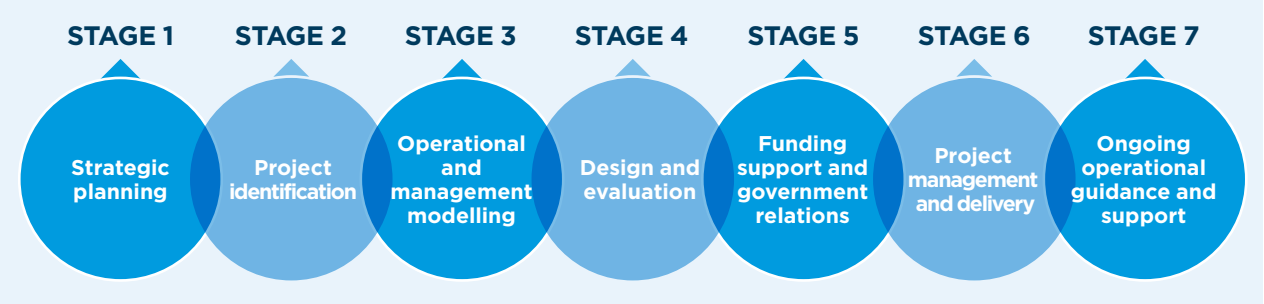
What you need to know

- No two sites or facilities are the same, so individual project and site planning is essential.
- Follow Tennis Australia's seven stages of project planning and delivery for projects of all scales.
- Many stages of the planning and delivery process can be informed by completing TA's venue Operational Health Check (OHC). This will also enable specific project outcomes to be measured.
- If undertaking a major project, design is likely to change several times. Ensure that design reviews are built into the project budget to avoid any surprises.
- Engage technical and / or planning consultants where needed – they will be a cost to the project but can save considerable time and resources throughout the planning and subsequent project delivery phases.
- Identify what the project can deliver beyond the benefits for the club or venue – funding partners will be looking for projects that stand out.
- Consider what disruptions may occur at venues during the construction phase and plan for alternatives to ensure service and activity continuity.
- Having a qualified or technical opinion (relevant to the project) on the completed works is strongly recommended. If this is not undertaken on completion, it can be difficult to rectify issues and non-compliances later if outside the documented defects liability period.

2.1.1 PROJECT PLANNING AND DELIVERY STAGES OVERVIEW

Tennis Australia has adopted a seven stage project planning process, as shown in **Figure 2.1.1** and defined in **Table 2.1.1.**

Figure 2.1.1
Tennis Australia's 7 stages of project planning and delivery



SECTION 2
PROJECT AND SITE PLANNING

Table 2.1.1
Tennis Australia's 7 stages of project planning and delivery

The following table identifies Tennis Australia's seven stages of project planning and delivery and key stakeholders involved at each step.

Project Stage	Description	Key Stakeholders To Be Involved
Stage 1 Strategic planning	• Project has been identified in a local council, Member Association or within Member Association, state sport and recreation plan/s • Stakeholder consultation has taken place to identify community needs beyond tennis • Site has been earmarked as part of a master plan or evaluation study for future site development • Project need is supported in the club / operator Business Plan and / or Operational Health Check (OHC)	• Land owner(s) • Local Government / Council • Club / venue operators • Coach(es) • Local community / site and venue users • Planning consultants • State or Territory Member Association and Tennis Australia
Stage 2 Project identification	• Gaps in existing provision have been identified and improvement works prioritised • Project evaluation / options assessment to address project need have been scoped (e.g. renewal vs redevelopment) including new opportunities • Capacity of the site has been assessed (e.g. technical investigations conducted) and key stakeholder support obtained for project progression • Project Plan is documented and key outcomes established including how will they be achieved • Project sponsor / coordinator from the club or venue is identified to work in conjunction with a Project Working Group (PWG) that consists of key stakeholders listed adjacent • Feasibility, Business case or Options Assessment to be undertaken.	• Land owner(s) • Local Government / Council • Club / venue operators • Coach(es) • Geotechnical Engineer • Local community / site and venue users • Technical / Planning consultants • State or Territory Member Association and Tennis Australia

Table 2.1.1 cont.

Project Stage	Description	Key Stakeholders To Be Involved
Stage 3 Operational and management modelling	• Service change initiatives that will result from the project are identified • Venue management and operations have been reviewed, including potential impacts of the project • For new infrastructure, venue management and operations have been identified • Proposed operational and management changes are outlined and relevant stakeholders have been consulted • Benchmarking has taken place to understand baseline venue operational data through an Operational Health Check (OHC).	• Land owners • Local Government / Council • Club / venue operators • Coach(es) • Local community / site and venue users • State or Territory Member Association and Tennis Australia
Stage 4 Design, documentation and budgeting	• Estimated budget has been outlined, ascertaining what is affordable to deliver and then maintain • All tennis and other multi-use / community requirements are factored into the design of the project • Design and technical professionals or contractors have been engaged • Design brief, initial concept plans and technical specifications have been prepared and reviewed by stakeholders • Project Manager sourced and appointed for project delivery • Planning, building and funding approvals and permits obtained.	• Land owners (local government) • Planning Authorities • State or Territory Member Association and Tennis Australia • Civil / Structural / electrical engineer • Court builder • Project Manager • Architect / designer • Land Surveyor • Quantity Surveyor • Planning Authorities

SECTION 2
PROJECT AND SITE PLANNING

Project Stage	Description	Key Stakeholders To Be Involved
Stage 5 Funding support and government relations	• Potential project and funding partners and sources are identified and confirmed • Further consultation has taken place with local or state-territory government and project support and delivery agreed • Funding partner requirements are factored into potential changes to the project • State / Territory Member Association is kept informed and consulted throughout the project.	• Land owners • Local Government / Council • State Government • State or Territory Member Association • Tennis Australia via National Court Rebate Program • Project Manager • Club / venue operators • Local community / site and venue users • Local businesses / private sector • Philanthropic sector
Stage 6 Project management and delivery	• Competitive contractor procurement process has been undertaken based on agreed project brief and technical specification • Project budget is finalised and contractors appointed • Clear timeframes, roles/ responsibilities and deliverables agreed upon • Construction process is complete, project hand-over and commissioning is finalised.	• Local Government • Club / venue operators • Project Manager • Contractors / Industry suppliers • State or Territory Member Association and Tennis Australia • Design consultants

Table 2.1.1 cont.

Project Stage	Description	Key Stakeholders To Be Involved
Stage 7 Ongoing operational guidance and support	• Completion of the project is promoted and the new access or service levels available • Funding acquittals are finalised and defects liability period is monitored • Operational responsibilities are allocated, maintenance budgets are implemented and sinking fund established • Management, maintenance and operational outcomes are monitored and reported annually via OHC benchmarking	• Club / venue operators • Coach(es) • Local community / site and venue users • Project funding partners • State or Territory Member Association and Tennis Australia

Before starting infrastructure projects, seek the services of a professional / engineer to clearly identify site infrastructure issues, key triggers and potential solutions (e.g. new / replacement vs retrofit / repair). For recommendations on sourcing a suitable and credible contractor contact the State or Territory Member Association and Tennis Australia.

Once infrastructure issues have been identified consult the local government authority to discuss project requirements.

Being able to deliver not only tennis but broader community objectivesand strategies is likely to be viewed more favourably by local government.

2.2.1 PROJECT PLANNING AND DELIVERY STAGES EXPLAINED

Stage 1 Strategic planning

Strategic planning involves a number of important stakeholders, including State or Territory Member Association (MA) staff and specialist facility (Places to Play) and participation teams. Before proceeding too far into identifying and defining the project, contact the MA to discuss facility ideas and needs. MA's will be able to guide through the facility planning process, identify strategic opportunities and advise on critical project considerations that you may not be aware of.

Local council and/or associated land owner(s) must also be engaged and involved in the project from the beginning. Discussing facility ideas, project scope, specialist report requirements and seeking approval from the local council and/or land owner(s) will be required. Undertaking this in collaboration with the MA is a positive approach to project and strategic

planning. Being able to deliver not only tennis but broader community objectives and strategies is likely to be viewed more favourably by local government.

Early consultation can help to avoid potential project delays, costly errors and ensure that projects meet all statutory requirements and planning approval processes. It may also open up additional opportunities and potential funding avenues that have not been considered.

FOR LOCAL GOVERNMENT:

Tennis Australia has developed a facility and participation planning template to assist local government and State and Territory Member Associations to work together to plan for tennis. For an up-to-date copy of the template, contact your State or Territory Member Association.

Stage 2
Project identification

Careful planning of the project is critical to achieving success and will require a focus on understanding the capacity and suitability of the site and / or existing facilities to accommodate further enhancement or rectification.

No two sites or facilities are the same, so individual project planning is essential.

Project identification needs to clearly define the project, what it's likely to cost, how it will be used and by who, and what club, venue, tennis and community needs will be met as a result.

During this phase it is important to identify what the project is trying to achieve by understanding the needs of the project and how they will be addressed. Once determined, evidence should be provided to funding partners. The Operational Health Check (OHC) tool and Business Plans great examples to achieve this, in addition to presenting documented records such as maintenance plans and usage reports. This is commonly referred to as testing the feasibility of a project. The primary purpose of testing project feasibility is to enable an objective decision regarding the longer-term viability of your proposal.

The key elements of feasibility, business case or assessment include:

- Identification of club / centre, member and user aspirations
- Schedule of existing court and facility usage
- Identification of any national or local trends that may influence facility development
- Consultation with your community and people outside the club / centre and ask what they wish to see provided and why
- Review of existing on and off-court facilities and services provided
- Evaluation of current court and facility maintenance practices
- Assessment of other local clubs or similar facilities to identify competitors and/or gaps in the market
- Identify potential funding sources and partners and any specific requirements they have
- How the project outcomes can align to local, state and national sport and recreation objectives
- Potential costing of construction and delivery
- Options assessment (if applicable).

Many of these elements can be identified by completing a Tennis Australia Operational Health Check (OHC) survey.

Stage 3
Operational and management modelling

Stakeholder engagement is an important element of this stage. Consultation with existing users, potential users, coaches and neighbouring residents should be considered and undertaken to inform project needs and operational outcomes.

At this stage, site usage and future service needs and opportunities should also be identified, tested and assessed against stakeholder objectives. Any potential changes to how the venue will be managed or operated should be identified.

If the project is likely to have a significant impact on site or facility operations, for example adding additional courts, building new social facilities or installing floodlighting for the first time, consideration of additional resources is required to manage and operate the venue. This may include financial or human resources.

A management and operations plan, including projected facility operating costs, governance structure and day-to-day management responsibilities should be considered and identify key partners to assist in project support, resourcing, delivery, future use and management.

Operational and management modelling is best underpinned by a venue business plan.

In identifying club and venue operational and business planning requirements, affiliated venues can access Tennis Australia's Operational Health Check tool via www.tennis.com.au/clubs/venue-management

Stage 4
Design, documentation and budgeting

If planning has progressed to this stage, there should now be a clear picture of the project.

There could be many ways of meeting project goals and it is recommended to explore all these options at this stage. Be prepared to be flexible to ensure the project can move to the next stage and attract the required funding.

For complex projects or where more expertise is required in evaluating or researching options, consider appointing a professional Project Manager (Refer to the Project Management and Procurement section for more information).

Some clubs may have capacity to appoint a member / volunteer as a project manager to save on project management costs. Depending on the scale of the project and the qualifications of the club member / volunteer, this may suffice. However, it is recommended that a professional / experienced project manager is appointed for large or complex infrastructure projects to reduce the liability of the club.

When assessing whether affordability of an infrastructure project, cost of maintenance is factored. Considering the cost of maintenance early will ensure facilities are kept and presented in the best possible condition.

SECTION 2
PROJECT AND SITE PLANNING

When considering the project design and development options, ensure the following tasks are completed, appropriate to the scale of the project:

- Define key objectives and outcomes
- A professional technical analysis of existing facilities and/or the proposed new site or location
- Concept plans and options to achieve the desired outcomes
- Project development and facility life cycle costs
- Impact of the project on the local environment
- Project budget and financial parameters
- Specialist consultant inputs.

At this stage, design consultants, engineers and / or architects should be engaged to assist the delivery of the above tasks. While this will be a cost to the project, the skills and expertise provided will assist in identifying the best long-term and cost effective solutions for the project. For some projects, such as clubhouse building projects or new court developments, professional designs or technical drawings will be required to secure local council or planning authority approvals (refer to **Sections 2.2 Site Assessment and 2.3 Site Planning).**

If the project is a minor project, discuss ideas and potential options with a range of qualified contractors or suppliers (refer to **Section 2.4 Project Management and Procurement).**

Following the testing of the project options, consult with the project stakeholders and design consultants in order to refine project objectives, prepare a design brief and start the design and development process. This process is often referred to as defining the project scope or preparation of a technical specification.

Project budget will need to be defined at this point as more information is obtained on potential costs and specific design elements. The project budget should also consider any additional management costs, maintenance costs and replacement costs that will result from the delivery of the project. These costs are often referred to as project life cycle costs or whole of life costs, in that they consider the true and full cost of implementation, ownership (management and maintenance) and replacement.

Consideration of these costs can have a significant impact on the project decision making and on the long-term sustainability of your venue *(refer to Financial Management section for more information).*

If undertaking a major project, design is likely to change several times. Ensure that design reviews are built into the project budget to avoid any surprises that may impact on capacity to deliver desired outcomes.

Stage 5
Funding support and government relations

This stage is focused on stakeholder and partnership consultation. State / Territory Member Associations and local government partners should be aware of the project by this stage and they will be able to assist in discussing and presenting project benefits to other potential funding partners.

Often tennis and local government funding is required to be committed in order to attract other partnership investment.

Once partner objectives and priorities are identified, they will need to link to project delivery outcomes. The positive impact the project will have on your venue, its current users and potential future users will be extremely important to communicate. As funding programs change regularly, it is important to stay aware of current opportunities and their requirements. This may also require changes to the project, its design and budget.

Identify what the project can deliver beyond benefits for the club or venue. Funding partners will be looking for projects that stand out in a very competitive funding environment. When engaging with stakeholders be sure to present all the features of the project to show why it is deserving of investment.

Stage 6
Project management and delivery

Once the project scope is defined, budget confirmed and investment secured, project contractors will need to be sourced.

Securing quotations or tender responses for works should be based on the agreed design and scope of works identified in previous stages to ensure fair comparison of quotes, prices and assumptions. Preferred contractor procurement methods will be influenced by the scale of project. Budget is likely to change again at this stage and will be based around contractor prices.

Appointing contractors can be a challenging process. At this stage, clubs may have appointed or determine that a Project Manager will assist in this process (Refer to **Section 2.14 Project management and procurement** for further details, roles and benefits of using a Project Manager).

Local councils often work directly on projects to support with identifying and appointing contractors and provide assistance to manage their work and adherence to the project scope or specification through the construction process.

During the construction phase there will likely be impacts on existing users, including changes to the way the venue is accessed and displacement of regular programs. Consider what disruptions may occur at the venue and plan for an alternative. Ensure that impacts and disruptions are communicated to users well in advance to help manage expectations.

When directly managing projects or on behalf of a club or venue, be sure to visit the site regularly to monitor progress. Ask the contractors questions if unsure of the process being undertaken or if the project is taking longer than anticipated. Weather conditions can have significant impacts on construction processes and may impact project timing. If this is the case, ensure that venue users are effectively communicated with to minimise displacement or inconvenience.

Stage 7
Ongoing operations

When finalising projects the focus will move towards future operations of the new or improved facility. Prior to this, a formal hand-over of the completed project from the contractor or Project Manager is required.

A project completion hand-over is the process by which control is taken back of the venue in its new or improved state, and commission any new or additional venue features to ensure they operate as specified and meet expectations.

For some project types, a formal sign-off process with the local council, service provider or relevant planning authority is required. Ensure the contractor allows time for this process and makes the necessary arrangements to avoid unnecessary delays in accessing the facility.

Having a qualified or technical opinion (relevant to the project) on the completed works is strongly recommended. If this is not undertaken on completion, it can be difficult to rectify issues and non-compliances later.

Communicate the completion of the project to all stakeholders and complete any necessary paperwork and funding acquittals.

Obtain all available warranties from contractors and suppliers for future use if required. These may be needed from time-to-time and are very useful when trying to identify equipment, parts or product models as part of possible future projects or repairs.

Remember to thank and acknowledge all project supporters and funding partners and invite them to the launch or opening of the new or improved facility. Recognition will go a long way in maintaining their support.

As Built drawings are a revised set of drawings submitted by a contractor upon completion of a project or a particular job. They reflect all changes made in the specifications and working drawings during the construction process and show the exact dimensions, geometry and location of all elements of the work completed under the contract.

Don't forget to continue to budget and account for ongoing management, maintenance, renewal and replacement costs to the benefits of the improved facility are maximised into the future. The establishment of a sinking fund or bank account to collect money for future venue renewal and replacement is essential for projects such as court resurfacing or floodlight replacement.

ADDITIONAL RESOURCES

Sustainable management and venue operations are essential for the long-term success of all tennis organisations and venues. Tennis Australia, in collaboration with State and Territory Member Associations, provide support to affiliates on venue sustainability. This includes management modelling, occupancy agreements/lease reviews, facility development and asset renewal.

Two resources provided by Tennis Australia that embody key components of venue sustainability are the **Operational Health Check and Business Plan Template.**

By adopting both of these tools as part of the annual planning and review process, organisations are strategically positioned to optimise performance while demonstrating accountability to internal and external stakeholders (e.g. Committee or board members, Local Council).

Evidence-based planning and reporting is instrumental to long-term venue viability and decision making. Adopting these resources also facilitates alignment with Tennis' four pillars of successful tennis venues of **accessibility, community benefit, sustainability and accountability.**

More information on the Operational Health Check and Business Plan Template can be found at www.tennis.com.au/clubs/venue-management

SECTION 2
PROJECT AND SITE PLANNING

2.2 SITE PLANNING

Site planning is an important part of project planning. Regardless of the project type (e.g. new facility, redevelopment or retrofit) the primary tennis facility planning and design elements for consideration remain the same:

1. **The area and physical constraints of the site**
2. **The proposed future management and operating model for the facility**
3. **Need and objectives of the project**

The above elements should be considered throughout the site planning process to ensure project outcomes deliver a functional and flexible facility layout.

Site planning should involve detailed stakeholder consultation to ensure potential issues, constraints, requirements and priorities are discussed with those that use the facility most regularly.

This section provides information to assist with the site planning process and includes a generic site plan illustrating how a typical tennis facility layout should be presented, where site conditions permit.

Key topics covered in this section include the following, with an overall focus on information that demonstrates the best use of Greenfield and existing sites:

2.2.1 **Planning schemes, controls and guidelines**

2.2.2 **The project brief**

2.2.3 **Site planning process**

2.2.4 **Planning considerations.**

Primary audience

This section has primarily been designed for:

- Local Government
- Architects, planners, developers, designers and builders.

KEY HIGHLIGHTS

What you need to know

- Contact your local council and other relevant planning authorities to seek information on planning requirements, guidelines and controls.
- Identify land ownership and zoning implications by undertaking a Land Title Search and discussion with a Planning Officer at the local council.
- Prepare a Concept Site Plan that can be used as a basis for the preparation of a feasibility, options assessment or cost plan.
- Confirm existing site conditions.
- Establish a site selection criteria to help evaluate the potential benefits and opportunities associated with each site or development option.
- Identify all key stakeholders and determine needs via a Project Brief that considers the way the facility is to be used, managed and operated.
- Engage planning professionals as required to assist in developing the site and facility plans. This is likely to be a Planning Authority requirement if planning or building permits are needed.
- Prepare a Concept Site Plan that can be used as a basis for the preparation of a feasibility, options assessment or cost plan.

Definitions

- **Accommodation brief / design brief** – Detailed document generally prepared by an architect / building designer that expands upon a project brief and outlines the specific space and area requirements for the design of a building.
- **Concept plan** – Plan prepared to scale by an Architect or Building Designer that shows an indicative tennis facility layout incorporating tennis courts, clubrooms, car parking, spectator and community facilities etc. This plan is generally sufficient for the purposes of establishing a high level preliminary budget estimate for a proposed development.
- **Court modules** – Tennis courts that are grouped and fenced together generally in two, three or four court groupings. Modules are dependent upon available site area and the proposed facility use and management model.
- **Feature survey** – Identification of land areas and location of obstacles with the collection of data and information on ground levels, site topography and site contours.
- **Greenfield site** – A clear site that has not previously been developed.
- **Land Title** – Legal document confirming land ownership and dimensional details of a land parcel.
- **Passive solar design elements** – Provision of architectural design elements to a clubhouse to reduce solar heat gain through the building fabric .
- **Planning scheme / development control plan** – Statutory document which sets out objectives, policies and provisions for the use, development and protection of land.
- **Planning zones** – This term refers to the areas within a municipality and are shown in a councils planning scheme / development control plan. It indicates the types of development that are permissible / compliant and those which are not. Permissions change based on the zoning applied to each individual land parcel.
- **Project brief** – Document generally prepared by the Client / Architect or Building Designer in conjunction with key project stakeholders (e.g. club committee, venue managers, project manager, local council) that summarises the key elements of the project and which forms the basis for developing a site concept plan and facility design.
- **Site survey** – Inspection of the site to gather information for a design or an estimate of cost to complete the initial tasks required for a tennis facility design concept. The site survey can determine precise location, access, best orientation for the site and the location of obstacles, services or other potential site constraints.
- **Surveyor** – Professional consultant able to prepare a site survey of Greenfield and existing tennis facility sites prior to the commencement of any concept site planning or design work.
- **Tennis facility planner** – Professional consultant that has specific experience and expertise in the planning and design of tennis facilities.
- **Topography** – The topography of a site describes the site's characteristics such as its existing levels, any existing buildings, location of trees and other site features.
- **Universal Design Principles** – Set of 7 principles that guide the design and operation of a venue or facility that enables full participation by all people.

2.2.1 STANDARDS, PLANNING SCHEMES, CONTROLS AND GUIDELINES

The key planning guideline that determines whether a proposed tennis facility is suitable for its nominated site is called a Local Council Planning Scheme or Local Council Development Control Plan. They also outline the required planning and design criteria of local areas and individual sites to achieve compliance with nominated planning conditions and controls.

Planning schemes and development control guidelines are referred to differently in each State and Territory. As such, they should be thoroughly checked with your local council before commencing your site planning.

Planning schemes relevant to your State or Territory are available online and should contain the necessary information to guide the site planning process, including information on:

- Zoning provisions and permissible uses.
- Building / clubhouse setback dimensions from site boundaries.
- Maximum building heights.
- Building form and material guidelines.
- Required car parking numbers for the size of the facility.
- Environmentally Sustainable Design principles such as stormwater detention.
- Pole height controls and operating times of outdoor sports floodlighting.
- Light pole height controls and operating times of outdoor sports floodlighting.
- Planning overlays and controls such as heritage, environment, flooding.

Refer to **Section 2.3 Site Assessment** for more information and references to Planning Authority controls.

Contact the local council or seek independent assistance from a Planning Consultant to confirm any zoning or planning constraints before undertaking any concept site planning for tennis facilities.

2.2.2
THE PROJECT BRIEF

A comprehensive Project Brief is vital to ensuring that all physical and operational facets of a project are defined early in the site planning process. This approach applies to Greenfield sites as well as reviewing the redevelopment potential of an existing site.

The Project Brief should be driven and structured primarily by the key purpose of the facility and its proposed management model. This varies from venue to venue and should be refined through consultation with the relevant Member Association, local council, facility users, club committee and venue operators.

Key elements to be considered within the Project Brief include:

- Number of courts and court surface types for the site – this could include an increase, a decrease, change in surface or a change in size (e.g. to provide ANZ Tennis Hot Shots courts).
- Size and level of amenities to be provided within the clubhouse to support the proposed management model and operational / activity mix.
- Reference to any specific requirements and recommendations of key stakeholders (e.g. Tennis Australia, State / Territory Member Association, club committee, venue operator / management and local council).
- Programming to be delivered at the venue and any specific amenities and requirements that are needed / or required to support such activities (e.g. ANZ Tennis Hot Shots courts, courts in specific modules to support coaching, access for all abilities).
- Need for event overlays or temporary amenities such as grandstand seating, spectator hospitality, medical facilities, overflow car parking.

The Project Brief is an opportunity to carefully consider facility needs required to meet the project objectives. The more definition provided in the project brief, the more informed designers and technical partners can be in their design solutions and ultimately the costs associated with the project.

Figure 2.2.2 Provides an example of a tennis venue with temporary event overlay and amenity provision.

Figure 2.2.2 Temporary event overlay example

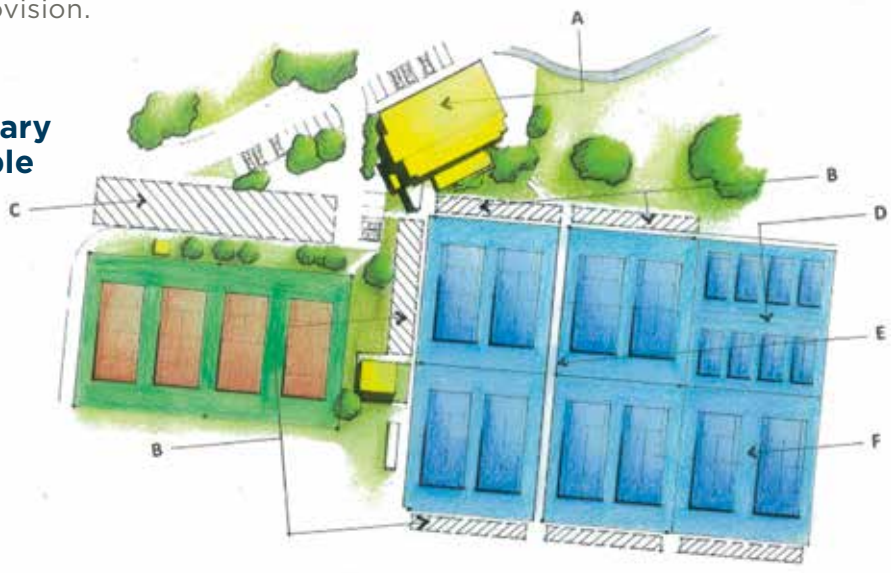


TABLE 2.2.1
Event overlay Reference

Reference	Event overlay consideration
A	Existing clubhouse amenities e.g. medical / first aid room, tournament office etc.
B	Temporary spectator grandstand zones
C	Carpark expansion area
D	Dedicated ANZ Tennis Hot Shots courts for specific events
E	Site circulation between court modules (where possible) to improve spectator viewing and movements in event mode
F	Dedicated practice courts in event mode

2.2.3 SITE PLANNING PROCESS

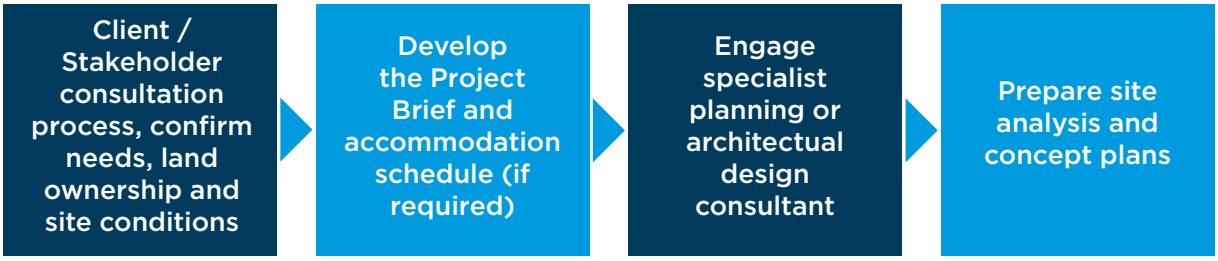
The site planning process requires the integration of many elements and variables and should be undertaken in collaboration with an experienced tennis facility architect, designer or planner. State and Territory Member Associations can assist to identify an appropriate expert for respective projects.

The following key elements should be considered as part of any early site planning phase. These considerations should be read and implemented in conjunction with the information presented in the Site Assessment section.

- Identify the key stakeholders for the project both internal (e.g. club members) and external (e.g. local council).
- Prepare the Project Brief and / or a detailed Accommodation Brief (refer to definitions) to establish a framework for the preparation of concept designs.
- Confirm land ownership details and the land area available for development from the Land Title. This document is available on-line from your relevant State or Territory Land Title's Office.
- Identify existing site conditions and topography by way of a site survey and / or feature survey. This process should be undertaken by a qualified Surveyor (refer to definitions).
- If undertaking a redevelopment of an existing site, source as many documents such as existing building plans, services and ground / soil condition reports etc. to provide to consultants, contractors and for inclusion / reference within the Project Brief.

The site planning process should follow the theme of the Project Brief and be driven by the way the facility is to be used, managed and operated. This is fundamental to creating a successful facility design outcome.

Figure 2.2.3
Site planning flow chart



The following site planning details, considerations and guidance should be read in conjunction with the example Site Plan provided. The Site Plan provides a visual representation of how the processes and considerations outlined can be successfully implemented.

Site gradients and crossfalls are critical at this point to ensure the site does not present significant pathway linkage issues.

Site planning examples

Figure 2.2.4 Draft concept site plan is a typical example of a draft concept used in the planning phase for stakeholder review and comment. Concept options are often prepared in sketch format to show potential relationships between amenities and activity areas and are likely to undergo a number of versions before arriving at a preferred site plan.

Figure 2.2.4
Draft concept site plan (sketch)

Concept Site Plans can also be in digital format.

Figure 2.2.5
Draft concept site plan (digital)

Is a representation only of a typical tennis facility showing both 2 and 3 court module layouts highlighting site circulation and a centrally located clubhouse with easy and direct access to car parking and roadway. These planning principles reflect a functional and operationally efficient layout which remains consistent for most tennis venues regardless of size. Potential for temporary infrastructure (e.g. grandstand for events) are subject to site specific capabilities.

Figure 2.2.5 Draft concept site plan (digital)

Table 2.2.2
Site planning reference

Reference	Event overlay consideration
A	Site area and expansion
B	Site access and car parking
C	Accessibility / site circulation
D	Court numbers, preferred layout and orientation
E	Clubhouse location
F	Multi-purpose clubhouse design / community hub
G	Additional amenity considerations

A
Site area and expansion

Site planning should incorporate as much flexibility into the concept design as possible for potential future expansion and event considerations by way of:

- An area allowance for court expansion to satisfy future projected needs for club or competition play
- An expansion plan for off-court clubhouse amenities to meet future facility requirements.
- Consideration of overlay zones for the provision of temporary grandstands adjacent show courts and selected main courts adjacent the clubhouse to accommodate greater numbers of spectators during event mode.

Each site provides its own unique opportunities for design, layout and potential expansion. As a guide, the following table provides an estimate of the land area requirements to develop a facility that includes court enclosures, spectator areas, clubhouses and car parking.

Table 2.2.3
Land estimates

NO. OF COURTS	Estimated land area required for court enclosures and perimeter pathways only	Estimated total land area required for full site development allowing for court expansion
2	1300m² / 0.13ha	3200m² / 0.32ha
4	2500m² / 0.25ha	8000m² / 0.80ha
6	3800m² / 0.38ha	12000m² / 1.20ha
8	5100m² / 0.51ha	15000m² / 1.50ha
12	7600m² / 0.76ha	22000m² / 2.20ha
16	10200m² / 1.02ha	32000m² / 3.20ha

B
Site access and car parking

Providing safe, easy and adequate car parking is important to ensure a comfortable and safe venue experience for all facility users.

Key considerations include:

- Car parking as close to the clubhouse entrance or walkway as possible for ease of access
- Dedicated accessible spaces (some local councils may also specify additional requirements)
- Secure, clear and well-lit point of entry to the clubhouse to increase security measures, particularly for evening or after hours use.
- Establish that the primary pathway and entry to the site and facilities is accessible

As a guide, seek to provide a minimum of four car parking spaces per tennis court and consider access to shared or overflow car parking to cater for peak times and event use.

C
Accessibility / site circulation

Accessibility for all patrons within and around a venue is a critical part of the site planning and building design process. Early consideration must be given to the process of both ambulant and accessible pedestrian entry from a carpark or roadway to the main facility entry point and must extend to pathway widths around the site and between courts.

Minimal walkway widths will depend on available land area, however it is recommended that a minimum of 2.5m is allowed between court modules to ensure universal access. This typically allows for a seat in addition to a comfortable clearance either side for travel either side of a seated spectator. When possible, larger walkways should be considered to maximise viewing space and access.

Other minimum circulation / design widths for site and accessibility planning include:

- Verandah widths incorporating seating – minimum 3.00m wide (dependent upon the site, design of the tennis facility, distance from a tennis court fence and how the verandah is to be used)
- General pathways around clubhouse – minimum 1.50m wide (allows two people to travel alongside each other)
- Gates and doors – 1.35m wide (optimum for universal access)
- Accessible ramp gradients – minimum 1:14 (standard)
- To ensure the site and facility concept design is compliant with current Australian Accessibility Standards it is recommended a professional Design Consultant is engaged.

D
Court numbers, preferred layout and orientation

Determining the number of courts for a site will depend upon a range of factors that should be addressed through early stages of project identification, site assessment and project brief development.

Key considerations should include:

- Available site area on which to build
- Venue management model
- Range of services and activities (tennis and other) that the venue may provide.

Courts should always be orientated in a north / south direction and are best grouped in 2, 3 or 4 court modules depending upon the site layout, location of clubhouse, site area and access. There are several advantages in grouping

courts into modules as they can:

- Achieve greater efficiencies for court lighting systems and controls
- Deliver operational benefits for tennis facility management and activity scheduling
- Optimise coaching operations
- Enhance tournament scheduling, access control and spectator viewing opportunities
- Decrease the impact on venue operations from court maintenance activities.
- By grouping courts into modules this also allows for greater pathway networks, delivering:
- Improved spectator circulation between courts
- A range of viewing opportunities and seating / shade provision for spectators. Particularly for families, wheelchair users and the mobility impaired
- Increased connectivity between courts, clubhouse and off-court amenities.

All tennis courts in Australia should be orientated on a true north / south axis (or ideally no greater than 15 degrees either side of true north), with the net line located on an east / west axis. This orientation minimises the effects of the sun in a participant's line of sight.

E
Clubhouse location

When planning a tennis facility in Australia, the clubhouse location should aim to be:

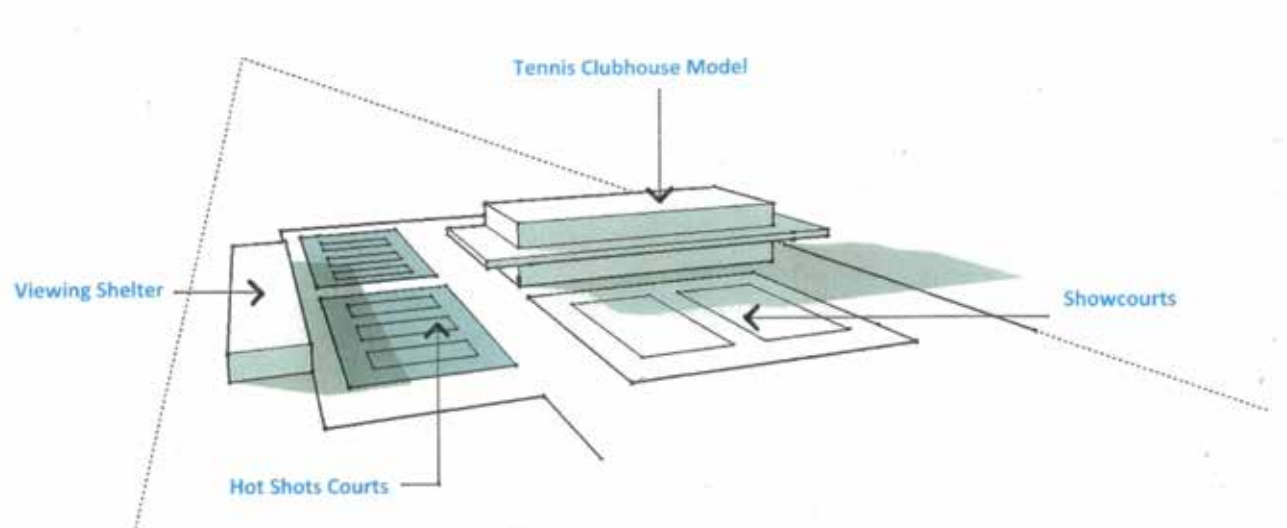
- Easily accessible from a carpark or roadway.
- Located as centrally as possible to the courts to maximise visibility and control, and minimise time in accessing the courts.

Shadow diagrams prepared by an Architect or Building Designer when developing the court layout can help to ensure that the clubhouse does not adversely overshadow the courts. (Refer to **Figure 2.2.6 Typical Shadow Projection**).

Ideally clubhouses are orientated with the longest dimension running east / west to maximise both viewing opportunities over the courts, and to maximise passive solar design benefits by way of wide verandas and other solar control measures.

ANZ Tennis Hot Shots courts, playground, community play spaces, BBQ areas should be located as close as possible to the clubhouse to provide direct viewing and access opportunities for parents and spectators.

Figure 2.2.6 Typical Shadow Projection



Tennis Facility Concept - *Shadow Projection Example*
(Shown at June 22nd @ 3.15pm – Latitude, Adelaide SA)

F
Multi-purpose clubhouse design / Community Activity Hub considerations

Tennis facilities provide opportunities to deliver a range of different activities. Early consideration to these opportunities is paramount to create flexibility within the design concept for both tennis infrastructure needs and wider community benefit.

There are several consistent and fundamental spaces essential in the planning of a new or redeveloped multi-purpose tennis / community hub facility. Information regarding these elements are also defined in greater detail in **Section 3.4 Clubhouse planning and design** and include guidance on their design, location and practicality of implementation.

These elements can include:

- Car parking – Community bus or volunteer transport provision
- Main clubroom space
- Kiosk / kitchen
- Accessible toilets and change facilities – with baby change tables or 'Changing Places' facilities
- Flexible meeting room with moveable walls
- Clubroom storage
- Coach's storage
- Hitting wall
- Shaded seating / viewing areas
- Tennis wheelchair storage
- Vertical access via lift with sufficient capacity

G
Additional amenity considerations

The ability to support a wider cross section of users and community activities within a tennis facility design (such as integrating with a Community Activity Hub) can be enhanced through additional amenities.

With reference to multi-purpose design example, **Figure 2.2.7**, additional amenities may include:

- Community play space or playground
- BBQ and outdoor social area
- Shade structures
- Temporary 'bump-in' grandstand seating for larger scale events
- Water coolers
- Covered courts.

Incorporating additional amenities can add significant value to the venue and increase potential membership, utilisation, participation and investment opportunities.

These opportunities could extend to the inclusion of potential leasing and hiring of function spaces and providing additional revenue streams. The adoption of these amenities is dependent upon stakeholder requirements, venue management, budget and the available developable land area.

Figure 2.2.7
Draft concept site plan (multi-purpose)

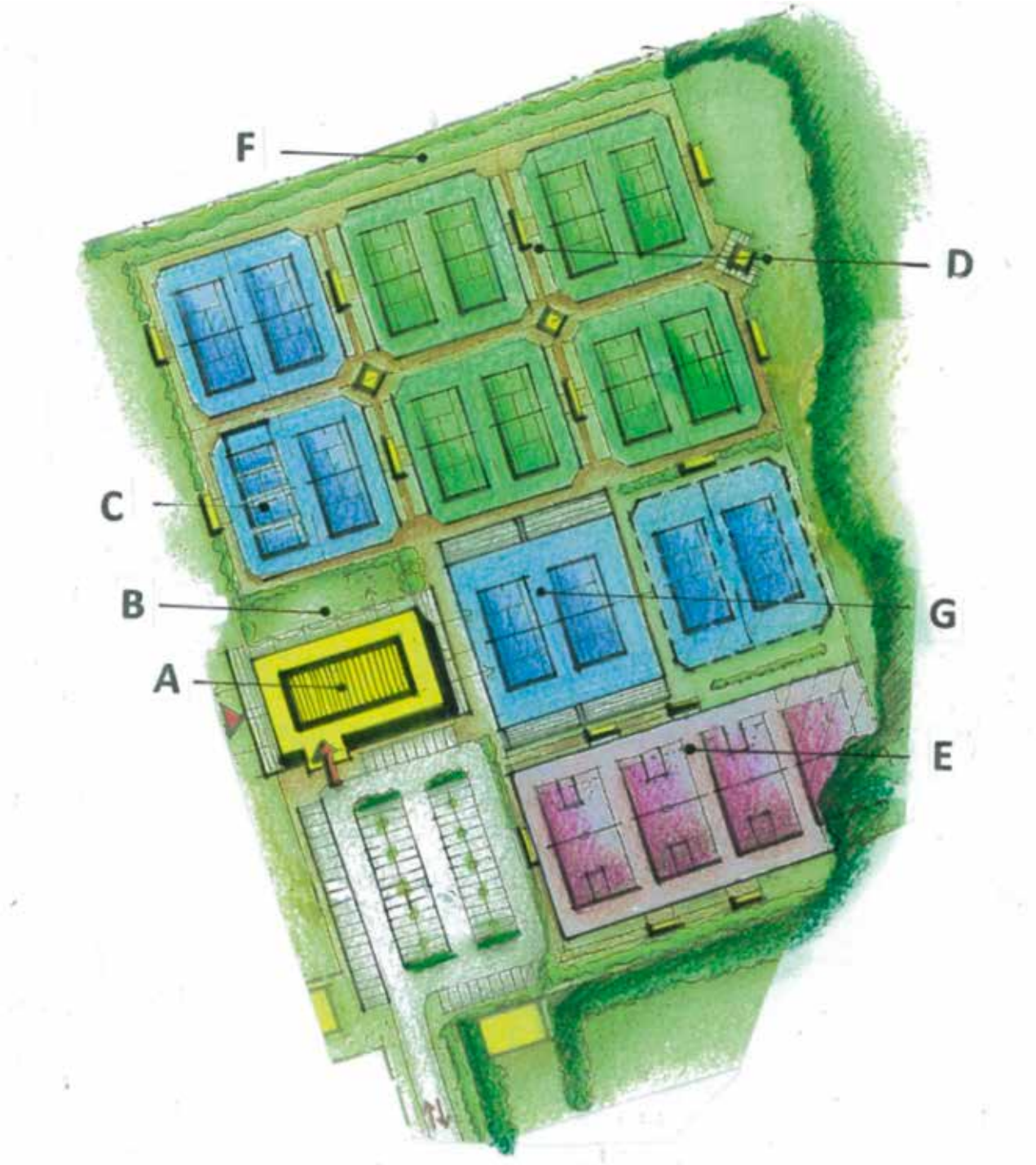


Table 2.2.4
Multi-purpose design example reference

Reference	Site amenities
A	Multi-purpose clubhouse design / community hub
B	Community play space or playground, BBQ and outdoor social area
C	ANZ Tennis Hot shots courts and hitting wall provision
D	Shade structures and water coolers
E	Multi-lined community courts e.g. Netball / basketball
F	Boundary landscape buffers and screening (depending upon neighbouring site constraints)
G	Temporary 'bump-in' grandstand seating for larger scale events to show courts and potentially other outside courts

2.2.4 PLANNING CONSIDERATIONS

Additional site planning recommendations include:

- Flexible site plan including multi-purpose areas to meet any future multi-purpose design requirements
- Design solution that can create opportunities for an additional income stream (e.g. café, commercial tenancy spaces)
- Peak and off-peak access to the site and amenities, providing flexibility of use
- Additional opportunities to support tennis specific programming such as ANZ Tennis Hot Shots and coaching programs that may further venue participation
- Implementation of the Book a Court system to improve casual venue access.

Regardless of the type and level of facility development, layout or operations, the above site / venue planning considerations can be considered to ensure that maximum value and utilisation of the facility can be achieved.

Universal Design principles

Universal Design principles deliver a set of considerations to guide the planning process to provide the best possible experience for all users.

The seven Universal Design Principles include:

1. **Equitable use**
2. **Flexibility in use**
3. **Simple and intuitive use**
4. **Perceptible information**
5. **Tolerance for error**
6. **Low physical effort**
7. **Size and space for approach and use**

UNIVERSAL DESIGN INFORMATION SOURCES

Universal Design should be applied to tennis site planning to ensure the best outcomes for the community. Refer to the following sources for further information:

- Sport and Recreation Victoria (2017) SRV Universal Design Principles
- Centre for Universal Design Australia (2017) Universal Design Australia
- Australian Disability Clearinghouse (2017) Australian Disability Clearinghouse
- International Paralympic Committee – Accessibility Guideline for Olympic and Paralympic Games

2.3 – SITE ASSESSMENT

Site selection is a critical step in the project planning phase. The limitations and constraints of a proposed site will ultimately guide design solutions and project budget requirements. Facility maintenance and management will also may be impacted by the conditions of each individual site.

Site selection requires the investigation of several key elements to ensure any site limitations and constraints are identified early in the planning process. This section identifies a range of potential site conditions and assessment required to assist in making informed decisions on site capability and capacity.

Key topics covered in this section include:

1. **Planning Authorities**
2. **Recommended site investigations**
3. **Site investigations explained**

Primary audience

This section has primarily been designed for:

- Local Government
- Architects, planners, developers, designers and builders.

Definitions

Arborist – Specialist in the cultivation, care and maintenance of trees and shrubs.

Aggregate – Stone particles within flexible pavements.

Authority assets – Infrastructure owned and operated by utility providers (i.e. electrical, communications).

Batters – Side slope of an embankment or cutting.

Brownfield site – Previously developed land that is no longer in use.

Bulk density – Dry weight of soil per unit volume of soil.

Cadastral boundaries – Extent and ownership of land.

Contours – Lines joining points of equal elevation on a surface.

Cultural overlays – Predefined areas of a state / territory that are of cultural / historical significance that may need to be protected and preserved as part of a site development.

Density ratio – Ratio of the bulk density tested in the field against the laboratory tested bulk density.

Earthworks – Processes of excavating, moving and filling of soil to prepare a pavement area for formation of a structure.

Easements – A right held by a party, typically a service authority (e.g. water authority), to make use of a section of the land owned by another party for specific purposes (e.g. water main). Easements may impose certain restrictions and limitations regarding construction works.

Fauna – Animals of a region, habitat or geological period.

Feature survey – Identification of land areas and location of obstacles with the collection of data and information on ground levels, site topography and site contours.

Flora – Plants of a region, habitat or geological period.

Foundations – Lowest load-bearing part of a building or other structural element (e.g. fencing).

Geotechnical investigation – Investigation performed by geotechnical engineers to obtain information on the physical properties of soil and rock around a site to inform the design of earthworks, pavements, footings and foundations for proposed structures and pavements.

Geo-membrane / liner product – Manufactured synthetic membrane or liner with low permeability used to minimise fluid migration.

Greenfield site – Clear site that has not previously been developed.

Groundwater – Water held underground in soil or pores.

In-ground services – Authority and / or private service infrastructure located in the ground (e.g. gas, drainage or sewers).

Loads (dead and live) – Forces applied to a structure (e.g. retaining walls). These can be self-static weight and / or dynamic loads.

Planning Scheme / Development Control Plan – Statutory document which sets out objectives, policies and provisions for the use, development and protection of land.

Planning zones – Areas within a local council area that are shown in a council's planning scheme / Development Control Plan. They indicate the types of development that are compliant and non-compliant. Permissions change based on the zoning applied to each individual land parcel.

Overhead services – Authority and / or private service infrastructure located above the ground (e.g. electricity or communication cabling).

Reactive soils – Property of soil that causes it to swell when moisture content increases, or shrink when moisture content decreases.

Retention / detention – Storage pond, basin or tank used to reduce the peak discharge within a drainage system.

Service proving – Locating of direction and level of in-ground services using penetrating radars, non-destructive excavation or other means.

Shallow footings – Foundation type that transfers loads very near to the surface.

Site survey – Inspection of the defined area where work is proposed to gather information for a design or an estimate of cost to complete the initial tasks required for a design concept. It can determine a precise location, access, best orientation for the site and the location of obstacles, services or other potential site constraints.

Slab on ground – Foundation type that is laid directly on the ground.

Spot levels – Elevation of any survey point.

Strip footing – Continuous strip of concrete that spreads loads near to the surface.

Subgrade – Natural earth surface beneath the court pavement.

Substrata material – Underlying material layer beneath topsoil.

Surveyor – Professional consultant able to prepare a site survey prior to the commencement of any concept site planning or design work.

Title boundary – Defines the boundaries of each parcel of land.

Topography – Topography of a site describes the site's characteristics such as its existing levels, any existing buildings, location of trees and other site features.

Standards

Depending on the project requirements there may be a range of standards that may need to be adhered to for a site investigation. It is recommended that for all sites requiring development a geotechnical investigation be undertaken.

The following Australian Standards should be followed for geotechnical investigations:

- AS1141 – Methods for sampling and testing aggregates
- AS1289 – Methods of testing soil for engineering purposes
- AS 1726 – Geotechnical site investigations.

All geotechnical investigations should be conducted at a National Association of Testing Authority (NATA) registered geotechnical testing authority.

Australian Standards can be purchased online via the Standards Australia – Search and buy a Standard at the website: Australian Standards Online

KEY HIGHLIGHTS

What you need to know

- A detailed site investigation is required to determine the appropriateness and possible limitations/ constraints for development on a particular site.
- The limitations and constraints of a site will determine project budget and guide appropriate design solutions.
- Relevant Planning Authorities should be engaged at the early stages of assessment.

2.3.1 PLANNING AUTHORITIES

Planning Authorities are overarching body's that decide on the appropriateness of land use in Australia. Planning Authorities are typically local councils, but can also involve other state or territory government statutory authorities that control the sale, use and occupancy of land.

Planning Authorities are also responsible for issuing of planning permission or developmental approval, which refers to the requirements for the use of a specific parcel of land and / or the construction or expansion of infrastructure on a particular site.

Key planning guidelines used to determine if a proposed site is suitable for use are usually referred to as a Local Council Planning Scheme or a Local Council Development

Control Plan. These guidelines outline the required planning and design criteria of local areas and individual sites to achieve compliance with nominated planning conditions and controls.

Planning schemes and development control guidelines are referred to differently in each State and Territory. As such, they should be thoroughly examined with your local council before commencing your site assessment.

These documents can be accessed online from your local council or relevant state / territory planning authority website. They should contain the necessary planning information to guide your site suitability assessment, including:

- Zoning provisions
- Permissible uses
- Vegetation protections
- Planning overlays and controls such as heritage, environment, flooding.

Ensure early contact is made with the relevant local council before commencing any preliminary site assessment to ensure the project meets relevant planning authority and council requirements. This can save time and unnecessary costs further on in the following project delivery phases.

2.3.2 RECOMMENDED SITE INVESTIGATIONS

The following provides an indication of recommended site investigations. These investigations are most relevant to the use and selection of new sites, however some may be relevant and required for redevelopment projects such as:

- Surface change or renewal
- Additional court redevelopment
- Clubhouse refurbishments or extension
- Lighting installation or upgrade
- Fencing installation.

The tables below provide an overview of site assessment elements, investigation detail and responsibility of the project contractor or technical professional. Working through this checklist will enable informed and balanced decisions on the development site for the project.

Investigations highlighted with * are described in more detail in **Section 2.3.3 Site investigations explained.**

INITIAL PLANNING

Table 2.3.1 provides an overview of the recommended initial assessment planning stages. This is a sample of overlays to consider, with each local government having site-specific requirements that must be adhered to under the relevant Planning Scheme.

Table 2.3.1
Initial planning assessments

Assessment type	Assessment definition or considerations	Site investigations recommended	Investigation responsibility
Cultural overlays	Identification of any relevant cultural restrictions (e.g. cultural overlays) which may impact the proposed development	• State government planning authority enquiry • Local government planning authority enquiry	• Planning consultant
Flood overlays	Ascertaining if the proposed site is susceptible to flood water inundation	• State government planning authority enquiry • Local government planning authority enquiry • Detailed catchment and flood analysis	• Planning consultant • Engineer
Flora and fauna	Completion of site flora and fauna assessments to determine any protected species. Should a protected species be identified, determine whether the protection parameters are significant enough to impact site development	• Flora assessment* • Fauna assessment*	• Arborist • Landscape architect

SURVEY WORKS

Table 2.3.2 provides an overview of the recommended assessment components to be considered in the project design stages.

Table 2.3.2
Survey works

Assessment type	Assessment definition or considerations	Site investigations recommended	Investigation responsibility
Existing in-ground services	Confirm the presence of any existing in-ground services (e.g. local water authority assets) that may impact the proposed development	• Detailed feature survey* • In-ground service proving (e.g. ground penetration radar, non-destructive excavation) • Dial Before You Dig enquiry* • Visual assessment*	• Surveyor • Engineer
Existing overhead service	Existing overhead services (e.g. high voltage power lines) often require clearance offsets that may impact the proposed development	• Detailed feature survey* • Dial Before You Dig enquiry* • Visual assessment*	• Surveyor • Engineer

Table 2.3.2
Survey works cont.

Assessment type	Assessment definition or considerations	Site investigations recommended	Investigation responsibility
Existing overhead service	Existing overhead services (e.g. high voltage power lines) often require clearance offsets that may impact the proposed development	• Detailed feature survey* • Dial Before You Dig enquiry* • Visual assessment*	• Surveyor • Engineer
Site topography	An ideal site will be relatively flat to enable ease of design and construction. An excessively sloping site will likely add significant costs to the project and may dictate the suitability of the site for development	• Detailed feature survey*	• Surveyor

Ground investigation

Investigation of the ground conditions will be required during the initial development stages and may also be required to understand pavement failures. **Table 2.3.3** outlines the type of investigations required.

Table 2.3.3
Ground investigations

Assessment type	Assessment definition or considerations	Site investigations recommended	Investigation responsibility
Ground conditions	Determine if existing ground conditions are suitable for the proposed development	• Geotechnical investigation*	• Geotechnical engineer
Contamination	Revision of historical site data and completion of an existing site material assessment will assist in determining the presence of any contaminates across the site. Disposal of contaminates can add significant costs to a project budget, and in some cases, may result in the site becoming unsuitable.	• Contamination assessment*	• Environmental engineer

ENGINEERING ASSESSMENT

Table 2.3.4 outlines assessments that should be undertaken by a qualified engineer during the project design phase.

Table 2.3.4
Engineering assessments

Assessment type	Assessment definition or considerations	Site investigations recommended	Investigation responsibility
Drainage Legal Point of Discharge (LPoD)	Locating the proposed stormwater discharge is the first step to confirm stormwater site constraints. Key areas to confirm with the local council and / or local water body authority are: • Quality requirements for water to be discharged from the site • Requirements for water retention or detention	• Visual assessment* • Dial Before You Dig enquiry* • Local government planning authority enquiry • EPA and / or state / territory water authority stormwater discharge water quality enquiry	• Engineer
In-ground service capacities	Identification of the connection / discharge point for site services such as electrical supply, water supply and sewer discharge. The available capacity for these services should be considered as part of the greater proposed site development.	• Dial Before You Dig enquiry* • Assessment of proposed demand versus availability • Relevant utility authority enquiry	• Engineer
Easements	Determining the presence of authority related easements / services that may impact the proposed development.	• State government planning authority enquiry • Local government planning authority enquiry • Dial Before You Dig enquiry* • Title boundary survey	• Surveyor • Planning consultant • Engineer

***The following sections are detailed further in Section 2.3.3 Site investigations explained:**

- Visual Assessment, Detailed Feature Survey, Geotechnical Investigation, Dial Before You Dig, Contamination Assessment, Flora and Fauna Assessment, Drainage Legal Point of Discharge.

Any upgrade to authority assets outside of the title boundary may result in excessive costs, further hindering site development.

For example, the electrical demand for a lighting or clubhouse upgrade may exceed the current site supply, resulting in an upgrade of authority infrastructure.

2.3.3 SITE INVESTIGATIONS EXPLAINED

Visual Assessment

A visual assessment should be included in the initial planning phase of a proposed site for every project. A visual assessment by a qualified Engineer/ Architect can provide an evaluation of the suitability of a site for development.

A visual assessment should include inspection of the following:

- Terrain gradient (slope of the land) – Is the terrain suitable for the construction of relatively flat courts?
- Drainage Legal Point of Discharge – Is there an available stormwater drainage outlet? (i.e. a point in which water can be discharged such as drains, lakes, rivers)
- Overhead services – Are overhead lines present that could impact the construction of fencing and / or lighting?
- Trees and vegetation – Is vegetation present that requires clearing for the development of the facility?

Preferable sites for a tennis facility development generally have the following features:

- Large trees not within close proximity to the development.
- Overhead services are not present.
- Minimal gradient; sites with significant level changes may require extensive earthworks and additional supporting infrastructure, adding cost to the overall project budget.
- Adequate access for machinery and construction vehicles.
- Capacity for courts to maximise road access and frontage to promote visibility.

Detailed Feature Survey

A detailed feature survey allows designers to plan the exact location of the courts and supporting infrastructure within the development. A qualified Surveyor should be engaged to undertake a topographical / feature survey of the site. It is recommended that a design professional such as an Architect and / or Engineer is engaged to produce a brief for the feature survey.

Survey specifics

A detailed feature survey should consist of a 3D CAD (Computer Aided Design) file. A survey CAD file is a precision drawing of the site, utilising assorted colours and layers to define various elements on the site.

A feature survey will typically include the following:

- Existing terrain levels (spot levels and contours)
- Exact location of existing above ground elements on the site (e.g. trees, fences, pathways)
- Location of the Title Boundary
- Existing underground services (if a service detection company is engaged)
- Existing above ground drainage infrastructure (e.g. drainage pits and associated depths)
- Easements and cadastral boundaries.

Figure 2.3.1
Example site feature survey (pdf version)

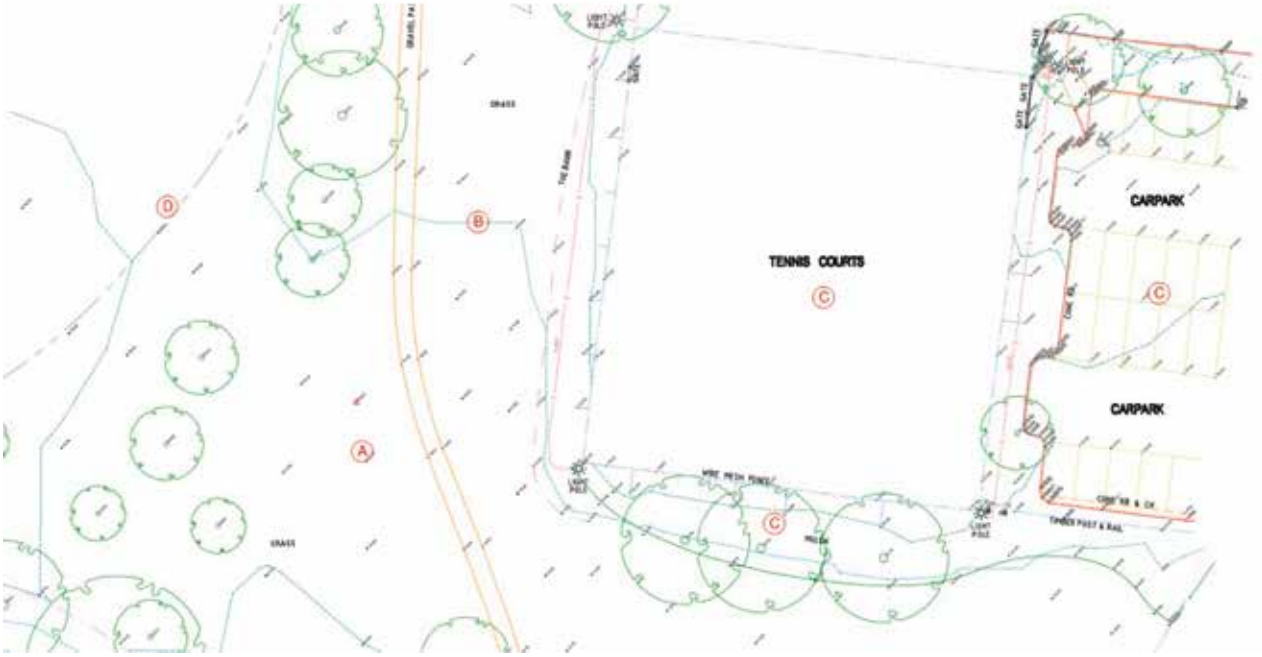


Table 2.3.5
Site feature survey reference

Reference	Description
A	Spot levels
B	Terrain contours
C	Above ground elements (e.g. trees, courts, fences)
D	Site boundary

In Greenfield sites, ensure survey grid pick up is no greater than 5m x 5m. Existing sites will require a tighter grid due to the greater level of detail.

Extent of Works

Ensure that the extent of survey works adequately covers the proposed footprint. This may require the survey to extend beyond the proposed footprint to allow 3D design to accurately tie into surrounding levels.

Ensure the feature survey picks up any upstream and / or downstream infrastructure such as storm water drainage legal point of discharge or clubroom sewer discharge manholes. This information may be beyond the scope of works boundary.

Deliverables

Further to obtaining the detailed feature survey as a 3D CAD file, ensure that a Portable Document File (PDF) version is supplied to enable viewing the output without the need of a CAD program.

The CAD file should also consist of an AutoCAD version (additional to PDF) which shows 3D triangles, used by designers to model the final design.

Ensure a 3D survey is in real world coordinates and is based off known benchmarks. 3D triangles are essential for designers to produce accurate designs of the facility.

Geotechnical Investigation

Prior to the commencement of project design and construction phases, it is necessary for a geotechnical investigation of the site to be undertaken.

This involves a geotechnical engineer conducting site soil testing and providing recommendations regarding the construction of the court pavement, light footings, clubrooms, roads and fence footings.

A geotechnical investigation report typically includes the following:

- Depth and composition of the soil
- Any signs of fill (i.e. imported material consists of construction debris or unnatural material to the area)
- Classification of soils
- Groundwater conditions
- Subsurface contamination
- Slope stability
- Reactive soils.

General Requirements

Typical geotechnical investigations and site classification (soil classification) in accordance with Australian Standards will include:

- Regular boreholes / test pits across the site, at varying depths to accurately classify the site soils; the extent and number will depend on the size of the site
- Accurate overview of the depth of rock across the site
- Identification of imported fill layers (fill that has been placed on the site, that is not of the same composition as existing natural soils)
- Characteristic surface movement (i.e. the classification of the average amount of shifting of the soil type)
- Identification of any factors that may affect earthworks, foundations and pavement design (e.g. groundwater).

When developing a brief for the geotechnical investigation, ensure that the Geotechnical Engineer is aware of the proposed development works (e.g. type of courts) to ensure their investigation aligns with project requirements.

Specific Areas for Investigation

Pavement subgrade remediation

Should the proposed site consist of unfavourable ground conditions (e.g. reactive clay or uncontrolled land fill) the geotechnical investigation report will provide recommendations for the remediation of the subgrade.

These recommendations usually include, but are not limited to:

- The extent of site stripping required (e.g. the amount of organic material, top soil or grass to be removed for site preparation)
- Compaction recommendations (e.g. density ratio or moisture ratios for capping and subgrade layers)
- Pavements suitable for the varying pavement types; this may include asphalt and crushed rock layer depths, aggregate size and grade, and measures to avoid potential movement and cracking
- Geo-membrane / liner product (if required)
- Drainage recommendations (e.g. central drainage or perimeter drains).

Clubroom foundations

For proposed building shallow footings recommendations shall include, but are not limited to:

- Determination of subgrade design parameters (limits and constraints) for the construction of shallow foundations (for both slab on ground and strip footing options) including the fill material and maximum allowable pressure bearing.
- Foundation depths and bearing capacities.

Refer to **Section 3.4 Tennis Clubhouse Planning and Design** for further information on clubhouse development.

Light Towers and Fencing

For deep footing recommendations (e.g. for each light tower or piles) footings may include, but are not limited to:

- Determination of subgrade design parameters for each geotechnical unit for the construction of deep foundations (i.e. different geotechnical layers that are encountered due to the depth of the foundation)
- Foundation depths and bearing capacities.
- The type of material the pile is to be founded in to.
- Type of pile (e.g. driven steel or precast concrete).
- Any issues concerning pile foundations within the site.

Retaining Wall

The geotechnical investigation report shall provide design parameters for retaining walls at rest (e.g. dead loads) and for active pressures (e.g. live loads) for materials encountered across the site.

Dial Before You Dig

Dial Before You Dig (DBYD) is a free national referral service designed to prevent damage and disruption to in ground services for sites within Australia.

Dial Before You Dig is a single point of contact for all of Australia's underground asset owners.

Free enquiries can be lodged by going online at www.1100.com.au or by downloading the iPhone application.

Image 2.3.1 Dial Before You Dig service detection

A DBYD enquiry should be one of the first steps taken when considering the suitability of a site as the results of the enquiry may present development difficulties.

A DBYD enquiry can be submitted online and provides information of any local authority underground and above ground assets and easements around the site. It is important to understand any limitations that the local utility providers may pose to the development and that some services may not be provided in the DBYD documents.

Engaging a service detection company is recommended to scan and mark out all underground services present at the site.

Site Contamination

Sites zoned by local councils for recreational purposes are often areas of low land value and may not be suitable for other purposes. Old landfill sites are generally repurposed for recreational areas. Soil contamination as a result of human made chemicals in landfills can pose health and development risks to the site.

Site contamination can be the result of activities that have occurred onsite in the past including:

- Use of manufacturing substances (e.g. petrol or oils solvents)
- Former industrial site / landfills
- Use of agricultural chemicals
- Use of waste products.

There are two main options available to the developer for a site that may present contaminated soils:

- Dispose of contaminated soil offsite at an approved Environmental Protection Authority (EPA) disposal site
- Provide a capping layer above the contaminated soil.

The selection of either option will be driven by factors including cost, depth, extent and category of the contaminant.

Treatment measures to ensure contaminated soils do not pose a health threat to users of the venue is critical and therefore must be properly assessed during the project planning stage.

The Environmental Protection Authority (EPA) is responsible for regulating development and activities which may impact on environmental quality.

Each state / territory has their own EPA, with its own set of regulations and guidelines regarding the assessment and treatment / disposal methods for contamination.

An EPA qualified soil contamination consultant should be engaged to conduct a soil contamination investigation and report of the proposed site. The aim of the site investigation is to identify if there is any contamination present. If contamination is identified, an action plan should be provided, to determine the most appropriate methods to develop on the site.

Flora and fauna assessment

A flora and fauna assessment may be required with planning applications for tennis facility developments proposed in environmentally sensitive areas.

Some flora and fauna are protected under state / territory and federal government legislations, and may limit the viability of development occurring on a proposed site.

Do not remove trees or vegetation without consultation with your local council or relevant planning authority. Unpermitted removal of trees and vegetation can result in heavy penalties.

A flora and fauna assessment should be undertaken by a suitably qualified individual with relevant experience in the survey and assessment of flora and fauna.

The flora and fauna assessment typically includes the following:

- Targeted flora and fauna survey, outlining conservation significance of specifies if relevant
- Vegetation assessment, including extent, type and condition of native vegetation
- Potential impacts of proposed works on ecological values
- Options to avoid / mitigate any impact on flora and fauna.

Drainage Legal Point of Discharge

The Legal Point of Discharge (LPoD) refers to the nominated stormwater drainage outlet point for an individual site, and may include connection to a below ground stormwater pit and pipe.

A developed site will require a drainage network which allows for runoff from the court and clubroom roof. It is important to ensure the existing site LPoD can cater for the run-off generated from the site and that it can be gravity fed (e.g. without a pump).

The following enquires regarding the LPoD should be made with your local council, Environmental Protection Authority (EPA) and/ or state/ territory water authority:

- Permissible water quality to be discharged from the site
- Pre-construction flow rate discharging from the site into council assets.

It is important to determine in collaboration with the relevant authorities what the permissible stormwater water quality and flow discharge from the site is, to ensure protection of downstream environment (e.g. rivers, oceans, etc.).

2.4 PROJECT MANAGEMENT AND PROCUREMENT

The complex components associated with tennis infrastructure planning and construction have seen many projects fail due to key requirements not being considered during critical project management and delivery stages. The role of a Project Manager for delivery of tennis construction projects requires extensive knowledge and experience that extends beyond the basics of courts, lighting, fencing and building.

Historically clubs have self-managed the design and construction process of their facility improvement or redevelopment projects. The role of a Project Manager however is time consuming and as most Australian clubs rely on volunteers (many with minimal infrastructure project management experience), the ability to successfully internally manage projects and maintain control and timely progression is challenging.

It is also recognised that not all community tennis clubs have access to project management expertise within their club and where appropriate community clubs should consider the cost of professional project management services in their overall project budget.

This section provides information on the key considerations of project management and procurement stages of projects, including:

1. **Role of a Project Manager**
2. **Appointing a Project Manager**
3. **Project management fees**
4. **Procurement**

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations, venue operators and educational institutions.

Definitions

Client – Typically a tennis club, venue operator or local council.

Contractor – A person, business or firm that are engaged to provide materials and/or labour to perform a service or a job. In the context of this Resource, those jobs are usually designing or constructing tennis related infrastructure.

Procurement – The process of finding, agreeing terms and acquiring goods, services or works from an external source, often via a tendering or competitive bidding process.

Project brief – Also common referred to as a Scope of works, the project brief is the process of defining the requirements of the facility project. The project brief is the key document upon which the design will be based.

Project manager – A suitably qualified expert who is engaged by a Client to oversee the design and/or the construction phases of a project.

Specification – Specifications are an exact statement of the particular needs to be satisfied, or essential characteristics that the client requires from its project and which the Contractor must deliver. It can include specific materials, methods, processes, services, systems or outcomes.

Tender – Written invitation sent to potential contractors or suppliers of a good or service to inform them about the information required by the Client or Client's representative (e.g. Project Manager) to choose among them.

Variation – An alteration to the Scope of Works in a construction contract in the form of an addition, substitution or omission from the original scope of works. Variations need to be strictly managed to ensure any project cost, quality or time implications can be effectively managed.

Standards

There is no standard related to the education requirements or qualifications associated with the project management of tennis infrastructure projects. Previous experience managing similar projects is however strongly recommended.

AS4915 – 2002: Project management—General conditions includes the general requirements, rights and responsibilities associated with managing projects of a construction nature. Various Tertiary Education courses and institutions offer project management education across a range of industries.

KEY HIGHLIGHTS

What you need to know

- Seek to appoint a Project Manager early in the project planning process.
- Ensure the Project Manager has experience in similar projects.
- Check the referees and references of potential Project Managers to help assess their suitability.
- Project management fees are generally between 5% and 10% of the project's total cost.
- When considering contractor quotations, assess them based on the best value for the project, not just price.
- Always ensure Local Council are engaged in any form of contractor appointment or procurement process.

2.4.1 ROLE OF A PROJECT MANAGER

In the context of tennis infrastructure construction, the typical roles and functions of a Project Manager dependent on the scale of the project include:

- Project planning
- Project initiation and scheduling
- Review and appointment of contractors
- Contractor coordination and management
- Oversight of project delivery and control
- Obtaining required permits
- Budget management
- Management of project variations
- Project handover.

A Project Manager will ultimately drive project planning and oversee the project from start-to-finish or stage-by-stage.

A Project Manager will assist to plan, coordinate and appoint specialists to undertake the delivery of tennis infrastructure projects and manage the outputs of contractors, integrating their work it into key stages of project planning, design, documentation, budgeting, delivery and handover.

Site issues can develop quickly and Project Managers can assist in identifying potential issues and helping avoid substantial or even serious failures of infrastructure. Significant ongoing maintenance costs or rectification works could end up being more expensive than the original installation costs, especially if it means demolition and starting again.

This is particularly relevant to smaller clubs who struggle for many years to raise the capital required to undertake major works. For a relatively small proportion of the overall development costs (usually between 5% and 10% of project costs), the engagement of an experienced Project Manager can considerably minimise their risk exposure.

Not only can experienced Project Managers save clubs and venue managers from costly mistakes during design and construction, they should also be able to provide advice regarding life cycle costing considerations, which are equally important to all facility owners and operators. Refer to **Section 2.5 Financial Management** for information on life cycle costs and project budgeting.

2.4.2 APPOINTING A PROJECT MANAGER

The appointment of a Project Manager should be discussed between both the club committee / venue operator, asset owner (e.g. local council) and State or Territory Member Association. These key project stakeholders may be able to offer additional advice or share previous experiences regarding the potential appointment.

Appointing a Project Manager early in your project planning process will contribute significantly to consistency in approach, communication and advice.

It will also be beneficial to talk to other clubs or venues in the local area as they may have undertaken a similar project and may be able to recommend a Project Manager.

Key considerations in appointing a Project Manager

- The person has the necessary skills and relevant credentials and insurances to manage the type of project. Ask for references and be sure to check with previous clients on their performance, knowledge and levels of communication, as well as overall satisfaction of the project outcomes.
- A clear and effective communication system between the club, venue manager, local council or other project representative is established. Project management combines knowledge and experience with strong communication, particularly when it comes to identifying and addressing issues in an effective way.
- All key stakeholders are engaged (e.g. club, venue manager, local council) and project representatives in decision making and problem solving. Often there can be a number of solutions to problems and different solutions will have cost implications.
- Clarify the fee structure of your appointed Project Manager. Project management is often costed via an hourly rate charge or as a percentage of the total estimated project cost. Be aware of the potential differences and any additional charges that may be involved, prior to appointment.
- Confirm the Project Manager works independently of any potential contractor or supplier and can operate impartially throughout the life of the project.

Considerations if self-managing a project

When managing projects independently, important considerations include:

- Project representative attends the site each day (or at least regularly) to check on construction progress and provide contractors with the opportunity to ask questions and voice any concerns.
- Ask questions or check contractor production against the original project scope of works. It's your project and you should be in control.
- Establish a clear, documented and agreed project fee and contractor payment system, whereby contractors or suppliers are paid at project stages of completion. This allows progress to be measured against scope, manage expectations and ensures 100% of the project is not paid in advance of works being completed.
- Holding back 10-20% final payment until formal project handover or product commissioning is completed is common practice.

2.4.3 PROJECT MANAGEMENT FEES

Project Managers can charge fees using a range of models which are typically hourly rates (which are more common for smaller projects) or a percentage fee of the total estimated project costs. Percentage fees usually vary between 5% and 10% and can cover a range of elements including site meetings, contractor appointment and management, project budget management and hold point inspections.

Regardless of the fee structure agreed, a documented project management scope needs to be defined and should identify all the tasks that the Project Manager is to undertake. During the appointment of a Project Manager, in addition to applicants addressing all project management tasks required, responses should clearly identify:

- Who the allocated Project Manager will be and their relevant qualifications and experience
- Number of site visits and inspections to be conducted
- Any additional expenses (e.g. travel costs) that may be incurred
- Hourly rate fee in case additional time outside the agreed scope of works is required.

2.4.4 PROCUREMENT

Procurement is the process of finding, agreeing terms and acquiring goods, services or works from an external source, often via a tendering or competitive bidding process. This approach is used to ensure the buyer receives goods, services or works at the best possible price, when aspects such as quality, quantity, time and location are compared.

The contractor procurement method will be influenced by a range of factors, including the type and scale of project, likely project cost, any statutory requirements or the knowledge and experience of the Project Manager. Securing quotations or tender responses for works should be based on an agreed project brief, Scope of Works and design to ensure quotes can be compared (refer to **Section 2.1 Tennis facility planning process** for more information on design requirements). Assisting in the procurement of contractors is a common task that Project Managers can undertake.

A tender is a written invitation sent to potential contractors or suppliers (e.g. Project Manager) to inform them about the information required for the buyer (e.g. club). Issuing a tender document initiates the tender process by which qualified and interested contractors or suppliers are selected based on such items as price, products, experience, availability and proposed delivery terms.

Lowest priced tender should not automatically be preferred. Tender and quotation evaluation should be conducted against a set of agreed criteria between all project stakeholders and each proposal measured consistently against each other.

When requesting quotations or tenders from contractors for any sized project, always prepare a project brief clearly articulating the project objectives in addition to any specific design requirements or performance outcomes. This allows contractors to base their price on a consistent Scope of Works and enables comparison of prices and proposals that are offering the best value whilst meeting the project's identified needs.

Local councils are experienced in procurement processes. They are a potential resource that could provide assistance, or even lead the project procurement process. Local councils are governed by strict tendering protocols, so be sure that clear evaluation criteria is established with input from those that have specific tennis infrastructure knowledge and expertise.

2.5 FINANCIAL MANAGEMENT

Project costs are one of the most significant influences over any project. These costs can change regularly and at any stage of a project. It is critical to implement strong financial management practices and controls over projects, regardless of scale.

This section should be read in conjunction with Section 2.4 Project management and procurement and examines the following considerations on project outcomes:

1. **Project budgeting**
2. **Life cycles**

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations, venue operators and educational institutions
- Local Government
- Architects, planners, developers, designers and builders.

Definitions

Budget – Total amount of financial resources allocated for particular purpose. Budgets should be documented and agreed between project stakeholders to ensure the necessary funds for implementation are confirmed and available.

Cash flow – Cash flow determines how and when money will be obtained and expenses will be paid. Cash inflows usually arise from financing, grants, existing bank balances and operational revenues, while cash outflows relate to the expenses that will be paid out.

Contingency cost – Allowance for costs that will or are likely to occur based on past experience and any known site conditions, but with some uncertainty regarding the amount.

Cost escalation – Changes in the cost or price of specific materials over a period of time. Prices for building materials can change or escalate over short periods of time, so where possible, ensure prices and costs are fixed for project lifecycles.

Life cycle cost – Combination of both initial capital costs for specific facility elements and ongoing usage, maintenance and replacement.

Sinking fund – Money set aside for the future repayment of a debt or replacement of a wasting asset.

Standards

AS/NZS 4536 – 1999: Life cycle costing – An application guide – details the process, definitions and various components and models of life cycle costing. As it covers a wide range of industries and products, the Standard needs to be read and interpreted by a representative with a deep understanding of life cycle concepts to maximise its value.

The Life Cycle Cost Guidelines for Sport and Recreation Facilities developed by the Western Australian Department of Sport and Recreation provides a contemporary view on life cycle cost planning, evaluation and delivery relevant to sporting infrastructure. It also provides resources to assist in the development of life cycle models specific to the project.

KEY HIGHLIGHTS

What you need to know

- Project budget determines affordability of the project brief
- Known costs and likely costs are essential in preparing budgets at the start of the project.
- Project budgets should be reviewed at every stage before progressing to ensure capacity to deliver on agreed objectives
- Costs increases over time is an important consideration when applying for funding to avoid potential shortfalls.
- Contingencies of between 10% and 20% of the project budget should be factored in to allow for unforeseen issues or costs over the life of the project.
- Evaluation of different products must consider the full product life cycle, not just the initial capital costs. Maintenance and renewal costs are just as important over time.

2.5.1 PROJECT BUDGETING

Costing projects can be very difficult with so much uncertainty, however a realistic budget must be set prior to the decision to proceed with the project and be achievable to fund.

From commencement of the project to starting construction it is also likely that the cost of materials or labour may increase, the project scope may vary or site conditions may alter, particularly if project planning spans across a number of years. These are referred to as cost escalation and can be minimised through the use of contingencies.

Contingencies of between 10% and 20% are often added to project budgets in order to cover these unforeseen costs and should be factored into all projects at the early stages of project identification and design.

Managing project cash flow is important to achieving successful project outcomes. Contractors will expect to be paid as they complete various stages of work, so ensure that funding is available to pay out upon satisfactory completion of work.

The project budget will ultimately guide project outcomes and what can be delivered, so it is important not to underestimate all costs involved. Last minute surprises will always cost more to resolve than if they were initially considered at the start of a project.

Replacement costs associated with the project or related infrastructure should be reflected in the project budget (refer to **Section 2.5.2 Lifecycles**).

Budgeting must account for ongoing management, maintenance, renewal and replacement costs to ensure maximum benefits of the improved facility into the future. Sinking funds or facility replacement funds are essential, allowing clubs, venue operators and local councils to regularly deposit funds into an account specifically for ongoing improvements. This will ensure that funds are available for maintenance works as well as renewal at the end of asset life.

Once the budget is completed and the project starts, actual spend should be regularly checked against budget estimates. This will inform whether the project is progressing as planned or if corrective action is needed.

Project budgets need to include 'contingencies' to account for any unexpected costs that may arise through the life of the project. Contingencies are particularly relevant during the project construction phases where unforeseen issues with drainage or ground works may be experienced, or significant rises in material costs or availability may only be known after project commencement.

Depending on the size and scale of the project, allow between 10% and 20% of the total anticipated project costs for contingencies. It is better to plan for these upfront than have to secure additional funding during the project construction phase.

Appropriate allowances for GST should be made and incorporated into project budgets. Many prices are often quoted exclusive of GST, creating the potential for an unbudgeted 10% on top of existing identified project costs. Regardless of whether the club or centre is registered for GST (i.e. registered to claim back GST paid), GST will need to be paid for products and services.

Example project budget

Table 2.5.1 Indicative project budget is a guide to project budgeting to assist in identifying the range of costs associated with key project phases. The Indicative Project Budget Table below reflects a generic range of budget cost allocations as a percentage of total project costs, against each project component likely to be associated with a tennis infrastructure project.

All budgets should be tested with contractors, local councils and industry advisors to ensure their accuracy. The example below is provided as a sample budget summary only and includes project components and percentage estimates of total estimated project costs.

Table 2.5.1
Indicative project budget

Project stage / phase	% of estimated budget
Project scoping	4%
Site planning	2%
Facility design	5%
Construction	68%
Project handover	1%
Project management / design / consultancy	8%
Cost contingencies	12%
Total estimated budget	100%

Due to the vast differences in project and site related costs associated with individual projects, specific development costs or even cost ranges cannot be provided with certainty. It is highly recommended that all projects follows the seven stages of planning outlined in the Facility Planning Process section in order to accurately calculate the project budget.

Information presented in the Site Assessment and Site Planning sections will also assist in preparing project budgets. They will help to guide you through a range of considerations that will influence the budget, including:

- Site location challenges (e.g. access, proximity from suppliers).
- Site conditions (e.g. ground conditions, soil types, topography).
- Local environment (e.g. flood impacts, climatic conditions).
- Statutory requirements (e.g. meeting Council planning and permit requirements).

2.5.2 LIFE CYCLE COSTS

Life cycle cost analysis compares not only the initial costs of development and installation, but also the ongoing costs to maintain the serviceability of a facility or facility element over a fixed period of time. The process is used to determine the sum of all expenses associated with a product or project, including acquisition, installation, operation, maintenance, and refurbishment and disposal costs.

In the tennis facility context, life cycle costs are typically used for court surfaces, court furniture, lighting, fencing and other associated infrastructure that has a clear fixed life span.

Life cycle cost analysis is an important element of the decision making process and in making informed value judgements when considering a range of facility options. It is not however the only factor in facility planning and decision making. Desired playing characteristics, overall venue amenity features and user preferences are all important elements for consideration.

Life cycle cost principles

The Life Cycle Cost Guidelines for Sport and Recreation Facilities developed by the Western Australian Department of Sport and Recreation provides four primary principles to consider when assessing life cycle costs and which are supported within the tennis context.

- Recognise that a facility development project begins at the concept and preplanning stage and is complete when the asset is sold or the site returned to its original condition.
- Examine the full cost of each project component across the life of a project rather than choose the cheapest option. This may mean a higher initial outlay but lead to reduced ongoing operational, maintenance and disposal costs and a net lower total ownership cost.
- Consider all of the economic and financial costs associated with constructing, procuring and operating a facility at a level for which it was originally planned.
- Developing a life cycle cost analysis is an intrinsic part of your overall asset (facility) management strategy.

Tennis infrastructure life expectancy

Table 2.5.2 provides an estimated life expectancy range (in years) for generic tennis facility infrastructure. These can be used to guide your product life cycle analysis. Information below assumes ideal site and construction conditions and that appropriate levels of maintenance have been delivered to manufacturer specifications, commensurate with the level and intensity of infrastructure use they are intended.

Budgeting for tennis infrastructure renewal

Planning for infrastructure renewal is an ongoing challenge for tennis venue owners and operators. Often Australian tennis venues experience financial constraints which inhibits substantial contributions to long-term infrastructure renewal.

As the owners of the majority of Australian tennis infrastructure, support from local government is required to ensure tennis facilities meet the needs of users. Timeframes for renewal and depreciation of tennis infrastructure is often determined by council policy and budget allocation. It is therefore important for local government authorities to include all facets of tennis infrastructure within their asset management plans, life-cycle renewal processes and capital budget planning.

Opportunities exist for council's to include ongoing maintenance requirements, asset renewal costs and capital development plans into venue operational and occupancy agreements, specifying the

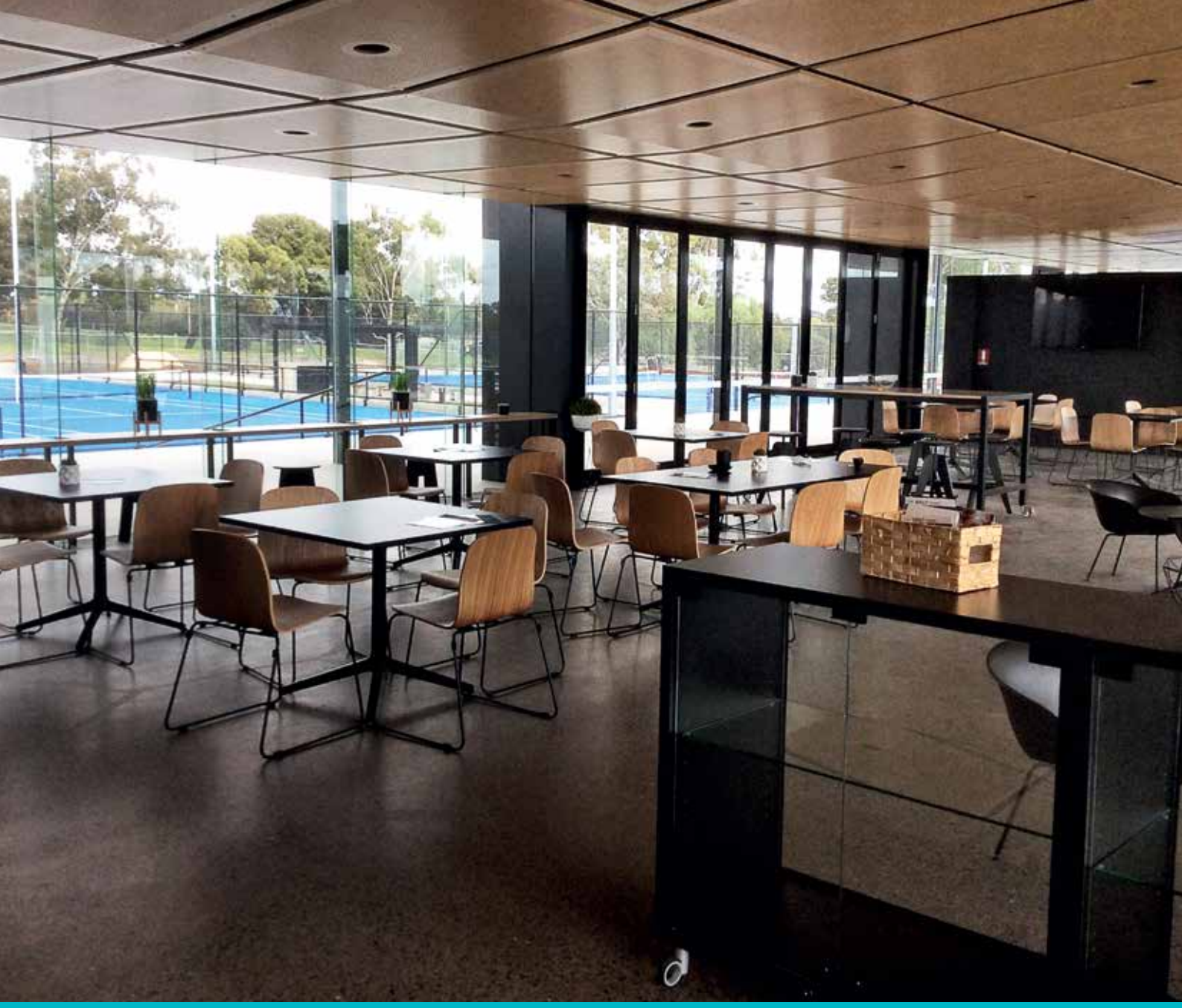
level or range of contribution required from venue users and key stakeholders. This will ensure that expectations are clear and costed. Regular court, clubhouse and site audit and assessment processes enable continuous monitoring of the condition and life-cycle of tennis infrastructure and guide the level of investment required to maintain them to a safe, playable standard that promotes a quality user experience

Table 2.5.2
Estimated life expectancy of tennis infrastructure

Infrastructure elements	Expected life
Court pavements / bases	
Asphalt pavement / base	20+ years
Concrete pavement / base	20+ years
Court surfaces	
Acrylic surface	8 – 12 years
Natural Clay / Red Porous (including En-Tout-Cas, Italian, Conipur, Har-Tru)	25+ years
Natural grass	30+ years
Synthetic filled surfaces (Sand Filled Acrylic Grass and Synthetic Clay)	8 – 12 years
Other court / site infrastructure	
Net posts and winders	20+ years
Court fencing	20+ years
Court lighting (including poles and fittings)	20+ years
Clubhouse (structural)	20+ years
Clubhouse (internal)	20+ years
Hit up wall	20+ years

The expected life of tennis infrastructure is dependent on a number of factors such as the quality of the original construction, levels of usage, maintenance practices and geographic location.

Table 2.5.2 Estimated life expectancy of tennis infrastructure is provided as a guide only.



SECTION 3

Facility planning, design delivery and maintenance

SECTION 3
FACILITY PLANNING, DESIGN DELIVERY AND MAINTENANCE

3.1 COURTS

Providing quality tennis courts is a crucial element of all tennis facilities. To ensure sustainability of a facility, tennis courts should be designed, constructed and maintained to meet the needs and demands of users. Careful consideration should be given to the project budget, local environment, site specific conditions and the level of use expected at the commencement of a tennis court project to ensure the preferred infrastructure outcome is achieved.

Tennis court development and construction consists of three key components:

- Planning
- Design
- Construction.

This section provides technical advice on the above elements through the delivery of detailed information on the following topics:

3.1.1 Court orientation, layout and geometry

3.1.2 Pavement subgrade preparation

3.1.3 Court bases (pavements)

3.1.4 Court surfaces

3.1.5 Maintenance

3.1.6 Supporting infrastructure

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations, venue operators and educational institutions
- Local Government
- State and Territory Government
- State and Territory Member Associations
- Architects, planners, developers, designers and builders.

Definitions

Aggregate – Stone particles within flexible pavements.

Agronomy – Science of soil management and crop production.

Asphalt – Mixture of dark bituminous substance with gravel aggregate stone.

Bagging – Process of clearing / levelling clay and / or synthetic based court surfaces.

Bearing Capacity – Capacity of soil to support loads applied to the ground.

Bitumen – Black viscous mixture which binds the aggregate material used in asphalt pavement.

California Bearing Ratio – Measurement of the load bearing strength of the subgrade materials.

Caulk Rebate – Waterproof filler and sealant.

Cement stabilisation – Process in which cement is mixed with earth to provide greater bearing capacity.

Centre strap and anchors – Centre straps and anchors are devices installed to the centre of the net to assist in further ensuring a correct net height.

Cold joints – Joints between successive passes of the asphalt laying machine where adhesion between the rows is unsatisfactory.

Compressive strength – Resistance of material breaking under compression.

Curing – The process which concrete undergoes the chemical reaction causing it to harden and achieve full strength.

Delamination – Failure of a product resulting in flaking of layers (predominately an acrylic surface issue).

Expansion joints – Joints placed in a concrete slab to localise cracking caused by concrete shrinkage during curing.

Flexible pavement – Non-bound granular pavement.

Formwork – Temporary mould to contain wet concrete prior to curing.

Geo-membrane / liner product – Manufactured synthetic membrane or liner with low permeability used to minimise fluid migration.

In-situ strength – Testing of the strength of the subgrade material on site.

Joints – Contraction / control joints are placed in concrete slabs to control random cracking due to concrete contraction and / or shrinkage.

Net cables and winding mechanisms – Devices used to alter the height of the net, winding mechanisms may be inside the net post or external and protruding.

Net footings – Base / foundation to which the net post is inserted, these may be round or square, depending on the type of post to be installed.

Particle Size Distribution – Range of aggregate stone / sand particles sizes within granular profile.

Pavement – Base structure of the tennis court (e.g. the layer between the subgrade and the surface).

Plane – Description of a surface indicating that it is not bowed or humped.

Ponding – Defect in the surface in which water sits, rather than draining away.

Prime coat – On asphalt, refers to a bituminous material sprayed on to the crushed rocks that aids with sealing the surface.

Proprietary Product – Product sold under a brand name owned by a company.

Rigid pavement – Bound granular pavement.

Run-off – Obstacle free space between the edge of the court line marking (e.g. sideline and baseline) and closest obstruction.

Saw-cut joints – Joints cut into concrete as soon as the slab can support foot traffic providing an intentionally weak point where shrinkage will occur in a controlled way.

Shallow footings – Foundation type that transfers loads very near to the surface.

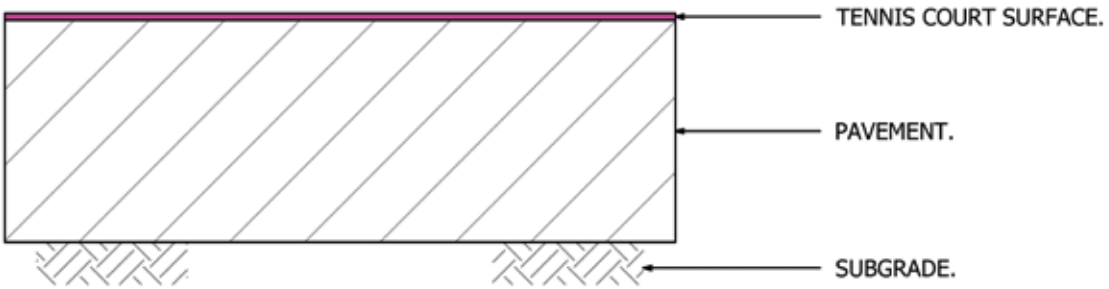
Slab on ground – Foundation type that is laid directly on the ground.

Strip footing – Continuous strip of concrete that spreads loads near to the surface.

Subgrade – Natural earth surface beneath the court pavement.

Tynes – Prongs / teeth that are driven into the playing surface to create small openings to allow for drainage / air into the profile.

Figure 3.1.1
Pavement base structure



Standards

The standards for tennis courts are established by the International Tennis Federation (ITF) Standards and can be accessed on the ITF website, ITF Technical Facilities Guide.

KEY HIGHLIGHTS

What you need to know

- Tennis court orientation should be north-south to minimise impact of rising and setting sun on a participant.
- New courts must adhere to the minimum run off requirements and ITF court dimensions.
- All courts shall feature a surface fall of a maximum of 1% for appropriate drainage purposes.
- Appropriate subgrade preparation is essential in ensuring the integrity of the overlying pavement. The subgrade should provide a stabilised, non-reactive foundation on which pavement materials for the tennis court can be constructed.
- Maintenance is vital to ensure the longevity and playability of all court surface types.
- Tennis netting and posts should be set to specific sizing and dimension and should be maintained to ensure longevity.

3.1.1 COURT ORIENTATION, LAYOUT AND GEOMETRY

Overview

Court layout and geometry is dependent on existing site constraints including spatial availability, existing buildings, terrain and in-ground services (Refer to **2.3 – Site Assessment** for a definition of these terms).

The following sections provide an overview on court:

- Orientation
- Layout (court dimensions)
- Geometry.

Orientation

The orientation of a tennis court is an important when planning and designing tennis facilities to minimise glare impacting on play from rising and setting sun.

The optimum tennis court orientation, to reduce impacts of glare on players, is north-south in Australia.

Where a north-south court orientation is not achievable, consideration should be given to use of buildings, trees or other design treatments surrounding the court to minimise glare.

Orientating courts both north-south and east-west at the one tennis facility should be avoided where possible to prevent visual distraction, refer to **Figure 3.1.2 Incorrect Court Orientation**. The ideal limits of court orientation are shown in **Figure 3.1.3 Preferred Court Orientation**.

Figure 3.1.2
Incorrect court orientation

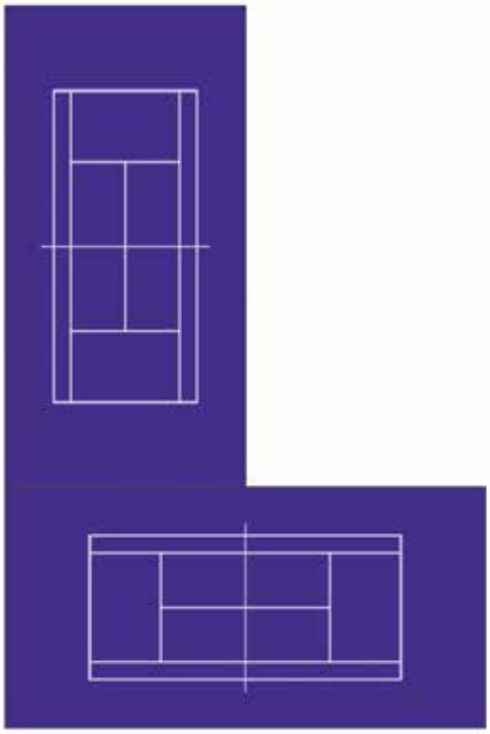
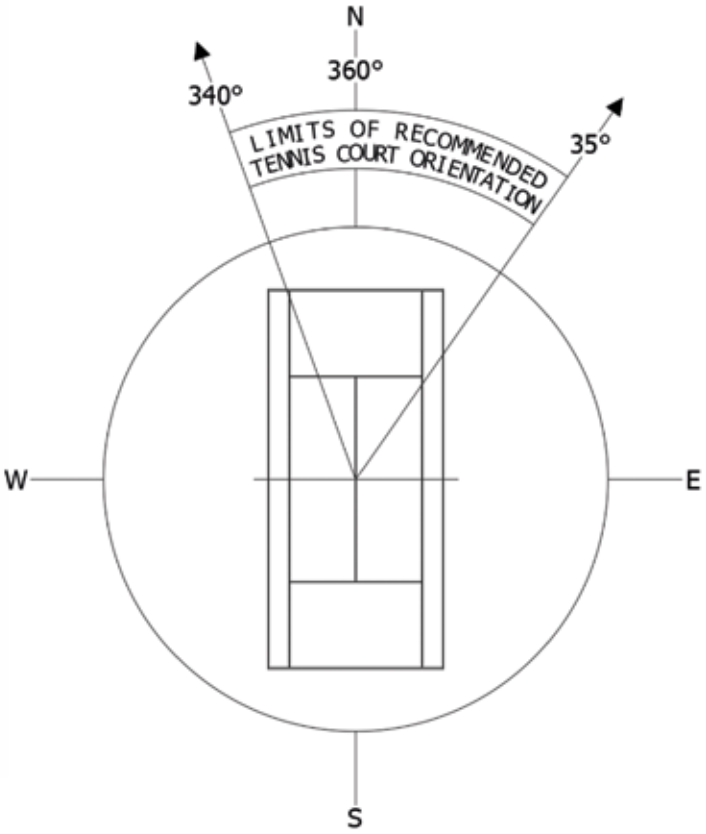


Figure 3.1.3
Preferred court orientation



The orientation of a tennis court should ideally be between 20˚ west of north and 35° east of north.

For facilities intending to host high level, national or international events, Tennis Australia must be consulted during the design phase. It is important to also consider all other infrastructure requirements in addition to court dimensions.

Layout (Court Dimensions)

The standard dimensions of a tennis court referred to as the Principal Playing Area (PPA) are 23.77m x 10.97m plus additional run-off zones. The extent of the court run-offs which determines Total Playing Area (TPA) is dependent on the standard of competition intended to be played at the facility (i.e. greater run-off required for higher standard of competition) and the needs of the intended court users (e.g. greater run-off recommended for wheelchair tennis).
Refer to **Figure 3.1.5 Playing Areas.**

Table 3.1.1
TF Court Dimensions and Runoffs

The following table provides a summary of the ITF's single court dimensions and runoffs for international and recreational use.

Dimension	Club/ Recreation (minimum)	International (minimum)	International (preferred)
Total Playing Area (TPA)	34.75m x 17.07m	36.57m x 18.29m	40.23m x 20.11m
Principle Playing Area (PPA)		23.77m x 10.97m	
Run-off at back of court	5.49m	6.4m	8.23m
Run-off at side of court	3.05m	3.66m	4.57m
Distance between multiple courts (unfenced)	3.66m	n/a	n/a

Refer to the ITF website for further information of court dimensions.

ITF Technical Facility Guide – courts dimensions

It is recommended that additional area be added to the above TPAs to allow for construction tolerances.

It is vital that all new court builds or court refurbishments are constructed to meet required dimensions, including minimum run-offs.

Figure 3.1.4
Court dimensions

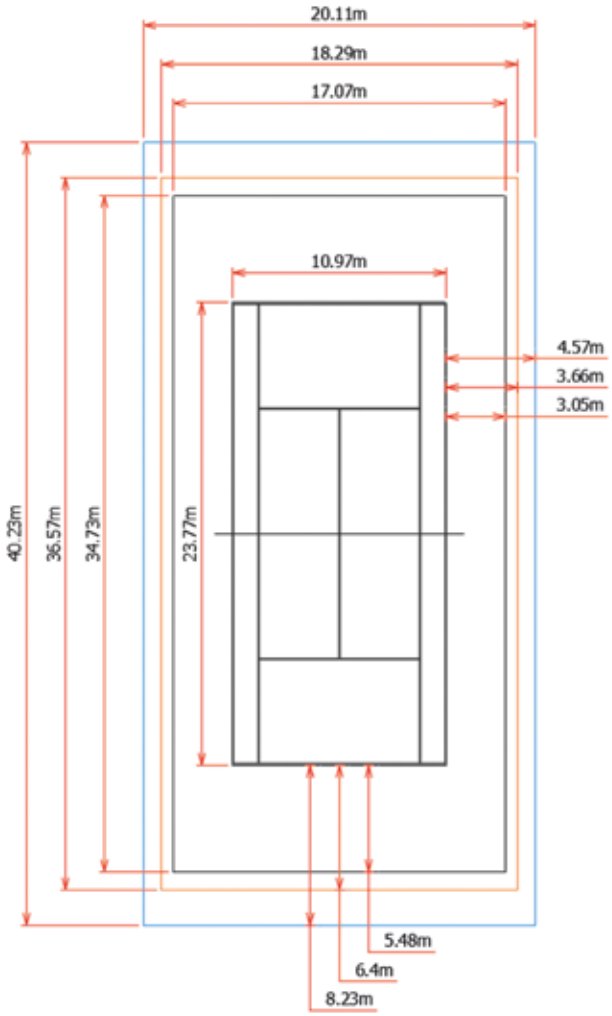
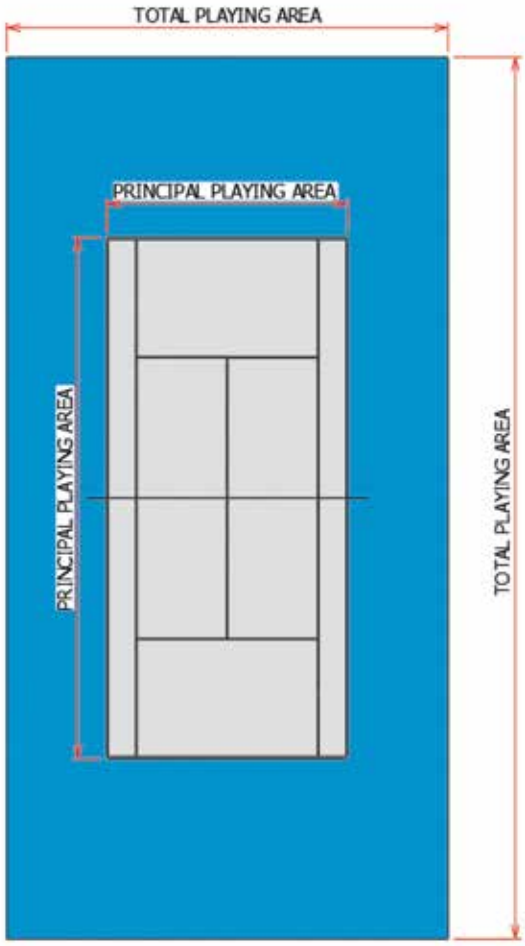


Figure 3.1.5
Playing areas

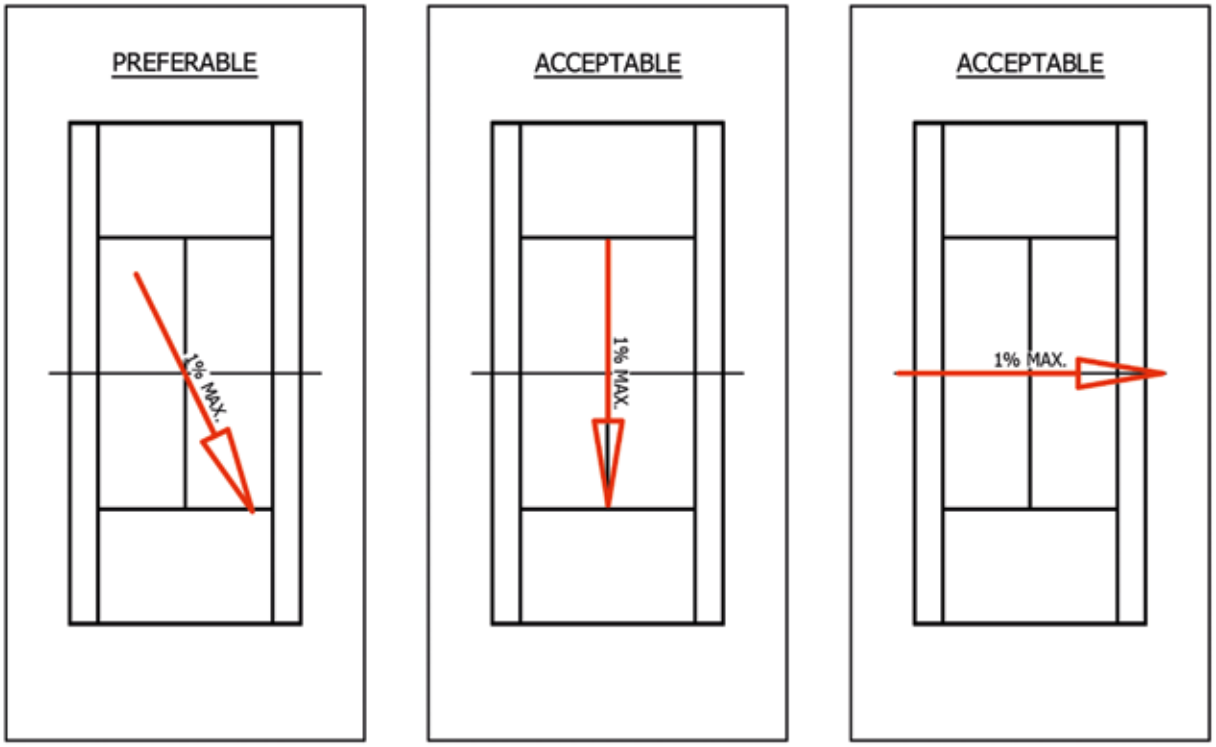


Geometry

For drainage purposes, it is vital for courts to include a surface fall to aid with draining water from the surface. A maximum grade of 1% is recommended as outlined in **Figure 3.1.6 Preferred Surface Grade Slope**. The preferred grade of the options presented is diagonal. Site constraints may dictate a flatter court gradient, and therefore it is important to consider the surface type to determine if it will be an appropriate option for effective drainage.

In the case of clay / red porous and natural grass courts, a shallower grade is recommended to minimise the erosion of top dressing. There is reduced concern with these court types collecting water across the surface due to their porous nature, which provides vertical drainage.

Figure 3.1.6
Preferred surface grade slopes



A maximum of 1% cross fall in any direction, as shown in Figure 3.1.6 should be achieved in all court renewal upgrades or new court developments. The preferred surface grade is diagonal. Further information can be found at www.itftennis.com/technical/courts/court-testing/slope-and-planarity.aspx

3.1.2 PAVEMENT SUBGRADE PREPARATION

Subgrade preparation (natural earth surface beneath the court pavement) is an essential component in the design and construction of tennis court pavements for all surface types. The subgrade should provide a stabilised, non-reactive foundation on which pavement materials for the tennis court can be constructed.

The subgrade physical characteristics will govern the design of the overlying court pavement. Together they will determine the design life of the pavement and the ability to maintain the required ITF surface grades (maximum 1% cross fall) and tolerances. For example, if the subgrade is not suitably prepared, a subgrade with reactive soils may move and may not maintain the 1% cross falls achieved in original construction.

To determine the extent of subgrade preparation, a geotechnical investigation of the site is required. The investigation will provide the following details:

- Pavement design requirements.
- If the conditions are undesirable, provide recommended subgrade remediation, which may include:
    1. Stabilisation
    2. Bridging
    3. Capping
    4. Replacement.

Refer to **Section 2.3.2 Recommended site investigations** for further details regarding geotechnical investigation.

Testing

To confirm the subgrade has been adequately prepared and meets requirements of the specification for the construction of the tennis court pavement, the following site tests should be undertaken on the finished subgrade by an independent NATA (National Association of Testing Authority) accredited testing company:

1. Compaction

- To provide adequate support for the overlying pavement, the subgrade must be compacted to an adequate density.
- If adequate and consistent compaction is not achieved, the subgrade will continue to compress after construction of the tennis court pavement, causing pavement cracks and deformation.

2. Strength

- The most common test to confirm the in-situ strength of the prepared subgrade is the Dynamic Cone Penetration (DCP) test. This test involves the driving of a metal cone repeatedly into the subgrade to measure the resistance of the surface. The test results can be used to determine the stability of the surface, as well as its strength.

3. Movement

- A proof roll inspection is undertaken to visually verify the compaction of the subgrade surface and subsequent crushed rock pavement layers. A proof roll involves the use of a heavily loaded vehicle with a smooth tyre (ideally a smooth barrel drum roller) moving over the prepared surface to ensure there is no movement in the surface.

These test results should be compared with those from the original site geotechnical test to confirm consistent findings. **Image 3.1.1 Crushed Rock Proof Roll** is a photographic example of a proof roll of crushed rock to visually check the preparedness of layer.

Failure to address existing subgrade issues will ultimately result in ongoing issues with the overlying pavement, including pavement cracking and uneven playing surfaces.

The testing outlined (compaction, strength and movement) must be completed to verify the design assumptions made on the subgrade.

Image 3.1.1
Crushed rock proof roll

3.1.3 COURT BASES (PAVEMENTS)

The design of tennis court pavement (base structure of court, layer between subgrade and surface) is crucial to ensure the integrity (longevity and quality) of the court. Poor pavement design and construction will inevitably lead to court damage, surface imperfections, surface life deduction and potentially avoidable rectification costs.

There is a strong relationship between the pavement and underlying subgrade. The structural properties and preparation of the subgrade will dictate the pavement design.

Selection of the court surface will also influence the design of the tennis court pavement, as not all surfaces can be laid on all pavement types.

Tennis court pavements are typically one of the following:

- Flexible pavement, or a
- Rigid pavement.

The key difference between the two pavement types is the way in which they distribute the loads. Flexible pavements load distribution is primarily based on layered system. While, in case of rigid pavements most of the load carries by slab itself.

Flexible bases

A flexible pavement generally consists of at least two elements:

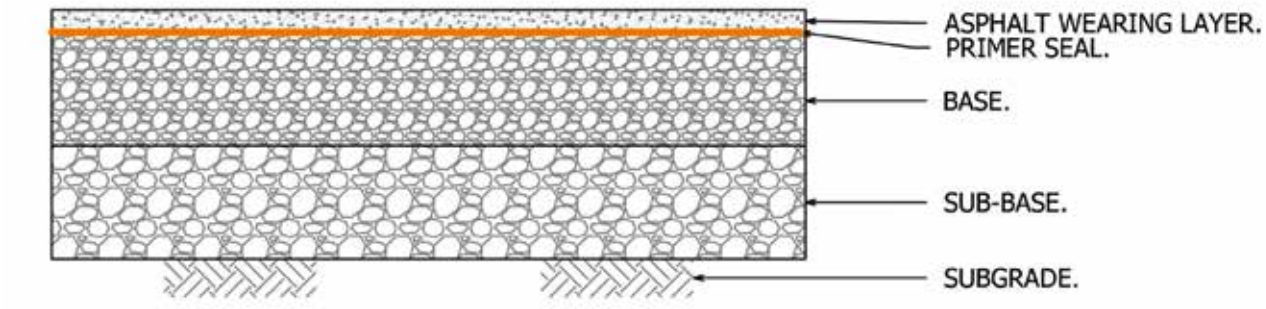
- Structural layer (Sub-base and base); typically crushed rock subbase and base layers, providing strength to the pavement and disburse the load to the underlying subgrade.
- Asphalt wearing layer; covering the base of the crushed rock, it provides a smooth surface for play and acts as a moisture barrier to protect the subbase and base layers from erosion and water penetration.

Common causes of pavement failure include:

- Reactive subgrade conditions
- Non-homogenous subgrade material (i.e. imported fill next to natural soils)
- Insufficient compaction
- Inadequate pavement depth
- Ingress of tree roots beneath pavement
- Incorrect material specification

These failures can be mitigated through appropriate design and documentation of the pavement by a qualified engineer.

Figure 3.1.7
Flexible pavement



Subgrade

Refer to Section **3.1.2 Subgrade Preparation** for specific details.

Base / Sub-base

The granular layer of base and subbase is typically a blend of crushed rock of different particle sizes, each with an angular shape that will assist in locking it together when compacted.

The granular material is spread out using a small grader, bobcat or similar machine and rolled with a smooth drum roller. The roller has a vibrating action to increase compaction. The natural moisture content of the crushed rock is a critical element of the process and this is maintained through the process to close tolerances to achieve maximum compaction and particle bind. The finished sub-base will be trimmed to match the same tolerances as the finished surface to aid with asphalt works.

Testing

The following tests are typically required on the base / sub-base material and the preparation of the layers:

- Material tests:
  1. Particle size distribution
  2. Laboratory tests to confirm strength (e.g. California Bearing Ratio).
- Site tests (post pavement formation):
  1. Compaction
  2. Proof roll.

Primer Coat

A primer coat is typically sprayed over the crushed rock base layer prior to the installation of the asphalt and allowed to cure. The primer coat is designed to:

- Bind the granular material to preserve its integrity
- Reduce permeability
- Stabilise moisture
- Provide a bond between the granular layer and asphalt.

Asphalt Wearing Course

The asphalt layer is applied to the crushed rock base layer. The asphalt layer typically consists of a mixture of bitumen and aggregate which is paved with an asphalt laying machine or 'paver' in strips, equating to the width of the paver (typically 2-3m wide).

The asphalt wearing course should be a small stone dense graded asphalt layer.

The paver tightly controls the tolerances of the finished surface. The asphalt team (including the machine operator and 3 – 4 team members spreading the asphalt) should take care to ensure the joins between the strips are essentially negligible.

Asphalt surface placement should be done to minimise impact on the number of joints. Where possible, the installation shall be undertaken to:

- Maximise the width of the asphalt runs
- Minimise the number of joins
- Maximise the length of paver runs.

Ensure the asphalt paver spreader bar is completely straight prior to the commencement of pavement works.

Construction Methodology Overview

Typical construction of a flexible pavement consists of:

1. Subgrade preparation
2. Place and compact granular base and subbase layers
3. Primer coat application
4. Asphalt paving using a machine, with a thicknesses of no less than 25mm (consolidated depth).
5. Compaction of the surface using a smooth drum roller to achieve the required density and plane.

A concrete perimeter edging is required for courts constructed with a flexible pavement.

If an acrylic surface is to be applied on the asphalt, the asphalt should be left to cure for a minimum of 28 days to ensure all impurities are removed.

Flood Testing

A flood test should be conducted on the completed asphalt surface to identify any low points that may be holding surface water prior to any surface works being completed. Any low points identified during the flood testing should be rectified with a suitable filling compound.

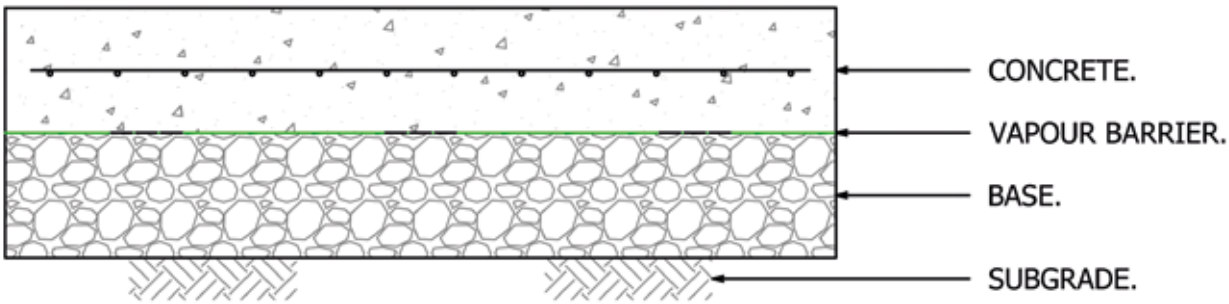
To ensure the remedial works were successful the flood test should be repeated.

Rigid Bases (Pavements)

A rigid pavement generally consists of at least two elements:

- A crushed rock base layer to provide a strong construction platform
- A steel reinforced concrete slab; a well-constructed rigid pavement will provide the greatest longevity of most tennis court pavements.

Figure 3.1.8
Rigid pavement



Subgrade

Refer to Section **3.1.2 Subgrade Preparation** for specific details.

Base

The granular layer of base is typically a blend of crushed rock of different particle sizes, each with an angular shape that will assist in the binding process when compacted. Unlike flexible pavement, rigid pavement doesn't solely rely on the base crushed rock layer for strength. The rigid concrete creates strength for this base option, with the crushed rock base primarily being used to construct the concrete pavement on.

The crushed rock is spread using a small grader, bobcat or similar machine and is then rolled with a smooth drum roller. The roller contains a vibrating action to increase compaction. The natural moisture content of the crushed rock is a critical element of the process and is maintained through the process to close tolerances to achieve maximum compaction and particle bind.

Testing

The following tests are typically used on the base material and the preparation of the layers:

- Material tests
    1. Particle size distribution
    2. Laboratory tests to confirm strength (e.g. California Bearing Ratio).
- Site tests (post pavement formation)
    1. Compaction
    2. Proof rolling.

Construction Film (Vapour Barrier)

The base layer is covered with a construction film, which is overlapped and taped at the joints. The film serves a number of purposes, including:

- Maintaining moisture content in the concrete mix
- Control of moisture ingress at other times
- Facilitating slippage during curing.

Concrete curing is an important step in the completion the rigid pavement. Care must be taken to ensure that the concrete cures evenly throughout the thickness of the pavement to minimise cracking. Care must be taken to prevent moisture loss at the surface.

Concrete Slab on Grade

Concrete is poured and agitated through the steel reinforcement mesh and retained by formwork. Prior to pouring, reinforced mesh is put in place using bar chairs to ensure the reinforcement has specified cover.

Slab thickness and mesh size to be designed by a suitably qualified engineer.

Construction Methodology Overview

Typical construction of a rigid pavement consists of:

1. Subgrade preparation.
2. Placement and compaction of the granular base layer.
3. Spreading of the construction film over the prepared base layer.
4. Placing of boxing (formwork) around the perimeter to contain the concrete at the time of the pour. The boxing is often set to the finished slab height so the concrete fills to the correct level (configure expansion joints).
5. Steel reinforcement mesh is placed over the construction film in sheets. Each sheet is overlapped and tied with tie wire. The mesh is placed on plastic bar chairs at the correct height to achieve required concrete cover.
6. Delivery of concrete in batches, preceding material spread and agitation.
7. Commencement of concrete curing period. The curing is a chemical process in which the concrete sets hard and dries out. As the concrete cures, it shrinks.
8. Final curing of concrete and installation of a saw cut / tool joint.

Rigid pavement joints

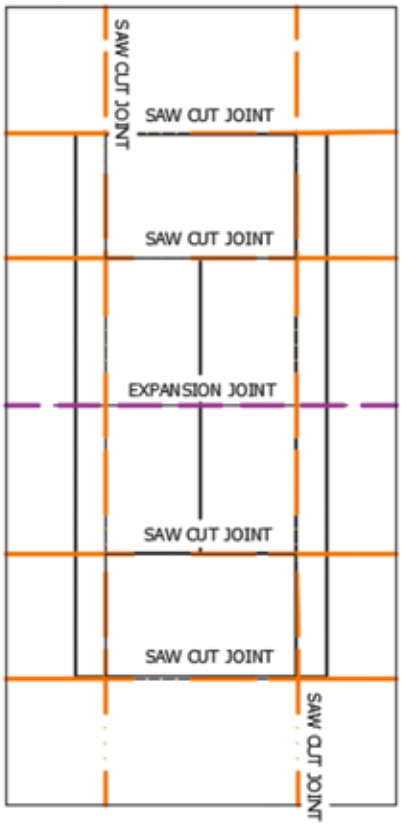
Cracking cannot be prevented due to the nature of concrete shrinking and swelling in environmental conditions, however it can be controlled to minimise the impact through the use of movement joints.

There are two typical types of movement joints that should be utilised for concrete crack control:

- Expansion joints
- Saw cut joints.

The selection of concrete rigid pavement joints should be undertaken by a suitably qualified engineer as the spacing is dependent of slab design. **Figure 3.1.8 Movement Joint Plan** shows a typical joint layout plan.

Figure 3.1.8
Movement joint plan



Expansion Joints

It is recommended an expansion joint (also referred to as construction joints) should be established across the court at the net line. Proprietary products (products sold under a brand name owned by a company) are available for this purpose.

Expansion joints should be filled with a polyurethane joint filler or approved proprietary product.

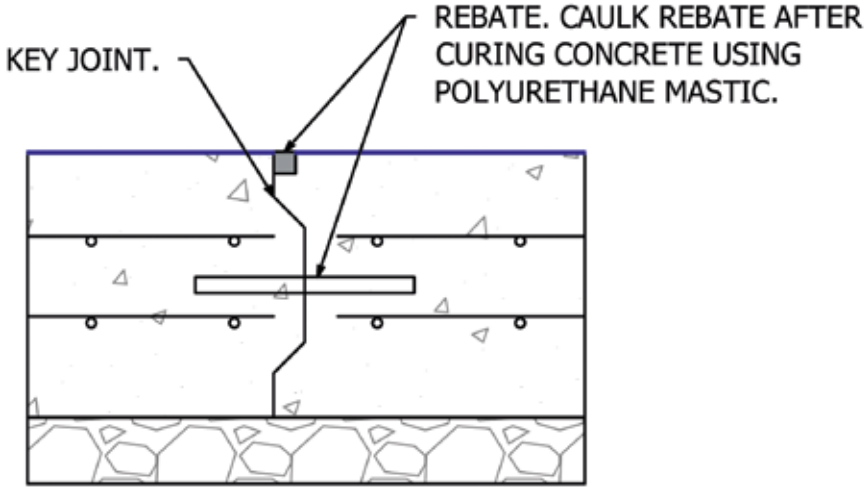
Prior to application of the court surface material, fine sand should be rubbed into the joint-filler surface before the curing period. This will ensure a bond with the surfacing material.

Movement and Expansion joints should be strategically located along court lines and net lined to minimise visual deterrents for players.

Inclusion of expansion joints is always required. The extent of the jointing may be altered based on the rigid pavement design.

Image 3.1.2
Expansion joint

Figure 3.1.9
Typical construction joint



Saw Cut Joints

Saw cut joints are installed immediately after the slab has cured, and it can be walked on. Saw cut joints are typically installed along court playing lines.

Image 3.1.3 Saw Cut Joint provides an example of a saw cut joint prior to being filled with polyurethane filler.

Figure 3.1.10
Saw cut joint

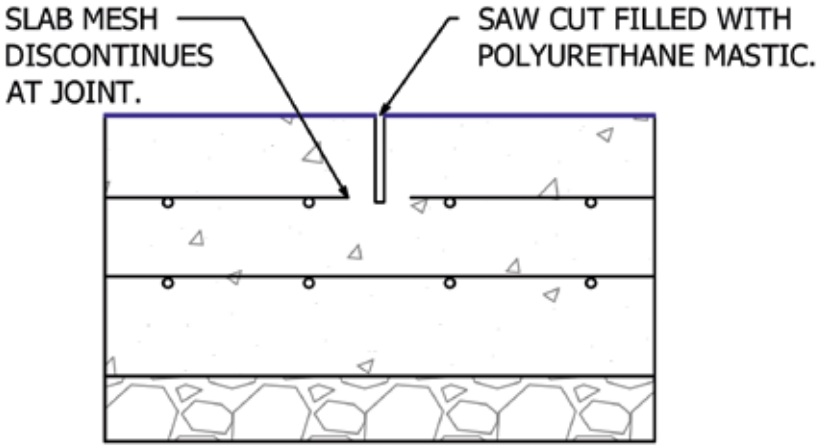


Image 3.1.3
Saw cut joint

3.1.4 COURT SURFACES

Tennis is played on a variety of surfaces, which have their own unique playing characteristics. This section will provide an overview of the key considerations for surface selection, various surface types, lifecycle and construction overview of each option.

Surface Types

Tennis Australia's National Court Surface Policy classifies court surfaces into the following categories:

- Acrylic
- Clay / Red Porous
- Grass
- Sand Filled Artificial Clay
- Synthetic Grass / Sand Filled Artificial Grass (SFAG)
- Other (asphalt, carpet, hybrid clay / wood).

These surfaces will be discussed in the more detail in the following sections.

Court surface comparison

The following table provides a summary of tennis court surfaces options. Court surface options are discussed in greater detail throughout this section.

Key Considerations

Prior to determining the preferred court surface for a facility, it is necessary to consider the following advantages / disadvantages of the surface:

- User group preferences
- Level and type of use (e.g. tournaments)
- Surface performance
- Local weather conditions and environment

Lifecycles provided in the table are indicative and heavily dependent on a range of factors including (but not limited to) levels of court usage, maintenance regimes and climatic conditions.

Refer to individual court surface sections for further information.

- Suitability of ground conditions
- Installation costs / budget constraints
- Ongoing maintenance equirements and costs
- Environmental impacts
- Replacement costs.

ITF Classifications

The ITF has developed a Court Pace Classification to assist in determining the speed of surfaces for different systems and types. Surfaces are classified into the following categories, according to the surfaces Court Pace Rating (CPR):

- Category 1 (slow)
- Category 2 (medium-slow)
- Category 3 (medium)
- Category 4 (medium-fast)
- Category 5 (fast).

The CPR is calculated using a ball projecting apparatus to measure velocities and temperatures in which the ball interacts with each surface.

See Image 3.1.4 ITF Court Pace Classifications.

Table 3.1.2
Court surface comparisons

Court Surface	Preferred Pavement	Estimated Surface Lifespan
Acrylic	• Flexible pavement with asphalt wearing layer on top • Rigid concrete	7 – 10 years
Natural clay / red porous **(Includes Italian, Conipur, Har-Tru and En-Tout-Cas)**	• Flexible crushed rock pavement	25+ years
Synthetic filled surfaces **(includes sand filled artificial grass (SFAG) and synthetic clay)**	• Flexible crushed rock pavement with an asphalt wearing surface • Flexible crushed rock pavement (cement stabilised if required) • Rigid concrete.	8 – 12 years
Natural Grass Courts	• N/A • Compacted free draining crushed rock base with sub-soil drainage (determined by climatic and environmental factors)	30+ years

Image 3.1.4
ITF Court Pace Classifications

The products included on the ITF Classified Surfaces lists are based on a court pace rating. The classified list is provided on the ITF website: **ITF Court Pace Classification.**

ITF Classifications do not imply any form of ITF approval or endorsement.

Refer to the ITF website for surface descriptions:
ITF Surface Descriptions

This information shall be used as a guide only, and in conjunction with this document to assist in the court surface selection process.

It is important to consider the dominant sport when selecting the product to be installed, as some products are better suited to sports than others. For example, netball acrylic surfaces contain a higher content of sand to create more grip due to the need to play in wet conditions.

ITF Surface Descriptions

The ITF have developed descriptions (including performance, use, advantages and disadvantages) of the various court surface options to provide guidance on surface selection.

Multi-use Facilities

If the facility is to provide multi-use courts for the wider community, the selection of court surface should also consider the other sports. Common examples include shared tennis / netball on acrylic hard courts or shared tennis / hockey on Sand Filled Acrylic Grass (SFAG) courts.

Key considerations in providing multi-purpose surfaces include:

- Use of dominant line marking to suit the main sport or activity utilising the surface
- Court programming
- Maintenance and renewal responsibilities
- Use of off court shared spaces.

Refer to section **3.1.8 Multi-use venues** for more information.

Lifecycle

The lifecycle of a court surface is heavily dependent on the following:

- Level of usage
- Level of maintenance
- Quality of initial construction (e.g. subgrade preparation, method of construction, quality of materials)
- Environmental factors (e.g. UV exposure, animal excrements).

Refer to each individual court surface description for expected surface life expectancy and additional factors that may impact surface performance and longevity.

Maintenance

Maintenance is vital to ensure the longevity and playability of all court surfaces. Maintenance recommendations for all court surfaces are discussed further in this section. Always check with the manufacturer for bespoke maintenance requirements of the surface type.

Acrylic surfaces

An acrylic surfaced tennis court requires the application of multiple layers of acrylic materials (e.g. resin, paint etc.) on a hard court pavement, typically concrete or asphalt. The speed of the acrylic surface is dictated by the quantity and particle shape of silica sand mixed through the acrylic layers.

Acrylic courts are used at the Australian Open and US Open Grand Slams and therefore are a popular development surface for players.

Generally, in Australia there are three types of acrylic surfacing systems:

- Non-cushioned
- Liquid applied cushion
- Mat laid cushion.

The key difference between a cushioned and non-cushioned acrylic surface is the layers of cushioned elements within the acrylic system. The cushioning can be provided as a prefabricated roll (mat laid) or an in-situ poured product (liquid applied) spread in layers until the desired thickness is achieved.

Cushioned systems can provide a higher level of shock absorption, however are generally more expensive to construct. A non-cushioned acrylic system is an affordable option for lower levels of competition.

At community level, it will be difficult for players to note the difference between a cushioned and non-cushioned surface.

A wide selection of manufacturers and installers of acrylic systems are available across Australia. It is important to note that often the outcome of the acrylic court is only as good as the installer. Seek advice from the State or Territory Member Association and assess the quality of the preferred installers past projects prior to engaging their services.

When resurfacing, the underlying pavement should be inspected by a qualified engineer prior to installation of the new surface.

Lifecycle

Well maintained acrylic surfaces have a life expectancy of between 7 – 10 years (pavement life expectancy is 20+ years), with manufacturers typically offering an acrylic product warranty of between 3 – 5 years, depending on the product.

Pavement Options

The pavement for this court surface option is, unless engineering conditions dictate otherwise, is a flexible pavement with an asphalt wearing surface (**Figure 3.1.11 Acrylic Surface with Flexible Asphalt Pavement**).

The following figures provide a typical cross section for the pavement options.

Figure 3.1.11
Acrylic surface with flexible asphalt pavement

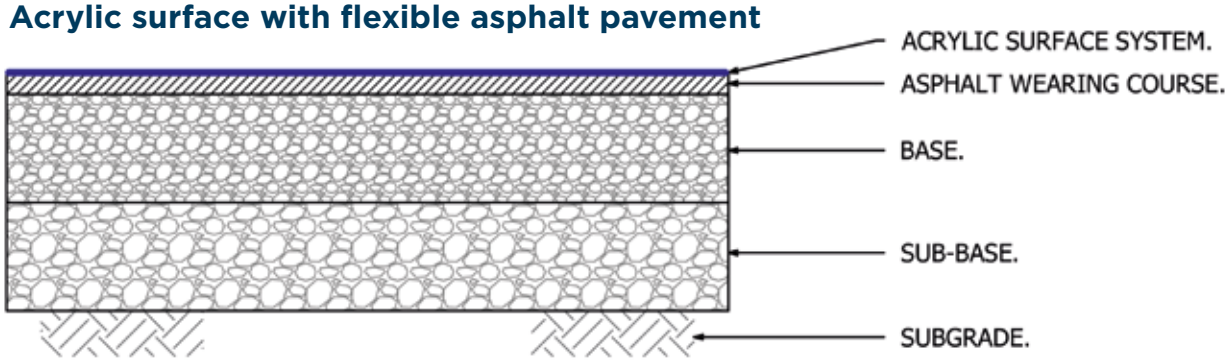
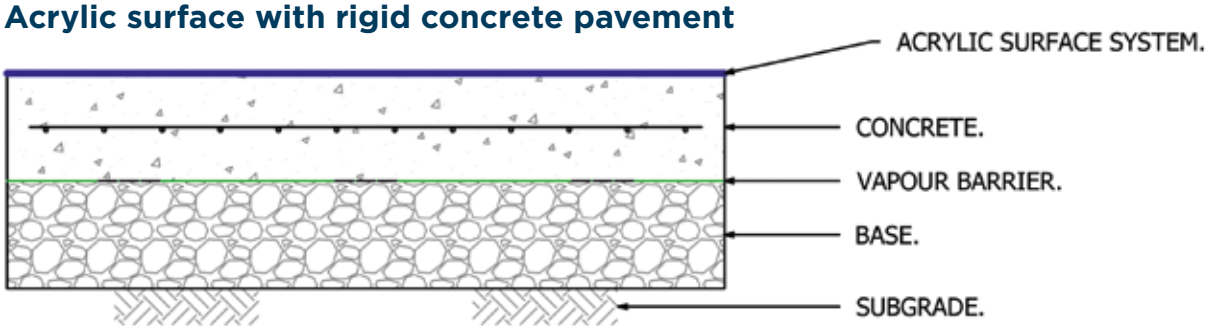


Figure 3.1.12
Acrylic surface with rigid concrete pavement



Construction overview

Application of the acrylic coating varies depending on whether a flexible or rigid pavement is constructed.

The application of an acrylic surface on an asphalt pavement should employ the following methodology:

1. Ensure cleanliness of the surface to maximise bond strength between pavement and acrylic surface
2. Application of a base coat, this usually consists of an acrylic binder and grading of silica sand
3. Once the base coat is dry, application of the required number of coats should be applied.

The application of an acrylic surface on a concrete pavement should employ the following methodology:

1. Hydrochloric acid treatment of the concrete surface
2. Filling of concrete joints (refer to **Section 3.1.3 Court bases (pavements**) for further detail)
3. High pressure cleaning of residual material
4. Application of primer coat
5. Application of acrylic coats

All application of acrylic materials should be applied to a high standard of uniform thickness and free of the following:

- Streaks
- Patches
- Visible squeegee applicator directions
- Build-up of materials.

The surface should be applied in line with specifications / manufacturers requirements and inspected for voids, irregularities, squeegee marks and any other loose materials on the surface between applications of the acrylic coats.

Acrylic materials should only be applied between surface temperatures of 16°C to 35°C and when rain is not imminent. At 35°C and above the moisture content in the acrylic will begin to evaporate, making it difficult to work with and potentially leaving streak marks. Under 16°C and the acrylics will not set properly.

Clay / red porous courts

Clay is a generic term used to describe a playing surface that has a clay / red porous-like natural look and feel.

A clay / red porous court is constructed by layering specific blends of clay and / or crushed natural stone. The finest level is used for the uppermost layers (top dressing) and loosely bound together with water.

Most clay / red porous courts have a solid permanent base with a fine coating of crushed brick on top, to allow sliding.

There are three clay surfaces currently classified as Tier 1 Clay Courts in Australia. The three surfaces are:

- Har-Tru – American Green Clay
- Italian Clay / European Clay
- Conipur Pro Clay – Australian Material.

Other Red Porous court surfaces commonly found in Australia include:

- Ant Bed
- Loam
- En-Tout-Cas.

All clay / red porous surfaces comprise of various compositions of materials, and therefore provide different playing characteristics. Examples for Red Porous and Italian Clay are shown in **Figures 3.1.13 and 3.1.14.**

Tennis Australia considers Tier 1 as the best performing surface, in terms of playing characteristics, available in Australia.

Figure 3.1.13
Red Porous

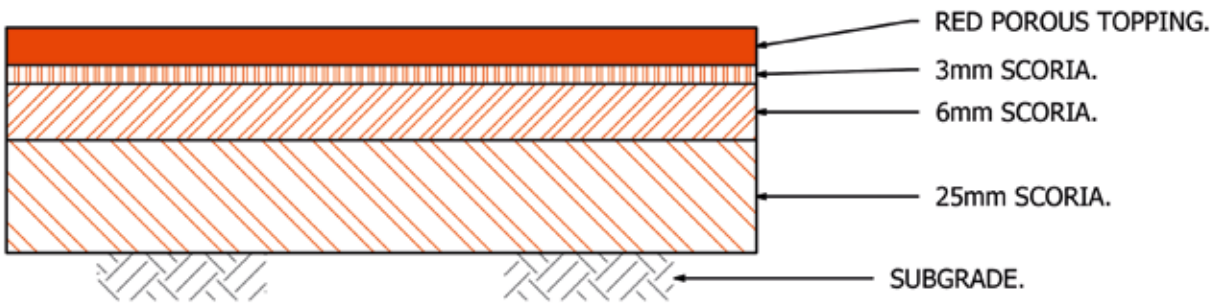
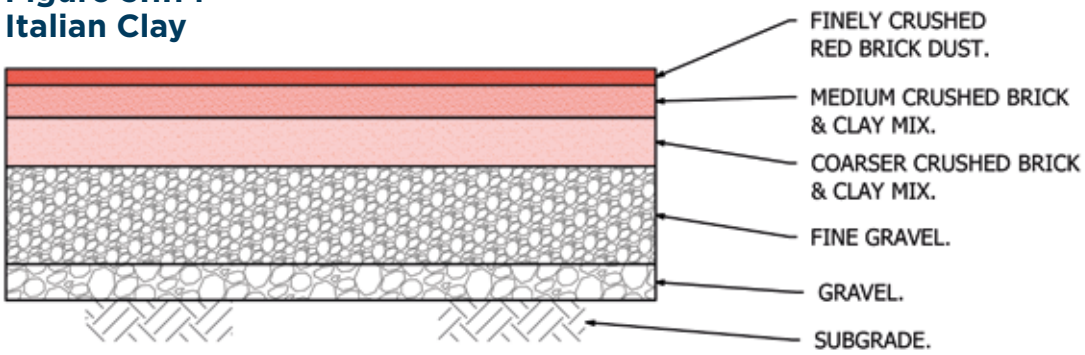


Figure 3.1.14
Italian Clay



Depending on local weather conditions, subsoil drainage may be required for a clay porous profile.

Close liaison with Tennis Australia throughout the clay / red porous court planning process is recommended to ensure the selection of the most suitable clay surface for your venue.

Clay / red porous surfaces are permeable, allowing the surface water to drain vertically through the court. Depending on the product, this can facilitate play shortly after rain (e.g. Conipur Pro Clay has greater water permeability than other clay surfaces). Although clay is permeable, the court design shall still incorporate a slope to assist with the drainage process.

The type of clay selected for your courts should be guided by the:

- Level of competition
- Ongoing maintenance costs
- Initial capital costs / budget availability.

Image 3.1.6
Clay Court

Lifecycle

It is expected that continued maintenance practices such as topping up high wear areas (especially the baseline and service lines) along with high quality initial construction, a clay surface will continue to be regenerated and have a lifespan of 25+ years. However, clay surfaces are susceptible to a range of issues if insufficient or ineffective drainage systems are in place.

Pavement Options

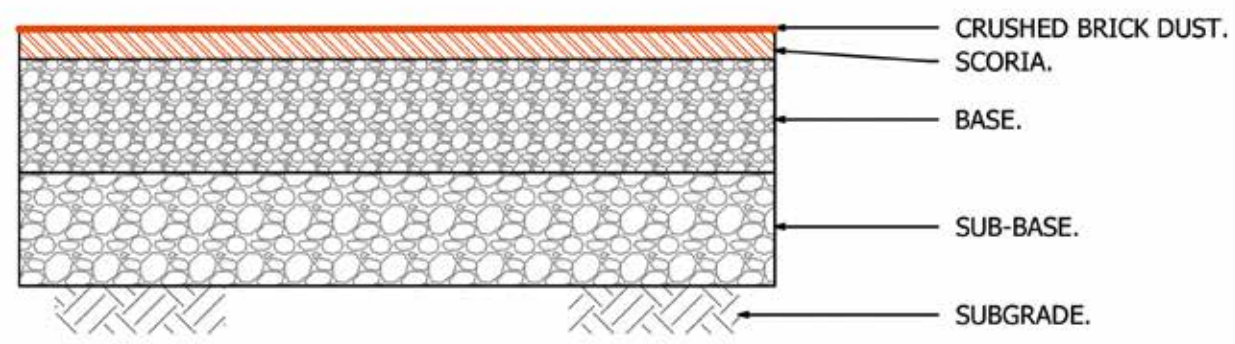
The pavement option for clay surfaces is flexible crushed rock pavement (no asphalt wearing layer). Climatic and environmental conditions may require additional sub-soil drainage.

Figure 3.1.14 Clay Court Preferred Pavement Base provides a typical cross section for the pavement options.

Construction Overview

The construction of a clay / red porous court will vary depending on the type of clay system chosen. It is recommended that a specialist clay court contractor with previous experience in the nominated clay product is engaged.

Figure 3.1.14
Clay court preferred pavement base



Natural Grass Courts

Natural grass courts remain a popular court surface choice in some states across Australia. The quality of a natural grass court is heavily dependent on local weather conditions, access to a sustainable water source and quality of maintenance.

The use of a natural grass court can be limited and seasonal, and it is necessary to allow sufficient time for the recovery of the natural turf.

Lifecycle

Natural turf tennis court surfaces have an expected life span of 30+ years, however resurfacing every 7 – 10 years will assist to remove the build-up of organic matter accumulated in the turf profile.

The condition and overall health of the turf will impact on the lifecycle of a natural turf court.

Preferred Pavement Base

The following figure provides a typical cross section for a natural grass tennis court. Climatic and environmental factors may also require free draining crushed rock base with sub-soil drainage.

Figure 3.1.15
Natural grass court cross section

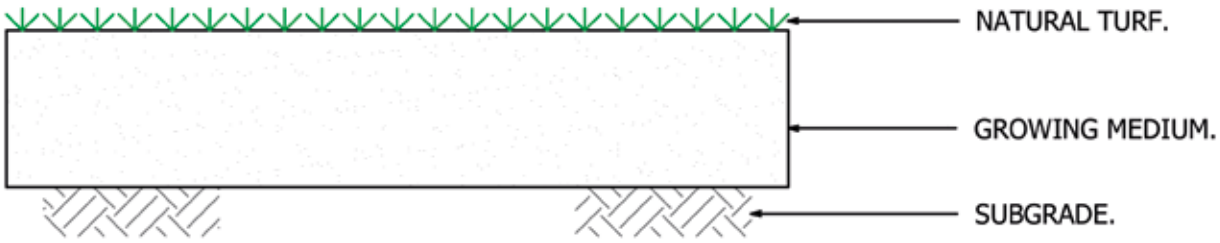


Figure 3.1.8
Natural grass court

Depending on local weather conditions, subsoil drainage may be required for natural grass tennis courts.

It is strongly recommended that an agronomist is engaged for input into the specifics of growing turf species.

Construction Overview

Construction of a natural grass tennis court typically consists of the following methodology.

1. Preparation of subgrade to specified tolerances
2. Installation of supporting infrastructure (drainage and irrigation)
3. Thorough testing of physical and chemical growing medium properties, prior to the importation of drainage gravel and growing medium materials
4. Importation and placement of playing surface profile (e.g. rootzone sand growing medium and drainage gravel if required)
5. Laying of washed turf.

Synthetic Filled Surfaces

Sand Filled Artificial Grass (SFAG) surface is a tufted synthetic carpet laid over a base, generally constructed of concrete, asphalt or crushed rock pavement.

The carpet is then filled with sand to fill the space between the fibres, holding the fibres upright and providing a firm playing surface.

SFAG surface playability is highly dependent on an effective maintenance regime. Generally, if constructed correctly, the surface can be played on when it is damp and shortly after rainfall events.

There are several artificial turf products available in Australia. Careful consideration should be given to selecting a quality product, capable of performing and withstanding the local climate and UV conditions.

A Sand Filled Artificial Clay (SFAC) surface is a carpet overfilled with a coloured sand product to simulate the appearance of a clay tennis court.

The surface does not require watering and provides similar cushioning and drainage properties to a SFAG court surface.

When resurfacing, the underlying pavement should be inspected by a qualified engineer prior to installation of the new surface.

Image 3.1.8
SFAG court

Image 3.1.9
SFAC court

Lifecycle

Current generations of synthetic filled tennis court surfaces have an expected life span of 8 – 12 years.

The life of the surface is determined by the maintained height of the synthetic pile, as well as compaction of the pile and sand particles. Due to the abrasive nature of the overfilled infill, it is expected that the life span of a SFAC can be slightly less than a SFAG court.

Tennis Australia's preference is an asphalt or concrete pavement base to ensure surface tolerances are maintained for the pavement life span and for ease of resurfacing. A flexible crushed rock base could be considered but doesn't necessarily meet these criteria.

Due to long term performance issues, Tennis Australia recommend that any conversion from an acrylic hard court to a SFAG shall require the removal of the acrylic surface via grinding or an appropriate treatment.

Pavement Options

The pavement options for both SFAG and SFAC surfaces are:

- Flexible crushed rock pavement with an asphalt wearing surface
- Flexible crushed rock pavement (cement stabilised if required)
- Rigid concrete.

Refer to **Section 3.1.3 Court bases (pavements)** for more information.

The following figures provide a typical cross section for pavement base options.

Figure 3.1.16
SFAG surface with flexible rushed rock pavement

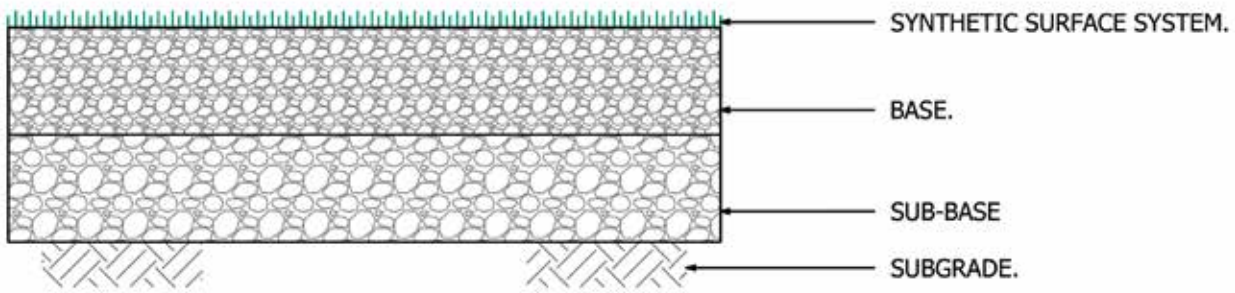


Figure 3.1.17
SFAC with crushed rock flexible pavement

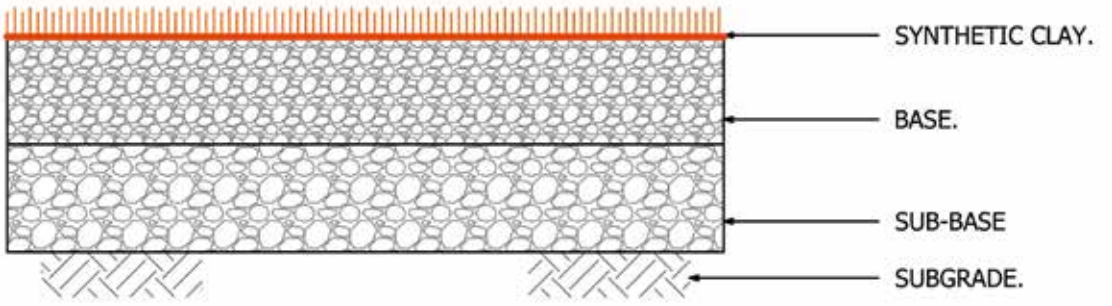


Figure 3.1.18
SFAG surface with flexible aspaht pavement

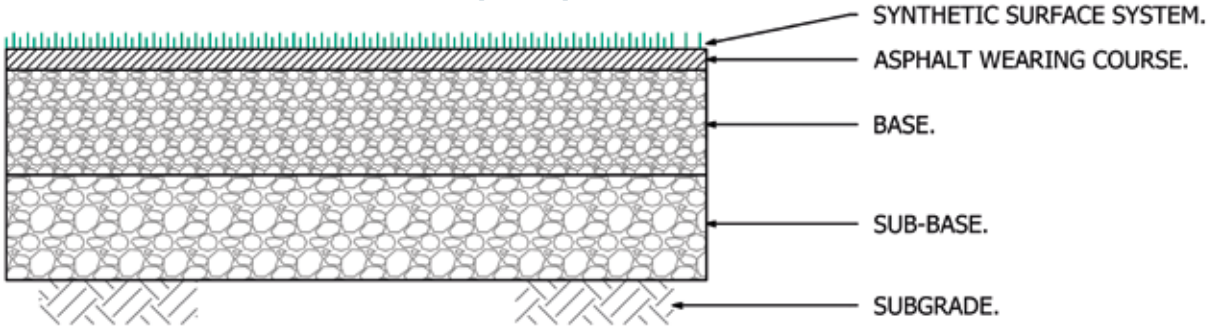


Figure 3.1.19
SFAC with flexible asphalt pavement

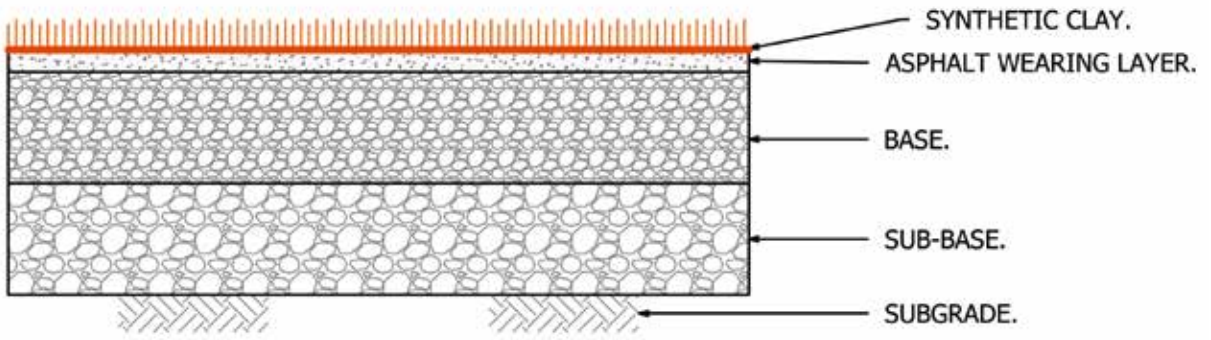


Figure 3.1.20
SFAG surface with rigid concrete pavement

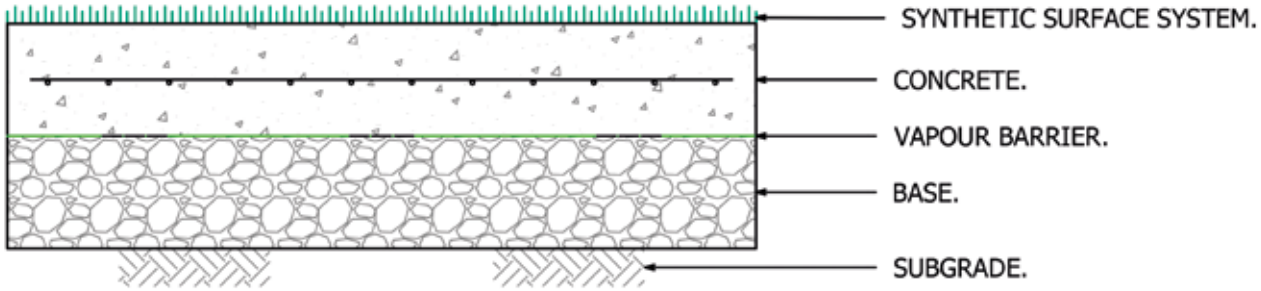
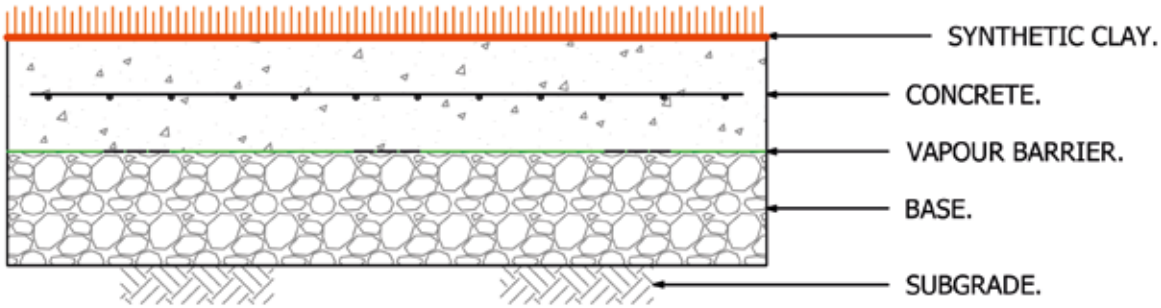


Figure 3.1.21
SFAC with rigid concrete pavement



Construction Overview

Typical construction of synthetic filled surface consists of the following:

1. Pavement construction and preparation to ensure the base meets specified tolerances
2. Preparation of a roll layout plan indicating line marking and seam placement
3. Laying of the synthetic surface in accordance with the roll layout plan, ensuring exact positioning of the line marking
4. Alignment of joining tape at the centre of the seams to ensure even stresses between each roll
5. Application of adhesive on synthetic seams
6. Dressing of artificial grass with infill as per manufacturer's requirements.

3.1.5
TENNIS COURT MAINTENANCE

Maintenance varies between surface types, however works should be scheduled and recorded in a maintenance plan, from daily to annual activities. This is important for the following reasons

- Planning – preparing responsibilities for tasks, inspections, scheduling contractors, communication to users
- Reporting – monitoring performance, managing risk and OHS, identifying trends, tracking maintenance tasks
- Evidencing – proving appropriate maintenance has taken place if there are surface issues, business cases for funding, demonstrating accountability for assets

Acrylic Hard Courts

Generally acrylic surfaces require the least regular maintenance of all court surfaces. To ensure the performance and longevity of the acrylic surface, it is recommended a regular maintenance regime is undertaken and includes the following:

- Regular surface cleaning
- Removal debris and foreign matter
- Removal of standing water
- Repairing of surface cracks.

The following advice is generic and should be verified by the acrylic manufacturer / installer.

Regular Surface Clean

An acrylic court should be power washed at least once per year, depending on the site location. The water blaster should be at around 2500-3000psi and held approximately 300mm from the surface. It is recommended that this be undertaken by an experienced professional.

The washing process should start at the high point of the court continuing back and forth along the width of the court until the wash terminates at the low point.

If tree sap or bird excrements are left on the court surface they can cause delamination to the acrylic.

Removal of debris / foreign matter

Removal of debris and foreign matter from the court surface should occur to remove risk from abrasive wear or gouging and to manage playability and maintain true ball bounce.

Removal of standing water

Standing water on acyclic surface can accumulate dirt and debris resulting in stains across the surface. Standing water should be removed as often as possible.

Repairing surface cracks

Repairing cracks in acrylic to prevent moisture migration under acrylic surface, which may lead to delamination. It must be noted that surface cracks are never permanently repaired without base / pavement reconstruction or rectification works are undertaken.

Resurfacing

A regular maintenance regime for tennis courts may include court resurfacing every 8 – 12 years. Depending on the initial design and construction of the pavement, an acrylic tennis court may be resurfaced several times before base reconstruction is required.

Non-cushioned surfaces can be resurfaced with only the top wearing surface needing to be replaced.

Cushion surfaces may require the rubber cushioning should be topped up when the acrylic surface is being resurfaced (e.g. every alternative resurface).

Clay / Red Porous courts

Generally, clay / red porous courts require a higher level of maintenance than other court surfaces. Maintenance is necessary to ensure the consistency of play, maintaining permeability of the surface, aesthetically pleasing and achieve a longer lifecycle. Maintenance of a clay / red porous courts should include:

- Removal of debris and rubbish
- Watering (regularly including overnights, before, during and after play)
- Bagging between sets
- Rolling
- Topping up high wear areas.

Maintenance requirements may vary between clay court surfaces. The following advice is generic and should be verified by the clay installer.

Removal of debris and rubbish

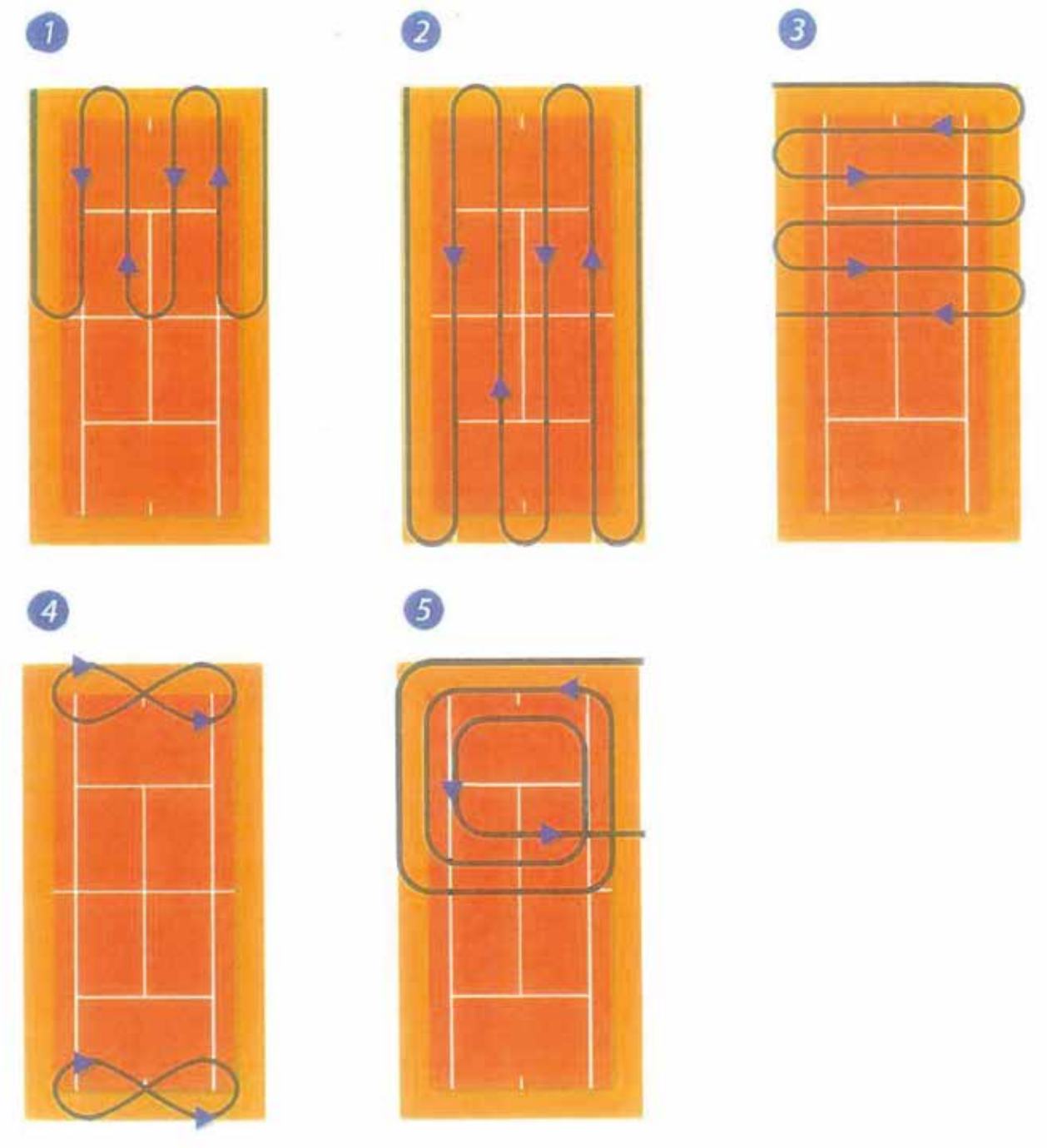
Removal of debris and foreign matter from the court surface shall occur to remove risk from abrasive wear or gouging.

Bagging and line sweeping

Regular bagging of the courts in varying directions is required **(see Figure 3.1.22 Court Bagging Methods)**.

Line sweeping should also be incorporated into the bagging maintenance regime.

Figure 3.1.22
Court bagging methods



Watering

A continuous and reliable water supply is required to keep moisture levels at the required level on a clay court. This is essential to maintain playing performance and promoting a long-lasting product.

The main intention of watering a clay court is to:

- Maintain the presence of clay fines on the court surface as helps prevent the clay from blowing away
- Keep the court firm and stable
- Ensure proper traction.

Rolling

Rolling a court will ensure the court surface is firm and fast, whilst also preventing it from losing top dressing material to wind. It is recommended that rolling does not occur when the courts are wet because the roller may make the surface uneven and may also pick up the fine clay layer on top of the surface

Topping up high wear areas

Continual topping up of high wear areas will prevent low points holding water and provide a safer playing surface. This ongoing maintenance of the surface levels will assist the longevity of the surface.

Algae and Moss Prevention

To prevent the establishment of moss and algae on the court surface, a moss killer algaecide should be applied to the court surface.

Prior to applying chemicals to the clay, consultation with the clay supplier is recommended to ensure the suitability of the product.

Natural Grass Courts

Maintenance of a natural grass tennis court is required all year round to ensure:

- Firm surface that provides good traction for players
- Consistent bounce of good height
- Even density and colour
- Surface is free of disease, weeds and pests.

Natural grass court maintenance regimes will vary depending on the level of play, however tasks required for courts would involve the following (described in further detail below):

- Mowing
- Rolling
- Irrigation
- Fertilising
- Top dressing
- Spraying for pests and diseases
- Repairs to high wear areas
- Dethatching and aeration
- Renovations.

Mowing

It is recommended that mowing occurs every second day, however in some Australian locations mowing may need to occur more or less frequently.

The cutting height will be between 4 – 8mm depending on use and competition.

Raising the cutting height will provide better protection of the surface from excessive wear, however it may reduce performance.

Rolling

Rolling of the court should be undertaken to firm the surface. It is important to consider the condition of the soil prior to rolling.

Irrigation

The depth and frequency of irrigation will be dependent of turf species and local weather conditions

Fertilising

Regular fertilising will:

- Ensure good recovery from wear
- Produce lateral growth
- Maintain colour and speed of court.

Soil testing should be conducted twice per year to gauge soil and plant requirements, and determine the appropriate fertilisers for the turf.

Topdressing

Application of the same growing medium (e.g. physical and chemical characteristics) as the playing surface is required periodically to assist with wear recovery and keep surface levels even.

Spraying

Spraying for pests and disease is necessary to control potential outbreaks of fungicide, pests and diseases.

A person with an appropriate chemical license should undertake spraying.

Repairs to high wear

Should the turf be damaged beyond repair, new turf should be laid with sufficient time provided for establishment.

Dethatching and aerations

A regular dethatching (e.g. removal of built up organic layer) program should be undertaken to limit thatch build up, which will result in a slower court and 'spongy' surface.

Aerate (e.g. decompact) the playing surface profile with 8mm tynes to promote a healthier and better performing surface.

Frequency of dethatching and aerating should be determined by the curator.

Renovations

At the end of the playing season natural grass courts should be renovated. The renovation should involve the following:

- Undertake soil testing to determine any nutrient deficiencies
- Scarifying to remove thatch build up
- Coring the surface to allow air entry
- Topdressing using the same profile material
- Laser levelling (if required)
- Top dressing
- Fertilising based on soil test results
- Applying chemicals to control pests/ diseases.

Synthetic Filled Surfaces

Regular maintenance of synthetic filled surfaces (sand filled artificial grass (SFAG) and synthetic clay) is important to achieve consistent and safe playing characteristics, prevent wearing of synthetic fibres and maintain the systems permeability.

Maintenance of synthetic filled court surface should include:

- Inspection of seam lines
- Removal of leaves, twigs and other debris
- Regular grooming (e.g. brushing) to maintain infill levels and keep fibres upright
- Regular treatment for moss and algae prevention
- Repairing of tears.

The following advice is generic and needs to be verified by the synthetic surface manufacturer.

Inspect high wear areas and seam lines

Seam lines should be inspected regularly to identify any minor separation, particularly in high wear areas. Separation can be a result of climatic conditions and should be rectified as per manufacturer's recommendations.

Rubbish removal

Regular removal of any plant debris and other rubbish on the court surface to prevent premature loss of pile and deterioration of surface permeability.

Grooming

- Regular brushing or grooming should be carried out using appropriate brooms or grooming machines, as recommended by the surface manufacturer. It is recommended that this occur when the court is dry for maximum effectiveness and that:
- Grooming should be undertaken in the opposite direction to which the rolls were laid, this will aid in pushing the fibres upright
- Regular brushing of the surface also aids in distribution of the sand
- The frequency of brushing is dependent on the level of use.

Synthetic clays surface may require additional bagging between sets, period watering and sand top ups than SFAG.

Algae and Moss Prevention

To prevent the establishment of moss and algae on the court surface, a moss killer algaecide should be applied to the court surface.

Prior to applying chemicals to the synthetic grass, consultation with the surface manufacturer is recommended to ensure the suitability of the product.

Repair tears

Tears shall be repaired as soon as possible to prevent greater deterioration. Depending on extent of tear, typical repair works options include:

Cleaning of the tear by peeling back and applying joint backing tape.

Cutting of square / rectangular shapes around torn areas and replacing with new synthetic using backing tape and adhesives.

Resurfacing

Resurfacing of the artificial grass surface will be required when the product reaches the end of its lifespan, typically 8 – 12 years. The artificial grass generally can be resurfaced multiple times before rectification of the underlying pavement is required.

3.1.6 SUPPORTING INFRASTRUCTURE

This section provides an overview of the supporting infrastructure required for tennis courts including:

- Drainage
- Irrigation
- Lighting
- Tennis Nets (posts and winding mechanisms)
- Fencing.

For furniture, fixtures or other equipment refer to Section 3.5 Equipment and Accessories.

Drainage

Drainage systems are a vital component of all tennis courts. A lack of effective drainage infrastructure can cause premature failure of the court pavement and premature degradation of court surface and surrounding areas.

There are two key components of a drainage design:

1. Surface and perimeter drainage
2. Subsurface drainage.

To achieve effective drainage, it is recommended that the court surface has a surface grade of 1% (maximum). Site constraints may dictate a flatter court gradient. It is important to first consider the surface type to determine if it will be an appropriate solution for effective drainage.

Refer to **Section 3.1.1 Court Orientation, Layout and Geometry** for further detail.

Surface Drainage

The fall of the court should be directed towards formalised drainage infrastructure, such as a spoon drain or grated trench. This drainage infrastructure should then collect the surface run-off and convey it into the site stormwater drainage network via a series of pits and pipes.

Subsurface drainage

To prevent subsurface water penetrating beneath the court pavement and undermining the strength of the pavement, typically perimeter subsurface drainage is installed around the perimeter of the courts. The subsurface drainage consists of slotted pipe work which intercepts subsurface water before it can pass into the pavement.

Should the court consist of a free draining base material (e.g. natural turf or clay / red porous) then subsurface pipe work may be located within the footprint of the courts and as well as the perimeter, subject to local weather conditions.

Irrigation

Where a natural turf or clay / red porous tennis court surface is selected, an irrigation system is required for maintenance purposes.

It is recommended that the system is fully automatic, with an irrigation controller to provide the correct amount of water to the court surface over a set time period.

Figure 3.1.23 Court Irrigation Layout provides an example of a tennis court irrigation system layout.

Lighting

Sports lighting is an important element of tennis courts, allowing for night time use.

The design of the court pavements and other supporting infrastructure should be coordinated with sports lighting poles and in-ground services.

Refer to **Section 3.3 – Court Lighting** for further information.

Net posts and winding mechanisms

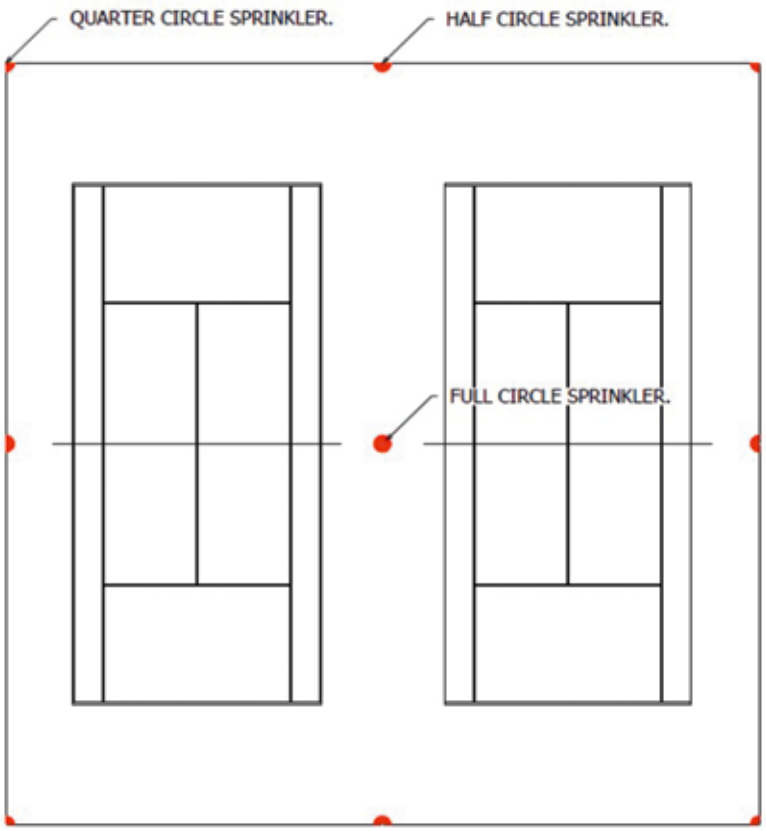
Net posts and winding mechanisms support tennis nets dividing the court across the centre, suspended by a cord or metal cable. All tennis courts require correctly installed nets and post, as per the specifications outlined by the International Tennis Federation (ITF). The location of these posts is different for singles and double courts due to the different court size. Courts will either have the option of singles or doubles net posts, or have doubles posts only with the option of singles sticks to adjust the net accordingly. Adjusting the cable / wire to the correct tension is important to avoid over tensioning and to meet the correct height requirements of the ITF. For further information refer to the ITF Technical Facility Guide.

Centre straps ensure that the centre height measurement of the net meets the ITF requirements.

Considerations when selecting and installing net posts are:

- Installation in into sleeves or concrete footings
- Posts in a sleeve allows for easier removal for multi-use courts
- Portable net posts are provided on grass courts to allow for court movement and rotation

Figure 3.1.23
Court irrigation layout



- Posts should be strong enough to withstand forces generated by the tension in the net
- Net posts are 1.07m in height and maximum 15cm in diameter, positioned 0.914m outside the court lines
- Winding mechanisms can be installed internally or externally to the post
- External winding mechanisms are prone to environmental damage and possible safety risk to players.
- Posts, sleeves and winding mechanisms should be made from non-corrosive material
- Cables may be galvanised, PVC coated or plain determined by local environment / climate conditions
- Portable net posts are provided on grass courts to allow for court movement and rotation to protect, manage and maintain court surface quality

Fencing

Fencing provides many functions within a tennis facility, including:

- Retaining the balls on the court.
- Dividing courts.
- Safety and security.
- Windbreak support.
- Signage display.

Refer to **Section 3.2 Fencing** for further information.

3.1.7 ANZ TENNIS HOT SHOTS COURTS

ANZ Tennis Hot Shots (ANZTHS) is a player development program using smaller courts, slower tennis balls and lighter racquets to guide slower paced play in a fun environment. This format is predominately used for those learning to play tennis but is also suitable for people of all ages and abilities.

The program was developed to encourage participation and learning through game play and allows participants to:

- Understand the rules and requirements of tennis
- Develop skills in a structured, fun and supportive environment
- Interact with other participants of the same skill level.

The ANZTHS court dimensions have been adapted from the International Tennis Federation's 'Play and Stay' model for smaller courts and from the United States Tennis Association (www.tennisplayandstay.com). However, ANZTHS standards and specifications in Australia should follow the information provided in this document.

Planning ANZTHS Courts

ANZTHS programs take place on specifically designed smaller courts which are key to successful ANZTHS programming. Most participants enrolled in ANZTHS programs find it challenging to cover a full-sized court, so the implementation of appropriately sized courts encourages ease of movement and assists in skill development techniques.

ANZTHS programming is usually targeted at junior participants of primary school age. The program encompasses four development stages for participants learning to play tennis.

The colour system assists in developing participant skills and confidence by providing a fun and supportive environment for play and allows progression through the colour stages at an individual pace.

Before starting any projects contact the relevant State or Territory Member Association.

Table 3.1.3
ANZTHS development stages

	Coaching	Match Play	Community Play
Blue Stage	3-5 Years		3-12 Years
Red Stage	5-8 Years	6-8 Years	
Orange Stage	8-10 Years	8-9 years	
Green Stage	9-12 Years	9-12 years	
Club Tennis		12+ years	

Professional advice should be sought from a qualified contractor when planning and implementing ANZTHS courts to ensure the correct specifications are met.

Dimensions and court layouts

Standalone ANZTHS courts can be constructed in two different sizes, these are referred to as Red Courts and Orange Courts. These are appropriately sized to suit participant ability and skill level, and align with the four stages of ANZTHS programming. ANZTHS courts can also be created on existing full-sized courts using blended lines.

Court orientation

There is no specific orientation for ANZTHS courts, however it is preferred that courts be of north / south orientation (as recommended for all Australian tennis courts) to avoid direct sunlight in the eyes of participants. ANZTHS court orientation may be restricted by the available space and existing infrastructure at an already established venue.

Surface type

Standalone ANZTHS specific courts are usually constructed on an acrylic hard court surface on a concrete or asphalt base, as this combination is strong and durable.

All ANZTHS colour coatings should be acrylic based and contain slip-resistant agents to optimise foothold and ensure a correct ball bounce. Qualified contractors can provide specific details on the ratio of ingredients suitable for court surfaces and specific application methods.

Acrylic paints should be applied in dry and warm weather conditions.

Red Courts

ANZTHS Red Courts are predominantly for first time junior tennis players, usually of primary school age. The Red Court size is specifically designed to allow ease of movement around the court.

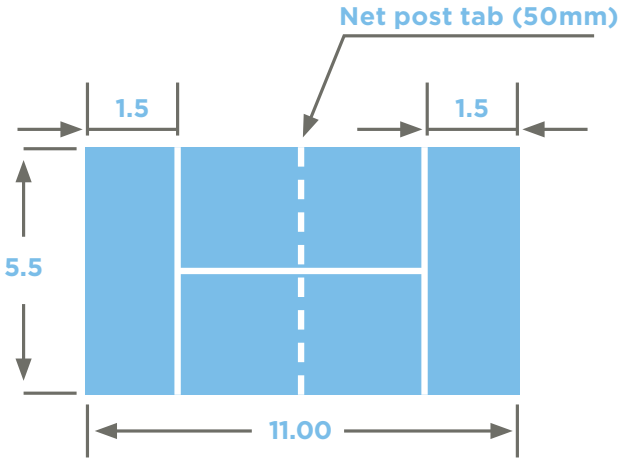
Orange Courts

Orange ANZTHS courts form part of the second stage of junior participant development. Participants who have gained the required skill set on a Red Court then advance to the larger sized Orange Court as part of the development process toward full sized tennis court play. Orange Courts can also be built stand alone, like Red Courts, but are most commonly incorporated into full sized courts through blended lines.

Table 3.1.4
Red court ANZTHS specifications

PPA – Principle Playing Area
TPA – Total Playing Area

Red Court Dimensions	
Length of PPA	11m
Width of PPA	5.5m
Minimum TPA	15m x 9.5m
Recommended TPA	17.1m x 10.38m
Service Box	2.75m x 4m
Net Height	65cm – 80cm
Line Width	Max. 5cm
Net Width	Max. 6m



Run-off area – Red Courts

Run-off Area	Distance	
	Minimum	Recommended
Run-back (Distance between court baseline and fence/other structure)	2m at each end	3.05m at each end
Side-run (Distance between court sideline and fence/other structure)	2m at each end	2.44m at each side
Common side-run (Distance between adjacent courts - no division fence)	2m	2.44m+
Common run-back (Distance between courts laid end to end - no division fence)	5m	Division fence to be installed between run-backs

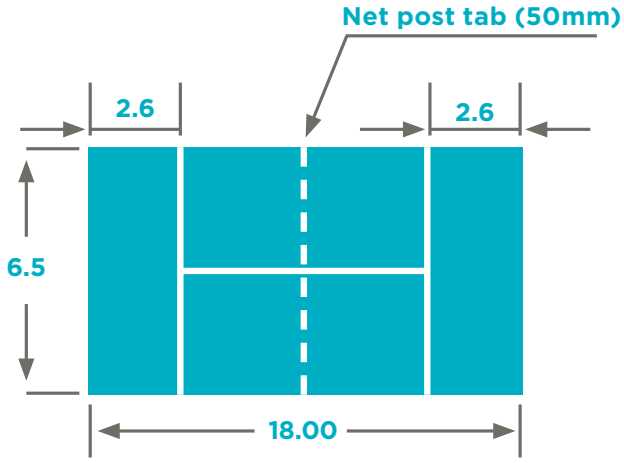
Court layout and Minimum space requirements – Red Courts

Court layout	Minumum space requirements
Single Court	15m x 9.5m
Two adjacent courts with common side-runs	15m x 17m
Three adjacent courts with common side-runs	15m x 24.5m
Four adjacent courts with common side-runs	15m x 32m
Two adjacent courts with common end-runs	31m x 9.5m

Table 3.1.5
Orange court ANZTHS specifications

PPA – Principle Playing Area
TPA – Total Playing Area

Red Court Dimensions	
Length of PPA	18m
Width of PPA (doubles)	8.23m
Width of PPA (singles)	6.5m
Minumum TPA	24m x 10.5m
Recommended TPA	20.54m x 10.5m
Service Box	As per full-size tennis court
Net Height	80cm
Line Width	Max. 5cm
Net Width	Max. 6m



Run-off area – Red Courts

Run-off Area	Distance	
	Minimum	Recommended
Run-back (Distance between court baseline and fence/other structure)	2m at each end	4.27m at each end
Side-run (Distance between court sideline and fence/other structure)	2m at each end	3.05m at each side
Common side-run (Distance between adjacent courts - no division fence)	3m	3.05m+
Common run-back (Distance between courts laid end to end - no division fence)	7m	Division fence to be installed between run-backs

Court layout and Minimum space requirements – Red Courts

Court layout	Minumum space requirements
Single Court	24m x 10.5m
Two adjacent courts with common side-runs	24m x 20m
Three adjacent courts with common side-runs	24m x 29.5m
Four adjacent courts with common side-runs	24m x 39m
Two adjacent courts with common end-runs	49m x 10.5m

Blended lines

Blended lines are an easy way to incorporate ANZTHS specific programming into clubs and venues without making significant changes to existing infrastructure. They are also a cost effective way of supporting junior participant development and can be added to existing full sizes tennis court surfaces with relative ease.

Key details on incorporating blended lines onto full-sized courts are:

- Up to four ANZTHS Red Courts can be provided through blended lines on a single full-sized tennis court.
- One ANZTHS Orange Court can be provided through blended lines on a single full-sized tennis court.
- Blended lines should not be white, so as not to interfere with existing full sized tennis court lines.
- Colour of the blended lines should be either a lighter or darker shade to the existing court surface.
- Blended lines should not intersect with existing white tennis lines (keep ANZTHS lines 2 – 3cm clear).
- Blended lines should be 3 – 4cm in width.
- The following images provide preferred blended line layout option and dimension requirements.

Blended lines are a cost effective way of successfully incorporating Hot Shots programming into venues.

Blended line layouts and dimensions

There are many clear advantages in providing blended lines on existing tennis courts:

- Existing infrastructure does not need to be changed or altered.
- Cost effective.
- Blended lines cause minimal disruption to existing programming and competitions.
- Portable netting can be used for ANZTHS activities and can be easily and safely stored away after use.

Blended line colouring

- Blended line colouring should be applied in a lighter or darker shade of the same colour as the tennis court surface to provide minimum disruption to regular tennis court users.
- There is no recommendation toward either a lighter or darker shade. The decision should be made after detailed discussions with your qualified contractor. The following typically applies to darker and lighter shade lines:
- A darker shade for blended lines can be applied with a mix of the existing court surface paints, with approximately 20 – 25% black acrylic paint.
- A lighter shade for blended lines can be applied with a mix of the existing court surface paints, with a mix of approximately 20 – 25% white acrylic paint.

If blended lines are being used on an existing court surface, the line marking paint material may vary, however all paints should be non-slip. Guidance should be sought from a qualified contractor on the suitability of the line marking material based on the surface and the external environment / climate of the venue.

Blended lines are often the preferred option for schools and public open spaces as they provide greater flexibility in programming options.

Non-slip materials should be used for all line marking on court surfaces to maintain player safety.

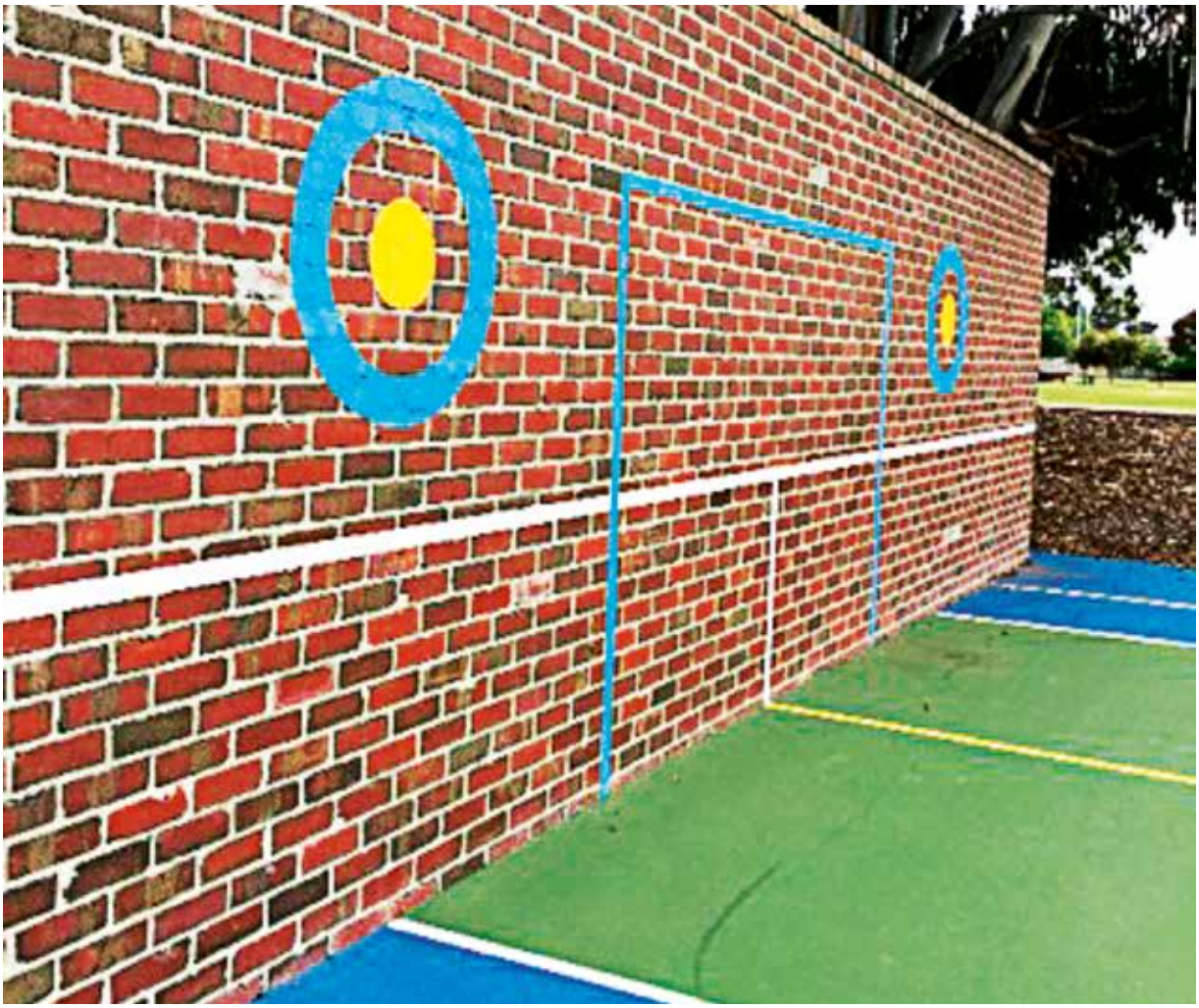
Kid's zones and hit up walls

Tennis venues may create separate specifically designed Kid's Zones, with dedicated ANZTHS courts and hit up walls for junior specific programming and activities.

Dedicated Kid's Zones should be attractive and appealing to participants. The use of red and blue colours have proven successful in existing Kid's Zones across Australia.

Hit up walls are a positive addition to Kid's Zones and may include activity markings (e.g. bullseye target) to assist in improving participant skills.

Image 3.1.14
Hit up wall



ANZTHS fencing

As with any tennis court, appropriate fencing is required to ensure the ball is kept within the playing area.

When planning for ANZTHS courts and Kid's zones, the following components should be considered.

- Chain link fencing is the preferred fencing type.
- Fencing should have both top and bottom railing for added safety and structural integrity.
- Optimum gate width is recommended as 1.35m for universal access.

Refer to **Section 3.2 Fencing** for specific information on fencing requirements and recommended gate widths.

The height of Hot Shots specific fencing can be between 1.2m (low level ball retention) and 3m (high level ball retention) and should be determined by overall venue requirements.

ANZTHS court funding

The costs of implementing ANZTHS specific courts can vary depending on the existing site components and the planning and delivery process. State/Territory Member Associations can provide guidance and cost estimates prior to the commencement of your ANZTHS planning project. Your Member Association can also provide direction on funding availability and qualified Hot Shot court construction contractors.

ANZTHS Equipment

ANZTHS play usually requires specific equipment such modified nets, posts, balls and racquets. Additional information on ANZTHS equipment can be found at: https://hotshots.tennis.com.au/.

3.1.8
MULTI-USE VENUES

Multi-use venues are a practical solution to support a range of sports and make effective use of available community infrastructure. Tennis has several compatible sports in which multi-use line marking can be implemented including netball, basketball and hockey. The type of tennis court surface will ultimately determine the suitability for other sport line marking.

Where multipurpose courts are designed, consideration needs to be given to line marking and court furniture fittings, such as net posts and lights. If converting existing courts to multipurpose line markings, blended lines should be consistent with existing surface colour to minimise impact on existing activity, whilst activating new sports and activities within the facility. Site specific elements will determine if a site is appropriate for multisport and multi-use line marking should meet the playing area standards of each relevant sport or sporting activity.

Where a multi-sport venues are being purpose built, Tennis Australia's Community Activity Hub model meets these needs through a community design driven by accessible programming and passive recreation options.

Benefits of shared space and sporting infrastructure arrangements may include:

- Meeting increasing venue operational costs through additional income streams
- Accommodating population growth and increased demand for a range of recreation opportunities
- Addressing the decline in the ability for clubs / venues to remain self-sustainable by increasing the number of users through different activities and programming
- Optimising limited activity space and lack of available land of new developments.

Implementing management models with shared services for multi-use venues can deliver the following benefits:

- Pooling of resources.
- Additional opportunity to generate income leading to greater sustainability.
- Year-round venue usage.
- Greater community benefit through increased accessibility.
- Potential to attract new participants.
- Increased community social networks and partnerships.
- Increased funding opportunities.

Image 3.1.19
Multi-use court

Compatible sports with tennis

In many cases, it may not be possible to accommodate several sporting activities on a single sporting playing area due to the differing sizes and specifications of courts and available space. Tennis does however have several compatible sports in terms of multi-line marking and use.

The most common sports suited for multi-purpose line marking with outdoor tennis courts include:

- Netball
- Basketball
- Hockey.

Technical specifications are shown in **Figure 3.1.29 Multi-use sport comparison.** The most common alignment of multi-line court marking is tennis and netball due to their similar sized playing areas and hard court acrylic surface preferences.

Multi-use line marking may also be suitable for tennis venues with a large number of courts. Offering access to other sports encourages participation from a greater range of users and can lead to further cross promotion of the game of tennis.

Figure 3.1.29
Multi-use sport comparison

Tennis Court Dimensions	Netball Court Dimensions	Basketball Court Dimensions	Hockey Court Dimensions
Length: 23.77m **Width:** 10.97m (doubles) **Width:** 10.97m (singles) **Surface:** Acrylic/asphalt /synthetic grass **Run off zone dimensions** **Sideline:** 3.05m **Baseline:** 5.48m **Between courts:** 3.66m **Lighting levels** **Recreation:** 250 lux **Competition:** 350 lux	**Length:** 30.5m **Width:** 15.25m **Surface:** Acrylic/asphalt **Run off zone dimensions** **Sideline:** 3.05m **Baseline:** 3.05m **Between courts:** 3.65m **Lighting levels** **Recreation:** 100 lux **Competition:** 200 lux	**Length:** 28m **Width:** 15m **Surface:** Acrylic/asphalt **Run off zone dimensions** **Sideline:** 2m **Baseline:** 2m **Between courts:** 2m **Lighting levels** **Recreation:** 100 lux **Competition:** 200 lux	**Length:** 91.4m **Width:** 55m **Surface:** Synthetic grass **Run off zone dimensions** **Sideline:** 3m **Baseline:** 2m **Between pitches:** 6m **Lighting levels** **Recreation:** 250 lux **Competition:** 500 lux

Compatible surface types

The most common multi-use tennis court surfaces are acrylic hard courts as multiple sports use this surface or similar. In a multi-use environment, these are usually aligned with outdoor netball and basketball but can also be used for adapted forms of other sport.

Acrylic surfaces provide a practical option for implementing multi-use line marking as it is a strong and easy to clean and is ideally suited for line marking paint.

Sand Filled Artificial Grass Surfaces (SFAG) have also provided a successful playing surface for some sports such as hockey, particularly within school environments.

Although SFAG surfaces can come in various forms, no one type of surface is suited to all sports.

To assist in identifying the best suited SFAG surface for venues with multiple sports, consider the following.

- Establish the standard of play to be conducted as this will impact the selection of the type of SFAG; high quality competition will require higher quality artificial turf.
- Preference is for SFAG tennis courts to have a pile height of no longer than 19mm and no shock pad under the surface.
- Usage levels; high usage may affect the expected lifespan of the surface.

In multi-use environments some compromise is required to ensure compatible provision across each of the associated sports.

It is important to note that in SFAG playing environments within Australia, tennis is usually the secondary sport to hockey.

Image 3.1.20
Acrylic court multi-use line marking

The WA Department of Sport and Recreation provides a detailed guide on playing field sport dimensions. See:

WA Department of Sport and Recreation – Sport dimensions guide for playing areas.

Image 3.1.21
SFAG hockey and tennis facility

Various court surface products are available on the Australian market. A detailed investigation on suitable surfaces for multi-use line marking should be discussed with suppliers, State or Territory Member Association and the relevant peak sporting body to ensure competition requirements are met.

Key considerations

Initial considerations when investigating an appropriate multi-use surface are:

- Playing characteristics (e.g. tennis ball bounce, slide).
- Player preference (e.g. impact on body, enjoyment, ability to cover court).
- Player safety (e.g. likelihood of slips, trips and falls on different surface types).
- Further assessments to be undertaken when selecting the preferred surface type and layout should include:
- Risk register to address any issues or problems
- Location of fixed equipment' to be located and / or stored outside of the tennis court or enclosed area.
- Procedure for changeover of equipment (e.g. nets) to ensure a safe playing area is maintained.
- Lighting levels meet the minimum requirement for all associated sports
- Court run-off requirements meet minimum requirements of all associated sports
- Innovative opportunities such as construction of a rebound wall as an alternative to enclosure fencing
- Selection of varying vibrant line marking colours, aligning dominant line colour with primary sport.

Line markings

Multi-line markings can be painted onto most sports surfaces. The most commonly used paint applied to hard courts is two-part polyurethane paint as it is most durable. Guidance should be provided by court manufacturers or construction experts on what product is most suitable to the surface. Line width of all sports should be 50mm.

Points for consideration when selecting products include:

- Avoid oil based paint as it can become slippery when wet
- Line markings should not be applied to new court surfaces for at least seven days
- Paint should be tested on the surface prior to the beginning the full line marking process
- All lines should be masked prior to application of any paint
- Ensure good quality paint products are used to avoid the need for reapplication.

Choosing court and line marking colours is an important part of the process, with white paint used for the dominant sport. Ensuring that multi-use line marked courts have clearly distinguishable boundaries is fundamental to ensuring a safe and clearly visible playing space for participants.

Table 3.1.6
Example line marking colours

Most utilised sport	Sport	Line colour
1	Tennis	White
2	Netball	Yellow
3	Basketball	Black
4	Hockey	Red

Sand Filled Acrylic Grass (SFAG) courts line-marking is dependent on the specific type of synthetic surface and associated sports and requires detailed site specific discussions with a qualified contractor.

ANZTHS court line marking

ANZTHS program specific line marking should be considered on any new tennis court development to further junior tennis player development.

See **Section 3.1.7 ANZ Tennis Hot Shots courts** section for more information.

Community Activity Hubs (CAH)

A Community Activity Hub (CAH) is a facility specifically designed to integrate multi-sport and multi-use options to activate a community through a range of leisure programs and services. This approach to facilities helps meet the needs of communities through integrated design and consolidated operating models with clear benefits to ongoing active lifestyles and increased venue sustainability. The CAH model aims to activate parklands and energise communities with tennis as a proven key driver in delivery. The CAH provides a 'more than tennis' experience by;

- Providing opportunities for tennis to develop partnerships with other sports, through facility use; and
- Encourages other types of recreation outside of sport (e.g. a café).

Community Activity Hubs promote participation in tennis and other social and recreation activities by providing easy to access courts. It offers an integrated operating model including a pavilion café, adjacent parklands, meeting and alternative program spaces as well as tennis courts and other sporting and recreation facilities within the precinct.

This holistic approach uses a range of activities to encourage whole and diverse communities to gather in a common location, encourages social interaction and community connectedness, which are key factors in addressing common mental health and lifestyle related chronic diseases.

Key elements

Key elements of the CAHs are:

- Construction / conversion of courts with acrylic hard court surfaces (lowest maintenance requirements)
- Introduction of café / kiosk incorporating external access from the surrounding parklands
- Dedicated ANZ Hot Shots courts in the parkland precinct to encourage junior development and casual family use

The resultant increased interest in the tennis centre and facilities will help drive a self-sustaining venue through higher participation levels and connection to the community. Increased court access, program participation and secondary spend opportunities helps grow the capacity to contribute to the maintenance of the venue driving a position of self-sustainability and a more secure long term future. This increase in efficiency and professionalism helps to relieve the maintenance burden and redirects the associated funds to other valuable community projects.

Benefits

The CAH has capacity to deliver a range of benefits including but not limited to:

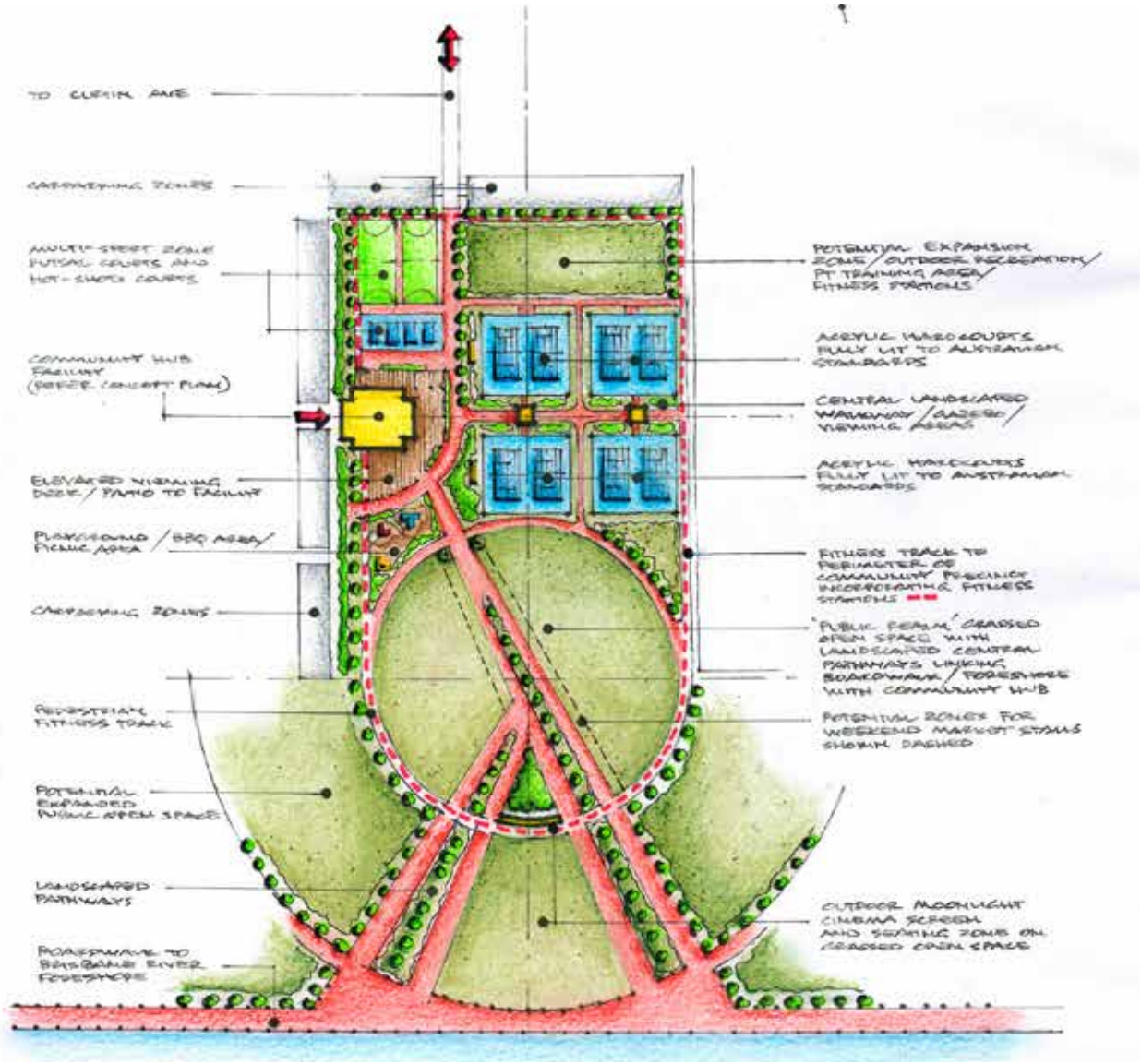
- Centralised management leading to operational savings (e.g. maintenance costs)
- Sustainable community venue and business model
- Activated parklands precinct for community engagement
- Hub for community connection with access to support groups through meeting and activity space
- Increased participation, formal and informal, through enhanced facilities and program delivery

Outcomes

Community Activity Hubs facilitate new opportunities within the community through sport, recreation and community engagement. Modern, accessible and user friendly assets with community links, outcomes can include:

- A healthier and more active population using the parklands for social activities, recreation and competitive sports which is actively reducing the risk of lifestyle related chronic disease.
- Greater sense of community with increased opportunities for social interaction and community events through regular exercise and activation of the existing parklands and associated venues.
- Creating a destination of choice for many different activities through community play on tennis courts and the connector of the café / kiosk.

Figure 3.1.28
Community activity hub concept design



3.2 FENCING

Tennis court fencing performs a number of functions:

- Retaining balls inside the court
- Dividing court playing areas
- Providing safety and security
- Windbreak support
- Signage display
- Safe child management within a contained area

Whilst fencing provides functionality to tennis courts, it can also be provided in a variety of ways to suit budgets, intended use, the local environment and site-specific conditions.

This section delivers detail on the following topics:

Primary audience

This section has primarily been designed for:

- Local Government
- Architects, planners, developers, designers and builders.

Definitions

Backstays – Outrigger additional structural support for fence.

Chain wire mesh – Diamond pattern woven fencing fabric.

Chamfered fence – Fence corners cut back at 45 degrees to provide angled corners.

Corner / end / intermediate posts and top/bottom rail – Fence structural elements.

Deep footing – Foundation type that transfers loads not near to the surface.

Divider fences – Soft mesh or solid fencing located between courts to retain balls in play.

Footings – Mass of concrete poured to support fence posts.

Galvanise – Coating iron or steel with a protective layer of zinc to prevent rusting.

Invert / concrete spoon drain / trench grate – Drainage infrastructure.

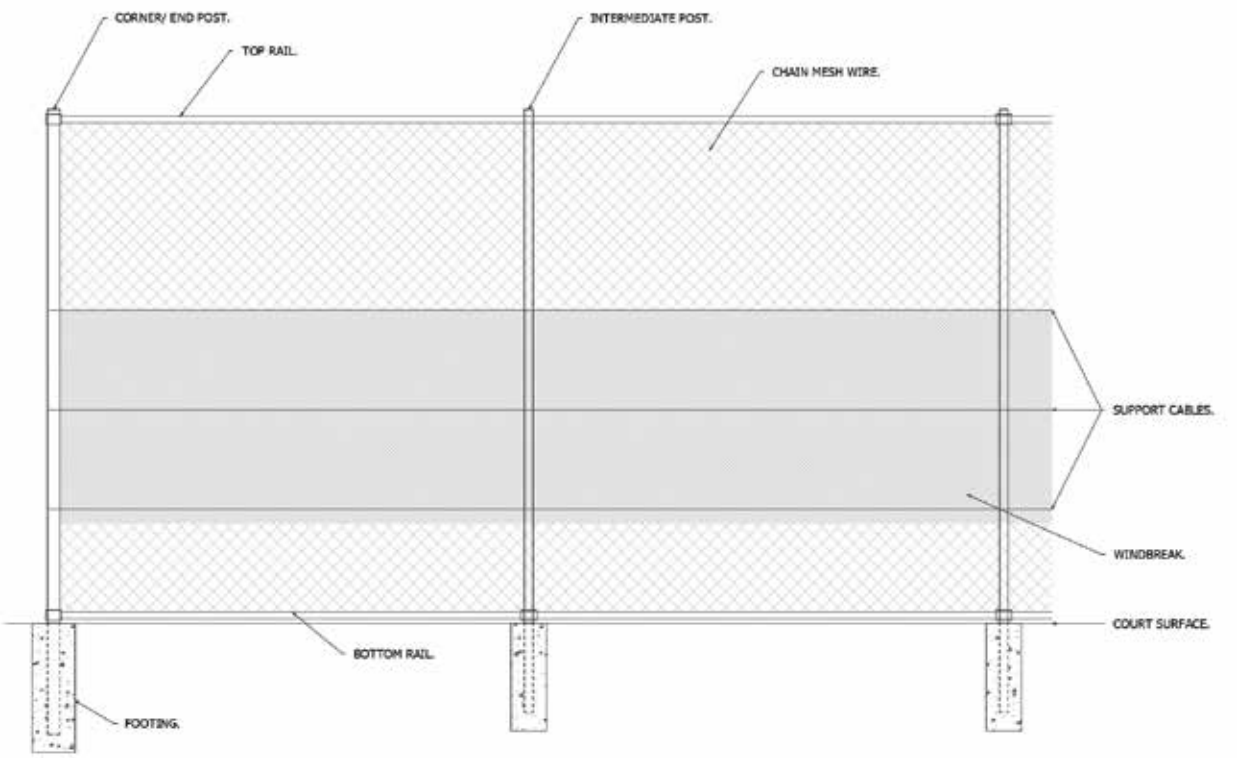
Pile – Deep foundation type which is a vertical structural element, typically driven or drilled.

Truncated fence – Transitioning of full height fence to lower height fence to improve spectator visibility.

Windbreak – Typically shade cloth used to protect field of play from high winds.

Figure 3.2.1 Example tennis court fence depicts the layout and location of a typical tennis court fence and shows the location of key components of the structural design. These definitions are used regularly throughout this section.

Figure 3.2.1
Example tennis court fence



Standards

Australian Standard AS1725.2 Tennis Court Fencing – Commercial provides recommendations for fencing heights, materials, post and rail sizes and installation for tennis facilities.

This Standard covers general fencing conditions but does not consider project specific conditions, such as poor or unique ground conditions, shade cloth and signage and therefore should be used as a guide only.

As stated in the standards preface:

'The objective of this Standard is to establish minimum requirements for chain link fabric fence materials and workmanship for commercial tennis court fences, in order to ensure satisfactory service by the fence for the purchaser and assist manufacturers and installation contractors by eliminating unnecessary minor variations in purchasers' requirements.'

Australian Standards can be purchased online via the Standards Australia – Search and Buy a Standard website: Standards Australia Online

An engineering design for fencing at tennis venues should always be undertaken by a qualified Structural Engineer.

Image 3.2.1
Tennis fencing

KEY HIGHLIGHTS

What you need to know

- An engineering design for fencing should always be undertaken by a qualified Structural Engineer.
- All baseline fences should be installed to 3.6m or 3.0m in height to ensure compliance with Australian Standards and to retain balls within the court enclosure.
- Fencing and any associated posts and backstays must be located outside the minimum ITF court run-off's and not impact on Total Playing Area (TPA) of a court.
- Design of court fencing must be designed to allow for site specific wind loads, particularly if windbreaks or sponsor signage is fixed to the fence.

3.2.1
FENCING PLANNING AND DESIGN

Traditionally, tennis court perimeter fences have been fully enclosed rectangular enclosures. However, alternative fencing arrangements can also be considered to suit venue specific infrastructure conditions and components such as:

- Increased spectator viewing opportunities
- Existing facility aesthetics
- Community accessibility options
- Specified project budgets.

The following key elements should be considered when planning fencing for a tennis venue and are detailed within this section:

- Fully enclosed or open fencing
- Truncated or half fences
- Chamfered fence corners
- Windbreaks and signage
- Divider fences and netting
- Access and maintenance gates.

The intended use and required level of access (e.g. open community facilities, Book a Court technology), will ultimately guide the type of fencing requirements and level of security and accessibility.

Fully enclosed fencing

A fully enclosed venue will control public access ensuring it is protected from unsolicited use. This will assist prolonging the durability of the court playing surface and regulate bookings, for example using Book a Court technology. Without an onsite operator or booking system in place, this type of fencing negatively impact usage opportunities through restricting ease of access.

Open venue fencing

Open venues provide access to the community and encourage both formal and informal use. The lower level of control over these sites can lead to increased maintenance requirements due to factors including improper use and vandalism.

Truncated and half fences

Reduced side fencing **(Figure 3.2.2)** provides enhanced spectator visibility of a court. Referred to as truncated and half fences, these designs can be utilised between courts and along the sides of courts. Half fences can provide cost savings to the venue development of renewal due the reduced amount of required materials. This option provides many of the functionalities required however does not provide full security as can easily be scaled.

Further points that can be disadvantages for both open and reduced fencing are:

- Protection for keeping the ball within the court enclosure
- Options for windbreak material.

Figure 3.2.2
Truncated fence diagram

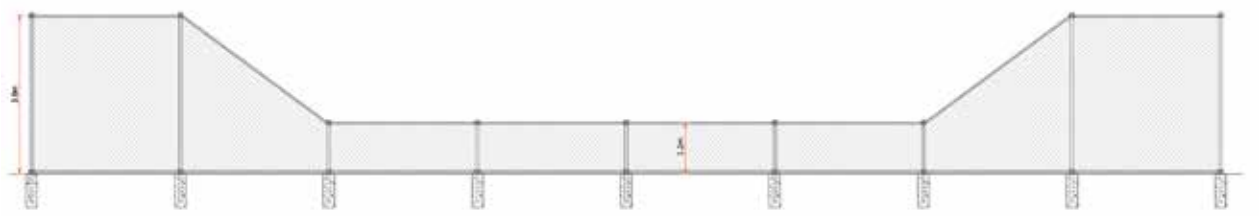


Image 3.2.2
Truncated tennis court

Chamfered fence corners

Chamfered fence corners are designed so that rectangular fencing corners are cut back at 45 degrees (**Figure 3.2.3**) to provide angled corners. Chamfered fence corners deliver the following benefits:

- More aesthetically pleasing
- Provide additional opportunities for spectator viewing at court corners
- Assist in directing the ball back to the baseline playing area
- Provide an opportunity for a gate entrance at the court corner
- Provide opportunity for lighting to be located outside the court enclosure in the corners.

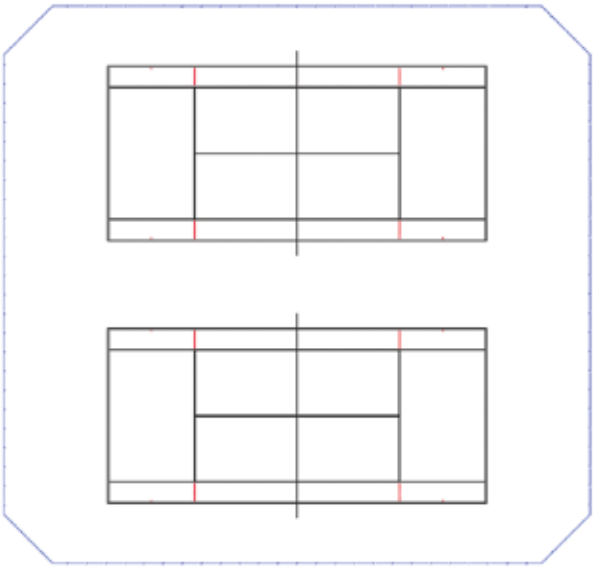
The chamfered corner should not have a width greater than 2.5m to ensure minimal obstruction to the court run off zone.

Windbreaks and signage

Windbreaks are installed to fencing surrounding courts exposed to higher wind levels, intended to divert the wind passage up and over the court. Windbreak material is typically shade cloth and is fixed to the perimeter fence.

Installation windbreaks and signage provide additional loading through the fence structure. Posts and footings must be designed by a qualified structural engineer to allow for the additional stresses of the wind loads.

Figure 3.2.3
Chamfered fence diagram



DISCLAIMER

The use of chamfered court fence corners reduces the run-off of the court total playing area in the corners. For facilities that will host events that require officials inside the court Total Playing Area, ensure Tennis Australia are consulted during the design phase to determine suitability of the use of chamfered court fence corners.

Image 3.2.3
Windbreak

Windbreaks on fences act as wind sails and as such translate high forces directly onto fence posts and rails. Different wind loadings apply across Australia depending on the location. The design of fencing with windbreaks must be completed by a qualified structural engineer.

If sponsorship is proposed on your windbreak you may need to consult with your local council to determine if planning permission is required.

Dividing fences and netting

Where two or more courts are provided adjacent to one another, a dividing fence is recommended to prevent balls rolling between courts.

Standard chain mesh solid fencing or retractable soft netting curtains could be utilised to divide courts. Either option should be designed with appropriate access points between the courts. Soft netting can reduce chances of player injuries from running into dividing fences.

For both options, the correct run-off to side fence is required (refer to Section 3.1 Courts). Due to the soft netting potentially being susceptible to billowing, it is recommended that additional side run-off be considered.

Soft court dividing netting is an ideal solution for multi-use facilities and has the capacity to increase flexibility, particularly for coaching activities.

Access and maintenance gates

Access to the tennis venue and their courts should be provided for:

- Users of all ability
- Maintenance vehicles
- Emergency vehicles.

It is important to have gates installed in appropriate locations around the venue to ensure ease of access.

The following table provides recommendations for the widths and heights of access gates for various purpose

Table 3.2.1
Gate access dimensions

Gate type	Recommended dimensions
Universal Access*	1.35m (w) x 2.1m (h)
Maintenance / Emergency Access	3.0m (w) x 3.0m (min.) (h)

* At grade access (i.e. free of vertical obstruction) for users is essential to providing seamless and unimpeded access entry to court enclosures. Where applicable, each court should have at least one at grade access point.

To achieve a fully accessible gated entry point onto a court, a seamless and obstacle free transition across the surface should be provided. Common forms of drainage infrastructure that may impede court access include:

- Trench grates
- Inverted concrete drains
- Shallow concrete spoon drains.

Accessibility issues with these drainage types can be avoided by constructing using a minimal invert depth **(Figure 3.2.4).**

Access gates should be located off center to avoid umpires chairs and other central supporting infrastructure.

Figure 3.2.4
Spoon drain (invert depth view)

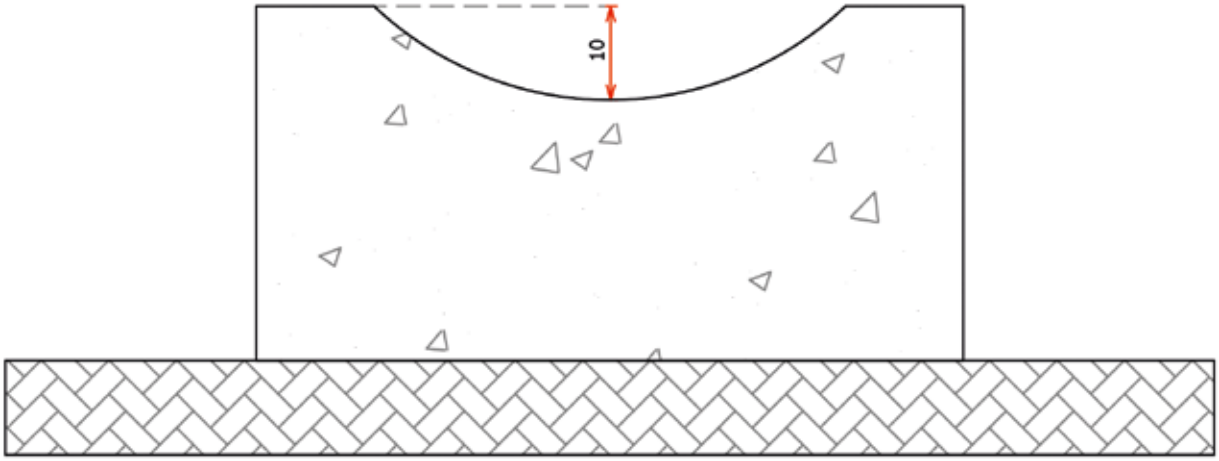


Figure 3.2.5
Universal access gate diagram

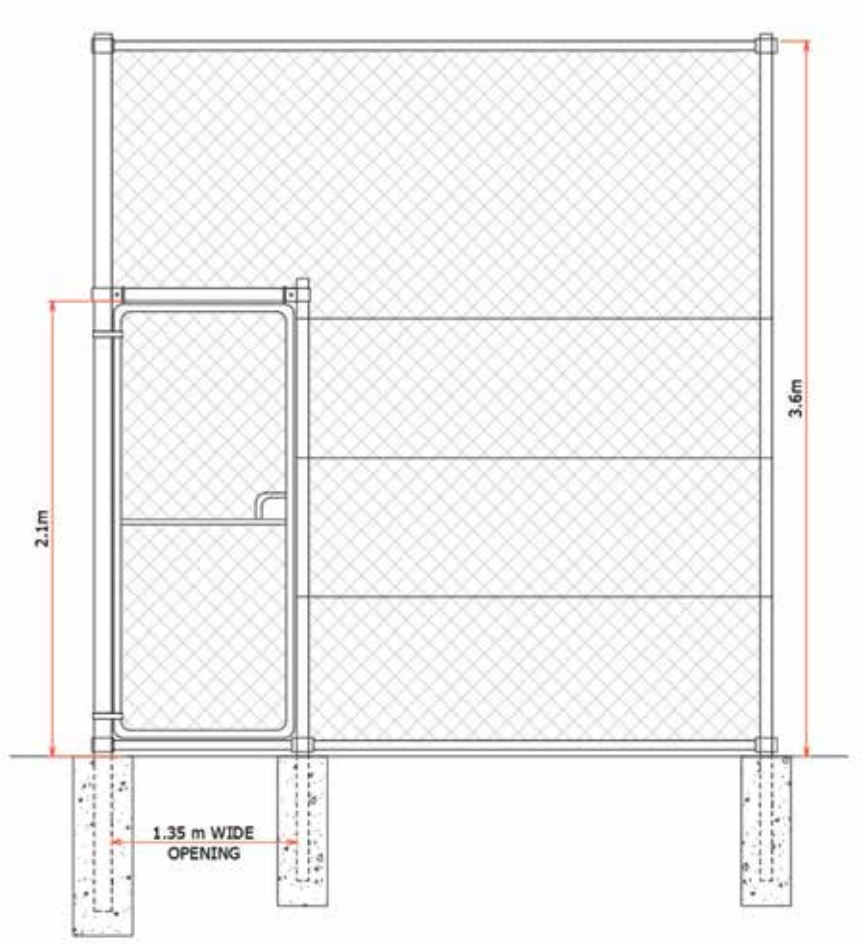
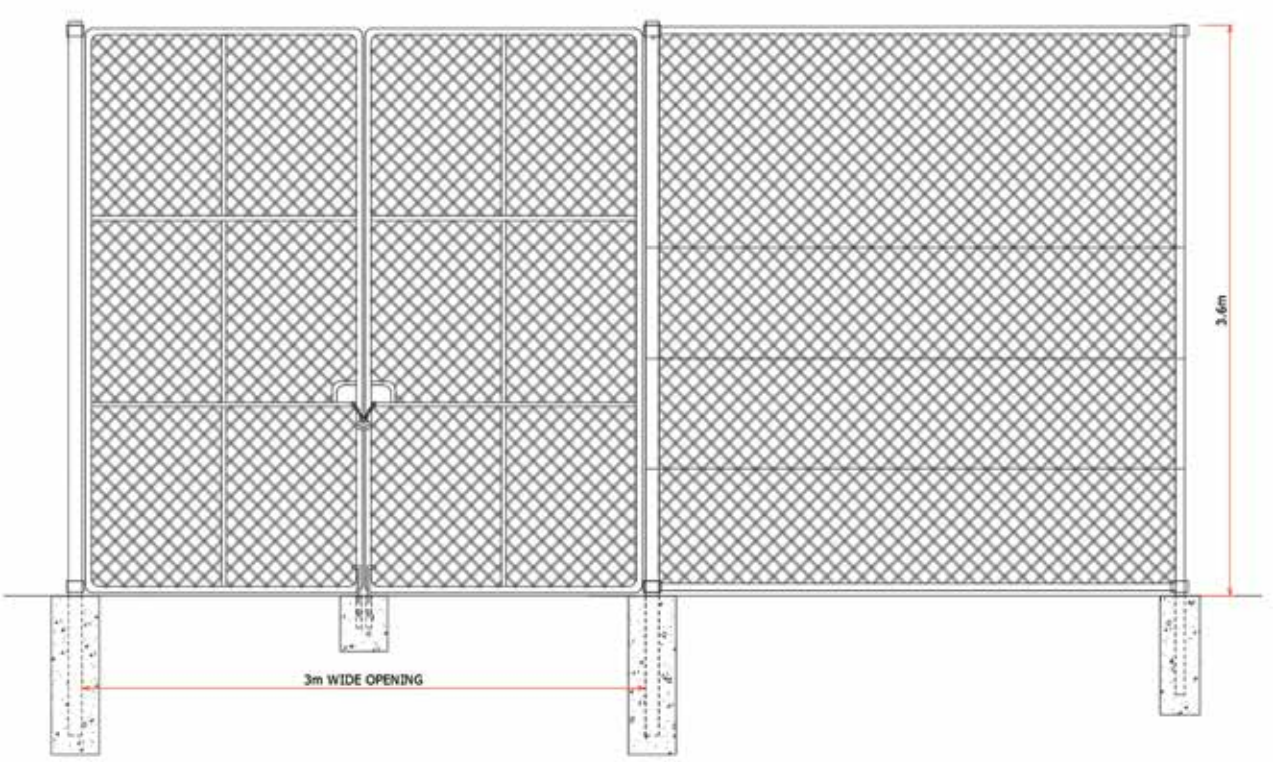


Figure 3.2.6
Vehicle access gate diagram



3.2.2 FENCING DESIGN AND CONSTRUCTION

Tennis court fencing must be designed considering site specific conditions, these include:

Ground conditions

The loads applied to the tennis court fencing are required to be counteracted by the fence post footing. The depth and diameter of the footings are dictated by the ability of the existing ground to retain the forces applied.

Wind loads

Wind loads refers to the load applied to the fence by wind gusts. Each site will have different wind loads and must be designed to allow for the site specific conditions. Wind loads are detailed further in this section.

Facility management

The type of management model in place at a venue will guide the selection of court fencing that is required. For example, an open venue is likely to have reduced fence heights, and a closed venue will usually consist of lockable 3.6m high fencing.

Spatial availability

The available space around the courts will impact fencing solutions; use of backstays should not be considered if the spatial availability is low.

Facility support infrastructure

The fence, associated footings and backstays need to be coordinated in conjunction with the relevant supporting infrastructure, e.g. storm water drainage and lighting electrical supply.

Image 3.2.4
Fencing

General requirements of tennis court fencing include:

Fence height

Tennis Australia recommended that a preferred height of 3.6m be met in club environments and elsewhere, wherever possible. For community facilities, 3.0m high fencing would also be suitable to allow for cost savings.

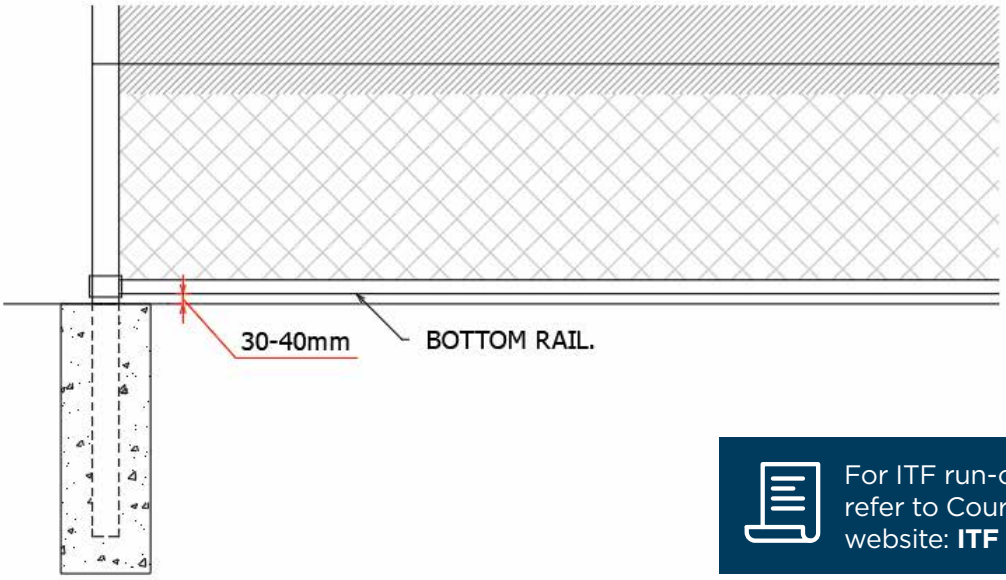
It is recommended that the height of the bottom fence rail be no greater than the diameter of a tennis ball (i.e. 65mm) from the finished surface level (refer to **Figure 3.2.7**).

Run-offs

When designing fencing, it is important to consider the International Tennis Federation (ITF) run-off requirements (refer to **Section 3.1.1 Court Orientation, Layout and Geometry**).

For player safety, the ITF run-offs must be measured to all fence posts and rails, ensuring there are no other fixed obstructions between the Principal Playing Area (PPA) and fencing structures

Figure 3.2.7
Fence bottom rail dimension diagram



For ITF run-off requirements, refer to Courts section or the ITF website: **ITF Court Dimensions**

Fence materials

Fencing structures should be designed with materials that suit local conditions to prolong the life of the fencing. For example, heavy galvanized fencing should be considered for facilities close to the ocean.

Australian Standard AS1725.2 for Fencing provides an overview of the options available for chain link fabric fence materials.

Chain mesh should be fixed to the internal side of the fence post and rails (i.e. court side) to minimise obstructions from the fence uprights to players.

Wind loads

If windbreaks or signage material are to be installed on fencing structures, it is necessary to understand the local wind rating, and the type and size of material to be installed on the fence. A structural engineer will consider these factors when designing fences and draw on the relevant Australian Standards and the outlined wind load factors across the various parts of Australia.

Windbreaks are typically installed at around 600mm from the top and bottom of the fence. Assuming the fence is 3.6m high and the windbreak mesh is 2.4m high **(Figure 3.2.8 Windbreak dimensions).**

It is necessary to consider the likelihood of future wind break or signage infrastructure when sizing fence posts.

Figure 3.2.8
Windbreak dimensions

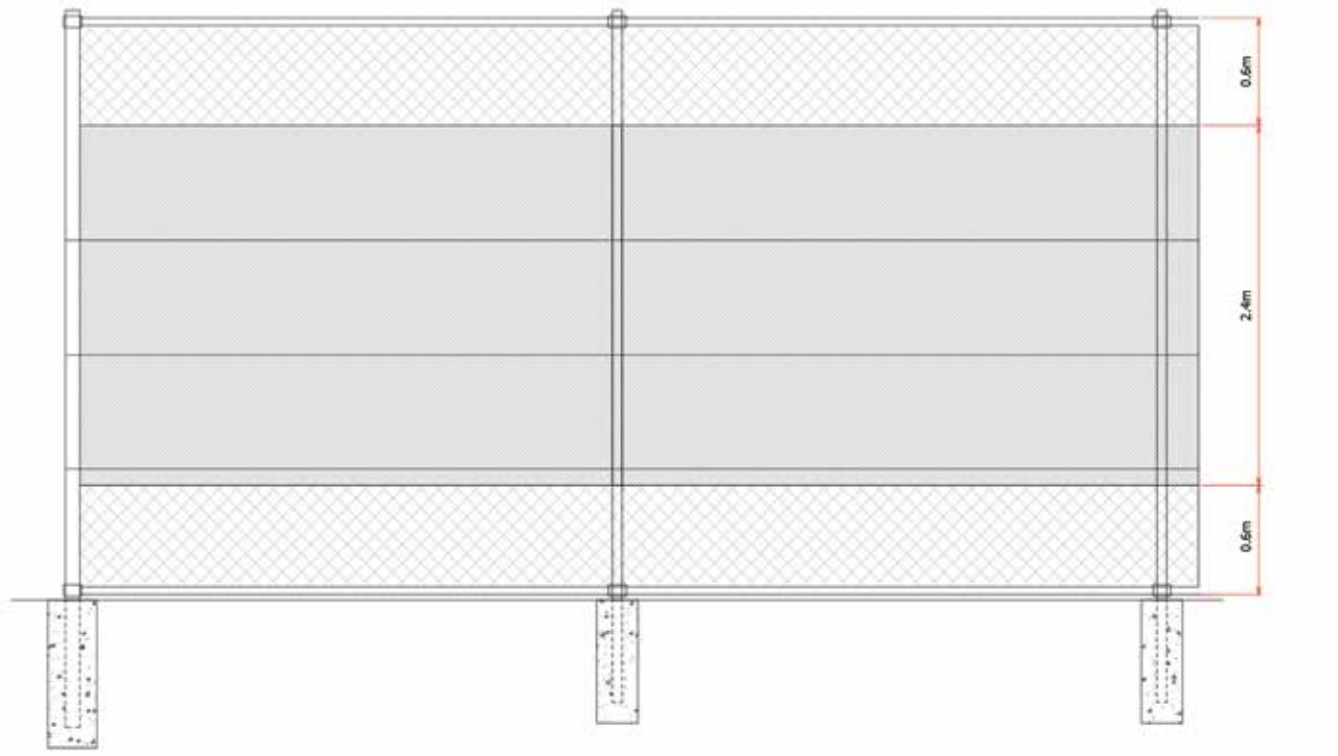


Image 3.2.5 Windbreak

Image 3.2.6 & 3.2.7 Incorrect backstay placement

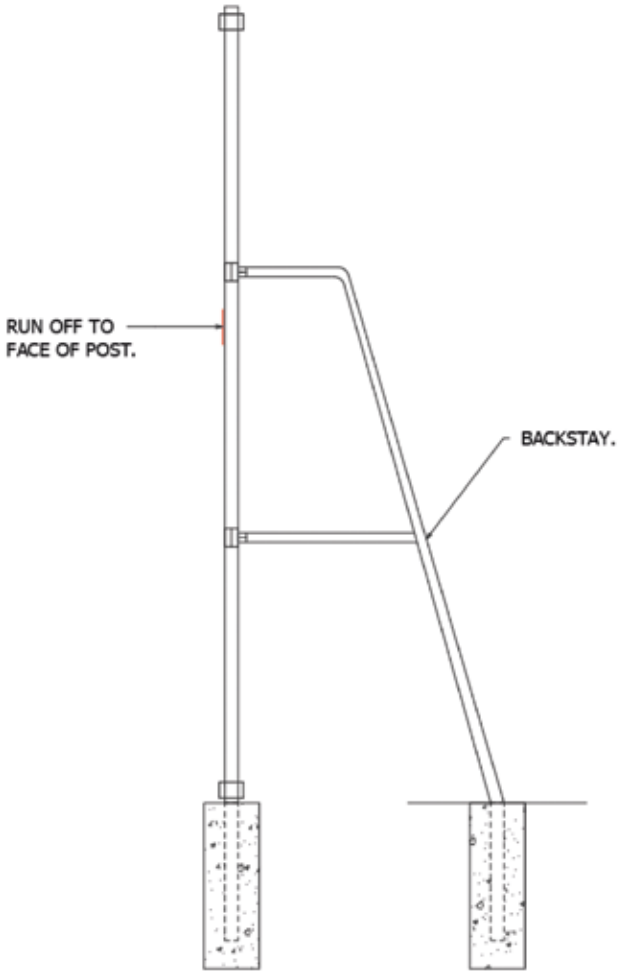
Backstays

The primary role of a backstay is to provide lateral stability to the fence lines, also assisting to keep the diameter of the fence posts down.

Fence backstays impact on the adjacent area of the fence line. If these areas are walkways and need to be obstacle free, the fence posts can be designed to have a greater post diameter and wall thickness to eliminate the need for backstays.

Backstays should never be positioned in an adjacent court enclosures or impact on the Total Playing Area (TPA) of another court.

Figure 3.2.9
Backstay diagram



Supporting infrastructure can be integrated into a fencing structure, however a sufficient run-off space must be maintained for player safety.

3.2.3 SUPPORTING INFRASTRUCTURE

It is important to consider the interfaces between the fence structure and supporting infrastructure (e.g. light towers) when designing fencing.

Book a Court access

Book a Court is an integrated gate access and online software booking system. The Book a Court gate access technology may be installed at tennis venues to provide easy access to courts for community use. Refer to **Section 3.2.5 Gate access technology** for additional information on the integrated access system.

Book a Court access gates require communication and 240V power cables between the equipment enclosure and the gates.

Fence post footings

The installation of fence post footings should be coordinated with the construction of court perimeter infrastructure, for example concrete edge strips, spoon drains and lighting infrastructure.

Guidelines during construction phase of fence post footings includes:

- ✓ Coordinate the pouring of the concrete footings with the perimeter infrastructure.
- ✓ Ensure the footing hole is free of debris and organic material.
- ✓ When pouring post footings ensure to agitate concrete around the posts.
- ✗ Do not use rapid set concrete.
- ✗ Do not allow water to sit on the footing during concrete curing time.
- ✗ Do not attach rails to the posts until the concrete curing period is complete (approximately 28 days).

Fence posts and rails

Fence posts and rails should be connected using prefabricated connection systems or site welded rigid connections to ensure long term durability.

The installation of the fence rails shall be one of the last items constructed as once they are up they act as a barrier which may impact other construction activities.

Guidelines during planning and construction of fence posts and rails includes:

- ✓ Review fence shop-drawings prior to works being ordered.
- ✓ Ensure all posts and rails are galvanised off-site.
- ✓ Use proprietary fence connections where applicable.
- ✓ Ensure fence uprights do not become a trip or movement hazard.
- ✗ Do not attach rails to posts until the footing concrete curing period is complete (approximately 28 days).
- ✗ Do not galvanise the posts and rails on-site; all galvanising should occur prior to onsite delivery.
- ✗ Do not use dented or damaged posts and rails.

Fence chain mesh

The installation of fencing chain mesh should ideally be completed once the court pavement works have been completed.

Guidelines during planning and construction of fence chain mesh includes:

- ✓ Mesh should be located on the inside of the fence posts and rails.
- ✓ Chain mesh ties should be knotted facing externally to the fence line.
- ✓ PVC coated chain link mesh should be used if the budget allows.
- ✓ Mesh should be pulled tight across the fence frame.
- ✓ Mesh joints should be located at fence posts.
- ✗ Do not use dented or damaged mesh.

Gates

Gates installation needs to consider both access and impact on court use.

Guidelines include:

- ✓ Locations provide the least amount of impact on court use
- ✓ Universal access width (1.35m – or as close as achievable)
- ✓ At grade access (i.e. free of vertical obstruction)
- ✓ Outward swing or inward swing that does not damage surface or interfere with play area
- ✓ Easy to operate gate opener at a height of 900mm

Where gates are positioned directly on the court enclosure they should open outwards and consist of a strike plate that prevents swinging onto courts as could be an obstruction to players and drop-bolts may damage court surface.

3.2.4 FENCE MAINTENANCE

To ensure the longevity of tennis court fences, ongoing maintenance works should be undertaken.

As with all infrastructure components of a tennis venue, routine maintenance and repair of fencing is required. Maintenance of tennis court fencing typically includes:

- Repairing holes in chain wire mesh
- Repairing tears in windbreaks
- Repairing broken or bent posts
- Lubricating gate hinges and bolts
- Re-tensioning chain wire mesh and cable wires.

Maintenance repairs

Chain wire mesh

The strength of the chain wire mesh relies on the continuity of the mesh with any breaks or dents reducing the overall integrity.

Depending on the extent of damage there are two typical options for repair:

- Locally repair the damage with additional wiring or overlapped mesh
- Replace the extent of the damaged mesh between adjoining fence posts.

Tears in windbreak

Similar to chain wire mesh repair, the strength of the windbreak mesh relies on the continuity of the mesh. Any tears or holes reduces the overall integrity of the windbreak

Depending on the extent of damage there are two typical options for repair:

- Locally repair the damage by sewing in a patch
- Replace the extent of the damaged mesh between the adjoining fence posts.

Image 3.2.8
Damaged chain wire mesh

Broken or dented posts

Damage to fence posts will reduce the structural integrity of the posts. Over time, this damage could result in failure of the overall fencing structure.

All damage to posts should be assessed by a structural engineer to determine the extent of damage and possible requirement of post replacement and need for installation of additional stability reinforcements (i.e. backstays).

Gate hinge and bolt lubrication

Maintaining hinge and bolt lubrication helps to protect the steel work galvanising. The galvanising layer will assist in preventing the steel work from rusting.

Re-tensioning of chain wire mesh and cable wire

To prevent sagging in the chain wire mesh ongoing re-tensioning of the chain mesh and cable wire will help extend the serviceability of the chain wire mesh.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3.2.5 GATE ACCESS TECHNOLOGY – BOOK A COURT

National tennis participation trends show a shift toward casual and social play, with 64 per cent of players playing occasionally (Roy Morgan Research, 2017). Tennis has previously faced challenges in providing accessible facilities, with cost and availability being the number one barrier for occasional players. However, Tennis' investment into an integrated online gate access system is providing the sport with a solution to the decline in occasional play and court accessibility issues.

Book a Court is Tennis's own gate access technology system. Click here for more information. This section provides information on the online booking and gate access technology, including:

- System overview
- Objectives and benefits
- Key considerations
- Successful system trends
- Marketing for a successful system

The Book a Court system has revolutionised access to tennis venues and has delivered significant increases in community tennis participation.

System overview

Book a Court comprises of two key elements to deliver an automated tennis court access system; software and hardware. This can be installed at almost any tennis venue with typical infrastructure in place including fencing, gates and power supply. Casual bookings are made via club / venue websites and a code is sent to the user via text message and email. Installation of the Book a Court system can assist in generating an additional income source for clubs / venues while reducing volunteer administration.

After initial registration with the online system, users can easily book a court at a venue by going directly to the club or venue website. Booking time's availability is controlled by the club / venue operator and the user:

1. Selects an available day and time
2. Enters credit card details
3. Receives a text message and email containing a four-digit PIN.
4. Accesses the club or venue up to 10 minutes prior to the selected booking time.

PINs are only valid during individual bookings. Once registered with the system, access to any Book a Court venue is streamlined with user details and credit card payment options stored in an individual online profile.

Figure 3.2.10
Book a court overview

SOFTWARE

Online booking and payment platform that connects with pin pad technology.

HARDWARE

Pin pad technology for easy access to courts and capability to turn on lights.

Objectives and benefits

The principle objectives of an automated gate access system are:

- Remove barriers to occasional play
- Reduce administration for volunteers
- Increase revenue and sustainability of venue resulting in increased opportunities for self-supported infrastructure upgrades and renewal.

Benefits for clubs and venue operators are substantial and include:

- Reduced administration for volunteers
- Increase in revenue and sustainability of venue
- Accurate reporting mechanism of court usage
- Greater ability to promote venues online via club website and social media
- Online payments
- Ease of venue access
- Attract occasional tennis players to your club.

Advantages for players and venue users are:

- Improved booking process and customer experience
- Freedom and flexibility to book and play anytime
- Increased security during play with locked access gates.

Key considerations

Book a Court hardware can be installed at almost any tennis venue. State and Territory Member Associations can advise on specific requirements and typical process / timeline to have the system installed.

It is estimated the average club or venue operator could recover the initial system outlay costs within the first two to three years, generated solely by income obtained through court bookings. Funding support is available from Tennis Australia's National

Image 3.2.9
Book a court keypad

Court Rebate and venues are encouraged to work with their local government authorities to subsidise the cost.

The ability of the Book a Court system to increase existing revenue allows for increased opportunities for club self-investment back into tennis infrastructure, further supporting venue sustainability.

Case studies

A comprehensive review of the initial system trial identified several key trends associated with successful, well-utilised Book a Court venues:

For more information visit: www.tennis.com.au/clubs/book-a-court or contact the Tennis State or Territory Member Association.

- Venues in a clearly visible location with elevated levels of pedestrian and vehicle traffic
- Venues within a heavily populated area
- Court booking prices are reflective of the socio-economic status of the surrounding population
- Venue has a club champion who is driving the system in their environment.

The Book a Court system evaluation found no correlation between courts surface type and the ability to increase court bookings, indicating that location, access and quality of courts is more likely to drive use over surface type.

Marketing

Simply installing gate access technology does not guarantee an increased revenue source for clubs / venue operators. Prior to any commitment to gate access technology the following areas need to be understood as core requirements for success:

- Club / venue website is easily accessible and has clear and concise instructions on how to Book a Court
- Book a Court signage and promotional material is displayed at the venue
- Strategy is established on how to capture the casual user market and convert to members or regular participants
- Utilisation of the online dashboard and reporting tools to evaluate trends in data and develop targeted marketing.
- Ongoing commitment from club or venue operators to ensure the continued success. Other gate access hardware

Other gate access hardware

Many clubs and venues operate successful independent online independent booking systems. These systems vary in installation and operating costs and have also demonstrated increased participation outcomes.

3.3 COURT LIGHTING

Trends in tennis identify strong and growing demand for evening participation and lighting is an increasingly important element to any tennis venue.

Quality court lighting assists to increase the capacity and use of courts over 12 months of the year. It enables diversity in programming and activities, assists in maximising usage and introduces new revenue streams to venue operations.

This section provides detail on the following topics:

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations, venue operators and educational institutions
- Local government
- State and Territory Member Associations
- Architects, planners, developers, designers and builders.

Definitions

Ballast – Equipment used with discharge light sources (e.g. Metal Halide) for stabilising discharge.

Colour appearance – Quality of colour of a light source independent of brightness.

Colour rendering – General expression of the ability of a light source to show colours of objects accurately.

Contrast – Difference of two parts of a visual field seen simultaneously or successively (e.g. brightness, colour).

Discharge lamp – Light source in which light is produced by electric discharge through a metal vapour, gas, or combination.

Fluorescent lamp – Tubular discharge light source in which most light is emitted by a combination of fluorescent material deposited on the wall of the glass tube and ultraviolet radiation.

Geotechnical engineer – Professional branch of civil engineering concerned with the behaviour of earth materials and the physical properties of soil and rock.

Glare – Visual condition in which there is a discomfort or impairment of vision, or both, caused when parts in the field of view are excessively bright in relation to general surroundings.

Glare Rating (GR) – Numerical value representing the degree of discomfort glare, higher values correspond to greater glare from the lighting system.

High Intensity Discharge (HID) – Type of electrical gas-discharge lamp (e.g. Metal Halide).

Illuminance – Quality and quantity of light emitted and arriving at a surface, divided by the area of the surface (unit: lux).

Illumination – General expression for the quantity of light arriving at a surface (physical measure illuminance).

Initial illuminance – Value of average illuminance initially provided by new or recently cleaned lighting systems.

Incandescent lamp – Light source in which light is produced by a filament, heated to emit light by the passage of an electric current.

Light-Emitting Diode (LED) – Semiconductor device, emitting visible radiation when initiated by an electric current.

Light-Emitting Diode driver – Electrical device which regulates the power to an LED, providing a constant quantity of power and responding to the changing needs (e.g. temperature). The driver can either provide for fixed illumination or enable the LED to dim as required.

Light source Lumen Depreciation factor (LLD) – Ratio of the lumen output of a light source after a given time in operation to initial lumen output.

Luminaire – Equipment that houses the light source(s) and directs the light to desired sections.

Luminaire Dirt Depreciation (LDD) – Efficiency of a new / clean luminaire compared to the efficiency of the luminaire due to accumulation of dirt on the luminaires surfaces.

Luminance – Physical quantity corresponding to the brightness of a surface in a specific direction.

Maintained illuminance – Defined level below which the average illuminance is not allowed to fall.

Metal halide lamp – High Intensity Discharge (HID) light source producing light by an electric discharge through a vapour.

Mounting height – Vertical distance between the luminaire and the ground / floor.

Principle Playing Area (PPA) – Area of a tennis court enclosed within the baseline and doubles court side lines, where the ball is considered in play according to the rules.

Total Playing Area (TPA) – Includes the PPA and areas immediately adjacent to (the surface area between the defined court area and the fence line or adjacent court) which a player might reasonably expected to travel during play.

Uniformity – Rate of change of illuminance over a defined area.

Uniformity gradient – Rate of change of illuminance over a defined area, typically only the highest value is recorded (i.e. worse).

Uniformity ratios – Two ratios (min & max), each providing a numerical representation of the uniformity of illuminance over a given area over a given area (i.e. best and worse values).

Lighting Standards

AS2560.1 – Part 1 General Principles of Outdoor Sports Lighting* provides the basic principles on which outdoor sports playing field lighting should be provided.

Standards can be purchased online via the Standards Australia – Search and Buy a Standard website at **Australian Standards Online.**

AS2560.1 do not apply to specialist lighting systems intended for television coverage or specific standards of competition. They do cover the visual requirements of participants, officials and spectators and the following levels of play:

- Recreational and residential
- Club competition and commercial
- International and national*

**Lighting standards for this level of play are provided as minimum only and are determined by individual event rules*

The vast majority of lighting installations at Tennis Australia affiliated venues **fall within the Club Competition and Commercial level of play.** Only venues that host regular Tennis Australia and ITF sanctioned events should consider permanent lighting to International or National level. These venues will require individual specific planning, design and development advice and are not documented in detail within this resource.

Always check the relevant Australian Standards for any recent updates as Standards are subject to change.

In addition to the Australian Standards referred to above, the following additional information sources have also been referenced in this section:

- AS4282 (1997) – Control of Obtrusive Effects of Outdoor Lighting.
- **AS2560.2.1 (2003) – Part 2.1 Lighting for Outdoor Tennis** provides a greater level of detail and identifies the design, standards and technical parameters required specifically for the lighting of outdoor tennis courts.
- ITF Guide to lighting tennis courts.
- Tennis Australia National Tennis Facility Planning and Development Guide.
- Tennis Queensland Technical Manual for the Design Construction and Maintenance of Tennis Facilities.
- Musco Lighting and Jasstech Solutions.

KEY HIGHLIGHTS

What you need to know

- A number of lighting design options and solutions can meet Australian Standards, however ensure that each or all are appropriate to the venue and site conditions.
- Every 2-3 years or when lighting performance appears to change, engage an electrical contractor or original supplier to conduct a performance assessment to advise on the potential options for improvement (e.g. more regular maintenance, globe replacement, system upgrade).
- Life cycle costs including capital, power supply, operational and maintenance should all be factored in when evaluating various lighting solutions.
- If replacing or upgrading existing lighting, ensure a qualified electrical engineer (in conjunction with the relevant power authority) assesses the power supply needs at the venue. Additional requirements such as increasing the power supply may add significant costs to lighting projects.

3.3.1 LIGHTING PURPOSE

Lighting for tennis should be designed and installed so that visual tasks by participants, officials and spectators can be performed clearly, comfortably and safely. Parameters that determine the effectiveness of lighting systems are:

- Suitable luminance and colour contrasts over the playing area
- Sufficient light to all parts of the playing area
- Correct distribution of light
- Adequate glare control
- Surrounding pathway and gate entry localised lighting to the court

Achievement of these objectives is determined by quality and quantity of lighting installed for the desired level of play. Minimum recommended requirements are outlined in **Table 3.3.1 Lighting Standards**. The higher the level of play, the higher class of lighting should be selected. If building a venue with capacity to host professional or high level tournaments, consult Tennis Australia directly to ensure lighting selection meets relevant standards.

Lighting purpose and needs of the venue should be agreed at the design and layout stage of planning so equipment and supporting structures are located to provide the required uniformity of illumination, minimise glare and obstruction to participants, and protect play from the obtrusive effects of outdoor lighting

3.3.2 TENNIS REQUIREMENTS

Tennis court lighting levels should be developed based on the intended standard of play, which also determines layout requirements.

Standards

Standards of play refer to the highest level of competition expected to be played at an individual venue.

Table 3.3.1 Lighting Standards provides information regarding recommended minimum lighting levels suitable for recreational, community and club competition. Lux and uniformity levels are measured for both the PPA and TPA (refer to definitions and **Figures 3.3.1-3.3.2**) and when combined assess the performance and suitability of lighting and the level of play.

The minimum standards provided do not meet criteria for all events at national and international level. Therefore consultation must take place with Tennis Australia during planning stages of projects. Lighting standards at national and international level are determined on an individual basis by factors including event rules and broadcast requirements.

Table 3.3.1
Lighting standards

Level of Play	Maintained horizontal illuminance* (LUX)		Minimum horizontal uniformities				Maximum Glare rating GR_{max}	Minimum Colour Rendering Index $R_{a\ min}$
			PPA		TPA			
	PPA	TPA	U_{1min}	U_{2min}	U_{1min}	U_{2min}		
Recreational and Residential	250	150	0.6	0.3	0.2	0.1	50	65
Club competition and commercial	350	250	0.6	0.4	0.3	0.2		
International and national**	1000	500	0.7	0.5	0.5	0.3	50	65

Notes
*Values of illuminance measured at the time of commissioning and installation (i.e. initial or close to) should be higher than the maintained illuminance values

** Lighting standards for this level of play are provided as minimum only and are determined by individual events rules

Lower level professional events have reduced lighting requirements. To ensure the correct lighting for the level of event are achieved contact Tennis Australia.

The ITF provides further guidance on lighting which can be found here https://www.itftennis.com/technical/facilities/facilities-guide/lighting.aspx

Visually impaired players are more susceptible to glare interfering with tennis activity and spectating. Indoor or covered courts minimise glare, providing a more comfortable and safe environment through enhanced vision.

Figure 3.3.1 TPA

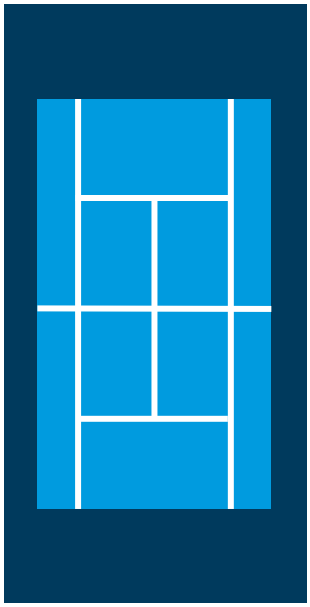
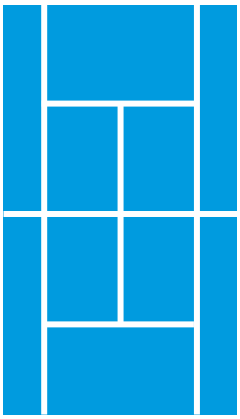


Figure 3.3.2 PPA



Measures

While meeting the standard lux levels is important in lighting installations, the consistency of light is critical and is measured by uniformity. Where uniformity is poor, the eye struggles to follow the flight of the ball and predict its speed.

Lux level readings are measured via a calibrated light meter and should be conducted by a qualified professional. The collection of lux level readings across the PPA and TPA areas contribute to a court's overall uniformity levels.

While lux level readings taken on individual grid points may fall below the recommended lux levels, the overall uniformity measures are the critical measure of lighting performance.

Uniformity is expressed by two illuminance ratios: U1 (minimum) and U2 (maximum). Uniformity tries to limit bright or dark patches on the field of play to create a consistent visual condition.

Uniformity ratio is often the determining factor for eligibility to host high level, national and international events. Both lux average and ratio need to be met, with uniformity more challenging to achieve. Different standards are required for various levels of professional events. Technology with variable outputs is recommended so venues can switch modes between events, competition and social play.

Pole design

AS2560.1 (2002) standards do not recommend a specific range of pole diameters to be used. Pole provision must be assessed in conjunction with the manufacturer and/or supplier specifications for lamps and housings, and should be designed and engineered to accommodate their weight, wind loading and site specific ground conditions.

Spectator area lighting

Spectator requirements must be considered as part of lighting design. Larger venues will require a higher level of illuminance to satisfy spectator needs where there are longer viewing distances to courts.

Ancillary area lighting

For the visual comfort of spectators and to maintain safety levels for users, when floodlighting is non-operational lighting levels around venues should be a minimum of 10 lux.

3.3.3 PLANNING CONSIDERATIONS

Consideration of lighting needs and the associated standards is required at design and layout stage of planning. This ensures the location of equipment and supporting structures support the required uniformity of illumination, minimise obtrusive effects to the environment and limit obstructive impact on play (e.g. glare).

Designing for requirements

Achieving lighting solutions that meet venue and user needs is dependent on a range of factors, including:

- Type of venue and its level of use for different types of play (social, coaching, competition)
- Programming, including potential for or frequency of court use at night time
- Local council planning conditions, permissions and requirements, including permits, development applications, zoning, heights, design impacts and operating times and restrictions
- Ground condition capacity to accommodate the lighting installation, levels of risk, cost or design compromises that may need to be made
- Site obstructions such as underground services and existing trees that may be protected under government legislation or local by-laws.
- Electrical supply conditions, limitations and current compliance with electrical standards, as well as the capacity of the venue (and local power suppliers) to cater for increased demand from lighting installations.
- Other sports (where lighting requirements may be different to the needs of tennis)

For professional and high standard events, lighting should be considered together with other infrastructure criteria, contact Tennis Australia to discuss individual event needs.

Provision for upgrade

During initial planning and design, consider the requirements of future upgrades to your lighting infrastructure. Planning for this early in the project can help to reduce costs of upgrades. Options to prepare for a higher level installation may include:

- Height, strength and position of poles
- Structural allowances for fixing of additional luminaires
- Provision of suitable electrical power

If considering moving, reusing or retrofitting existing poles, Structural Engineer certification will be required.

Obtrusive effects of lighting

Floodlighting spill and glare can impact the surrounding local community, in particular neighbouring residential properties. Every effort should be made to limit the impact and conform to local planning guidelines and the Australian Standard AS4282 (1997) – Control of Obtrusive Effects of Outdoor Lighting.

Lighting spill is the degree to which a lighting installation falls beyond the area being lighted and is disturbing to a person near the playing area. If required, ensure the luminaires provided can be fitted with spill shields to reduce spill light. New design specifications for sports lighting must consider cut-off reflectors and high efficiency from the sport light fittings.

The impact of glare can range from preventing performance of tasks to causing discomfort or nuisance. Some glare from light sources is unavoidable

and the need to limit glare may conflict with other requirements, with compromise necessary to control effectively. This may mean exclusion of luminaires from certain positions or mounting at specific heights.

In addition to identifying planning constraints in the design and budgeting of lighting projects, it is important to consider the future lighting needs for the venue. It can be financially advantageous to make allowances during an initial lighting installation rather than retrofitting later.

Consideration of additional underground services, housing for future luminaires or increased electrical supply at the time of installation is strongly recommended for all lighting projects.

Lighting suppliers

When procuring lighting suppliers ensure they have the following:

- Required approvals and certifications to sell luminaires in Australia
- Warranty terms and conditions that cover the full cost of replacement and stipulate required maintenance and service intervals.
- Relevant experience in tennis court lighting (research to verify)
- Satisfaction of previous customers regarding design, supply, installation and operational performance (consult with other clubs / operators on their experiences)

3.3.4 TYPES OF COURT LIGHTING

Tennis courts require lighting technology with high brightness to illuminate large areas, requiring specific types of luminaires. There is a range suitable lighting equipment on the Australian market, with different systems providing various cost and operational benefits. Types of light sources commonly used in tennis are (refer to definitions for descriptions):

- Fluorescent
- High Pressure Discharge (Metal Halide (MH))
- Light Emitting Diodes (LED)

In comparison to traditional lighting such as Fluorescent and Metal Halide, LED technology is increasingly recognised as the preferred lighting option due to performance outputs, operational advantages, cost efficiencies and environmental benefits. **Table 3.3.2 Lighting Technologies Comparison** provides information on the key differences and benefits of LED technology versus traditional lighting. For the purpose of providing comparative information, Metal Halide (MH) lamps have been described in further detail alongside LED.

Metal Halide (MH)

MH are the preferred choice of HID lamps for tennis courts because of advantages such as good colour rendition (producing very clean and natural light) and high lumen output. The working principle of each type of HID lamp vary, however all HID lights require a control gear called ballast which starts and operates the lamp (e.g. dimming).

A key feature of these lamps is the ‘warm up period’ which refers to the time taken to start-up until the heat and pressure inside the tube is high enough for the lamp to reach the optimum brightness. This means light output is not instantaneous, and can take a longer time to restart if turned on and off quickly.

MH lamps generally have good life span however at the end of useful life will become less energy efficient and fade in brightness and colour of the emitted light. With MH it should be assumed the lamps will be replaced and the fittings cleaned multiple times during the service life of the luminaires.

Light Emitting Diodes (LED)

High quality LED lighting is constructed using specific materials to produce extremely durable technology that is resistant to low temperatures and vibrations, whilst allowing light outputs to be brighter and more concentrated. It is the components of an LED and how light is generated that leads them to behave differently and have a longer lifespan than other types of bulbs.

LEDs do not burn out the same way other lamps do, however they will still depreciate over time and this is influenced by factors including the quality of the product, power supply to regulate optimum voltage (referred to as driver) and ambient temperature (unless designed accordingly).

Periodic maintenance of LED lighting such as cleaning fittings is required. It can be generally assumed LED light engines will not fail requiring replacement parts and that frequent switching on and off will not impact on the service life.

Selection Criteria

Light sources of the same type can still have different properties. When selecting a lighting system, the following should be considered to identify the best balance for intended use:

- Luminous efficacy (how well the light source produces visible light)
- Initial and running costs
    1. Annual cost of owning the installation (cost of obtaining money at the current interest rate)
    2. Annual depreciation (money to be set aside annually to allow replacement at the end of its useful life)
    3. Total energy costs per annum (based on total system wattage, hours of operation and cost of energy)
    4. Total annual maintenance costs (i.e. light source replacement, cleaning and other component replacement costs)
- Estimated lifespan
- Colour appearance and rendering
- Size and shape of the source (visual appearance)
- Light source run-up and restrike times
- Ability to control luminaires using control management system or similar (including controllability / dimming).

Preparation of a lifecycle cost analysis of different lighting systems in association with a lighting specialist will help to quantify the financial implications and benefits of both systems. The lifecycle cost analysis should include initial capital costs, operating costs and projected maintenance expenditure over the life of each installation (refer Financial Management section for further information on calculating a lifecycle cost analysis).

Table 3.3.2
Lighting technologies comparison*

Advantages	
LED	• **Long life** – LEDs do not have components of other lamps that cause bulbs to burn out so take longer to depreciate • **Energy efficient** – Higher lumen output per watt and less energy lost as heat, contributing to lower running costs • **Reliability** – Resistant to temperature fluctuations and robust design (i.e. no movable or delicate parts such as glass) • **Instantaneous illumination** – Operate at full brightness once turned on • **Environmental** – Do not contain toxic materials dangerous for the environment (e.g. mercury), solar compatible • **Versatile** – Dimmable, remote control options, spill control, fittings can be retrofitted to existing systems
MH	• **Life span** – MH bulbs offer a reasonable life span • **Excellent colour rendering** – Emitting light close to a natural sunlight • **Large variety of wattages and forms** – MH lamps are available in many varieties allowing for a range of applications • **Light output is fully restorable** – New (or near new) performance restored during each maintenance cycle
Disadvantages	
LED	• **Light output is only partially restorable** – During a maintenance (cleaning only) cycle • **Price** – initial capital costs higher than traditional lighting, although lower operational costs and longer lifecycle
MH	• **Power supply** – Additional power may be required to manage strike up ay in reaching full output • **Higher lumen depreciation** – Some models lose initial brightness faster as the lamp operates • **Replacement costs** – Bulbs can be expensive to manufacture and purchase • **Delayed restrike**** – Lamps take time to warm-up and restart (restrike) if the lamp has been running at optimal temperature • **Environmental** – MH bulbs contain small portions of the toxic element mercury which requires special disposal

*Subject to engineering certifications

** When power is restored following a breakdown, LED light sources will give full light immediately, whereas HID / MH can take 5-20 minutes to restrike and longer to reach full output (in the absence of an available circuit to facilitate)

The Moe Tennis Club (in Victoria) chose to upgrade its Metal Halide lighting system to a new LED system which reduced glare, minimised light spillage and provided improved operational efficiency. The club replaced the lighting on 10 courts to LED technology at a cost of $300,000.

3.3.5 LIGHTING DESIGN CONFIGURATIONS

Locations of lighting is determined by many site specific factors, with early consultation between architects and lighting designers essential to ensure provision is made for suitable locations and mounting of equipment. Installations are often limited by physical constraints which can be mitigated if addressed at design stage. A well-considered design and layout of floodlighting infrastructure is critical to ensure:

- Required uniformity of illumination
- Minimise glare to participants and obstruction to play
- Limit the obtrusive effects of outdoor lighting.

Multi-use

Line marking for multiple uses may impact lighting design, preferred pole locations and performance requirements if floodlighting for some or all activities is required. In all situations, lighting poles must be located outside all relevant fields of play and associated run-off areas for all uses.

Configurations

Tennis court lighting configurations generally consist of two main types: high-tower corner lighting and low-level side lighting. Examples of lighting types and configurations provided in **Figures 3.3.3 and 3.3.4** (design options) are for information purposes only as generic options. It is recommended that a qualified lighting contractor be engaged to advise on the optimal lighting arrangement, lighting levels required, adherence to Australian Standards and site conditions and constraints, in addition to compliance with any ITF court run off requirements.

High tower corner lighting

High-tower corner lighting is typically used for multiple court configurations as high-tower masts are ideally located outside each corner of the court enclosure. High-towers are generally no higher than 15m in height.

Regardless of the configuration, ensure the lighting bases are flush with the surrounding surface or well defined to not become a trip hazard

Side lighting

Side lighting can be configured in a number of designs. Typically for a single court they are provided in four or six pole designs with poles ranging from 8m to 12m in height. For all lighting installations, poles must be installed outside court run-off areas.

Diagrams provided are illustrative only.

Variations on pole configurations can be achieved if performance outcomes are able to be met. Different lighting types will produce different results in a range of settings and professional lighting advice should be sought to ensure proposed design can meet long-term requirements and standards.

Pole and mounting heights

Pole and mounting heights of luminaires should be determined by appointed lighting specialist and site constraints. Factors including the required lighting levels, proximity of neighbouring properties, glare control and lighting spill levels need to be considered when designing the most appropriate pole height.

Figure 3.3.3
Corner lighting design option

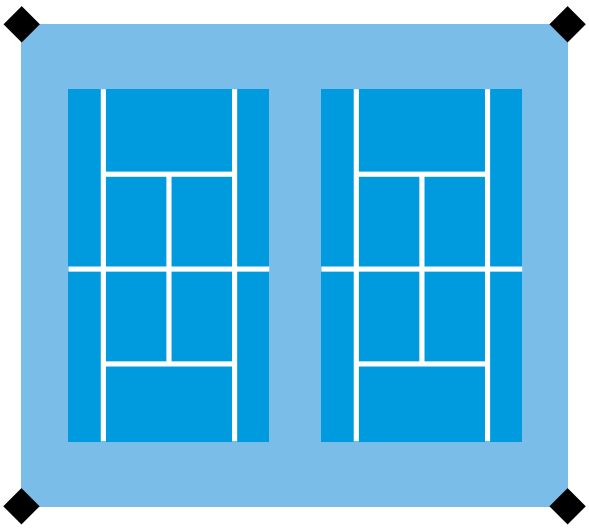
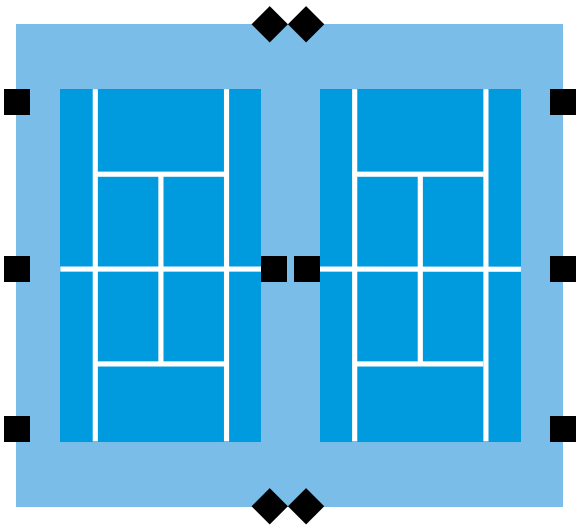


Figure 3.3.4
Side lighting design option



It is essential that any lighting installation and associated pole design considers compliance with relevant ITF court run-off requirements. Designs where lighting poles are located within the fenced court enclosure area (even if located close to enclosure fence line) run the risk of creating non-compliance court run-offs, are a safety hazards for players and can obstruct changing of ends for wheelchair players.

3.3.6 CONSTRUCTION REQUIREMENTS

Locations of poles and mounting heights must be decided in consultation with the architect and lighting designer to accommodate physical site constraints and cleanliness of location (i.e. climatic conditions, air pollution).

The power supply to existing or planned tennis venues is an important factor when planning and designing floodlighting. Power to the site may exist, but in many cases, achieving performance of 250-350 lux or greater may require a power upgrade to existing sites or the installation of new sub-station infrastructure which can be a costly exercise.

For the same lighting output LED installations may not require the same level of power supply or upgrade as Metal Halide. It is recommended that an electrical engineer be consulted to define requirements for each specific installation.

A careful evaluation of the available power utility is important and the application of back up sources is required for all sports lighting equipment. Both the normal preferred power and back-up power should be fully sized to allow 100% of the sports lighting to work if the normal preferred power source is lost.

Ground conditions

All lighting designs will be impacted by the immediate site and associated ground conditions. Prior to any lighting system design taking place, a geotechnical investigation into local soil conditions will be required to inform the recommended pole installation method, the depth of

footings and foundation design required. This should be undertaken by a qualified structural engineer.

Refer to **Section 2.3 Site Assessment** for additional information on evaluating ground conditions.

3.3.7 MAINTENANCE AND OPERATION

Maintenance

Lighting contractors should provide information on the recommended maintenance regime and instructions and this should include the following information:

- Light source types
- Replacement intervals
- Cleaning frequency
- Maintenance tasks
- Depreciation of illuminance

Commitment to frequent light source replacement (as required), cleaning and maintenance schedule alongside original selection of a quality system will determine the lighting performance and overall lifecycle. Cost of servicing needs to be considered, as the likelihood of effective and regular maintenance taking place increases when lights can easily be reached and maintained.

Allowance for Depreciation

Reduction in illuminance (light loss factor) of all lighting systems will occur over time due to:

- Light source lumen depreciation (LLD) – influenced by type of source selected
- Luminaire Dirt Depreciation (LDD) – influenced by design of luminaires, location and cleaning cycle adopted.

Also referred to as Depreciation Factor, Maintenance Factor is a statement of the amount by which the lighting performance of the system will fall, compared to its performance after 100 hours of use. For instance, if the Maintenance Factor of an installation is 0.8, the lighting levels will never fall below 80% of the values after 100 hours of use provided the system is properly maintained.

When designing lighting, the as-new performance must be high enough to ensure that lighting levels will still be adequate when all degrading factors have taken effect.

A documented justification of the calculation Maintenance Factor should be provided in conjunction with detailed lighting designs.

Measuring lighting performance

Lux level readings are measured via a calibrated light meter and should be conducted by a qualified professional. The collection of lux level readings across the PPA and TPA areas contribute to a court's overall uniformity levels. While lux level readings taken on individual grid points may fall below the recommended lux levels, the overall uniformity measures are the critical measure of lighting performance. Uniformity is expressed by two illuminance ratios: U1 (minimum) and U2 (maximum). Uniformity tries to limit bright or dark patches on the field of play to create a consistent visual condition.

Table 3.3.3 Lighting Performance provides further information about what the assessment criteria terms mean and how the lux test can be interpreted.

Table 3.3.3
Lighting performance

Criteria	Definition
Total Lux	The sum of all lux readings taken across the TPA
Grid points	The number of lux readings taken across the TPA
Average lux	The **Total Lux** divided by the number of **Grid Points**
Maximum	The highest single lux reading taken across all grid points
Minimum	The lowest single lux reading taken across all grid points
Min/Av. ratio (U1)	The lowest single reading (**Minimum**) divided by the average of all readings (**Average lux**)
Min/Max ratio (U2)	The lowest single reading (**Minimum**) divided by the highest single reading (**Maximum**)

Fitting an 'hours run indicator' to lighting systems tracks operating hours. This allows venue operators to keep track of energy use and will provide valuable information for repair and maintenance purposes and in identifying additional environmental benefits.

3.4 TENNIS CLUBHOUSE PLANNING AND DESIGN

Tennis clubhouses play a vital role in the overall function and sustainability of tennis venues. They provide a space for social connection, a point of sale to drive revenue and a base from which to conduct and promote activities.

Any tennis clubhouse or related project should be based on a sound foundation of club, community, Member Association and local council consultation in line with the project planning processes (**Section 2.1 Facility planning process**).

Informed business and management planning should precede design processes to ensure that clubhouses and their spaces adequately reflect both tennis and community needs, and they are functional to ensure that the club, users and the venue itself remains viable and sustainable.

When looking to plan and design a new tennis clubhouse or refurbish / redevelop an existing facility, the design and size of the development will depend on a range of factors, including:

- Purpose of the venue and role within the local venue network
- Physical size and orientation of the site
- Proposed management model (e.g. volunteer club managed or professionally operated)
- Demographic of users and their requirements
- Circulation between the point of entry, clubhouse and courts
- Proposed activity mix schedule
- Location of car parking and site access points
- Available budget
- Consider accessibility planning – wheelchair athletes, special schools or community groups

In seeking to design a functional, sustainable and efficient tennis clubhouse, the following information is presented within this section:

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations, venue operators and educational institutions
- Local Government
- State and Territory Government
- State and Territory Member Associations
- Architects, planners, developers, designers and builders

Definitions

Accommodation brief – Detailed document generally prepared by an architect / building designer that expands upon a project brief and outlines the specific space and area requirements for the design of a building.

Building application (BA) – Building applications to obtain building approval are required for most developments to ensure building complies with relevant laws and the Building Code of Australia. Building approval is usually obtained by submitting a building application to a relevant Planning Authority (mainly local council).

Concept floor plans – Architectural sketch plans that present a very high level or conceptual representation of a clubhouse design idea. The plans show a general arrangement of spaces and their functional relationship with each other (i.e. spaces that should be located adjacent to each other to create the most functional and efficient floor plan layout).

Cross flow ventilation – Also referenced as natural ventilation in this context. The process of supplying air to and removing air from an indoor space without using mechanical systems. Cross flow ventilation via open doors and windows is an effective method of achieving cross flow ventilation within a clubhouse building.

Development application (DA) – Formal request to a relevant Planning Authority (mainly local council) for consent to carry out a development.

Design brief – Document usually prepared by an Architect or Building Designer that presents a detailed description of the proposed accommodation elements, materials and finishes for the clubhouse. This document is sometimes included within the Project Brief or Accommodation Brief.

ESD (Environmentally Sustainable Design) – The consideration of the long term environmental impact of the clubhouse by adopting 'green initiatives' in the design process by way of considered siting, material selection and performance criteria for the building.

Heat load – Amount of heat energy that would need to be added to a space to maintain the temperature in an acceptable range. Cooling load is the amount of heat energy that would need to be removed from a space to maintain the temperature in an acceptable range.

ITF sized courts – Tennis courts that are sized to satisfy ITF (International Tennis Federation) requirements which are able to support events sanctioned by the governing body.

Line of sight – Degree of visibility a spectator or player has specifically from the clubhouse or verandah level towards a tennis court's playing surface. A clear uninterrupted line of sight to the court is desirable to create the ideal spectator experience.

Management model – Proposed manner in which the facility is to be managed (i.e. via volunteer club committee or by professionally appointed facility managers).

Multi-purpose community space – Term given to a space within a clubhouse design that offers flexibility of use for a range of potential stakeholders and facility users that can be accessed independently either during or after hours.

Project brief – Also commonly referred to as a Scope of Works, this is the process of defining the requirements of the facility project. The project brief is the key document upon which the design will be based.

Shallow footings – Foundation type that transfers loads very near to the surface

Show courts – Term used for the main tennis courts usually located close to and directly visible from the main social area. Depending upon the proposed management model and size of events to be held at the venue, these courts ideally should be sized to satisfy ITF dimensional requirements.

Slab on ground – Foundation type that is laid directly on the ground

Solar panel arrays – Term given to a row (or rows) of roof mounted solar panels.

Strip footing – Continuous strip of concrete that spreads loads near to the surface

Stormwater detention – A typical local council or planning authority engineering requirement to detain a certain level of stormwater on site (usually in tanks) before releasing it into the stormwater system.

Standards

Australia has a number of Standards, Acts, Codes and Regulations that are relevant to tennis infrastructure planning. It is important that they are complied with and fully considered during the planning and design of tennis clubhouses and associated buildings by your Architect or Building Designer.

A list of applicable information to consider is provided below with specific links to information source:

- Australian Standards (using the version applicable) –SAI Global Australian Standards online store.
- The Human Rights and Equal Opportunity Commission (HREOC) Advisory Notes.
- The Building Code of Australia: National Construction Code (NCC, formerly the BCA) – applicable at the time a Construction Certificate is applied for.
- The National Code of Practice for the Construction Industry and the Australian Government Implementation Guidelines for the Code is available via www.abcc.gov.au.
- The Environment Protection and Biodiversity Conservation Act (1999); and the requirements of State and Territory Departments and Authorities responsible for planning and environmental matters.
- The National Standard For Construction Work document, National Occupational Health and Safety Commission - NOHSC:1016.
- The Protective Security Policy Framework (PSPF) document promulgated by the Australian Government Security Construction and Equipment Committee (SCEC).
- Work Health and Safety Acts (2011) (WHS).

In addition, all designs (new and refurbished facilities) must fully comply with the Disability Discrimination Act (DDA) and relevant Australian Standards, which include, but are not limited to the following:

- Disability Discrimination Act (1992)
- Disability (Access to Premises – Buildings) Standards 2010
- AS 1428.1 – Parts 1, 2, and 4 - Design for access and mobility.

Standards can change over time and will be the responsibility of your Architect, Building Designer and/ or Building Surveyor to be aware of the latest standards. Planning Authorities such as local councils should also be aware of the most up-to-date requirements and information as the granting authorities of building designs, permits and compliance certificates.

SECTION 3
FACILITY PLANNING, DESIGN DELIVERY AND MAINTENANCE

KEY HIGHLIGHTS

What you need to know

- Be clear in how the clubhouse will be used, managed and operated before undertaking concept design and planning.
- Seek professional Architectural or Building Design assistance to develop a Project Brief, Accommodation Brief / Design Brief to assist with Council Development Application and certification processes, as well as advice on preferred tendering and procurement options.
- Ensure that the preferred design professional has the necessary experience and expertise in tennis facility planning and design in addition to knowledge of tennis venue management and operations.
- Adopt recommended Clubhouse Design, Universal Design and ESD Principles, through construction and into venue operations to ensure the requirements of all users are considered.
- Use suggested clubhouse areas (Clubhouse Accommodation Schedule) to identify preferred clubhouse amenities, and measure proposed new spaces against the venue (or another similar venue) to help picture how your space may change or be used.

3.4.1 CLUBHOUSE DESIGN PRINCIPLES

Presented in this section is a summary of key design principles to be considered in the design process when creating a typical tennis clubhouse. These features and recommendations are equally applicable to both a new and existing tennis facility. Professional Architects and Building Designers should be aware of these principles and where possible seek to work closely with the selected stakeholder group to incorporate into the Design Brief and Concept Design phase of the project.

The principles of Universal Design, Occupational Health and Safety, and Environmental Sustainability should also be adopted and reflected through all venue management and operational activities to ensure they are fully integrated into all aspects of the tennis venue design.

Universal Design (UD)

Facilities at all levels share a commonality in that irrespective of age, gender, ability and/or cultural background, people come from all walks of life to participate and be involved. As a sport, Tennis needs to ensure current and future facilities are designed not only to encourage participation in the game, whether it be as a player, umpire, spectator, coach or club volunteer, but are also flexible in their use to cater for other community members.

Through the adoption of Universal Design Principles, tennis clubhouses and facilities can promote and facilitate inclusion for not only sporting-related users, but also community groups who use sporting venues and supporting facilities as places to meet, interact and hold events. By incorporating Universal Design Principles into facility development and operations, it enables all people to be included, without the need for differentiated or specialised/ adapted features.

Sport and Recreation Victoria provides a strong focus on Universal Design and provides online information on principles and purpose, as well as detailed design information via its Design for Everyone Guide.

Occupational Health and Safety (OH&S) and Safe Design

Section 22 of the Work Health and Safety Act 2011 refers to the 'Duties of designers of buildings and structures'. All designers are to be committed to improving Occupational Health and Safety (OHS) outcomes through Safe Design approaches. Safe design processes must integrate hazard identification and risk assessment early in the facility design and procurement process.

Environmentally Sustainable Design (ESD)

When building new or redeveloping existing clubhouse buildings and supporting facilities, it is important to reduce direct environmental impacts through the implementation of practices and design ethos such as:

- Optimising the size of new buildings and/or the potential of existing structures.
- Investing in energy efficient technologies and green energy usage through initiatives such as passive solar design and natural ventilation systems.
- Protecting and preserving water.
- Using environmentally friendly and green materials.
- Enhancing indoor environmental quality.
- Optimising operational and maintenance practices.
- Minimising waste through recycling and efficient use of resources.
- Ensuring the facilities are designed, occupied and operated with the objective of best practice environmental performance.

Many of these industry led and promoted principles are featured in the design examples and guidance within this section. Consistent with the planning process outlined in **Section 2.1 Tennis facility planning process**, there are clearly defined stages for preliminary clubhouse design that should be adopted with the view of achieving a fully resolved design solution.

Tennis specific clubhouse design features

The differences in the design of clubhouses, whether new developments or refurbishments, depends primarily upon the proposed management model and activity mix for the venue, as well as available funding.

There are general clubhouse design principles that should be applied where possible for every scale of project. These principles are presented using the annotated artist's impression in **Figure 3.4.2**. This tennis clubhouse concept is in 3D perspective, refer to cross referenced design features for associated references and explanations.

Figure 3.4.1
Clubhouse Design Process

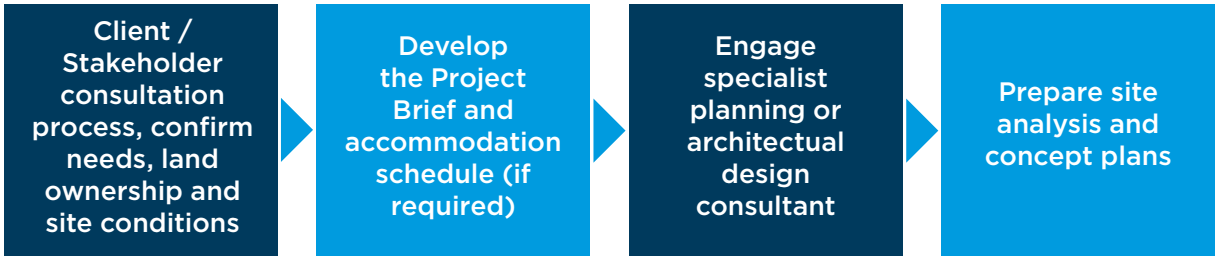


Figure 3.4.2
Clubhouse design image

A Clear entry point to the building

- The arrival point from the carpark or walkway from the site boundary needs to be clearly defined so as to act as a control point for venue management.

B Elevated building platform and walkways

- By elevating the finished floor level of the clubhouse and verandah above the surrounding court levels, spectator viewing of the courts can be greatly improved. This can also be applied to walkways between courts as shown.
- Provision of DDA compliant building access must be considered in the design.

C Tiered seating and spectator line of sight

- By elevating the building platform the opportunity exists to create tiered seating to the perimeter of the verandah or covered viewing areas to maximise the number of spectators with a clear line of sight to the courts.
- Dedicated accessible viewing areas should be established, with adjacent companion seating and seating for people with mobility impairments.

D Wide verandahs and covered viewing areas

- Weather protection for both players and spectators should be provided immediately outside the main clubroom area for patron comfort and convenience.
- Reduce the heat load on glazing (particularly on the east, north and west elevations of the building) by introducing wide verandahs and / or solar control devices such as window treatments internally and external sun shading.
- Offer general seating opportunities for spectators immediately outside of the main clubroom space.
- Provide adequate circulation space for wheelchair users and prams by incorporating ramp access and sufficient travel width.

E Maximise clubroom glazing (refer ESD Principles also for more information)

- The extent of clubhouse space glazing should be maximised with fixed glazing / full height windows and / or openable glass doors to ensure viewing to the optimum number of courts can be achieved.

- Glazing protection should be integrated into the building design for heat load management.

F Natural light into main clubroom space

- Depending on the size of the main clubroom the introduction of natural light via skylights or by other means can assist in creating a warm pleasant environment for players and spectators.

G Access provisions

- Ensure access to the clubhouse, walkways and courts are accessible for all, including wheelchair users (e.g. ramped access) and comply with all relevant BCA and DDA Standards.

H Clubhouse servicing

- Depending upon the size of the clubhouse (where practical) provide vehicular access as close to the clubhouse as possible to assist with the servicing of the kitchen / kiosk / bar and storage areas.

I Environmentally Sustainable Design (ESD) features

- Adopting an ESD approach in the design of a clubhouse facility ensures that elements and materials adopted for design and construction are sustainable and have consideration for long term impact upon the environment. Refer to **Figure 3.4.3** ESD clubhouse design concept for practical application of ESD features.
- With reference to the clubhouse concepts in **Figure 3.4.3**, the following ESD considerations should include (where practical):
  - **A** Stormwater Detention Tanks (as per local council requirements)
  - **B** Solar Panel Arrays to the roof
  - **C** Passive Solar Design principles such as:
    - **a)** building orientation and siting
    - **b)** wide verandahs to protect glazing (northern and western glazing in particular) and to reduce heat gain into the building
  - **D** Openable windows (where practical) for cross flow ventilation
  - **E** Sustainable building material selections for wall cladding, flooring, external paving materials etc.

Concept Cross Section of Tennis Clubhouse Design

The concept design below highlights Environmentally Sustainable Design (ESD) features and general recommended design features.

Equitable access

Designing for equitable access results in a venue that supports and enables use by everyone. Considerations to achieve equitable access include:

- Quality of amenities
- Entrances and exits, and how users travels around the site (e.g. from the carpark to the clubhouse)
- Recommended door widths for universal access within a clubroom is 1.35m, however it should be recognised this is not always viable and will also be subject to Building Certifier compliance advice.
- Comfort amenities such as water coolers, viewing shelters and spectator seating
- Pathway and security lighting
- Spaces with consideration for type of equipment and targeted age group
- Wayfinding and signage
- Communication systems such as PA systems and speaker locations.

Figure 3.4.3
ESD clubhouse design concept

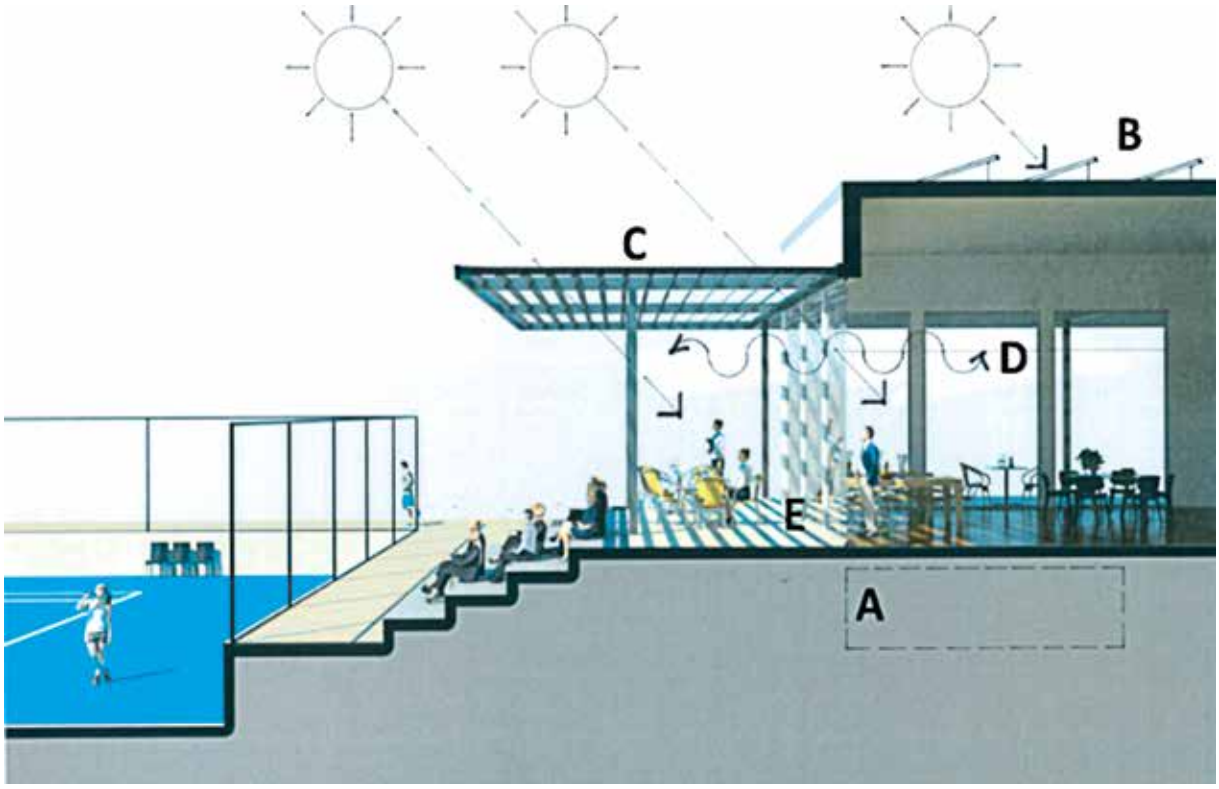


Table 3.4.1
ESD clubhouse design concept legend

Reference	ESD Features (Selected)
A	Stormwater Detention Tanks (as per local council requirements)
B	Solar Panel Arrays to the roof
C	Passive Solar Design principles such as: • building orientation and siting • wide verandahs to protect glazing (northern and western glazing in particular) and to reduce heat gain into the building
D	Openable windows (where practical) for cross flow ventilation
E	Sustainable building material selections for wall cladding, flooring, external paving materials etc.

3.3.2 KEY AMENITIES AND FUNCTIONAL RELATIONSHIPS

A functional and well serving clubhouse must consider a range of amenities. This section identifies how amenities can work best together and provides an area schedule of typical spaces relevant to tennis clubhouses of different sizes and purpose. Amenities include features and facilities that are practical or desirable within a building or venue. Many of these are dependent on the facility size (e.g. number of courts), existing or proposed management model, likely activity mix and available project budget. A selection of typical tennis clubhouse amenities are explained in this section.

1. Main / central entry point
2. Multipurpose clubhouse space
3. Sanitary facilities – provision of unisex accessible, ambulant accessible facilities. Consideration of baby change table in unisex accessible toilets adds flexibility of use
4. Kitchen / kiosk / café space
5. Tennis Pro-Shop
6. Tennis / tournament office space
7. Multi-purpose / function / meeting space
8. Verandah and spectator seating
9. Gymnasium
10. Commercial tenancy space
11. Secure storerooms and lockers

Elements to be considered when planning a new tennis clubhouse or renovating / redeveloping an existing facility are summarised below.

1. Main / central entry point

The main / central venue entry point should be a clearly identifiable control / access point with direct access for community, club members and visitors.

Figure 3.4.4
Accessible clubhouse entrance

Where possible, it should have direct access to the carpark, be safely trafficable and lit at night.

2. Multipurpose clubhouse space

The main clubhouse space should be designed as a warm inviting space for user comfort and to maximise viewing opportunities over as many courts as possible. This can promote spectator engagement and viewing in comfort, particularly during extreme or unpleasant weather (e.g. heat or wind). It can be achieved by creating an elevated building platform and providing large areas of protected glazing.

Main clubhouse spaces should be zoned to accommodate multiple concurrent uses such as spectator seating, player lounge area and social spaces, supporting

Figure 3.4.5
Multipurpose Clubhouse space

different levels of amenity for patrons whilst maintaining as much flexibility as possible. The size of the clubhouse will be determined by the number and demographic of users, along with the activity mix and type of events being delivered at the venue.

3. Sanitary facilities (male / female / accessible / change rooms)

Sanitary facilities should be accessible from both within the clubhouse and externally. Providing such access for players, spectators and coaches (particularly in event mode) reduces the need to access the clubroom area and enables the clubroom to be locked after hours if required.

The number and type of sanitary facilities provided is determined by the Building Code of Australia (BCA). Architects or Building Designers can provide the necessary guidance for the project size and budget in respect of these amenities. The suggested area schedule in **Section 3.4.3 Indicative clubhouse concept plans** provides guidance on the spatial needs of sanitary facilities in relation to building size, function and user numbers.

Figure 3.4.6
Accessible sanitary facilities

4. Kitchen / kiosk / café

The kitchen / kiosk / café space is often considered the hub of a tennis facility. In many smaller community level venues, it also provides a space for retail sales, administration and tournament control thereby minimising overall staffing and resourcing requirements.

This space should be accessible by patrons from both within the main clubroom and verandah or covered spectator viewing space via counter / serveries, minimising congestion to the clubroom during peak times. Bench and counter heights should consider users of all ages and abilities.

The size and level of amenity and type of appliances to be provided within the kitchen will depend upon the size and operating model of the venue and should be scoped based on individual venue needs.

5. Tennis pro-shop

Tennis pro-shops should ideally be positioned near the main entry point of the clubhouse to not only present the sale of sporting goods, but to enhance the general control and visibility over the venue.

This space is most commonly shared with the Kiosk or Café function of the centre and depending upon the selected management model the Pro-Shop could accommodate features such as:

- Space for a stringing machine
- Product display space for racquets, sporting equipment and accessories on walls, clothes racks and floor mounted display areas
- Glass fronted drink machines or ice cream fridges
- Consideration of point of sale bench heights and accessibility of products to cater for all users

Figure 3.4.7
Kiosk / cafe

Figure 3.4.8
Kiosk / cafe

Create universal counter height of 900mm where EFTPOS or point of sale is cordless

6. Tennis / tournament office

A multi-purpose space that can be used as an administration hub by venue managers, volunteers, coaches, tournament officials etc. should form part of the central control point of the facility and be located either within or adjacent to the kiosk / café or pro-shop.

The office should, where possible provide direct access from the servery to an outside undercover space / verandah to assist with event operations.

Recommended elements to include in a tennis office space include:

- One to two work stations
- Under bench storage for tennis balls
- Lockable drawers and cupboards for paperwork and electronic portable devices
- Bench space for office accessories such as photocopiers, printers and PA systems
- Variable window heights to accommodate users of all ages and abilities.

7. Multi-purpose / function / meeting space

To optimise facility patronage and flexibility, additional multi-purpose rooms should be considered. These spaces add value to the facility and provide an opportunity to hire the facility externally, maximising usage and providing an additional income stream for the club / venue.

Figure 3.1.10
Multi-purpose space

Figure 3.4.9
Administration hub / tournament office

8. Verandah areas and spectator seating

Maximising spectator seating and viewing from the clubhouse / verandah areas over the courts is a key factor to achieve a user friendly tennis facility. The ability to monitor the progress of play is easier if the courts are able to be viewed from an elevated position, and more comfortable if covered tiered seating is provided at the edge of the verandah (**Refer to Section 3.4.1 Clubhouse design key principles** for more information).

The spectator experience from within the clubhouse is also enhanced by maximising the areas of shaded glazing to the northern and western elevations of the building to reduce both glare and heat. This means that by increasing the areas of glazing that are shaded by some means, the heat load on the glass and subsequent glare will be significantly reduced.

The provision of shaded viewing areas / seating shelters for spectators in thoroughfares between courts should be offered to further enhance the spectator experience.

Figure 3.4.11
Wide Clubhouse verandah

Figure 3.4.12
Tiered spectator seating

9. Gymnasium

Depending on the management model and size of the facility, a gymnasium / fitness training area could be incorporated into the clubhouse design to add value to the venue's service offering. This may be provided with a separate entrance if managed by an external operator or accessed internally from the main clubhouse space.

A gymnasium area can also provide an alternate space for off-court activities at times of inclement weather or as a warm up / cool down space for players.

Commercial tenants can often include allied health agencies such as physiotherapy, podiatry and sports massage, as these services can support tennis activities and also benefit the wider community. Independent tenancy spaces should ideally have their own direct entrance to the venue, be able to be accessed directly off a carpark and have clear visual exposure to passing traffic.

10. Commercial tenancy spaces

Tennis facilities with zoned spaces and/or approval for commercial use may consider the integration of commercial tenancies as an added value proposition. Tenancies and activities that provide synergies with tennis activities (e.g. physiotherapy, personal training) or complementary offerings (e.g. healthy food or beverage service) are recommended.

Commercial leasing or other access arrangements should be negotiated to provide benefits for both the venue and the service provider. This will help to maximise any cross promotional benefits that may arise from both the tennis and added value service.

11. Secure Storerooms and Lockers

Where possible, the following types of storage should be integrated into the venue:

- Main internal clubhouse store room for furniture and general items (e.g. tables and chairs), ideally located near an external access point.
- Externally accessible storeroom to hold coach's training equipment and court maintenance appliances for direct access from the courts (e.g. ball machines, baskets, balls, nets, rollers (refer to **Section 3.5 Equipment and accessories**). This storeroom should include an automated security roller door where possible for compliance with safe work practices.
- Lockers for secure personal storage.

Single storey v double storey clubhouse design

When designing a clubhouse and exploring the viability of a single storey or double storey option, the following factors need to inform decision making:

- Will two levels practically support the current and future management structure and events to be held at the facility, or will an expanded single level footprint meet this demand?
- What local government planning constraints may impact a two storey development?
- Does the available land size better support a single or double storey clubhouse building?
- Are there budget constraints and how much additional income will be required to meet the added expenses of a double storey building?
- What sort of clubhouse building do the existing site conditions support? E.g. is the site sloping or flat?
- Can an existing clubhouse adequately support and accommodate a second storey
- What would the impact be on existing services through a renovation period?
- Will a double storey clubhouse provide a better patron / spectator experience than a single level?
- What are the NCC technical requirements for the height rise needed?
- What capacity lift do we need? i.e. single or double wheelchair capacity

A feasibility study should be undertaken when considering any double storey tennis clubhouse development or redevelopment to ascertain if this is the best option for all stakeholders.

Two storey clubhouse siting and design considerations

When contemplating a double storey tennis clubhouse, the recommended site planning factors outlined in **Section 3.4.1 Clubhouse design key principles** for a single level clubhouse apply. The most important factor to be addressed is the location of the clubhouse with respect to the court layout to ensure overshadowing onto the court(s) is minimised.

Accommodation Briefs will vary for clubhouses and be dependent upon size, proposed management model and nature of events to be held at the venue.

A double storey clubhouse design may include the following:

Ground Floor

- Main / central entry point
- Toilet and change room amenities (internal and external access)
- Storage (internal and external)
- Tennis Pro-Shop
- Café / kiosk
- Tournament office space
- Main clubroom space
- Multi-purpose spaces.

Second Floor

- Social, function or multi-purpose space(s)
- Spectator viewing provision (decking and balcony off the main function room, meeting room or multi-purpose space)
- Toilet amenities
- Storage to support second storey activities
- Kitchen to support second storey activities.

A key consideration for a double storey development is patron access, which will often require a lift to meet Building Code, Disability Discrimination and Universal Design requirements. Lifts can add significant costs to the overall project budget.

Modular or Prefabricated Clubhouse Design Options

Modular or prefabricated buildings are increasingly being investigated and adopted by sporting clubs and associations around the country as a potentially more economical alternative to designing and constructing in-situ (i.e. built in place) facilities.

With the advent and improvement of construction material technology a modular or prefabricated building can not only be a more cost effective solution, but can potentially offer an equally visually appealing clubhouse design to that constructed in a traditional manner.

General design considerations

A modular building design will need to comply with all national design and construction standards including the NCC (National Construction Code) and AS 1428.1 – Parts 1, 2, and 4 – Design for access and mobility requirements, where ramp access in particular is a fundamental consideration due commonly to floor systems being elevated above ground level.

Modular building systems can be designed with all typical amenity requirements for a tennis facility including an open clubroom space, sanitary facilities, kitchens / kiosk / canteen, offices, storage rooms etc.

Planning and construction considerations when using modular building systems

Planning Approvals

Like any building project a prefabricated or modular clubhouse building will need to follow due planning processes including requiring both a Development Application (DA) and Building Application (BA).

Universal Design (UD) principles and equitable access applies equally to modular buildings as they do for in-situ clubhouse development. The selection of construction materials for durability and desired building longevity should be a priority if selecting a modular clubhouse solution.

Construction Process

One of the key benefits of a modular building system is the speed of construction and therefore the ability to have an operating clubhouse and facilities in place much faster than with a traditional development.

Construction Cost

As each clubhouse project is different in respect of general site locations and differing site conditions (i.e. flat or sloping), access constraints, material selection etc., it is difficult to present a true and consistent cost comparison between a modular building system and a traditional design and construction outcome. Depending upon the type of building system selected there could possibly be cost benefits ranging from nominally 15% – 30%.

If investigating a modular building system it is recommended to:

- Research or seek professional advice on the number of building systems available that could be suitable for the site.
- Adopt realistic budget expectations noting that a modular system may not be as cost effective as initially envisaged.
- Agree on the proposed longevity and durability for the facility which in turn reflects upon the type of system selected (particularly concerning material selections).
- Confirm access requirements for the site and the ability for large cranes and / or trucks to position themselves close to the nominated site for the clubhouse.
- Ensure disability access considerations are integrated into the design stage.

Contact the State or Territory Member Association in the first instance when deciding how much space the venue will need for tennis activities.

Benefits and Limitations

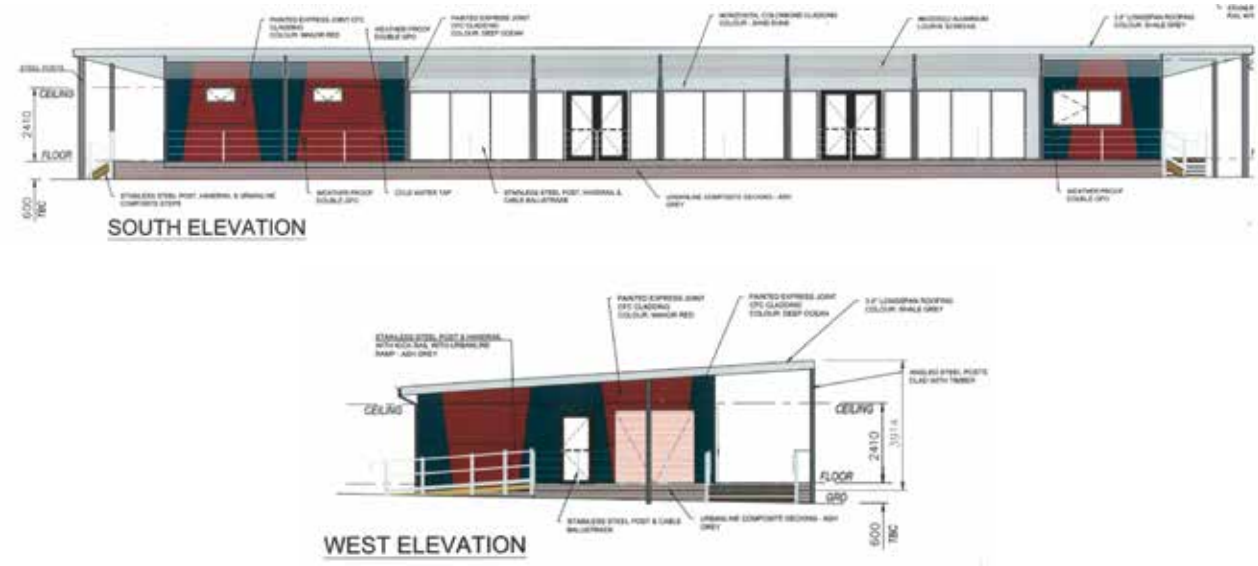
Benefits of modular design solutions may include:

- Increased flexibility of design and material selections.
- Relatively simple relocation opportunities (if the building ever needs moving).
- Potential cost savings versus a traditional clubhouse in-situ construction method (depending upon site location / conditions etc.).

A modular design solution may not:

- Offer the durability and longevity that a traditional building can offer.
- Suit the selected site and soil conditions due to the requirement for large vehicle / crane access and / or specially engineered footing systems.
- Satisfy Council Planning conditions / constraints.
- Offer the perceived cost savings envisaged.

Figure 3.4.14
Modular Clubhouse Design



3.4.3 INDICATIVE CLUBHOUSE CONCEPT PLANS

The following Accommodation (or Area) Schedule has been developed to guide stakeholder understanding of the size of spaces within clubhouses.

An Accommodation (or Area) Schedule can be used to:

- Test concepts and needs with venue stakeholders
- Compare the likely size of future areas with existing spaces
- Develop a Project or Design Brief with or to provide Architects or Building Designers
- Support the preparation of concept drawings.

The sizes for designated spaces are to be used as a guide only and individual venue's spatial requirements will need to be developed and refined with the preferred venue management model and activity mix in mind at all times.

The following also provides an indicative schedule of spaces for each of the three levels of clubhouse examples that would support flexible design to cater for a range of tennis activities and community uses.

Fixed minimum standards are not provided due to the vast range of sites and conditions applicable to tennis venues. Each clubhouse needs to reflect local needs, planning controls, expected usage and number of users.

Table 3.4.2
Accommodation (or Area) Schedule guidelines

The Accommodation (or area) schedule below should be used as a guide only when planning spaces. In all situations club use and functionality should drive all areas and spaces to be included in a clubhouse design or redesign.

The accommodation schedule is provided to assist with clubhouse layout planning, but is not prescriptive as each project scope varies, based on functional requirements and management model variants.

Functional area	Estimated floor area in m^2		
	Clubhouse A: 2 to 4 court venue	**Clubhouse B: 4 to 8 court venue**	**Clubhouse C: 8 to 12+ court venue**
Main / central entry point	n/a	$12m^2$ – $15m^2$	$15m^2$ – $25m^2$(+)
Main clubhouse / social space	$60m^2$	$120m^2$	$120m^2$ – $180m^2$(+)
Facilities (male, female, ambulant, accessible and change rooms)	$40m^2$	$50m^2$ – $55m^2$	$50m^2$ – $60m^2$(+)
Kitchen / kiosk / café space	$12m^2$	Integrated Spaces $25m^2$ – $50m^2$	Integrated Spaces $25m^2$ – $60m^2$(+)
Restringing area	n/a		
Tennis / tournament office / venue management space	n/a		
Multi-purpose / meeting space	n/a	Meeting Room $12m^2$ -$15m^2$	$120m^2$ (Divisible into 2 x $60m^2$ rooms)
Verandah and spectator seating	$60m^2$	$100m^2$ -$120m^2$	$180m^2$ – $200m^2$(+)
Gymnasium / off-court training space	n/a	n/a	$20m^2$ – $60m^2$
Commercial tenancy space	n/a	n/a	$50m^2$ -$150m^2$(+)
Main clubhouse store room	$8m^2$	$12m^2$ – $15m^2$	$15m^2$ – $25m^2$(+)
Equipment store room	$6m^2$	$8m^2$ – $12m^2$	$12m^2$ – $15m^2$

* **N/A** refers to areas that are not applicable or not necessarily required at this level of facility.

* **Square metre (m^2) sizes** have been calculated using the following concept design models and to scale clubhouse designs. They have been calculated based on estimated user numbers, application of relevant standards (e.g. DDA, BCA) and from review of a range of industry design projects.

Clubhouse concept floor plan examples

This section provides three concept plans for clubhouse layouts and design guidance based on different sized tennis venues. These layouts can assist with the development of a Project Brief for architects and / or building designers, also offering an indication of key amenities that can support a range of different activities within a tennis clubhouse environment. These examples can be used to plan new clubhouses or to identify opportunities in how existing clubhouses could be redeveloped to incorporate any or all of the identified features.

The tennis venues that are represented **Figures 3.4.16, 3.4.17 and 3.4.18** are defined in **Table 3.4.3 Clubhouse venue definitions.**

As each site is different and management models vary between tennis facilities, the following plans should be used as a guide only to assist Architects or Building Designers when preparing concept plans.

Table 3.4.3 Clubhouse venue definitions

Clubhouse Example	Venue definition (guide only)
Clubhouse A: 2 to 4 court venue	Suits many smaller community club level venues, mostly managed by volunteer committees and focused on club activities, recreational competition and social play
Clubhouse B: 4 to 6 court venue	A mix of venues are provided at this level, blending both smaller community clubs and those that provide a broader range of activities and events. The larger venues in this category may have professional venue management.
Clubhouse C: 8 to 12+ court venue	Venues at this level should provide a vast range of tennis and non-tennis activities and have professional operations in place. These venues are also more suited to more frequent event use and may require a greater diversity of amenity at the venue and within the clubhouse building.

The success of any concept design is determined by the quality of the planning and amenities provided to suit each specific site and the ability to enhance the player and spectator experience.

Figure 3.4.15
Concept Sketch Design example
('high level' spatial arrangements between Clubhouse areas).

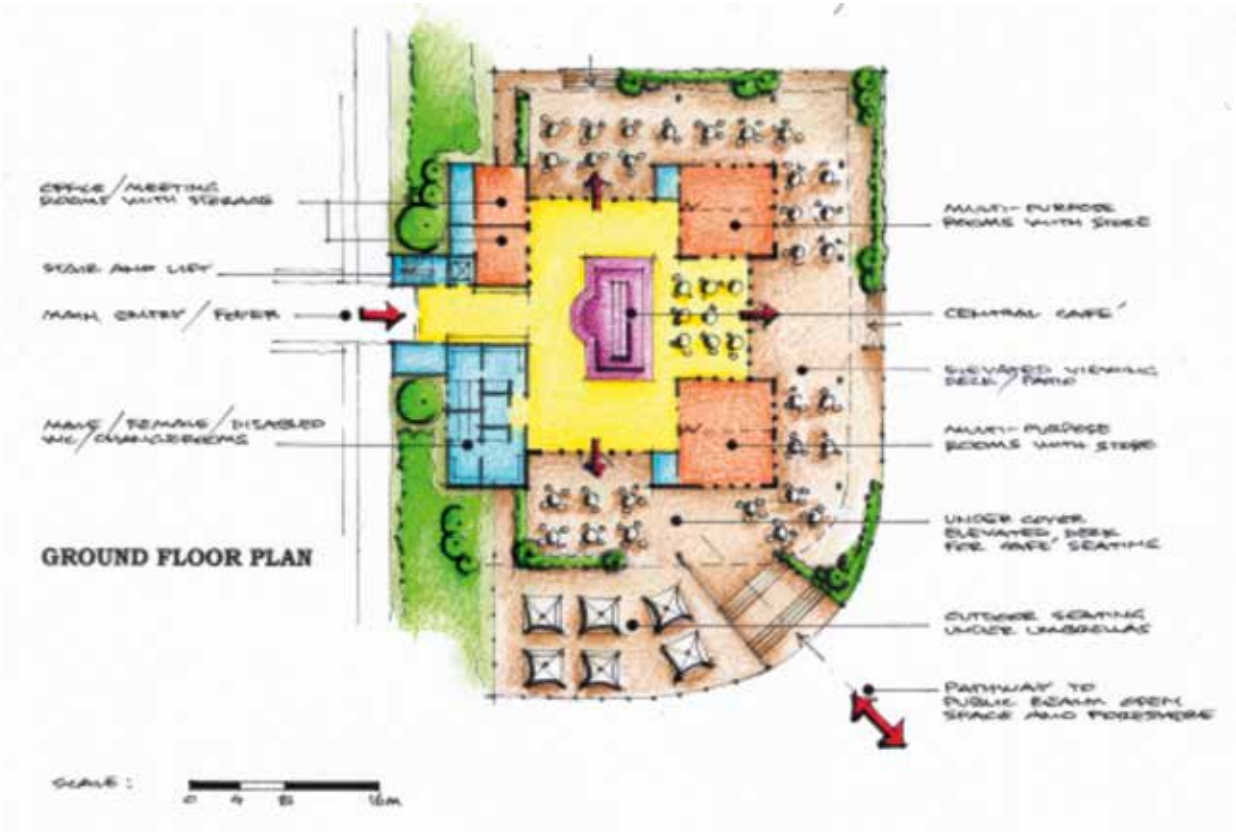
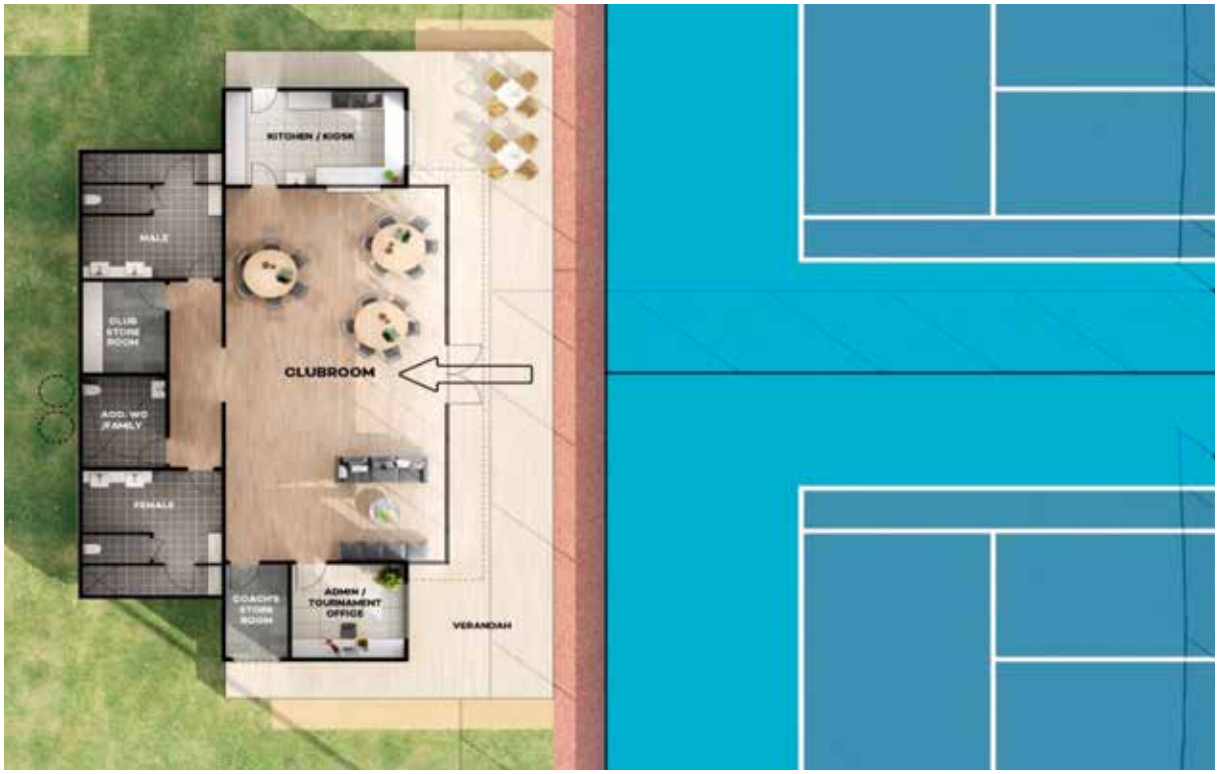


Figure 3.4.16
Clubhouse concept design (2 – 4 court)



Tennis Clubhouse A: 2-4 court facility

For a 2 – 4 court facility the minimum accommodation elements within the clubhouse environment are:

- Main Clubroom space (includes social / community area) and external verandah
- Kitchen / Kiosk with servery to the Main Clubroom space and verandah
- Tennis Office
- Storeroom (accessible from outside with security shutter)
- Male / Female / Accessible amenities (including toilets, shower and changing area).

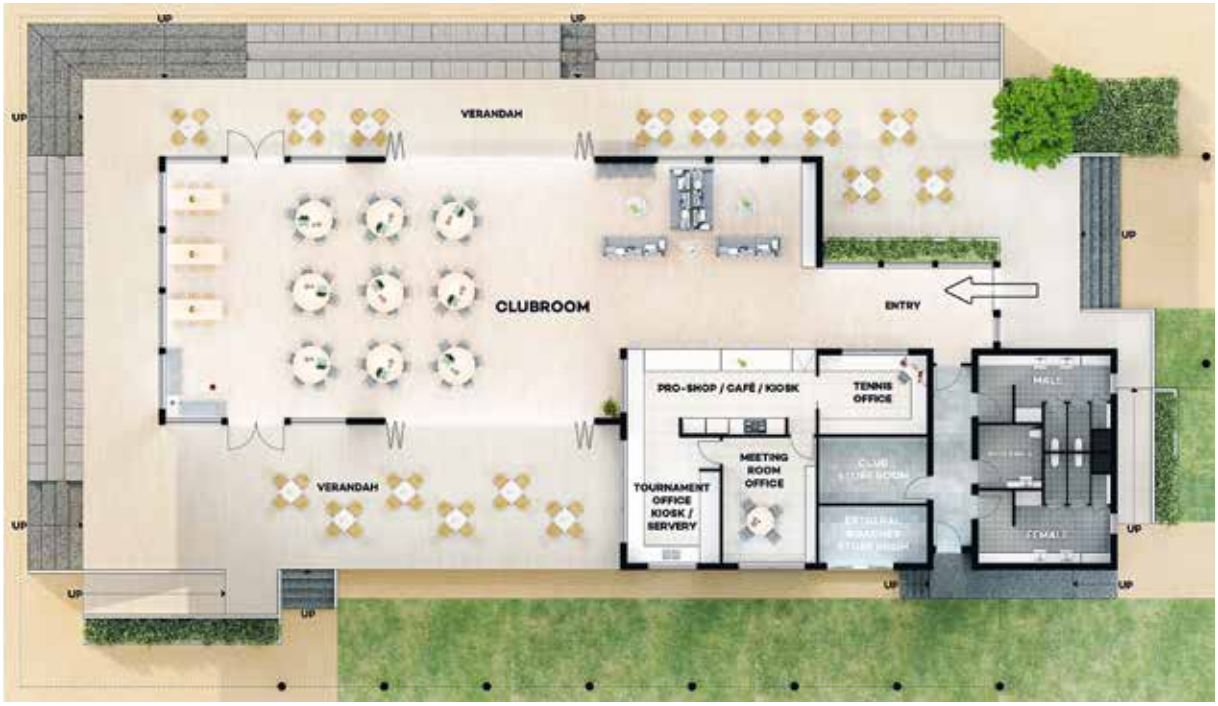
Where 4 courts are grouped together the orientation of the Main Clubroom space should face directly towards the courts (i.e. north / south) with full height glazing to maximise views to the courts.

The plan in **Figure 3.4.16** shows a simple lay out with the Main Clubroom sitting centrally and flanked by the Tennis Office and Store Room to one side, and the Kitchen / Kiosk to the other. Access to the toilets and change room areas is shown via the Main Clubroom space, however external access to the sanitary facilities could also be provided to one side of the storeroom if desired.

The plan reflects a flexible layout meeting the following Universal Design Principles:

- Easily identifiable entry point
- Clearly laid our amenities (e.g. male / female / accessible)
- Ample spectator / seating areas.

Figure 3.4.17
Clubhouse concept design (4 – 6 court)



Tennis Clubhouse B: 4-6 court facility

For a 4 – 6 court facility the following minimum accommodation elements are recommended:

- Main Clubroom space (includes social / community area) and external verandahs
- Kitchen / Kiosk / Café / Pro-Shop (with servery to the Main Clubroom space and verandahs)
- Tennis Office
- Tournament Office (shared with Kiosk / Café with servery to the verandah)
- Meeting Room
- Clubroom Storeroom
- Coaches Storeroom
- Male / Female / Accessible amenities (including toilets, shower and changing areas and accessible both internally / externally).

Creating efficient and functional relationships between the accommodation elements of a tennis facility are key to supporting the selected management model and delivering the best possible user experience for players and spectators.

The plan in **Figure 3.4.17** shows a simple layout for this sized venue. The clubhouse is accessed from the east (right of plan) with the design enabling viewing of courts from three sides of the Main Clubroom and from the wide verandahs. The elevated floor level provides the opportunity for tiered seating as shown to the verandah perimeter creating access requirements such as ramping, a critical design element.

Figure 3.4.18
Clubhouse concept design (6 – 12+ court)

The Main Clubroom is sized to provide both lounge seating and tables and chairs while the Kiosk / Café / Pro-Shop is centrally located adjacent the Tennis Office and functions as the control point for the facility. In event mode the Kiosk servery doubles as a Tournament Office control point reducing the reliance for additional staffing on such occasions.

The plan reflects a flexible layout meeting the following Universal Design Principles:

- Universal access
- Easily identifiable entry point
- Secondary controlled access point to storeroom and amenities area
- Clearly laid our amenities i.e. male / female / accessible
- Ample spectator / seating and viewing areas
- Easily identifiable and accessible Café / kiosk facilities.

Tennis Clubhouse C: 6–12+ court facility

For a 6 – 12+ court facility the following minimum accommodation elements are recommended:

- Main Clubroom space (includes social / community area) and external verandahs
- Kitchen / Kiosk / Café / Pro-Shop (with servery to the Main Clubroom space and verandahs)
- Tennis Office
- Tournament Office (shared with Kiosk / Café with servery to the verandah)
- Meeting Room
- Multi-Purpose Community Space (with operable dividing wall)
- Clubroom Storeroom
- Coaches Storeroom

- Male / Female / Accessible amenities (including toilets, shower and changing areas and accessible both internally / externally).

This clubhouse concept is an extension to the 4-6 court clubhouse concept. The key addition is a Community Multi-Purpose Space that can be accessed independently after hours and from within the entry foyer of the main building.

The Main Clubroom size and configuration is generally larger and spaces should be calculated by the Architect or Building Designer using the Accommodation (or Area) Schedule to ensure that the building's population and sanitary facility provision are in accordance with BCA Guidelines.

The design and operational flexibility provided by the inclusion of the Community Multi-Purpose Space maximises the opportunity for a club or association to attract 'value add' activities and uses throughout the year, not just during the tennis season. Additional amenities that could be introduced as part of the multi-purpose space include a Gymnasium, Commercial Tenancy space or similar activity. UD principles satisfied are similar to the 4-6 court facility and are enhanced in this option through the additional amenity offered by the Multi-Purpose Space.

Hitting Walls

Hitting Walls are a feature that can be added to an existing site or integrated as part of a new tennis complex as a value add amenity. They provide an opportunity for both coaches and players to use either formally as a coaching tool, warm up area or generally as a fun way to enjoy the sport without the need to access a full sized court or a partner to play with.

Where land area permits a hitting wall can:

- Form part of (or be an extension to) the existing tennis court fencing or site boundary fencing.
- Be a stand-alone feature on the site (within view of the clubhouse for supervision purposes).
- Integrate as part of the clubhouse structure (albeit away from the main clubroom space for acoustic separation).

Hitting wall types

There are a variety of hitting wall types comprising different materials and construction systems. Depending on the type of wall the detail design and certification should be undertaken by a qualified structural engineer due to the required height above ground level. Typical Hitting Wall construction systems can include:

1. Concrete masonry / concrete core filled with a flush rendered and / or painted finish.
2. Reinforced concrete or concrete precast panel with a flush rendered and / or painted finish.
3. Composite steel frame / insulated panel clad in either lightweight CFC (Compressed Fibre Cement Sheet), plywood or similar panel material) and painted finish.

Type 1 or 2 above are the preferred options primarily due to general durability, longevity and overall performance. Stand-alone lightweight walls tend not to provide the required performance as they absorb the impact of a ball rather than rebound the ball. They can also prove to be very loud acoustically.

Hitting wall dimensions

Hitting Walls range in height from approximately 2.40m (as a minimum) to around 3.60m high. The overall height will generally depend on the location of the wall and its surroundings. The ideal width is the width of a court (i.e. 10.97m) however where the site or land area is insufficient a minimum width of approximately 6.00m is considered satisfactory.

A net line painted across the wall at the correct level (i.e. 91.4cm) is also recommended. A court surface similar to the adjacent courts should be constructed to one (or both sides) of the wall (once again depending upon the wall's location).

Sunken Tennis Courts

The ability to watch tennis from outside a court enclosure can be significantly improved by either elevating the clubhouse viewing platform above natural ground level (refer **Section 3.4.1 Clubhouse key design principles**) or alternatively by sinking the playing surface below ground level.

Due to the high cost of excavation, sinking tennis courts is generally reserved for larger tennis venues where fixed tiered spectator seating is required.

Sunken courts must also consider accessibility requirements for all participants.

Covered courts

There are primarily two types of covered courts in Australia:

- Enclosed 'indoor' courts
- Shade structures or 'covered outdoor' courts.

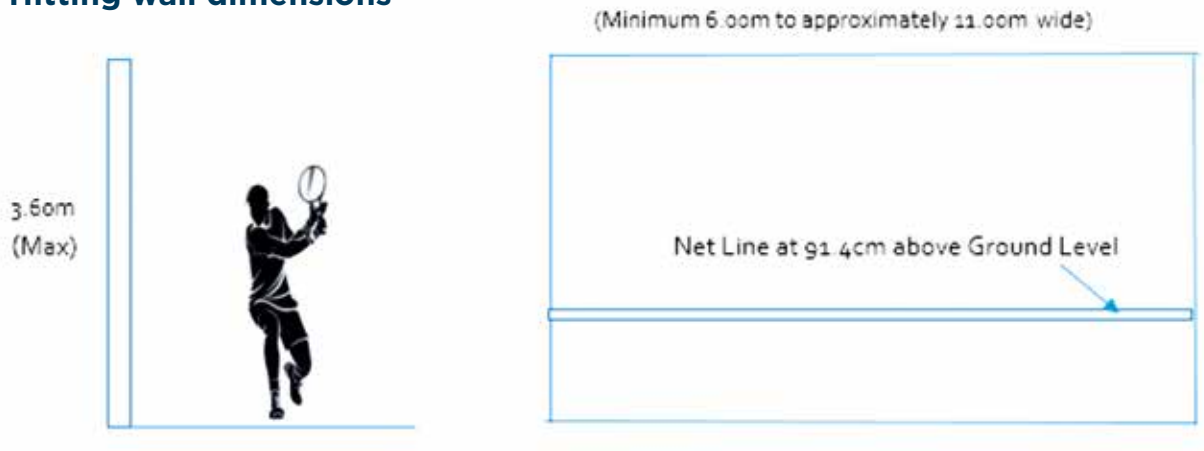
Enclosed or indoor courts

These type of courts are constructed within a building envelope with 4 walls and a roof and may be air-conditioned, have natural ventilation and may or may not have some form of indoor heating.

Some venues have spectator seating as part of the building design while others provide space for bump in or temporary seating.

Such courts are more commonly found in school or recreation centre gymnasiums while dedicated indoor tennis courts for competition are generally located at larger tennis venues around the country.

Figure 3.4.19
Hitting wall dimensions



Hitting Wall Section

Wall Elevation

Shade structures or covered outdoor courts

These type of courts can also be found in schools or recreation / sporting and tennis club facilities and generally consist of either lightweight cloth fabric or metal deck roofing on a steel framed structure. The provision of covered courts is generally driven by local weather and climatic conditions.

Siting, planning and design considerations

- Enclosed Indoor Courts can be constructed as 'built form' development (i.e. distinct from a simple shade structure) as long as the use is complying under local government zoning and the building envelope is designed in accordance with BCA standards.
- Enclosed courts are the only tennis courts that are not required to be orientated primarily in a north / south direction although where possible is it is still recommended.
- Planning advice should always be obtained before considering the development of both enclosed and shaded courts.
- Shaded or Covered Outdoor Courts should always be designed by qualified structural engineers due to the size and climatic conditions that need to be considered for different sites.

As the development of covered courts is a specialised area it is highly recommended that Clubs and Associations contact relevant State or Territory Member Association for advice on whether a covered court option is suitable.

When looking to install a hitting wall seek advice from the State or Territory Member Association in the first instance for the recommended size, type and construction system suitable for the tennis facility. A building permit from the local council or relevant planning authority may also be required.

SECTION 3
FACILITY PLANNING, DESIGN DELIVERY AND MAINTENANCE

3.5 EQUIPMENT AND ACCESSORIES

Nets, racquets and balls are the fundamental requirements of any tennis activity. In addition to this there is a range of additional on and off court equipment that can improve the existing infrastructure and the playing experience. Courts that are used for limited social play will have different requirements than courts used for coaching or competition. The additional equipment and accessories will be determined by this usage and the surface types.

Equipment and accessories covered in this section are removable or portable, for fixed infrastructure such as net posts and lighting refer to **Section 3.1.6 Supporting Infrastructure.**

This section includes detailed information on the following topics.

3.5.1 Tennis nets

3.5.2 On-court equipment

3.5.3 Off-court equipment

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations, venue operators and educational institutions
- Local Government.

Definitions

Centre straps and anchors – Centre straps and anchors are devices installed to the centre of the net to assist in ensuring the correct net height is maintained.

Defibrillators – Machine used to control heart fibrillation by application of an electric current to the heart.

Net cables and winding mechanisms – Devices used to alter the high of the net. Winding mechanisms may be inside the net post or external and protruding.

Net footings – Base / foundation to which the net post is inserted. These may be round or square, depending on the type of post to be installed.

Singles sticks – Portable posts that are used to support the tennis net to the correct height for singles play.

Standards

Equipment and accessory specifications should meet International Tennis Federation Basic Permanent Equipment (2017) requirements. **http://www.itftennis.com/technical/facilities/facilities-guide/equipment.aspx**

KEY HIGHLIGHTS

What you need to know

- There is a range of on and off court equipment specifically designed for tennis
- Equipment requirements will be determined by the need, activity types (e.g. competition), service levels and surface type
- Minimum equipment recommended for facilities is nets and brooms / sweepers (for maintenance).

3.5.1
TENNIS NETS

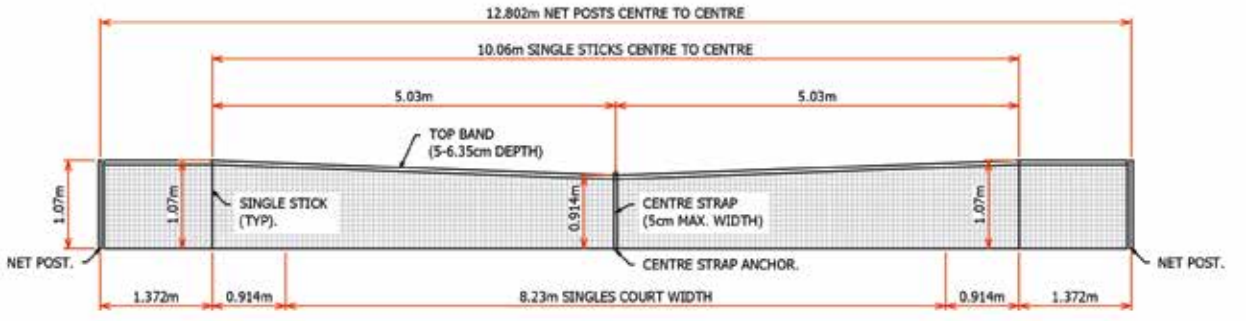
Nets are a required part of play on every tennis court. There are several components of tennis netting that make up a fully functioning net system to achieve the correct dimensions. These include posts and winding mechanisms (see Section 3.1.6), centre straps and anchors, and the net. General considerations for tennis nets are:

- Quality can vary significantly, a good quality net can be expected to last 5-7 years.
- Varying nets grades are available on the market, with ranges developed to suit various levels of play and environmental factors (e.g. outdoor, indoor, and humid).
- Nets are available in two drop heights (space between the court and the top of the net); 0.76m or a full drop.
- The net is not required to touch the court surface; however it is recommended that the space between the two is no greater than 0.6cm.
- Nets should be black in colour with a thick white band at the top.
- Most tennis nets are made of braided polyethylene, providing effective resistance to the Australian climate.
- Nets can be provided in single or double braid, with double braiding providing more absorption, the braided nature of net construction ensures they are strong and sturdy.

Netting dimensions

Image 3.5.1 ITF Netting Dimensions provides an overview of the International Tennis Federation (ITF) requirements of netting dimensions. Centre straps ensure that the net remains at the correct height. For information on net posts and winding mechanisms refer to **Section 3.1.6.**

Image 3.5.1
ITF netting dimensions



Singles tennis net measurements
Net height centre: 0.194cm
Post Height: 1.07cm
Net width: 8.23m + 0.914m = 9.144m

Doubles net measurements:
Net height centre: 0.194cm
Post Height: 1.07cm
Net width: 10.97m + 0.914m = 11.884m

Image 3.5.1
Tennis net

Conducting regular checks of the nets and their associated components will assist in prolonging the lifespan.

See Section 3.1 – Courts for information on net posts and footings.

IMPORTANT INFORMATION

For singles, net posts should be positioned 0.914m (3 feet) outside the court lines. The location of these posts is different for singles and doubles courts due to the different court dimensions of the games.

Centre straps and anchors

Centre straps ensure the centre measurements of the net meet ITF regulations (Image 3.5.1 ITF Netting Dimensions). Ground anchors secure centre straps to either a concrete base or footing in the middle of the net line via a non-corrosive hook.

- The centre strap should contain a height adjusting non-corrosive buckle that prevents slipping when tensioned. ITF rules state the centre tennis net height should be limited to 0.914m (3 ft.), with a 50mm wide strap.
- Centre straps are not always installed, especially at community level venues.

Net installation

Net installation / assembling will usually depend on the brand of net and the supplier should provide direction accordingly. A general guide the process is:

Image 3.5.2
Centre strap

1. Majority of nets will come with a single loop at one end; attach the loop to the post that does not contain the winding mechanism and stretch the net outward toward to the post that contains the winding mechanism.
2. Attach the unlooped end to the post with the winding mechanism and wind to obtain the required tension.
3. Turn the mechanism until the net is 0.914m (3 feet) high in the centre making sure not to over tension the net as this can apply too much pressure on the posts.
4. Install the centre net strap and attach to the ground anchor (if applicable).

Net maintenance

Tennis nets require maintenance to ensure their durability. Depending on the environment of the net location (i.e. indoor or outdoor, climate, environment etc.) the level of maintenance a net requires may vary.

The following checks and maintenance should be undertaken regularly for tennis nets:

- Wearing of net bands, requiring repair or replacement.
- Corrosion / deterioration of cable wire and centre strap buckles (as applicable) especially in extreme weather conditions.
- Scratches and nicks on net posts that require touch up to prevent corrosion and prolong the lifespan.
- Lubrication of the winding mechanisms of nets regularly to ensure ease of use.

Nets and posts are made durable and long lasting, so do not need to be disassembled and reassembled each day.

3.5.2 ON-COURT EQUIPMENT

There are a variety of products available on the market to assist in creating a greater tennis experience for players, whilst alleviating venue maintenance and management responsibilities.

A brief recommendation regarding on court equipment is listed below to assist clubs and venues in creating and maintaining a welcoming and desirable environment.

Court numbers

Court numbers clearly outline the location of each court and are a requirement for coordinating programming. Court numbers should be:

- Bold and clearly visible.
- Consistent design and font.
- Fixed in the same position of the fencing on all courts.

Directional and instructional signage

Clear signage should be displayed throughout the venue to ensure participants and spectators are aware of the location of amenities, available services and venue policy and procedures. Good quality and well maintained signage significantly contributes to the overall presentation of venues.

Court covers

A range of covers are available to protect court surfaces but are not widely used through Australian community tennis venues. State and Territory Member Associations can provide further guidance on court cover options.

Umpires chairs

Most community level tennis venues do not have specific umpire chairs as they are often not a requirement due to self-umpiring. For venues holding high level tournaments, umpiring chairs may be made available.

Considerations for umpiring chairs include:

- Materials that will not damage the court surface.
- Positioned to not affect play.
- Desk area to support scoring documentation.
- Umbrella or shade sail for sun protection

Player chairs and shade

Most venues have portable, plastic chairs that are kept in close proximity to the court. This is done so that either the players can carry them on to the court, or the venue can have them placed on the court prior to the match, ready for the players to sit on during a change of ends in their match.

At most community venues, there is no permanent on court seating for players but most venues will provide plastic chairs suitable for player use during matches. Additionally, venues may also provide shade on the back of these chairs to shelter players from elements such as rain, wind and, most prominently, the sun during their matches.

Ball machines

There are a wide range of tennis ball machines available. Machines are used most commonly by tennis coaches and private tennis court owners to project balls for return in practice settings.

Considerations for ball machines are:

- Need / purpose – Ball machines offer a range of features including oscillating, varying speeds, varying trajectories and differing spins on the ball. Therefore, it is important test ball machines prior to purchase.
- Power source (if required) – Check the distance from the court to the nearest

power source before purchasing machines. Additionally, most machines are now battery operated so it is important to ensure regular testing of batteries is being conducted in addition to having battery replacements available.

- Noise outputs – Consider the noise outputs of ball machines and times of use to minimise potential disruption to the surrounding community.

Ball retrievers

Retrievers are used to minimise ball collection times and eliminate the need to manually gather balls as this can be physically strenuous and repetitive. These come in various forms and sizes and are available from most tennis equipment suppliers. Variations of a ball retriever can include but are not limited to;

- "Sweeper" – A hand held device that you can push/wheel around the court for balls to be picked.
- "Tube/Barrel" – Cylinder in shape with open ends, coaches and players use these by pressing the end of the cylinder onto the ball. Once the cylinder is full of tennis balls they can be returned and emptied into the coaches basket.

Scoreboards

Tennis score boards are available in many shapes and sizes and can be temporary and portable or permanently installed. Electronic and manual options are available.

Windscreens

Windscreens provide wind protection and increase privacy of tennis courts enclosures. Windscreens can also provide an opportunity for club / venue visual advertising and sponsorship.

Windscreens are made from high strength tensile fabrics such as vinyl coated mesh and polypropylene, and have anti-glare properties to minimise sun reflection. Windscreens can be made in a range of weights and grades to suit specified tennis venue environments.

When selecting a windscreen, the following should be considered:

- Level of wind the screen is being installed to block will determine the material, weight and grade.
- Colour of the windscreen to blend with the surrounding environment and not distract participants.
- Advertising should not dominate the entire screen space.
- Strength of the existing fencing and ability to hold the windscreens during high winds.
- Windscreens should be permanently attached to the inside of enclosure fencing to prevent vandalism.

Windscreen installation and maintenance should be guided by suppliers and / or contractor.

Refer to **Section 3.2 Fencing** or more information

Coaching baskets

Coaching baskets are an essential piece of equipment for all levels of coaching for an effective ball retrieving and storage process.

ANZTHS equipment

ANZTHS play usually requires modified equipment such nets, posts, balls and racquets. Additional information on ANZTHS equipment can be found at: https://hotshots.tennis.com.au/

Refer to **Section 3.1.7 ANZ Tennis Hot Shots** for more information

Drag mats, brooms and sweepers

Court brooms and sweepers are designed to:

- Remove court debris (all court surfaces)
- Remove excess surface water (e.g. squeegee for hard courts, absorbent roller for clay)
- Even out surfaces (spread clay and sand on synthetic surfaces)
- Line presentation (e.g. line brooms for clay and synthetic surfaces)

Sweeping should be a part of daily court maintenance.

Drag mats are specifically designed for clay / red porous court maintenance. There are different types for collecting debris and levelling out surfaces, with regular sweeping required to ensure playability. They can be stored on court as shown in **Image 3.5.5.**

Refer to **Section 3.1.5** for more information on court maintenance.

Image 3.5.4
Clay court drag mat

Image 3.5.5
Drag mat storage

Image 3.5.6
Spreader machine

3.5.3 OFF-COURT EQUIPMENT

Off court equipment should also form part of venue or infrastructure planning provision.

Spectator seating

All tennis venues should have courtside seating options available. Existing infrastructure (e.g. number of courts) can assist in determining the type and preferred capacity of seating provision. Seating can be bench or chair style in grandstand format or rows, both fixed and portable.

Temporary seating can be hired and used to meet increased spectator demands during large scale tournaments and events. These are best sought locally to remove shipping / transportation costs.

Waste bins

Waste and recycling bins should be placed around the venue to assist in keeping a clean and presentable site.

First aid kit and defibrillators

First aid kits should be kept on site at all tennis venues. The installation of a defibrillator machine should be considered. The location of the first aid kit and defibrillator should be easily accessible and clearly marked with signage.

Drinking fountains

For the convenience and wellbeing of players and visitors, drinking water should be available around the venue.

Shoe cleaning facilities

Shoe cleaning brushes and / or grates should be provided at venues with clay courts or synthetic surfaces to ensure correct etiquette is observed both on and off court (e.g. transfer of clay / sand in to club house).

SECTION 3
FACILITY PLANNING, DESIGN DELIVERY AND MAINTENANCE

3.6 ACCESSIBILITY

Tennis Australia supports all forms of tennis which includes deaf tennis, persons with an intellectual disability (PWID), visually impaired (VI) and physically impaired (wheelchair tennis). An accessible and inclusive club design that meets the needs of these players can benefit all users, fostering participation growth by providing opportunities for all community members to engage in club activities.

Users who may benefit from accessible venues include but are not limited to:

- Parents and carers with prams, pushchairs and wheelchairs
- People using mobility aids
- People with low literacy, where English is a second language or don't speak English
- People with temporary impairments or injury
- Aging population.

To achieve accessible facilities and amenities both standards (measurable) and Universal Design (principles) should be embedded in to planning from all stages of the planning, delivery and operation.

This section provides recommendations on how to ensure tennis venues are accessible to as many people as possible, highlighting considerations for the following areas.

Standards

All new building designs or upgrades to existing buildings in Australia must comply with the Disability Discrimination Act (DDA) and relevant Australian Standards, which include, but are not limited to the following:

- Disability Discrimination Act (1992).
- Disability (Access to Premises – Buildings) Standards 2010.
- AS 1428.1 – Parts 1, 2, and 4 – Design for access and mobility

These provide minimum specifications that do not meet the needs of all people with a disability or temporary impairments. Tennis Australia recommends these standards are used as a baseline when designing new developments or refurbishments, integrating of the principles of Universal Design in order to be fully inclusive.

Refer to **Section 2.2.4 Planning considerations** and **3.4.1 Clubhouse design principles** for information on Universal Design.

KEY HIGHLIGHTS

What you need to know

- Australian Standards are considered to be minimum planning requirements for accessibility at tennis venues and broader Universal Design principles should also be implemented to promote inclusion.
- The width of sports wheelchairs is greater than day chairs therefore door widths up to 1.35m with the appropriate design is recommended as the optimum width for universal access of gates and doorways.
- Sport and Recreation Victoria's Design for Everyone Guide provides more information on inclusion design practices for sports facilities.

Primary audience

This section has primarily been designed for:

- Community tennis clubs, associations and venue operators
- Local Government
- State and Territory Member Associations
- Architects, planners and designers

Definitions

Ambulant facilities – Facilities designed for use by a person with an impairment or disability that does not prevent walking.

Amenities – Desirable or useful features of a venue.

Grade access – Access free of vertical obstruction providing seamless and unimpeded access entry to facilities.

Building Code of Australia – Technical provisions for the design and construction of buildings / structures in Australia

Disability Discrimination Act (DDA) (1992) – Act passed by Parliament of Australia prohibiting discrimination against persons with disabilities.

Disability – An inability or a reduced capacity to perform a task in a specific way.

Ground tactile indicators – Tactile Ground Surface Indicators (TGSI's)

Impairments – Any loss or reduced capacity of a psychological or physical function.

Stair nosing – A grip and colour contrasting surface on the top edge of each stair tread

Premises Standards – Standards applying to buildings covered by building classifications in the Building Code of Australia.

Thoroughfares – Road or path forming a route between two places.

TPA (Total Playing Area) – Includes all areas of the defined court area and up to the fence lines where a player might reasonably expected to travel during play.

Universal Design – A design philosophy that ensures that products, buildings, environments and experiences are accessible to as many people as possible.

For information on the types of classifications for wheelchair tennis competition visit www.itftennis.com/wheelchair/players/quad-classification.aspx and for wheelchair tennis tournament hosting including specifications visit www.itftennis.com/wheelchair/organisation/rules-regulations.aspx.

3.6.1 PLANNING

Planning for all forms of tennis involves eliminating barriers that players may experience to enter a venue and use the facilities. Impairments can be both physical and psychological, temporary or permanent. The level of accessibility of a venue will therefore be interpreted differently by individual users and their ability.

Community and State or Territory Member Association consultation in project planning stages is critical to achieve a user-centred design (focussing on users and their needs) and integration of inclusive features above legislative requirements. Other venues, specialist organisations (e.g. access consultants) and experienced personnel (e.g. Tennis Australia accredited coaches) can also assist with the co-design of developments with architects.

This collaborative approach is vital to ensuring any changes improves the experience and safety of all users. Safety both on and off court (e.g. obstructions, uneven surfaces) should be managed as Workplace Health and Safety (WHS) requirements by venue operators.

When planning facility developments or auditing to understand existing provision, any number of the following facilities and amenities can be fundamental to influencing whether prospective users attend a venue:

- Courts
- Clubhouse
- Amenities
- Parking / public transport
- Thoroughfares
- Equipment

All forms of tennis can be integrated with venue programming where appropriate facilities and amenities are available. The minimum requirements for access above legislative standards are determined by individual ability and preferences.

3.6.2 COURTS

It is essential to ensure all court users (players, officials, coaches, spectators, volunteers) can safely access and navigate on and around the court, including changing ends. Some barriers that may exist and need to be considered include:

- Steps to court enclosures / sunken courts – each court should have at least one at grade access point
- Inadequate gate widths – recommended width for universal access is 1.35m
- Lighting – sufficient lighting levels and location of posts outside TPA
- Gates – location, weight, handle position and swing direction should all be considered
- Moveable equipment – Umpire chairs, player benches, bins etc. should not impede on TPA
- Inadequate court run offs – obstructions (e.g. lighting, fencing, equipment) should not impede on TPA

Questions potential users may have about a venue that could determine how accessible it is may include:

- Do the courts have at grade access?
- Does the clubhouse have a lift?
- Do changing rooms have fixtures and fittings s uch as hand rails?
- Are there parking bays in close proximity to the entrance?
- Are pathways clearly signposted and free from obstructions?
- Does the venue offer modified equipment?

- Additional allowances should be given to run offs, turning spaces and manoeuvrability around the perimeter of the court for wheelchair tennis players.
- Accessible viewing areas and circulation spaces leading to the court. Sightlines above or through the surrounding fences is a key consideration.

Refer to the ITF website for further information of court dimensions and access provisions:

ITF Technical Facility Guide - court dimensions

Ensure provision is made courtside for spectator seating allowing for wheelchair / mobility aid access.

TRIP HAZARDS

Image 3.6.2
Court entrance with step

3.6.3 CLUBHOUSE

All facilities within the clubhouse environment require considered design for access by wheelchair users, mobility aids and prams. Location of amenities should be planned in consultation with community groups to ensure ease of access and use. Additionally, furniture should be arrange in a logical manner that provides easy access.

Player lounges and catering are often on the second level of clubhouses, therefore if there is not a lift available that fits a sports chair then these areas may be considered inaccessible.

In existing builds not designed for inclusive access, clear and appropriate signage should be in place indicating alternative service provision or option(s) for players.

As the first point of contact with users, there are important considerations to take into account when designing the customer service area, these include:

- Variable bench heights
- Suitable leg clearance underneath counters and tables
- Circulation space around and between furniture and fittings
- Clear directional signage
- Adequate lighting
- Variable bench heights – universal bench heights i.e. 900mm
- Hearing augmentation where Public Address System
- Ramp access to stages or presentation areas

3.6.4 AMENITIES

Amenities are any desirable or useful features of a venue. It is important to ensure that amenities are designed to cater for all club users. Some key considerations to be aware of include:

- Mobility and manoeuvrability
- Offering unisex accessible options that cater for families and users with carer
- Appropriate signage
- Regular maintenance
- Unisex accessible toilets that contain baby change tables, showers, first aid kits, defibrillators, sharps bins that provides more flexible use.
- Changing Places toilets are now a key feature in very large community facilities. These provide a specialise area where adults who have high care needs are able to be assisted for person hygiene or medical care needs in a dignified, safe and functional environment.

Accessible changing facilities

Dedicated accessible toilets are just one type of amenity that can meet the needs of players who have physical disability. Ambulant toilets or larger than standard cubicles can also be advertised as viable options. As standard practice for all amenities, importance should be emphasised on cleanliness and provision of necessary equipment (e.g. bins and hand wash). Fittings such as grab rails and shower seats can also significantly assist independent use.

Signage

To facilitate wayfinding around venues signage should be located at the following:

- Carpark bays
- Directional pathways to various areas
- All entrances and exits
- Changing facilities / toilets
- Any non-accessible entrance (directing to an accessible entrance)

A list of considerations when creating signage are:

- Clear, concise and easy to read
- Contain braille and tactile markings
- Placed at suitable location and height
- Sufficient lighting of signs
- Appropriate font
- Created using contrasting colours appropriate terminology (e.g. ‘accessible’ not ‘disabled’)

Fully accessible washrooms for people with complex needs can be met with a Changing Places facility, visit www.changing-places.org/ for more information

For further information about accessible communication, Victorian State Government Accessible Communication Guidelines provide considerations to ensure the widest possible audiences are reached, including those with a disability.

3.6.5 PARKING / PUBLIC TRANSPORT

Dedicated accessible parking bays are required to cater for all users and should adhere to the following recommendations:

- Located as close as possible to the venues primary entrance
- Sufficient space provided adjacent to dedicated parking bay for safe embarking and disembarking from vehicles and loading and unloading of equipment or aids
- Parking bay connects to a continuous accessible path of travel to the venue to ensure safety
- Managed / monitored to ensure appropriate use
- Consider undercover waiting areas with rest seating in line of sight of pick up / drop off locations, particularly important for kids and the elderly
- Consider locations of community transport where groups can load and unload safely

If accessible parking to relevant standards is not viable, consider allocating the most appropriate space as signed reserved parking.

3.6.6 THOROUGHFARES

A continuous pathway that accesses the entire venue to all common areas and facilities is required for manoeuvrability and safety of all club users. Where possible entrances, doorways and access ways should comprise of the following relevant features:

- Level and step free access throughout the facility – Clear building lines free of obstructions
- Slip-resistant surfaces
- Ground surface tactile indicators – Inclusion of colour and textural contrast to minimise the use of Tactile Ground Surface Indicators (TGSI's)
- Steps marked with bright colours to highlight location, distance and depth
- Sufficient width of entrances and pathways to accommodate for wheelchairs, prams etc.
- Appropriate signage including raised lettering and / or braille
- Clear walkways clear of obstructions
- Weight, swing direction and handle location of doors – easy to operate or automated entry doors
- Lighting and colour contrast between the walls and floor surface
- Gradients of ramps – graded walkways or ramps with appropriate components such as handrails

It is recommended that ramps are provided as an alternative to stairs to ensure equity of access for venue users. Where a ramp is unable to make a facility accessible, alternatives include:

- Contrasts on the stairs nosing to make them easily identifiable
- Slip resistant surfaces
- Handrails on both sides extending past the top and bottom sides of the stairs.
- Vertical platform lifts
- Porch Lifts
- Stairway Platform Lifts

3.6.7 EQUIPMENT

All venues should consider modified equipment to offer all forms of tennis, for example ANZ Tennis Hot Shots nets for children and provision of sports chairs for wheelchair users.

Blind and vision impaired tennis use tennis balls that are audible and range from various materials, sizes and colours. Venues are encouraged to provide a range

Sports chair cambers (angle of wheels) are significantly wider than day wheelchairs, which can inhibit access to certain wheelchair pathway areas built to the DDA Australian standards.

of balls that support players that are blind or visually impaired. For more information visit: Blind and Vision Impaired Tennis

Sports chairs can generally be categorised as small, medium and large. Tennis Australia recommend a minimum of two small chairs for junior participation and two medium chairs for adults. They can be hired, purchased, jointly procured in partnership with basketball clubs or loaned.

Venues are encouraged to allocate dedicated storage for sports chairs and have somewhere secure for players to put day chairs when not in use.

3.6.8 EVALUATING ACCESS

To assist venue users to understand the level of venue accessibility and facilitate operators to target investment into the right areas, Tennis Australia have developed a Framework that can be used as a starting point to evaluate accessibility. This information can also be used to communicate potential barriers to wheelchair users, people using mobility aids or prams to make informed decisions as to whether the venue is accessible to their needs.

The Framework is designed to practically assess the key areas covered in **sections 3.6.2 – 3.6.7** that prospective users may have questions regarding access. Each component can be evaluated as accessible, partially accessible or inaccessible.

Accessible

Best practice components of a venue that are accessible for all users. These are typically built on flat land with plenty of space and additional features such as automatic doors, designated accessible amenities and modified equipment.

Partially Accessible to Assisted Access

Partially accessible components may have good accessibility with the exception of one or two features that have potential to be worked around. Small investments into these components such as hand rails, portable ramps or widening of paths may enhance their usability. It is important venues clearly identifies partially accessible components so users can decide if they are able to adapt for their use.

Inaccessible

These components are unlikely to be considered accessible and may not be considered viable to invest in improvements.

Existing venues are likely to have a hybrid of accessible, partially accessible and inaccessible features and the Framework can be used to highlight these strengths and weaknesses.

For more information on the Framework and ways it can be used contact your State or Territory Member Association.

Tennis Australia have sports chairs available to loan children and adults, for more information visit Wheelchair Loan Program

The Access Framework is not designed to measure accessibility but to provide an understanding of core requirements and identify strengths and weaknesses, to communicate potential gaps in provision to users.

SECTION 4
REFERENCES AND RESOURCES

4.1
ACKNOWLEDGEMENTS

The Planning, Design and Delivery Resource for Australian Tennis Venues has been a collaborative project between Tennis Australia, insideEDGE Sport and Leisure Planning, SportENG and SportDev, with input and support provided by national tennis, local government and industry professionals.

Further information and recommendations have also been derived from consultation with the following organisations:

- State and Territory Member Associations
- Musco Lighting
- City of Latrobe
- Anglesea Tennis Club
- Alexander Park Tennis Club
- Jasstech Solutions
- Moe Tennis Club
- Tweed Heads Tennis Club
- William Loud
- Association of Tennis Professionals
- Australian Sports Foundation
- Sport Environmental Alliance
- Chris Sale consulting
- Enervest / Eco Community
- Parks and Leisure Australia.

SECTION 4

References and resources

SECTION 4
REFERENCES AND RESOURCES

4.2 SOURCES AND RESOURCES

The following information sources have been used throughout the development of this Resource.

Where online access is available, a weblink has been provided.

Australian Government Disability Standards

www.legislation.gov.au/Details/F2010L00668

Australian Government Department of Environment and Energy

www.environment.gov.au

Australian Government Protective Security Policy Framework

www.protectivesecurity.gov.au/Pages/default.aspx

Australian Human Rights Commission

www.humanrights.gov.au/our-work/legal/legislation

Australian Institute of Designers Environment Design Guide

www.architecture.com.au/services/edg

Australian Sports Commission

www.ausport.gov.au/

Australian Sports Foundation

asf.org.au/

Australian Standards

- AS 1725.2-2010 Chain link fabric fencing Tennis court fencing – Commercial
- AS 1725.3-2010 Chain link fabric fencing Tennis court fencing – Private/Residential
- AS 2560.2.1-2003 (R2017) Sports lighting Specific applications – Lighting for outdoor tennis
- AS 2560.2.1-1982 Guide to sports lighting Specific recommendations – Lighting for outdoor tennis
- AS 2560.2.2-1986 (R2017) Guide to sports lighting Specific recommendations – Lighting of multipurpose indoor sports centres
- DR AS 1725.2 Chain-link fabric Part 2: Tennis court fencing – Commercial
- DR AS 1725.3 Chain-link fabric Part 3: Tennis court Fencing – Private/Residential
- DR 00197 CP Sports lighting Part 2.1: Specific applications – Lighting f or outdoor tennis
- AS/NZS 4066:1992 Eye protectors for racquet sports
- AS 1428.1 – Parts 1, 2, and 4 – Design for access and mobility

infostore.saiglobal.com/

The Building Code of Australia

www.abcb.gov.au/

Department of Sport and Recreation, Western Australia

www.dsr.wa.gov.au/

SECTION 4
REFERENCES AND RESOURCES

Game, set, match

Facility development

www.gamesetmatch.net.au/ClubToolkit/Facilities/FacilityDevelopment.aspx

Governance

www.gamesetmatch.net.au/ClubToolkit/ClubOperations/Governance.aspx

International Tennis Federation

ITF Court Rules of Tennis (2017)

www.itftennis.com/technical/publications/rules/courts/overview.aspx

ITF Basic Permanent Equipment (2017)

http://www.itftennis.com/technical/facilities/facilities-guide/equipment.aspx

How to mark out red and orange courts

https://www.tennis.com.au/wp-content/uploads/2011/10/ITF-mini-court_setup_guide.pdf

Tennis Play + Stay

www.tennisplayandstay.com/home.aspx

Safe Work Australia

www.safeworkaustralia.gov.au/construction

Sport and Recreation Victoria

Universal design

sport.vic.gov.au/our-work/participation/inclusive-sport-and-recreation/universal-design

Tennis Australia

Funding and facilities

www.tennis.com.au/clubs/funding-and-facilities

National court surface policy

www.tennis.com.au/wp-content/uploads/2017/04/176513519-TA-National-Court-Surface-Policy_updated-April-2017.pdf

Courts, nets and lines

www.tennis.com.au/learn/rules-and-scoring/10-and-under-tennis-rules/courts-nets-and-lines

Tennis Queensland

Technical Manual for the Design, Construction and Maintenance of Tennis Facilities (2010)

www.tennis.com.au/qld/files/2015/08/Technical-Manual.pdf

Tennis Victoria

Club Guide – Funding for facility development

www.gamesetmatch.net.au/site/DefaultSite/filesystem/documents/P2P/Guide%20to%20Funding%20Facility%20Development%20in%20Victoria.pdf

Tennis Victoria and Netball Victoria Facility Factsheet

nvclubhouse.com.au/document/2377/netball-tennis-facility-fact-sheet

United States Tennis Association

Tennis Courts. A construction and maintenance manual (2006)

Work Health and Safety Acts (2011)

www.legislation.gov.au/Details/C2016C00887

4.4
GLOSSARY AND DEFINITIONS

Several tennis specific and technical references are made throughout the Resource. A brief explanation / definition of these is provided below.

Accommodation Brief
A detailed document generally prepared by an architect / building designer that expands upon a project brief and outlines the specific space and area requirements for the design of a building.

Acrylic
Material used for surfacing courts that provides colour and texture in the court surface.

Aggregate
The stone particles within flexible pavements.

Agronomy
The science of soil management and crop production.

Arborist
Specialist in the cultivation, care and maintenance of trees and shrubs.

Architect
Professional who designs buildings and in many cases supervisors their construction.

Asphalt
A mixture of dark bituminous substance with gravel aggregate stone.

Authority assets
Infrastructure owned and operated by utility providers (i.e. electrical, communications).

Backstays
Outrigger additional structural support for fence.

Base
The part of a court structure on which the playing surface is applied.

Batters
Side slope of an embankment or cutting.

Bearing Capacity
The capacity of soil to support loads applied to the ground.

Bitumen
A black viscous mixture which binds the aggregate material used in asphalt pavement

Book a Court
Tennis's own gate access technology system.

Budget
A project budget is the total amount of financial resources allocated for particular purpose (i.e. your project). Budgets should be documented and agreed between project stakeholders to ensure the necessary funds for implementing the project are confirmed and available.

Building Application (BA)
Building approval is required for most developments to ensure building complies with relevant laws and the Building Code of Australia. Building approval is usually obtained by submitting a building application to a relevant Planning Authority (mainly local council).

Bulk density
Dry weight of soil per unit volume of soil.

Business Plan
A formal statement of club / venue / association goals and incorporating an action plan for reaching those goals.

Cadastral boundaries
Extent and ownership of land.

California Bearing Ratio
Measurement of the load bearing strength of the subgrade materials.

Caulk Rebate
Waterproof filler and sealant.

Capital replacement program
A statement of all the required tasks, responsibilities and costs that should be taken into consideration for the future replacement of infrastructure.

Cash flow
Cash flow enables you to determine how and when you are going to obtain money for the project and how you are going to pay for your expenses. Cash inflows usually arise from financing, grants, existing bank balances and operational revenues, while cash outflows relate to the project expenses that will be paid out.

Cement stabilised
A process where cement is mixed with earth to provide greater bearing capacity.

Centre straps and anchors
Centre straps and anchors are devices installed to the centre of the net to assist in further ensuring a correct net height.

Chain wire mesh
Diamond pattern woven fencing fabric.

Cement stabilisation
A process in which cement is mixed with earth to provide greater bearing capacity.

Civil Engineer
Professional engineering discipline that specialises in the design, construction, and maintenance of the physical and naturally built environment, including works such as court bases and drainage.

Client
Typically a tennis club, venue operator or local council.

Cold Joints
Describes the joints between successive passes of the asphalt laying machine where adhesion between the rows in unsatisfactory.

Compressive Strength
The resistance of material to breaking under compression

Concept Floor Plans
Architectural sketch plans that present a very high level or conceptual representation of a clubhouse design idea. The plans show a general arrangement of spaces and their functional relationship with each other (i.e. what spaces should be located adjacent to each other to create the most functional and efficient floor plan layout).

Concept Plan
Plan prepared to scale by an Architect that shows an indicative tennis facility layout incorporating tennis courts, clubrooms, car parking, spectator and community facilities. This plan is generally sufficient for the purposes of establishing a high level preliminary budget for a proposed development.

Contingency cost

Contingency refers to costs that will or are likely to occur based on past experience and any known site conditions, but with some uncertainty regarding the amount.

Contours
Lines joining points of equal elevation on a surface.

Contractor
A person, business or firm that are engaged to provide materials and/or labour to perform a service or a job. In the context of this Resource, those jobs are usually designing or constructing tennis related infrastructure.

Cost escalation
Changes in the cost or price of specific goods or services over a period of time. Prices for building materials can change or escalate over short periods of time, so where possible, ensure your prices and costs are fixed for the life of the project.

Court modules
Tennis courts that are grouped and fenced together generally in two, three or four court groupings. Modules are dependent upon available site area and the proposed facility use and management model.

Clay / red porous
ITF: Unbound mineral aggregate.

TA: Tier 1 Italian Clay (Terre Davis), Har-Tru and Conipur. See the TA website for further information. tennis.com.au/clubs

Colour rendering
Describes the ability of a light source to reveal and reproduce colours accurately.

Concept Site Plan
Plan prepared to scale by an Architect or Building Designer that shows an indicative tennis facility layout incorporating tennis courts, clubrooms, car parking, spectator and community facilities etc. This plan is generally sufficient for the purposes of establishing a high level preliminary budget estimate for a proposed development.

Contingency cost
Contingency refers to costs that will or are likely to occur based on past experience and any known site conditions, but with some uncertainty regarding the amount.

Cost escalation
Changes in the cost or price of specific materials over a period of time. Prices for building materials can change or escalate over short periods of time, so where possible, ensure your prices and costs are fixed for the life of the project.

Cross Flow Ventilation
Also referenced as natural ventilation in this context. The process of supplying air to and removing air from an indoor space without using mechanical systems. Cross flow ventilation via open doors and windows an effective method of achieving cross flow ventilation within a clubhouse building.

Cultural Overlays
Planning overlay for predefined areas of a State/Territory that are of cultural/historical significance and present limitations and constraints on site development.

Curing
The process which concrete undergoes the chemical reaction causing it to harden and achieve full strength.

Compressive strength
Resistance of material breaking under compression.

Cold joints
Joints between successive passes of the asphalt laying machine where adhesion between the rows is unsatisfactory.

Cushioned acrylic
Acrylic surface that includes cushioned properties.

Defects liability period
A set period of time after a construction project has been completed during which a contractor is required to return to the site to remedy defects. A typical defects liability period lasts for 12 months but may vary depending on type and scale of project.

Defibrillators
A machine used to control heart fibrillation by application of an electric current to the heart.

De-lamination
Failure of a product that results in flaking off in layers (predominately an acrylic surface issue).

Density ratio
Ratio of the bulk density tested in the field against the laboratory tested bulk density.

Design Brief
A document usually prepared by an Architect or Building Designer that presents a detailed description of the proposed accommodation elements, materials and finishes for the clubhouse. This document is sometimes included within the Project Brief or Accommodation Brief.

Development Application (DA)
Formal request to a relevant Planning Authority (mainly local council) for consent to carry out a development.

Divider fences
Soft mesh or solid fencing located between courts to retain balls in play.

Earthworks
Processes of excavating, moving and filling of soil to prepare an area for formation of a structure.

Easements
A right held by a party, typically a service authority (e.g. water authority) to make use of a section of the land owned by another party for specific purposes (e.g. water main). Easements may impose certain restrictions and limitations regarding construction works.

ESD (Environmentally Sustainable Design)
The consideration of the long term environmental impact of the clubhouse by adopting 'green initiatives' in the design process by way of considered siting, material selection and performance criteria for the building.

Expansion Joints
Joints placed in a concrete slab to localise cracking caused by concrete shrinkage during curing.

Fauna
Animals of a region, habitat or geological period.

Feasibility Study
An assessment of the practicality (including financial viability) of a proposed plan or development option.

Feature Survey
Identification of land areas and location of obstacles with the collection of data and information on ground levels, site topography and site contours.

Flora
Plants of a region, habitat or geological period.

Footings
Mass of concrete poured to support fence posts.

Foundations
Lowest load-bearing part of a building or other structural element (e.g. fencing).

Funding acquittal
Provision of evidence at the completion of a project that demonstrates all requirements specified within a funding agreement have been completed. It is usually a formal documented process that requires invoices, payment receipts and photographs of completed projects.

Geotechnical Engineer
Professional branch of civil engineering concerned with the behaviour of earth materials and the physical properties of soil and rock.

Geotechnical Report
A ground condition report prepared by an appropriately qualified engineer for a specific site. It reports such factors as soil type, compaction, moisture levels, and potential for ground movement and moisture level change.

Glare
Visual condition in which there is a discomfort or impairment of vision, or both, caused by an unsuitable distribution or range of luminance, or due to extreme contrasts in the field of vision.

Glare Rating
A numerical rating on scale of 0 to 100 representing the degree of glare from a lighting system for given observer positions and viewing directions. Higher values correspond to greater glare from the lighting system.

Greenfield site
A clear site that has not previously been developed.

Groundwater
Water held underground in soil or pores.

Heat Load
This is the amount of heat energy that would need to be added to a space to maintain the temperature in an acceptable range. Cooling load is the amount of heat energy that would need to be removed from a space to maintain the temperature in an acceptable range.

In ground Services
Authority and / or private service infrastructure located in the ground (e.g. gas, drainage, sewers).

ITF Sized Courts
Tennis courts that are sized to satisfy ITF (International Tennis Federation) requirements which are able to support ATP / Pro-Tour events (Refer to the Courts section for more details on court dimensions).

Illuminance
The total amount of visible light illuminating a point on a surface from all directions above the surface. The standard unit for illumination is Lux.

ITF
International Tennis Federation. The international governing body for tennis administration.

Joints
Contraction/ control joints are placed in concrete slabs to control random cracking due to concrete contraction and/or shrinkage.

Land Title
A legal document confirming land ownership and dimensional details of a land parcel.

Lifecycle cost
A comparison of not only the initial capital cost for specific facility elements, but an analysis of ongoing usage, maintenance and replacement costs.

Line of sight
This term relates to the degree of visibility a spectator or player has specifically from the clubhouse or verandah level towards a tennis court's playing surface. A clear uninterrupted line of sight to the court is desirable to create the ideal spectator experience.

Loads (dead and live)
Forces applied to a structure (e.g. retaining walls). These can be self-static weight and / or dynamic loads.

Luminaire
The housing that contains a floodlight lamp. The term includes the lamp, reflector and the lens.

Lux
The unit of measurement of illuminance.

Master Plan
A comprehensive plan that clearly articulates a full plan of action for a particular site or venue, inclusive of concept design, priorities for delivery and identification of resources required to deliver.

Management Model
The proposed manner in which the facility is to be managed (i.e. via volunteer club committee or by professionally appointed facility managers).

Member Association (MA)
Peak body responsible for tennis development and administration in each state and territory of Australia.

Multi-Purpose Community Space
A term given to a space within a clubhouse design that offers flexibility of use for a range of potential stakeholders and facility users that can be accessed independently either during or after hours.

Net cables and winding mechanisms
The devices used to alter the high of the net. Winding mechanisms may be inside the net post, or external and protruding.

Net footings
The base / foundation to which the net post is inserted. These may be round or square, depending on the type of post to be installed.

Obtrusive Light
Spill light which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information.

Overhead Services
Authority and / or private service infrastructure located above the ground (e.g. electricity, communication cabling).

Particle Size Distribution
The range of aggregate stone/sand particles sizes within granular profile.

Passive solar design elements
The provision of architectural design elements to a clubhouse to reduce solar heat through the roof and window glazing.

Pavement
A term used to describe an asphalt or concrete court base.

Pile height
The fibre material that forms the playing surface in synthetic grass and synthetic clay / red porous courts. Fibres are available in a range of colours. Pile height refers to the length of the pile.

Plane
The description of a court surface indicating that it is not bowed or humped.

Planning Authorities
Public Authority whose duty it is to carry out specific planning functions for a particular area (e.g. Local Council) and issue planning and other related permits where required.

Planning Consultants
Professionals that offer a wide range of advice on all matters concerned with planning, development and environmental issues which surround a site or facility planning project.

Planning Scheme / Development Control Plan
Statutory document which sets out objectives, policies and provisions for the use, development and protection of land.

Planning Zones
This term refers to areas within a local council area and are identified in council's planning scheme / development control plan. It indicates the types of development that are permissible/compliant and those which are not. Permissions change based on the zoning applied to each individual land parcel.

Ponding
Refers to defect in the surface in which water sits rather than draining away.

Prime Coat
In asphalt, refers to a bituminous material sprayed on to the crushed rocks that aids with sealing the surface.

Principle Playing Area (PPA)
The area of the court bounded by the baselines and the doubles side lines.

Project Brief
Also commonly referred to as a Scope of works, the project brief is the process of defining the requirements of the facility project. The project brief is the key document upon which the design will be based.

Procurement
The process of finding, agreeing terms and acquiring goods, services or works from an external source, often via a tendering or competitive bidding process.

Project Manager
A suitably qualified expert who is engage by a client to oversee the design and construction phases of a project.

Project Plan
A formal, approved document used to guide both project execution and project control. The plan should be agreed and approved by the Project Manager, project team and all key stakeholders.

Proprietary Product
A product sold under a brand name owned by a company.

Reactive soils
Property of soil that causes it to swell when moisture content increases, or shrink when moisture content decreases.

Red Porous
Commonly referred to as En-Tout-Cas, red porous is the term given to clay / red porous courts that are generally found across metropolitan Melbourne in Victoria.

Rigid pavement
Bound granular pavement.

Run-off
The obstacle free space between the edge of the court line marking (i.e. sideline and baseline) and closest obstruction.

Saw-cut Joints
Joints cut into concrete as soon as the slab can support foot traffic. These joints provide an intentionally "weak" point where shrinkage will occur in a controlled way.

Schedule of use
A document that details the intended use and occupancy of a facility and is sometimes compared to the existing use of a facility.

Service proving
Locating of direction and level of in-ground services using penetrating radars, non-destructive excavation or other means.

SFAG
Sand filled artificial grass.

Show Courts
The term used for the main tennis courts usually located close to and directly visible from the main social area. Depending upon

the proposed management model and size of events to be held at the venue, these courts ideally should be sized to satisfy ITF dimensional requirements.

Sinking fund
A fund formed by periodically setting aside money for the gradual repayment of a debt or replacement of a wasting asset.

Site Survey
The inspection of a defined area where work is proposed. Used to gather information for a design or an estimate of cost to complete the initial tasks required for a facility design concept. It can determine a precise location, access, best orientation for the site and the location of obstacles, services or other potential site constraints.

Solar Panel Arrays
The term given to a row (or rows) of roof mounted solar panels.

Specifications
Specifications are an exact statement of the particular needs to be satisfied, or essential characteristics that the client requires from its project and which the Contractor must deliver. It can include specific materials, methods, processes, services, systems or outcomes.

Spot levels
Elevation of any survey point.

Standards Australia
Australia's peak non-government Standards organisation. It is charged by the Commonwealth Government to meet Australia's need for contemporary, internationally aligned Standards and related services.

Stormwater Detention
A typical local council engineering requirement to detain a certain level of stormwater on site (usually in tanks) before releasing it into the council stormwater system.

Structural Engineer
Professional branch of civil engineering that deals primarily with the design and construction of structures (i.e. buildings, fences, floodlighting).

Subgrade
The natural earth surface beneath the court pavement

Substrata material
Underlying material layer beneath topsoil.

Surveyor
A professional consultant able to prepare a site survey of both a Greenfield and existing tennis facility site prior to the commencement of any concept site planning or design work.

Synthetic clay
Collective term applied to outdoor carpet products that provide similar playing properties of red porous or clay courts.

Synthetic grass
Collective term applied to outdoor carpet products used in tennis court and other sports facility surfacing.

Tender
A tender is a written invitation sent to potential contractors or suppliers of a good or service to inform them about the information required by the Client or Client's representative (e.g. Project Manager) to choose among them.

Tennis Facility Planner
Professional consultant that has specific experience and expertise in the planning and design of tennis facilities.

Title Boundary
Defines the boundaries of each parcel of land.

Top and bottom rails
Horizontal rail supporting the chain mesh at the top and bottom of court enclosure fencing.

Topography
The topography of a site describes the site's characteristics such as its existing levels, any existing buildings, location of trees and other site features.

Total Playing Area (TPA)
The total court area including the principle playing area and the court surrounds to the edge of the court surfaces (usually all that is enclosed within the court enclosure fencing).

Truncated fence
Transitioning of full height fence to lower height fence to improve spectator visibility

Tynes
Prongs / teeth that are driven into the playing surface to create small openings to allow for drainage / air into the profile.

Uniformity
This is a measure of light on a tennis court. It is important as it measures the difference (and consistency) between the bright and dark areas.

Universal Design Principles (UD)
A set of principles to assist in ensuring venues and environments are accessible to all.

Variation
An alteration to the scope of works in a construction contract in the form of an addition, substitution or omission from the original scope of works. Variations need to be strictly managed to ensure any project cost, quality or time implications can be effectively managed.

Wattage / Watts
An amount or measure of electrical power. The operating power of a lamp is expressed in watts.

Windbreak
Typically shade cloth used to protect field of play from high winds

SECTION 4
REFERENCES AND RESOURCES

4.5
KEY CONTACTS

Please refer to the following Member Association contact details for more information on specific states and territories.

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