



**Norman
Disney &
Young**
A TETRA TECH COMPANY

Sport

Capability Statement



Table of contents

Introduction	03
Our values, purpose & vision	04
What we do	05
Our Sporting and Stadia capabilities	06
Sustainability & Sports	08
NDY Sporting and Stadia experience	09

NDY by numbers

 established **1959**

 **600+** people

 **9** key markets

12  offices

 **5** countries

Introduction

Established in 1959, Norman Disney & Young (NDY) has a long and proud history of offering an extensive range of engineering services and delivering award-winning world-class projects.

Our technical capabilities come to the fore in servicing sporting arenas, multi-use facilities, and landmark projects.

We understand that these types of facilities require engineers with solid design experience and a history of working on similar projects.

Our ability to cater to the specific demands of sporting and live performance spaces is complemented by our specialist consultants who have a deep understanding of areas such as acoustics, audio visual, communications, fire engineering, architectural lighting, and security.

This document provides you with an insight into our sporting and stadia expertise. The case studies included in this document showcase our global experience and capabilities.

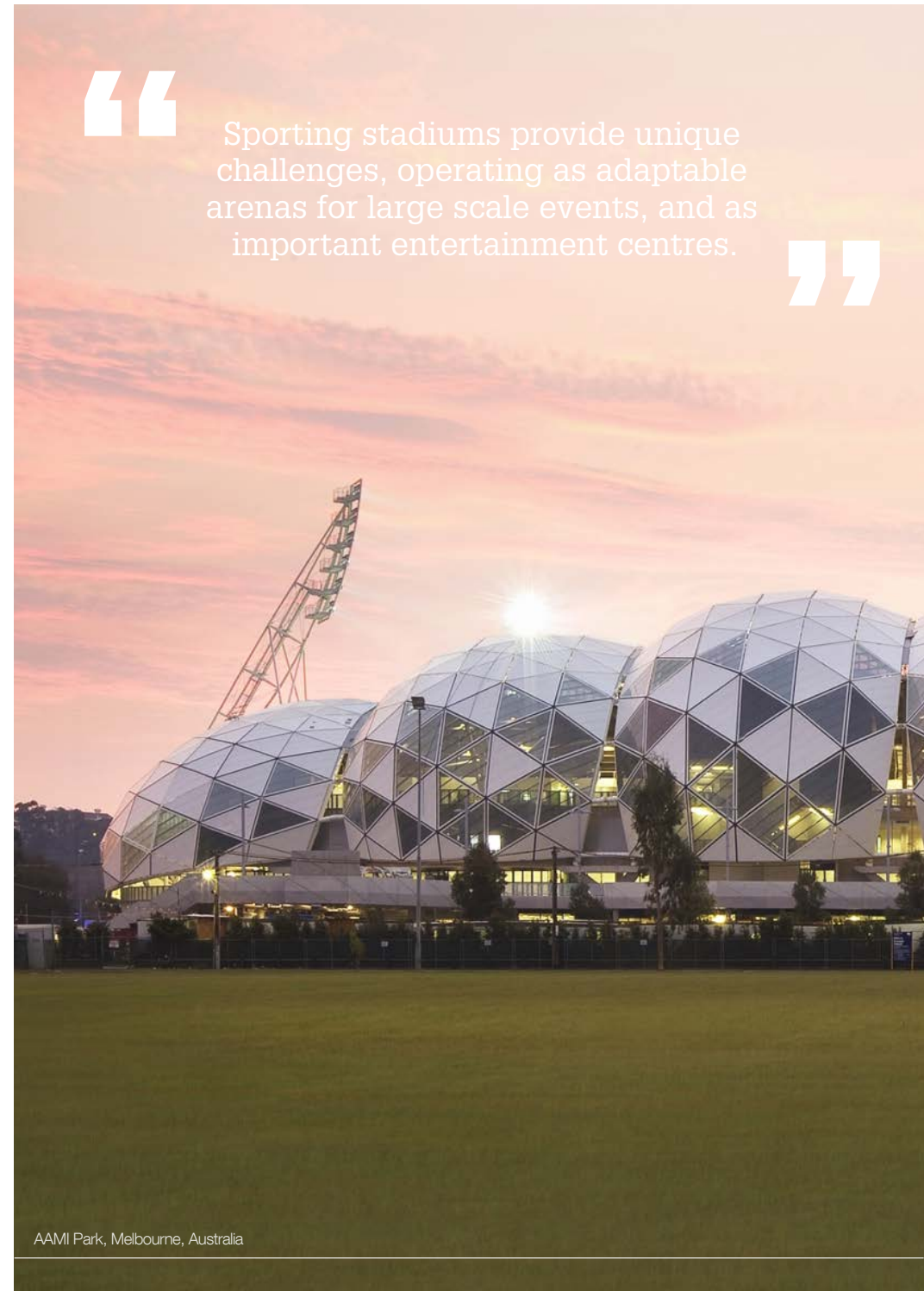
With international experience and a network of offices across six countries, NDY is in a privileged position to provide engineering excellence to your project.

We look forward to the prospect of working with you on your next project.

“

Sporting stadiums provide unique challenges, operating as adaptable arenas for large scale events, and as important entertainment centres.

”



AAMI Park, Melbourne, Australia

Our **values**

Excellence

Do it once, do it well

Leadership

**Lead in our profession, industry
and the community**

Integrity

Treat others as we wish to be treated

Collaboration

Listen, share and contribute

Accountability & Ownership

**Understand the impact of our actions
and own the outcomes**

Innovation

Inspired creativity to challenge the norm

“
Our purpose
is making
spaces work
”

Our **vision**

To enhance the lives of others,
by engineering outstanding projects,
mindful that every project matters.

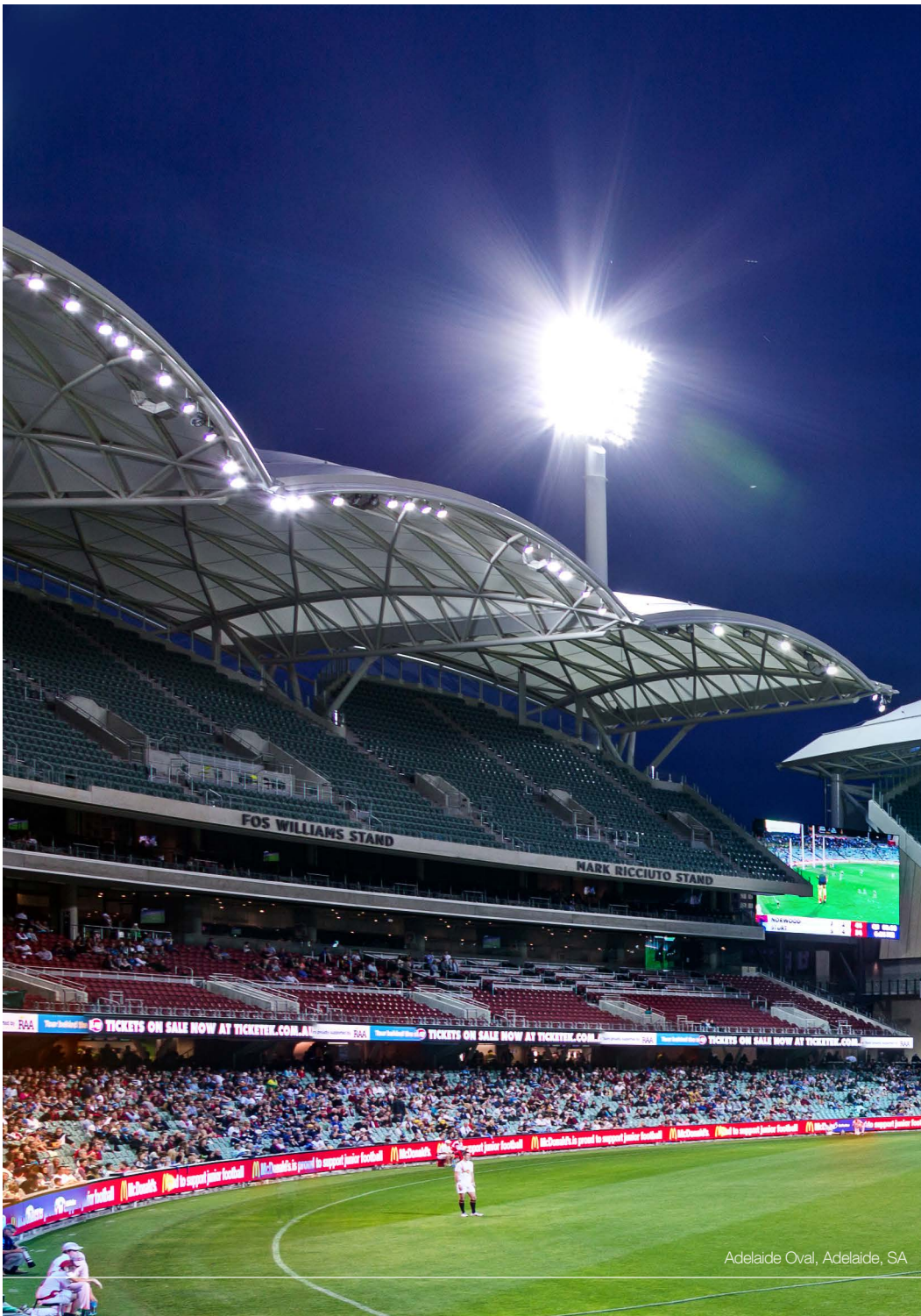
To sustain deep and trusting
relationships with our clients,
through solving their problems and
serving them with utmost reliability,

and

To engage our people with
meaningful, rewarding and
inspiring opportunities.

Our ethical statement

NDY has a proud tradition of upholding the highest ethical standards in the manner by which we conduct ourselves as a company. Read our ethical statement at www.ndy.com/about-us/our-ethical-statement



What we do

As consulting engineers, our purpose is making spaces work. We listen to the unique requirements of each client, and tailor our services accordingly to every project.

Our collaborative approach to excellence and innovation are core values at NDY. We consistently deliver best practice sustainable solutions to achieve our clients' objectives.

Clients come to NDY because they want quality. We take ownership and provide clear recommendations while consulting with the utmost integrity.

Most of all, clients come to us because we listen. We look forward to better understanding your business and collaborating with you to achieve successful outcomes.

Our markets

- › Civic
- › Education
- › Health
- › Industrial
- › Mission Critical
- › Offices
- › Residential & Hotels
- › Retail
- › Transport

Our services

- › Acoustics
- › Asset Performance
- › Audio Visual
- › BIM (Building Information Modelling)
- › Communications
- › Controls & Integration
- › Electrical
- › Fire Engineering
- › Fire Protection
- › Hydraulics
- › ICT Consultancy
- › Interiors
- › Mechanical
- › NDYLIGHT (Lighting Design)
- › Property Consultancy
- › Security
- › Sustainability
- › Vertical Transportation

Our Sporting and Stadia capabilities

To celebrate mankind's inspiring efforts in sporting excellence, NDY is a part of creating high-performance venues.

The greatest sporting stadiums, arenas and facilities come out of creative partnerships.

NDY collaborates with leading architects, and organisers of sporting events worldwide, to create inspiring venues that perform better.

Our eye for detail and technical expertise, intersects with our reputation for sustainable designs, resulting in exceptional commercial outcomes and visitor experiences.

Our engineering designs have been called on for some of the most innovative and diverse sporting facilities in the world.

When the world watches The Australian Open Tennis Grand Slam, the AFL grand final, highlights from the 2000 Olympics, or the Test Match Cricket around Australia, they are witness to our engineering services expertise.

Most of the venues are also multi-use facilities, transforming into a leading international destination for the world's largest live acts, from musicians and performance artists through to circuses and indoor motorsport.

It's our approach to understanding the needs of our clients, and the stadium users of today and tomorrow, that makes us engineers of choice.

A holistic approach

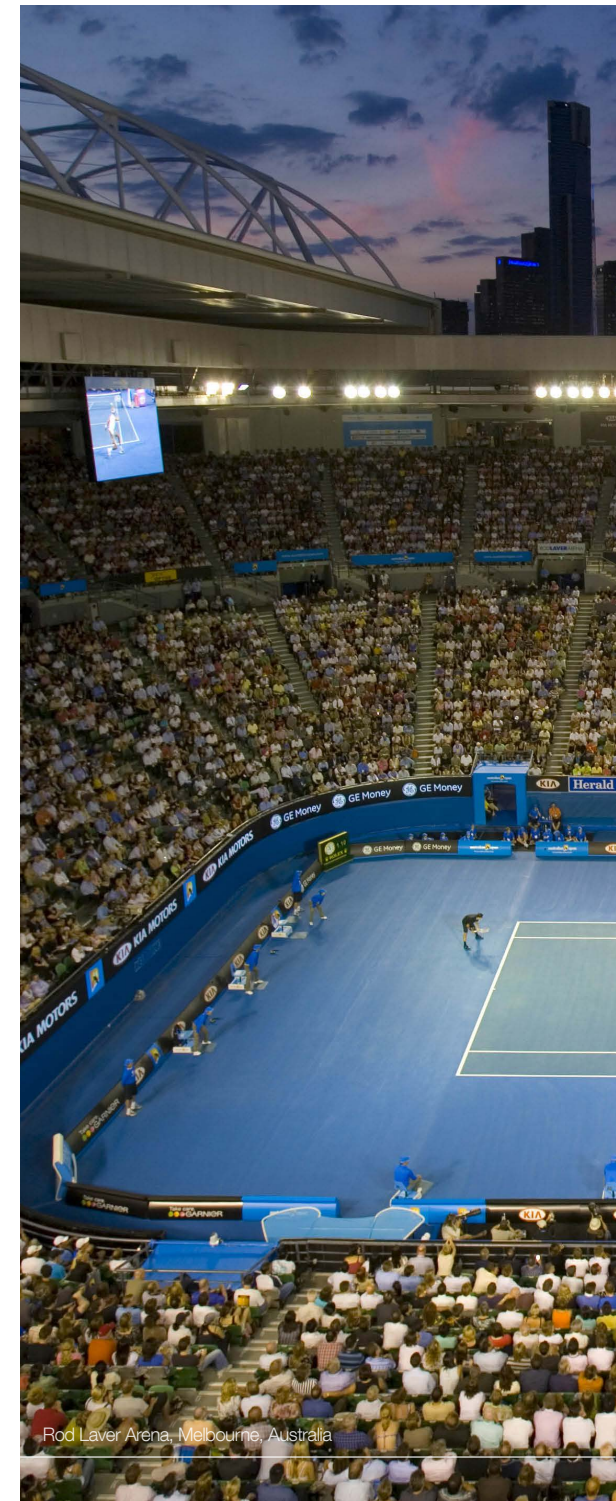
Entrepreneurial ideas have transformed the conventional approach to sports development, to produce financially sustainable facilities.

NDY designs allow clients to explore innovative and commercial models, including more flexible venues for sports and entertainment.

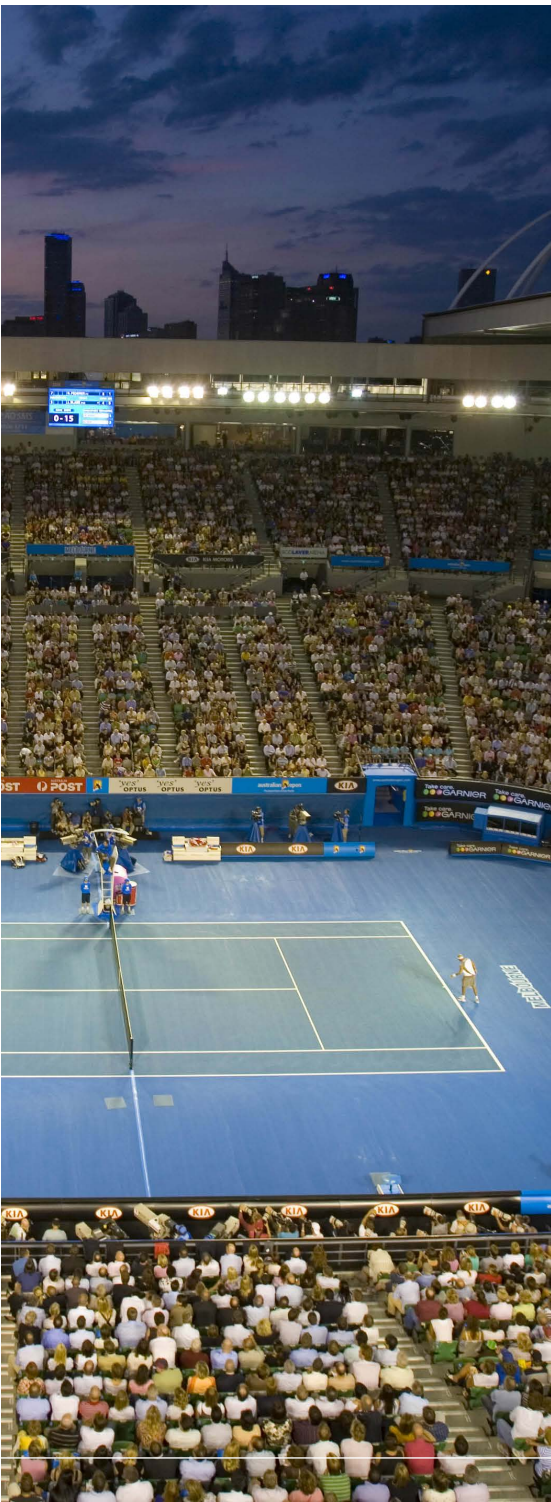
Take for example the AAMI Park rectangular stadium in Melbourne. This stadium required flexibility to accommodate a number of different sports, and the provision for adaptable seating: it is one of the few stadiums in the world to house four different sporting codes.

Aesthetically, AAMI Stadium is celebrated across the world for its unique bio-frame roof featuring a spectacular LED lighting treatment, which is a public art installation. The stadium also features a sports medicine centre, elite training facility and administration complex, making it a true sports campus.

We collaborate with developers, clubs and venue operators to plan, build and run smarter sports projects and rich visitor experiences for events, venues, sports parks or even entire sport cities.



Rod Laver Arena, Melbourne, Australia



Our Sporting and Stadia **capabilities**

Leaders in specialisation

Our specialists in IT and communications, multimedia and broadcasting systems, acoustics, security, lighting and sustainability, contribute to best practice operational readiness.

NDY is a leader in adopting designs to suit climatic and environmental challenges; from the heat and humidity of Papua New Guinea, to ice rinks in Vancouver.

Our specialists undertake detailed research and modelling of acoustical and vibrational challenges for stadium environments and prescribe solutions that maximise visitor comfort and ensure operational reliability.

Our fire engineering and safety solutions also include emergency modelling and are considered innovative and best in class for today's modern stadiums.

Our work with clients, architects and stakeholders also ensures we promote opportunities to improve operational performance and long-term efficiency through sustainable design options.

3D modelling

The use of Building Information Modelling (BIM) is inherent within our design methodology. And nowhere is this more apparent or important than in the construction of stadiums.

Our application developers are now leveraging exciting advancements such as Augmented Reality (AR) technology on smartphones, tablets and wearable devices, allowing users to scan and identify products, transforming their environment to include meaningful information touchpoints.

This is where NDY is considered a leader. We help dispel the myths and mysteries around BIM and facilitate an integrated design process between architects and design partners.

BIM allows project stakeholders to leverage related building data across any facility type in ways that eliminate guesswork, identify issues before site works and streamline construction execution. With our BIM expertise, we can quickly and accurately visualise the final form of a proposed project in the context of existing conditions.

We utilise BIM as a platform for efficiency that captures valuable data: a tool that improves constructability, cost reliability, communications across all stakeholders, planning, operations and logistics.

Designing with legacy in mind

While a world-class event such as the Olympics or World Cup can fast track the development of stadiums, greater consideration is now given to maximising the sustainable legacy of these structures, bearing in mind the huge investment and upkeep they require.

Successful world-leading stadium design means thinking beyond the obvious and certainly beyond the main prestige event: a true legacy design involves maximising the stadium's usage providing enduring value.

We believe stadiums are an integral part of the broader built environment and communal space, with a capacity to contribute to the social fabric. Designs that engage, protect and connect with users and visitors are always at the forefront of our approach.

Sustainability & Sports

Stadiums that are designed to hold world class events can also become world leaders in sustainability, with a positive impact on facility management and patron experience.

As a founding member of the Green Building Council of Australia, NDY is committed to the design, construction and operation of sustainable buildings.

NDY's Australian sustainability team has provided consultancy services on more than 150 Green Star-rated projects since the rating system was introduced in 2002.

Our teams in Canada, New Zealand and the United Kingdom are also committed to using best practice benchmarks, and have extensive experience working with industry standard rating tools and systems.

Our work on hundreds of international green building projects gives us the deep experience and expertise to deliver efficient, affordable solutions with exceptional outcomes – from reduced operating costs and better health and wellbeing, through to higher profit margins and market differentiation.

Modern sporting facilities are a marvel of complex engineering, with large moveable roofs and variable depth swimming pools, and lighting that is tailored to events. This adds to the spectacle, and creates long term viability of these arenas through a strong focus on sustainable building design and features.

Increasing attention is being given to sustainability aided by the strength of our modelling capabilities. There are tremendous opportunities for stadiums to become models of energy efficiency.

We have provided designs that accommodate onsite power generation with photovoltaic arrays on the roof to minimise grid power consumption, grey water reuse which removes some of the reliance on water infrastructure, thermal storage to lower the heating or cooling requirements of the building, and a stronger focus on carbon neutrality.



Metricon Stadium, Gold Coast, Australia

NDY Sporting and Stadia experience

For more than sixty years NDY has provided consulting engineering services on strategic projects throughout Asia, Australia, Canada, Europe, New Zealand and the UK.

These award-winning projects are testament to the quality of our innovation, expertise and personnel. The following examples of our experience are a snapshot of our ability to deliver world's best practice for master planning projects of all sizes.

To view a comprehensive outline of our project experience visit our website www.ndy.com



Australian Rugby Development Centre, Moore Park, Sydney

Services

- › Communications
- › Electrical
- › Fire Protection
- › Hydraulics
- › Mechanical
- › NDYLIGHT (Specialist Lighting)
- › Security
- › Sustainability
- › Vertical Transportation

About the project

Located in one of Sydney's biggest sporting precincts at Moore Park, the Australian Rugby Development Centre is the new home to Rugby Australia as well as UTS' sport and exercise science and physiotherapy programs.

Spanning 6 levels, the facility offers a mix of office space, gymnasiums, indoor playing fields, hydrotherapy pools, indoor and outdoor running tracks and even an environmental room which can be adjusted between 4°C and 40°C.

With NDY being engaged for mechanical, electrical, fire protection, hydraulics, specialist lighting and ESD services for the base building works as well as the ARU and UTS fitouts, this was a challenging project from the onset. The facility is wrapped in a distinctive bronze sunshade, which assisted with the building

achieving sustainability targets by reducing the amount of solar heat transferred to the building.

This required careful coordination between the NDY Ecologically Sustainable Development (ESD) team and the architect to ensure that sustainability targets were being met for the project whilst ensuring that the overall project aesthetics were retained.

The theme of sustainability was present throughout the entire project with solar panels being installed on the roof to help offset the electrical consumption of the UTS floors. The mechanical systems also aimed to reduce electrical consumption by utilizing a dedicated mechanical unit to each teaching space/gym to ensure individual temperature control to each space and in turn minimizing the amount of overcooling. On the ground floor, NDY designed

the retail component of works as well as the services interfaces to the hydrotherapy pools including a dedicated system which cools down the cold plunge pool by rejecting heat to the spa pool.

Throughout the entire project, there were a multitude of challenges which provided NDY an opportunity to rise above and beyond, earning the praise of clients, the project team and contractors alike.

This unique project is a testament of NDY's ability to problem solve with a win-win mentality in order to achieve the best outcomes for the overall project and resulted in the client obtaining world-class and energy efficient services that will serve them well for years to come.

Civic, Australia



The Aquilini Centre South project was credited with LEED Gold Equivalent

Stadium Canada

Rogers Arena South Tower, Vancouver, CA

Services:

- › Hydraulics (Plumbing)
- › Mechanical

About the project:

Norman Disney & Young, A Tetra Tech Company (NDY), is completing plumbing and mechanical design solutions for the Aquilini Centre South in Vancouver, BC.

Rogers Arena is an indoor sports and entertainment complex that hosts some of Vancouver's biggest events. It also has facilities for ice hockey, basketball, concerts and a variety of other indoor sports.

Recently, the venue has been expanding into a precinct-level development, with two of three new towers built across Rogers Arena in the heart of Vancouver CBD.

As such, the mechanical and hydraulics system must cope with high variations in temperature and volume. Aquilini Development engaged NDY to design solutions for the mechanical and plumbing platform of the 32-storey South Tower of Rogers Arena.

Results and Innovations

Our team has developed a work plan for the plumbing and mechanical upgrades of the 32-storey residential tower with multi-purpose rooms, fitness area, meeting room, amenity lounge and lobbies (excluding the podium-level car park).

Sustainability was identified as a key performance indicator, and the project satisfies as a LEED Gold Equivalent Building. Several LEED Credits included in our scope includes stormwater design: quality control, water use reduction of 37% and enhanced refrigerant management.

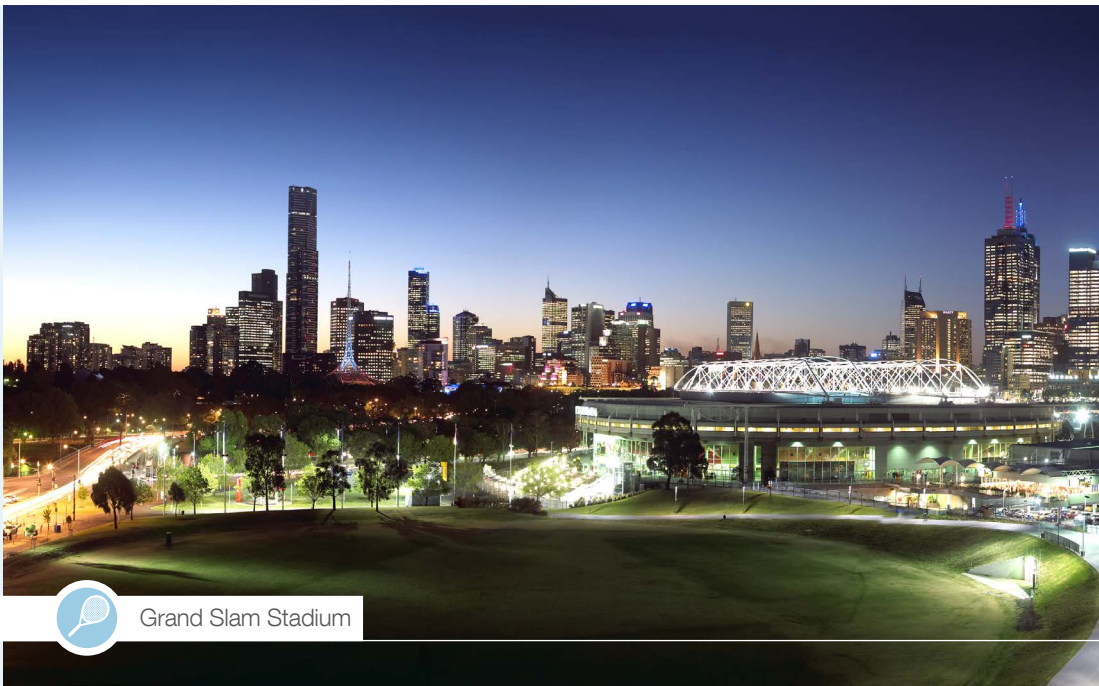
NDY partnered with Aquilini Development, BMZ, Francl Architecture, Nemetz and Pitt Meadows Plumbing towards completing the successful project.

Work Performed and Solution

NDY was not only involved in the mechanical and plumbing design of the South Tower. Our team also worked on tenant improvements for the West Tower, excluding the base building design.

The hydraulic solution selected is a Sovent plumbing system that utilizes an alternate way of waste and venting by slowing the velocity of the liquids and solids through a series of aerator fittings and double offsets. This removes the need for a secondary vent line, saving cost on materials, labor and maintenance, a considerable benefit to a high-rise building.

The building also utilizes a Vancouver-based Neighborhood Energy Utility company called Creative Energy to create a flexible, low carbon neighborhood energy across the city.



Grand Slam Stadium



Stadium Australia

Rod Laver Arena Melbourne, Victoria

Services:

- › Acoustics
- › Communications
- › Electrical
- › Fire Engineering
- › Fire Protection Services
- › Hydraulics
- › Lighting (NDYLIGHT)
- › Mechanical
- › Security
- › Vertical Transportation.

About the project:

Rod Laver Arena was originally completed and opened in 1988 in time for the 1988 Australian Open. It was developed primarily for tennis as part of the National Tennis Centre development to replace the existing Kooyong venue. When not used for tennis, the centre serves as a multipurpose arena with the capacity to feature international sporting, entertainment and music events.

A dynamic sporting and entertainment facility, the Rod Laver Arena remains an icon of the Australian Open and the global tennis circuit.

Current work on the Rod Laver Arena Refurbishment includes a new eastern-facing primary entrance, which also provides food and beverage facilities, an expanded public concourse space, accessible entrances to the seating bowl and significant back-of-house

improvements, including upgrading of player and artist facilities to ensure that Rod Laver Arena continues to host the best events in Australia across all modes of operation.

NDY was part of the successful Cox Architecture lead design team, subsequently novated to builder Lend Lease, to deliver all building services for this complex and multi staged project.

A key challenge was to implement all refurbishment works while the venue remained fully operational, including through four Australian Open tennis tournaments during the construction period.



Rod Laver Arena operates as a sporting and music venue, so our approach had to carefully consider the Acoustics and Lighting needs of these two very different functions.





Stadium Australia

Suncorp Stadium Brisbane, Queensland

Services:

- › Building Services
- › Communications
- › Electrical
- › ICT
- › Lighting
- › Security
- › Sustainability.

About the project:

The Queensland State Government embarked on a \$200M redevelopment of the existing Lang Park Football Stadium to provide world class facilities for 55,000 patrons. The venue caters for many sports including Rugby League, Rugby Union and Soccer as well as entertainment and public assembly events.

The venue consists of open air seating, open corporate boxes, air conditioned corporate suites, players facilities, food and beverage outlets, function rooms and media rooms.

The elevational treatment of the building reflects the subtropical climate of South East Queensland, with the overhanging roof, the sheltered semi-external spaces and the use of the timber screens develop the transition zone between the stadium and its urban landscape.

The electrical and lighting systems were designed to be sympathetic with the architectural design and to

minimise light pollution and glare to the neighbourhood. The lighting is controlled by a sophisticated system that provides ultimate flexibility and maintains energy efficiency.

The communications system consists of state of the art 'blown' optic fibre network for support of stadium wide communication services including video replay screen data, stadium management system, point of sale and ticketing systems. A separate copper cabling reticulation network was employed to facilitate telecommunications and intercom systems.

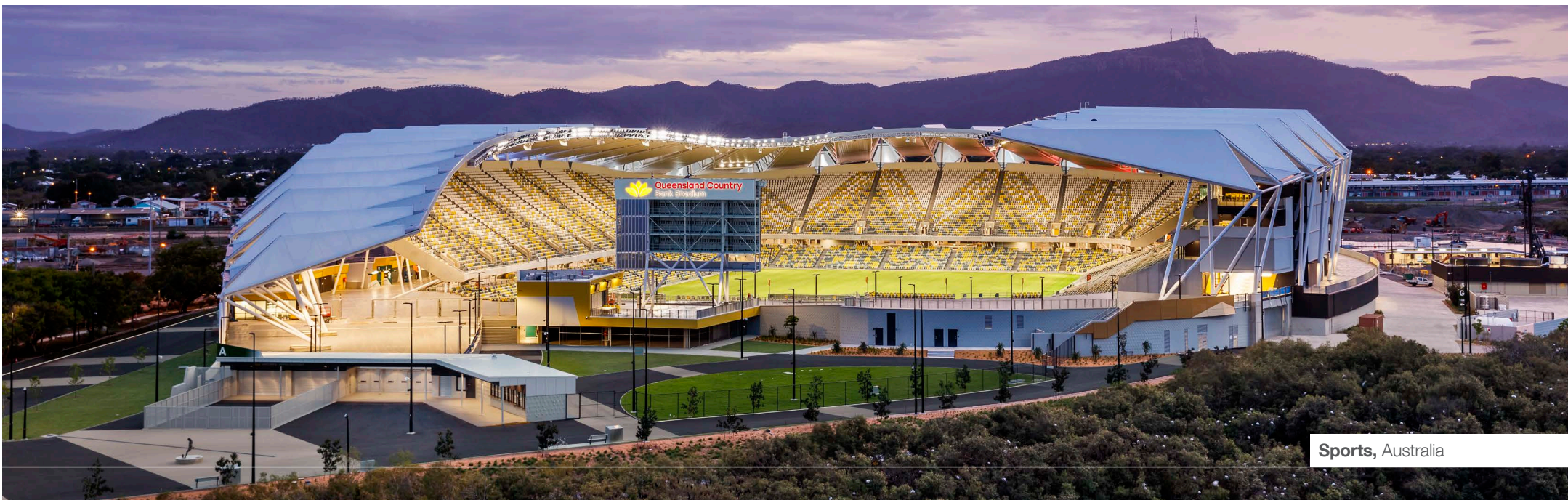
The Closed Circuit TV (CCTV) system consists of some 140 cameras monitoring the stadium and external patron access within the surrounding precincts. These cameras are controlled, monitored and digitally recorded from two control rooms within the stadium.

The stadium is also equipped with a state of the art access control and alarm management system.



Suncorp Stadium has become the premier large events arena in the state, and puts Brisbane on the map as a major events city.





Queensland Country Bank Stadium, TOWNSVILLE, QUEENSLAND

Services

- › Audio Visual
- › NDYLIGHT

About the project

Queensland Country Bank Stadium, previously known as the North Queensland Stadium, came to life as part of the historic Townsville City Deal. The project delivered a world class, 25,000 seat multi-purpose regional arena in time for the 2020 National Rugby League (NRL) season, with the facility home to the North Queensland Cowboys NRL team and an attractive venue for major music acts.

A joint project of the Queensland Government, Stadiums Queensland, Australian Government, Townsville City Council and supported by the National Rugby League and the North Queensland Cowboys, NDY worked with each project partner to understand their requirements and provide a unified design solution that captured their needs.

NDY provided sophisticated audio visual and lighting design for the project. With the stadium's roof continuous around the arena except for one end where it is open to the sky, challenges regarding sports lighting and public address coverage needed to be overcome. Careful consideration was required within the design to ensure delivery of broadcast television grade sports lighting for the area of the field adjacent to this space. NDYLIGHT worked closely with Cox Architecture to develop feature lighting that illuminates the stadium, creating an exciting atmosphere for visitors and a recognisable addition to the city skyline. One of the key features of the design, the solution uses reflections from the sails mounted on the building's unique façade in order to provide uplighting to the stadium.

Providing a facility that will be used by North Queenslanders for generations to come, the project also delivered an infrastructure boost for Townsville, creating local employment and development opportunities for the Townsville City Waterfront Priority Development Area and CBD.

In addition, the Queensland Country Bank Stadium project scored a hat trick at the 2020 Master Builders North Queensland Awards, winning in the following categories:

- › Project of the Year
- › Best Sporting Facility
- › Excellence in Workplace Health & Safety.



Stadium Australia

AAMI Park Melbourne, Victoria

Services:

- › Architectural Lighting (NDYLIGHT)
- › Building Services
- › BIM
- › Communications
- › Electrical
- › Fire Engineering
- › Fire Protection
- › Hydraulic Services
- › ICT
- › Mechanical
- › Security
- › Sustainability
- › Vertical Transportation.

About the project:

Melbourne's world-class stadium, Melbourne and Olympic Parks Trust's \$280 million stadium "Rectangular Pitch" is home to soccer, rugby league and rugby union matches.

The stadium provides the missing link in Melbourne's sporting infrastructure for a medium size, purpose-built rectangular pitched stadium. It also features a sports campus, including an elite training centre and office accommodation which will rival the world's best.

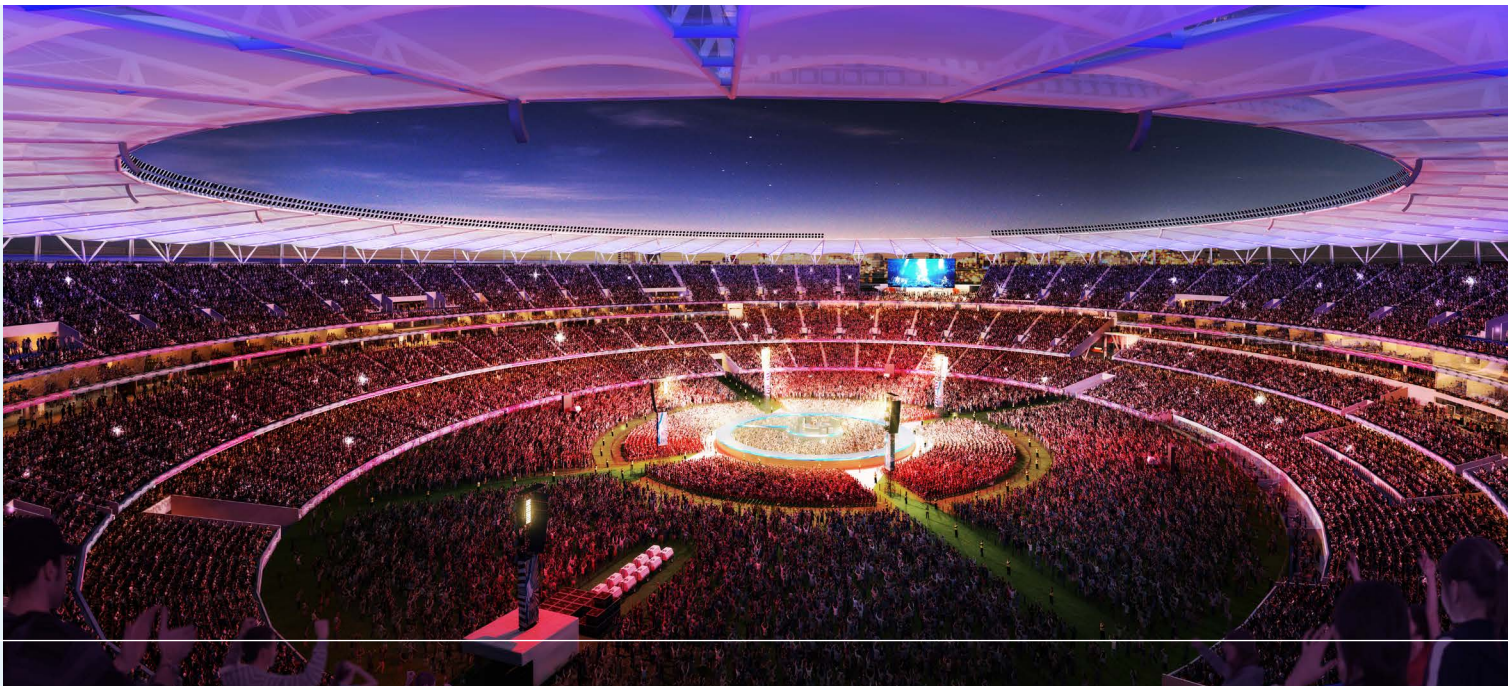
The lighting design to the Rectangular Stadium was designed to provide a simple architectural lighting solution to the public areas within and around the stadium.

NDYLIGHT worked with Cox Architects to develop the project brief for the Stadium and then worked with the architectural team to develop the lighting to the public areas of the facility including; the Corporate Box facilities, dining rooms, internal and external concourses and initial evaluation of the pitch lighting locations.

In general the lighting to the Stadium was designed to use simple solutions using the scale and repetition of the architectural forms to create a visual pattern and identity to the lighting. The lighting is designed to be both a feature in itself, but also reference that architectural language of the project.

Features and Innovations:

- › ICT solution includes new Voice Over Internet Protocol (VOIP) telephony solution that spans the entire precinct, including emergency power systems
- › Cutting-edge Bioframe design with a geodesic dome roof which will substantially cover the seating area. This design uses 50 per cent less steel than a typical stadium roof of the same size
- › Programmable outside architectural lighting, creating visual appeal and customisable according to the event
- › Unique structure offers a landmark visual appeal, while also providing exceptional cost benefit.



Stadium and Sports Precinct Australia

New Perth Stadium Perth, Western Australia

Services:

- › Electrical Services
- › ICT Systems
- › Fire Engineering
- › Fire Systems
- › Hydraulic Services
- › Mechanical Services
- › Security Systems
- › Sustainability
- › Vertical Transportation.

About the project:

The new Perth Stadium and Sports Precinct is leading the regeneration of the Burswood Peninsula. The Precinct provides extensive parkland and recreation space with the Swan River Pedestrian Bridge creating a new link to East Perth.

The Precinct is also home to the new 60,000 capacity multi-sports Stadium, which incorporates the latest technologies to provide an exceptional fan experience. The project aligns with the public transport strategy, which includes a new Pedestrian Bridge over the Swan River and associated Bus Stands plus rail and roadlink upgrades through the Burswood corridor.

NDY was engaged to act as technical advisors for the Stadium and Sports Precinct on behalf of the Government of Western Australia.

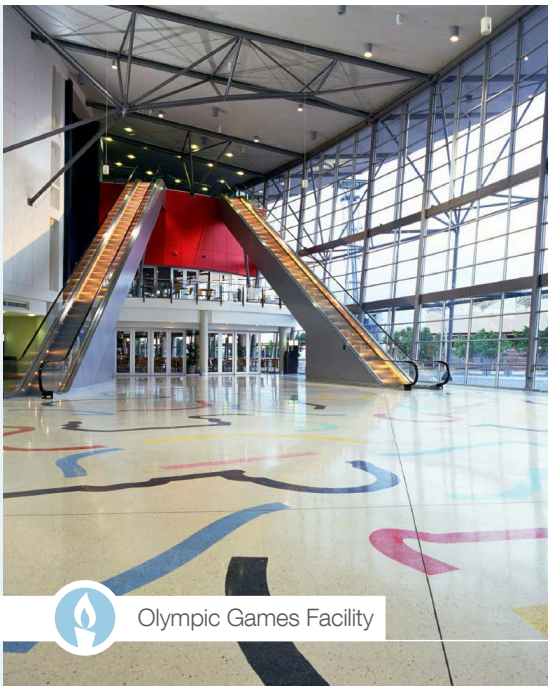
Features and Innovations:

- › Development of international best-practice performance criteria for the precinct
- › Participated in stakeholder workshops as required to ascertain technical design requirements
- › Provided technical input into the development of the Request For Proposals documentation, including the project brief, in collaboration with the State Government and other Technical Advisors
- › Participated in a technical interactive tender workshop for each Respondent and in review and evaluation of technical aspects of Respondent Proposals.

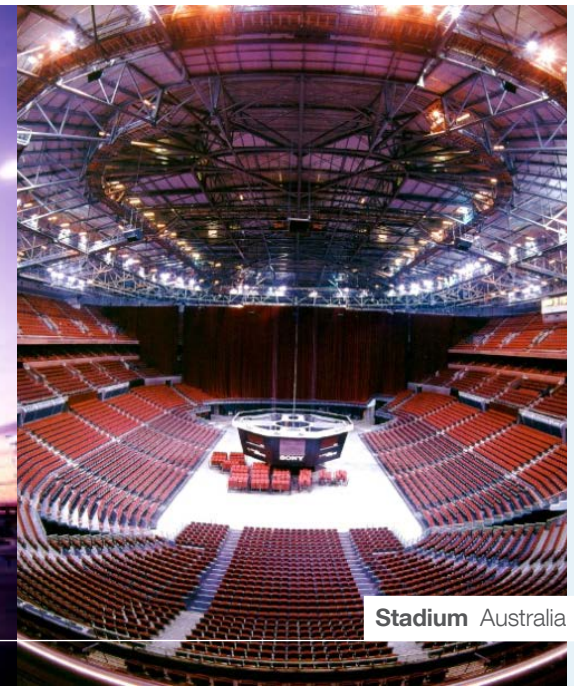
“

The New Perth Stadium forms an integral link in the development of the Burswood Peninsula, integrating with transport infrastructure, and adding vibrancy to the region.

”



Olympic Games Facility



Stadium Australia

Sydney Superdome Sydney, NSW

Services:

- › Acoustics
- › Communications
- › Electrical
- › Fire Engineering
- › Fire Protection Services
- › Hydraulics
- › Lighting (NDYLIGHT)
- › Mechanical
- › Security
- › Vertical Transportation.

About the project:

The size and complexity of the Sydney SuperDome presented NDY with some intriguing design challenges. Not only did these require NDY to make use of its full range of skills and experience across all disciplines, but also required considerable use of computer modelling techniques.

The design and construction process also required a flexible approach from all of the team members.

The establishment of a central design office staffed by all design team members was the beginning of a management process which continued through to a permanent site presence by all consultants and a close liaison with the trade contractors and the construction process.

Features and Innovations:

- › Computer modelling and design of the multi mode sport lighting system to cater for numerous and varied operating scenarios
- › Communications infrastructure design to facilitate the rapid installation of outside broadcasting facilities and cabling requirements
- › Audiovisual design associated with the sound reinforcement and public address systems, media aid in-house video networks
- › Three dimensional computer simulations of the air conditioning and ventilation systems under normal and fire scenarios.



The success of the 2000 Olympic Games was in no small part due to the outstanding facilities, developed at Olympics Park.





Stadium and Sports Precinct Australia

Cockburn Arc Cockburn Central, Western Australia

Services:

- › Electrical
- › Fire Engineering
- › Hydraulics
- › Sustainability
- › Vertical Transportation

About the project:

The City of Cockburn has partnered with the Fremantle Dockers Football Club, State and Federal Governments to deliver this \$80 million facility, the largest of its kind ever undertaken in Western Australia. The project spans 3 levels with a total floor area of 32,000 sq m.

NDY was commissioned by the City of Cockburn to provide the sustainability, electrical, hydraulics and fire services to assist in developing their new regional aquatic and education centre.

As part of the commission NDY developed a custom sustainability strategy, which aligned with the Council policy objectives in reducing greenhouse gas emissions from renewables on all new building projects.

The new activity centre features a strength and conditioning gym, multipurpose training spaces, indoor stadium and courts. The aquatic facilities includes an eight lane lap pool, nine lane outdoor pool, water slides, learn to swim space, spa and steam room. The centre includes spaces for throwing sports, hydrotherapy and recovery pools, consultation rooms, environmental simulation laboratories and training facilities, seminar rooms and athlete amenities.

The centre is designed to accommodate training, testing, recovery and associated support services for high performance athletes, coaches and support staff. The new centre will also be the training ground and headquarters for the Fremantle Dockers Football Club.

Features and Innovations:

- › Geothermal pool heating servicing 100% of heating requirements for the 50m outdoor and 25m indoor pools
- › Approximately 1 MW solar photovoltaic system to offset electrical demand taken from the grid;
- › Sub-metering of all significant energy and water use component
- › Improvement on section J envelope requirements
- › An environmental GHG life cycle assessment, with initiatives for lowering embodied carbon implemented
- › Registration with the WA WaterCorp Waterwise Aquatic Centre Program.



Commonwealth Games Facility

Stadium Australia

Coomera Indoor Sports Centre Coomera, QLD

Services:

- › Communications
- › Electrical Services
- › Fire Services
- › Fire Engineering
- › Hydraulic Services
- › Mechanical Services

About the project:

The Coomera Indoor Sports Centre will host a range of sports including both the gymnastics competition and netball finals of the Gold Coast 2018 Commonwealth Games. This Sports Centre will provide an important piece of community infrastructure for one of the Gold Coast's fastest growing regions.

The centre will be constructed from exposed tubular steel columns and roof trusses to achieve a single clear span of 75 metres, allowing the full use of the open space for the required sporting activities.

Primarily, the ground floor level will accommodate eight combination basketball, netball and volleyball courts, and a separate gymnastics arena. Supplemented with player change rooms, and public amenities, staff and meeting rooms, and a kiosk/cafe.

The upper level will accommodate five meetings rooms, a multi-purpose space and spectator seating of 350 permanent seats, with provision for expansion to 7,600 with the addition of temporary seating during Games Mode.

The Coomera Indoor Sports Centre – as with the majority of all Commonwealth Games venues – has been planned to be within a 20-minute vehicle journey of the Games Village which will be located in Southport.

Features and Innovations:

- › Sports halls are set up for mechanical ventilation utilising roof mounted ventilation and smoke exhaust fans
- › Sports hall facades and roof incorporate translucent panelling to allow natural daylight when possible

- › Player amenities incorporate energy efficient point of use instantaneous hot water, activated only when required
- › Potential for rainwater harvesting and Solar PV systems to be incorporated
- › Amenities (WC's) cater for up to 1000 spectators with additional WC's and showers dedicated to athletes, officials and performers during legacy mode
- › LED lighting throughout the majority of the facility including high bays to the sports halls
- › Energy metering for all electrical usage
- › Sports hall distribution boards incorporate plug-in type connection points for bump-in generators during event modes.



Adelaide Oval Redevelopment - Architectural Lighting Adelaide, SA

Services:

- › Specialist Lighting

About the project:

The Adelaide Oval Redevelopment has become a landmark in Adelaide drawing visitors to enjoy sport and other events in this unique world-class facility. The design compliments the surrounding parkland and the Torrens River, properly integrated into its environment.

NDYLIGHT was appointed sports lighting designers for this project in 2011.

The stadium design meets the requirements for the Australian Football League and International Cricket (ICC) sporting codes to HD broadcasting standards. The stadium was also designed and built with the ability to be modified via overlay for other international sporting code requirements including soccer, rugby and NRL as required.

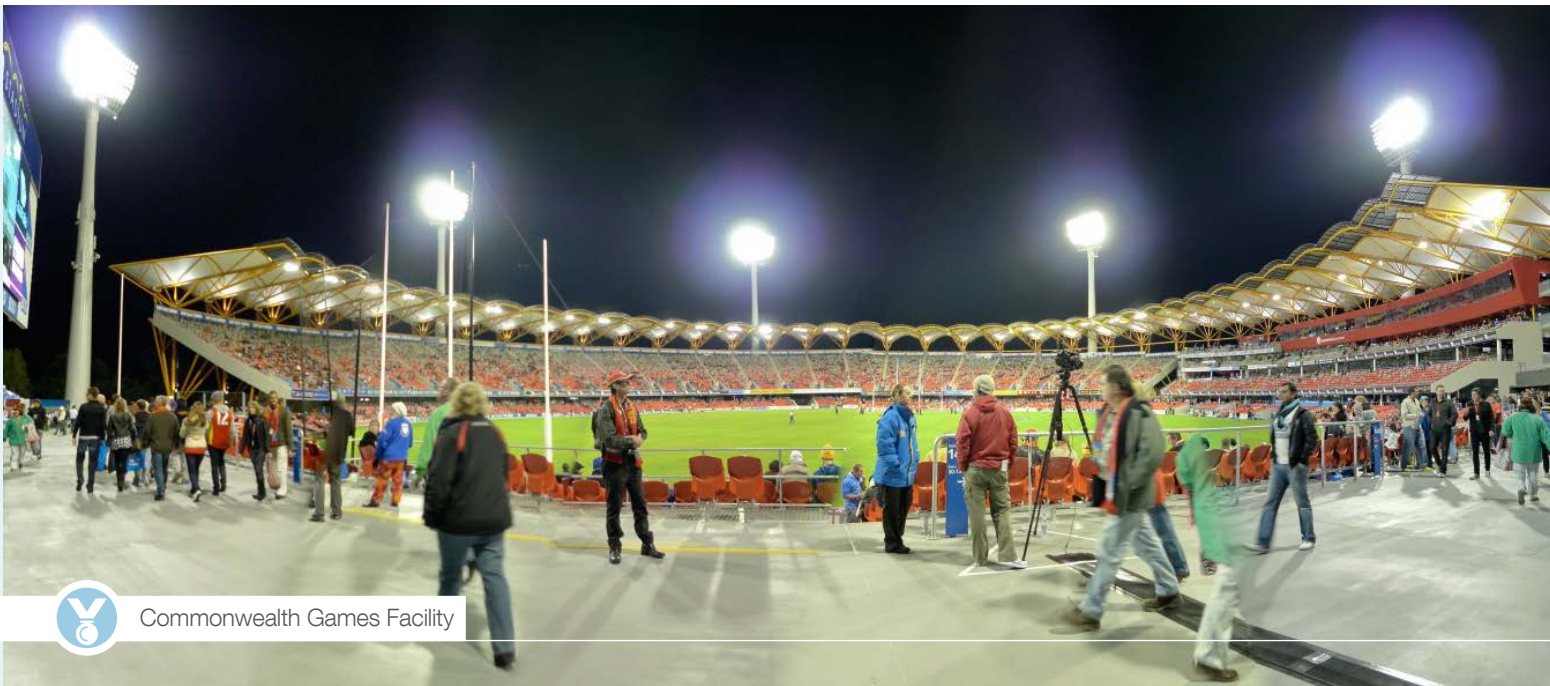
Features and Innovations:

- › Lighting solution that provided efficient lighting to the variety of sports and field shapes in the stadium
- › The proximity to commercial and parkland areas required specific attention to lighting overspill, to avoid lighting pollution
- › Efficiency was a focal point, with efficient lighting significantly lowering the operating costs.

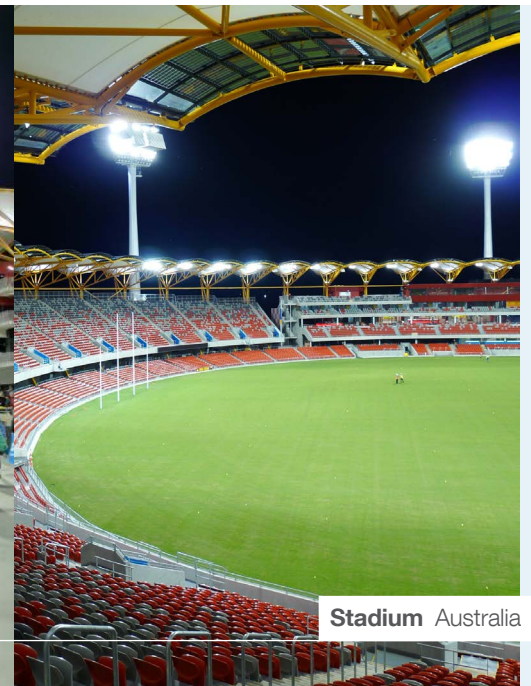
“

The redeveloped Adelaide Oval provides an upgrade to a landmark sporting facility on the edge of the CBD, bringing it in line with contemporary stadiums without losing its heritage or charm.

”



Commonwealth Games Facility



Stadium Australia

Metricon Stadium Gold Coast, QLD

Services:

- › Communications
- › Electrical including emergency power systems
- › Fire Engineering
- › Fire Protection
- › Hydraulic Services
- › Mechanical
- › NDYLIGHT
- › Security
- › Sustainability
- › Vertical Transportation.

About the project:

NDY was appointed by the consortium redeveloping the AFL Stadium at Carrara on the Gold Coast. The \$126 million redevelopment of the stadium increased the capacity from 8000 seats to 25,000, and is now the home of the Gold Coast Football Club.

The stadium is capable of hosting cricket, entertainment and cultural events and holds 2,000 corporate seats with a range of corporate facilities, including: Chairman's lounge, Field Club, Club Lounge, Corporate Suites and BBQ Decks.

It also accommodates merchandising outlets, catering facilities and media, player and officials facilities.

Full solar photovoltaic (PV) panelling up to five metres in width was installed around the inner edge of the stadium's roof.

In a Queensland first the installation of solar panelling will generate approximately 275,000 kilowatt hours (kWh) of electricity per annum, or more than 20 per cent of the stadium's total electricity needs.

This is equivalent to powering more than 250 Queensland homes.

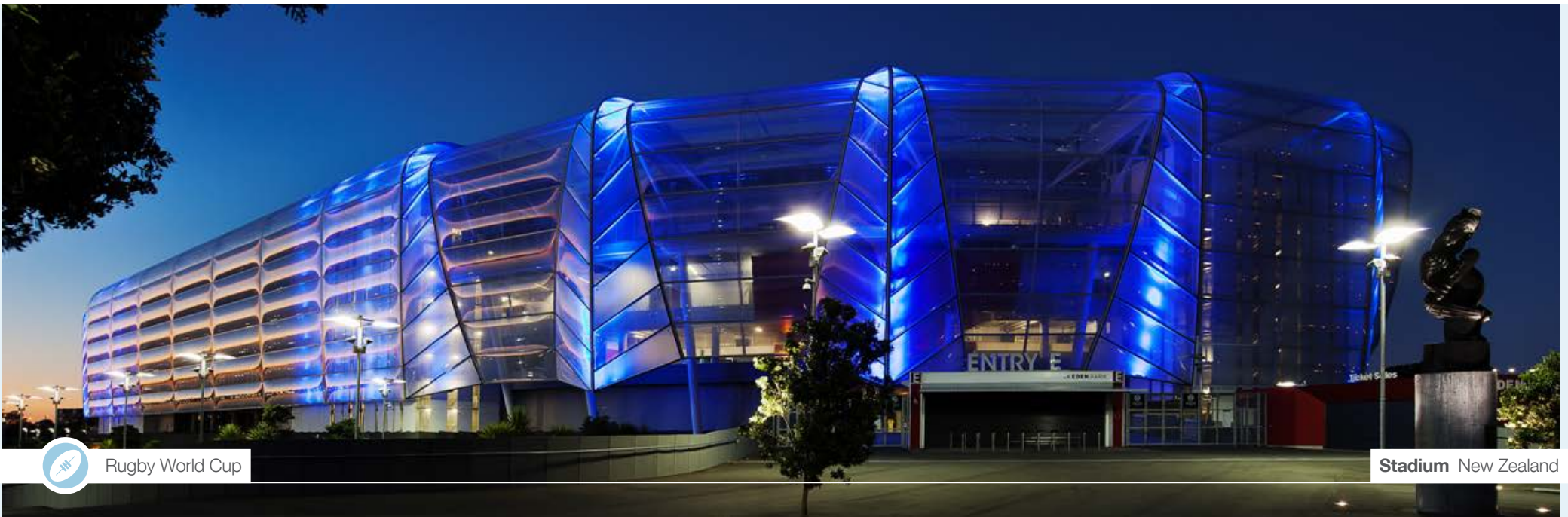
This unique solar element makes the Gold Coast Stadium the largest solar stadium in the southern hemisphere.



Metricon Stadium will offer the ultimate spectator experience for the live event, in a stadium that showcases cost effective and distinctive design. We are very proud to have Metricon Stadium, home of the Gold Coast Suns, as our newest AFL stadium.

**-Simon Gorr AFL Stadium Development
Manager**





Rugby World Cup

Stadium New Zealand

Eden Park Auckland, New Zealand

Services:

- › Specialist Lighting

About the project:

NDYLIGHT was commissioned to design the facade lighting for this major stadium project in Auckland.

Eden Park is an existing venue which has been refurbished to include one new three-tier 22,000 seat South Stand with 50 corporate boxes, and a new, unroofed two-tier East Stand (replacing the eastern terraces) with 8600 seat capacity.

The project involves the LED illumination of the massive southern facade. Once realized, this will be one of the major LED facade lighting schemes in Australasia.

The design process included extensive testing of luminaire options on site, on the ETFE material used on the facade. The lighting system will be able to activate on match nights, to add colour and movement, even represent team colours at different ends of the ground.

The project was completed in time for the 2011 Rugby World Cup, and provided an exceptional arena for this premier sporting event.

Features and Innovations:

- › Lighting solution that provided efficient lighting to the variety of sports and field shapes in the stadium.
- › The proximity to commercial and parkland areas required specific attention to lighting overspill, to avoid lighting pollution.
- › Efficiency was a focal point, with efficient lighting significantly lowering the operating costs.



Adding a creative lighting element to Eden Park established the venue as a modern, vibrant, and prestigious stadium, that was proudly displayed to the world during the 2011 Rugby World Cup.





Commonwealth Games Facility

Stadium and Sports Precinct Australia

Carrara Sports Precinct Gold Coast, QLD

Services:

- › Acoustics
- › Audio Visual
- › Communications
- › Electrical Services
- › Fire Protection and Detection
- › Fire Engineering
- › Hydraulics
- › Mechanical
- › Security
- › Sustainability
- › Vertical Transportation

About the project:

The new Carrara Sports Precinct is split over two sites (Carrara and Metricon) and incorporates six major projects including the new Carrara Sport & Leisure Centre (CSLC), Gold Coast Suns Elite Training and Administration Facility (GCS-ETAF), refurbishment of the existing Carrara Indoor Sports Stadium (CISS), new northern elite sport and training fields, new community grade football fields and the upgrade of the existing Metricon Stadium lighting. Games Overlay provisions are also built in to each project as a separate sub-project.

The City of Gold Coast has already secured the 2017 World Badminton Federation Sudirman Cup which will be played in the new CSLC and also has an ongoing annual arrangement to host the Big Day Out music festival.

Features and Innovations:

- › Sports halls are set up for four modes of ventilation; full natural ventilation, hybrid natural ventilation with fan assisted roof ventilators, full mechanical ventilation utilising smoke spill fans and dull air conditioning (chilled water cooling).
- › Sports hall facades and roof incorporate translucent panelling to allow natural daylight when possible.
- › Player amenities incorporate energy efficient point of use instantaneous hot water, activated only when required. Solar hot water with gas backup to permanently occupied spaces.
- › Energy metering for all electrical, central chilled water and gas usage.
- › All lifts are Queensland Ambulance Service and BCA stretcher compliant.
- › The new CSLC and all critical services are elevated above the Q100 flood plane (substation, switch rooms, communications rooms, mechanical plantrooms).
- › Undergrounding of overhead HV in front of the neighbouring Westpac rescue helicopter base to allow safer pilot visibility and landing and broaden the flight paths.
- › Full acoustics and pole mounted sports lighting CiD studies undertaken to ensure minimal impact on neighbouring residential properties.
- › Sports hall distribution boards incorporate plug-in type connection points for bump-in generators during event modes.



Pacific Games Facility

Stadium Papua New Guinea

Sir John Guise Redevelopment Port Moresby, Papua New Guinea (PNG)

Services:

- › Acoustic
- › Electrical
- › Fire Engineering
- › Fire Protection
- › Hydraulic
- › Mechanical
- › PA System Design
- › Specialist Lighting
- › Vertical Transportation.

About the project:

NDY was part of the successful Peddlethorp consortium, selected to redevelop the Sir John Guise Stadium in preparation for the 2015 Pacific Games.

Other New Zealand members of the consortium were project managers: Xigo, cost consultants: Rider Levett Bucknell and structural engineers Structure Design. The New Zealand consortium members partnered with local PNG consultants consisting of Peddlethorp PNG, M&E Partnership, Cost Consultants and Stocks & Partners.

The Peddlethorp consortium was appointed by the Venues Infrastructure & Equipment Committee (VIEC) for the PNG 2015 Pacific Games and design work occurred during 2012 and 2013 with the building being ready in time with the Pacific Games which started on 4th July 2015.

Various sports lighting studies were completed using the original towers. However the original towers were beyond repair and were replaced with new towers providing 500 lux (h) average across the full track and 1500 lux (h) average across the infield.

100% standby generator set was provided for the facility and active voltage conditioners were incorporated into the main switch boards to ensure appropriate power quality to the venue.

Facilities were designed with ease of maintenance in mind.

Features and Innovations:

- › Renovation and expansion of the existing grandstand both internally and externally, including player facilities, offices and lounges
- › Renovated grandstand also included Media Centre, toilets, change room/lockers, match officials changing rooms, medical and first aid rooms
- › Increased and re-shaped venue seating from approx. 5,000 to 15,000 seats
- › New certified IAAF outdoor athletic track
- › New Stadium lighting to enable television telecasts of infield sports at night
- › New Public Address System
- › New Electronic Scoreboard.



Olympic Games Facility



Aquatic and Sports Centre Australia

Sydney International Aquatic Centre (SIAC) Sydney, NSW

Services:

- › Communications
- › Electrical Services
- › Fire Services
- › Fire Engineering
- › Hydraulic Services
- › ICT
- › Mechanical Services

About the project:

With a gross floor area of over 24,000 sq m the Aquatic centre houses four pools and was the scene of some of Australia's greatest successes in the 2000 Sydney Olympic Games.

The brief for the indoor environment provided a major challenge, by requiring both the spectator seating and the pool concourse to be fully air conditioned within distinctive design criteria.

NDY carried out the design and documentation of the Mechanical, Fire and Vertical Transportation services.

NDY has maintained its involvement with the Olympic Co-ordination Authority by implementing a software based Facilities and Asset Management System (FAMS) for the Aquatic and Athletic Centres.

Energy conservation was also a major consideration, and the facility incorporates a novel heat recovery system to transfer waste heat from the air conditioning chillers into the pool heating system.

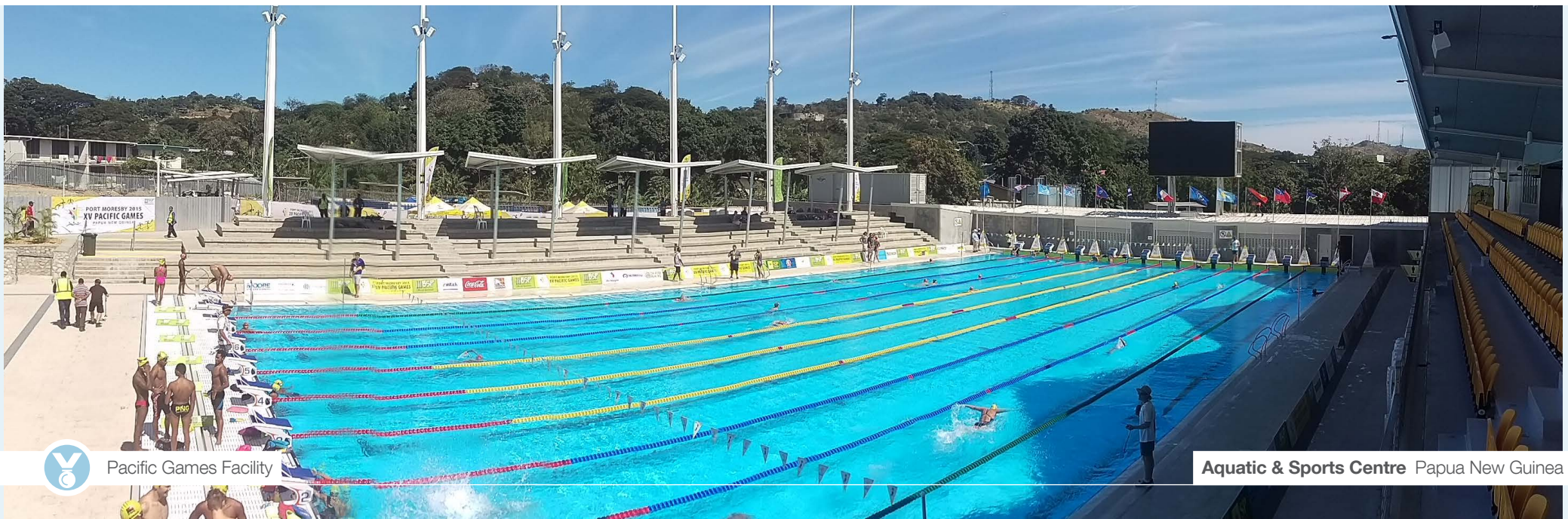
The fire system was one of the first to make use of an Engineered Solution, which saw the deletion of sprinklers to the pool hall, and the incorporation of highly sensitive smoke sampling systems at high level.

The specifications for all services paid special attention to the materials selected, to ensure an adequate life span for all components, in what is recognised as a potentially corrosive environment.

NDY's design of the Aquatic Centre has won recognition from both the developer (Lend Lease) in the form of their Environmental Achievement Award and the ACEA who

awarded the project their Highly Commended Award.

As a result many aspects of the mechanical design process in particular were "world first" involving the use of advanced computer analysis techniques (in association with the University of Sydney), and the testing of a full scale model of a section of the seating structure, to develop and analyse the performance of an innovative under seat supply air system for the spectator areas.



Pacific Games Facility

Aquatic & Sports Centre Papua New Guinea

Taurama Aquatic Centre & Indoor Sports Complex Port Moresby, Papua New Guinea (PNG)

Services:

- › Acoustic
- › Electrical Services
- › Fire Engineering
- › Fire Protection
- › Hydraulic Services
- › Mechanical Services
- › PA System Design
- › Pool water, Filtration and Dosage Systems
- › Specialist Lighting
- › Vertical Transport.

About the project:

NDY was part of the successful Peddlethorp consortium which was selected to design the new aquatic and sports complex in Papua New Guinea.

Other New Zealand members of the consortium were project managers: Xigo, cost consultants: Rider Levett Bucknell and structural engineers: Structure Design. These NZ consortium members partnered with local PNG consultants consisting of Peddlethorp PNG, M&E Partnership, Cost Consultants and Stocks & Partners.

The Peddlethorp consortium was appointed by the Venues Infrastructure & Equipment Committee (VIEC) for the PNG 2015 Pacific Games. Design work occurred during 2012 and 2013 with the building being ready for the 2015 Pacific Games.

The mechanical services design was required to give full consideration to operating costs in legacy mode. The unit price of power is extremely high in PNG and air-conditioning of spaces was restricted to administration areas and the corporate lounges.

CFD studies were conducted in order to model a forced ventilation system at very low velocity. The goal was to achieve no more than a 20°C rise in temperature indoors at both the playing and occupied zones within the arena space.

Sports lighting was designed to IBF Standards with the provision to add spotlights to increase both horizontal and vertical illumination for TV.

100% standby power plants were designed for the facility and voltage conditioners were incorporated into the main switch room to ensure appropriate power quality.

Features and Innovations:

- › 50 metre FINA standard competition swimming pool
- › 25 metre FINA standard warm up swimming pool
- › Splash and Play areas
- › 3 Volleyball Courts
- › 3 Basketball Courts
- › Corporate Lounges
- › Weight lifting Studios
- › Martial Arts Studios.

Contact **us**

Australia

Adelaide

P: +61 8 8290 6800
E: adelaide@ndy.com

Brisbane

P: +61 7 3120 6800
E: brisbane@ndy.com

Canberra

P: +61 2 6295 1788
E: canberra@ndy.com

Gold Coast

P: +61 7 5512 1235
E: goldcoast@ndy.com

Melbourne

P: +61 3 9862 6800
E: melbourne@ndy.com

Perth

P: +61 8 9281 6800
E: perth@ndy.com

Sydney

P: +61 2 9928 6800
E: sydney@ndy.com

Canada

Vancouver

P: +1 604 734 9338
E: vancouver@ndy.com

Ireland

Dublin

P: +353 1 264 6995
E: dublin@ndy.com

New Zealand

Auckland

P: +64 9 307 6596
E: auckland@ndy.com

Wellington

P: +64 4 471 0151
E: wellington@ndy.com

United Kingdom

London

P: +44 20 7553 9494
E: london@ndy.com



Join us on social media at
www.ndy.com/followus

Office Locations

Australia

Adelaide
Brisbane
Canberra
Gold Coast
Melbourne
Perth
Sydney

Canada

Vancouver

Ireland

Dublin

New Zealand

Auckland
Wellington

United Kingdom

London

This document contains confidential material.

All reasonable precautionary methods in handling the document and the information contained herein should be taken to prevent any third party from obtaining access.

Copyright © Norman Disney & Young. All rights reserved. No part of the contents of this document may be reproduced or transmitted in any form by any means without the written permission of Norman Disney & Young.