STAGE 4

SPORT NEW ZEALAND

Procurement of Contractors

The procurement of a contractor is outlined below and covers:

- The procurement process
- Selection of a contractor
- Contract form and payment mechanism
- Evaluation criteria (selection criteria and weightings).

Contractor Procurement Process

Contractor procurement can be undertaken via a two-step process (pre-qualification via expressions of interest or a pre-approved panel and a request for proposals) or a single step (request for proposals). Local government agencies may have suitable pre-approved panels instead of a separate pre-qualification process.

The important factor to consider is that the respondents to a request for proposals have the ability to undertake the work, and have specific sports facility experience.

Contractor Procurement Route Options

APPROACH	SUMMARY	COMMENTS
Expression of Interest and tender	**Documentation** 1. Expression of interest issued (the party leading the project) to open market 2. Response to the expression of interest (prepared by the contractor) 3. Evaluation and shortlist (typically 2-4 parties) 4. Request for tender issued (typically 2-4 parties) (from the party leading the project) 5. Response to the tender (prepared by the contractor) 6. Evaluation and selection	• Typical timeframe including evaluation and selection 12-16 weeks • 70% of the time will be response preparation by contractor • 30% of the time will be assessment, evaluation and selection of contractor • Note additional time to prepare response documents is required
Tender only	**Documentation** 1. Request for tender (the party leading the project) 2. Response to the tender (prepared by the contractor)	• Typical timeframe including evaluation and selection 6-8 weeks • 70% of the time will be contractor preparation • 30% of the time will be assessment, evaluation and selection of contractor

Contracting Type

The procurement strategy will also outline the preferred contracting type. The preferred contracting type establishes the framework for the life-cycle delivery of the project (ie, how its management, design and construction will be commissioned). There are several delivery models available, which represent varying degrees of complexity, risk, innovation, client involvement and programme influence. These are summarised for construction in the table below.

Delivery Model Summary – Construction

DELIVERY MODEL	DESCRIPTION
[1] **Alliance**	A partnership between the owner, consultant and contractor. This method of procurement is directed towards aligning the goals of all parties so that decisions are made in the best interests of the project
[2] **Design and build**	The owner contracts to a single entity (company or consortium) that is responsible for the design and construction or implementation of the project
[3] **Traditional**	The owner engages a consulting engineer to design and specify a project, then calls for tenders for the construction or implementation

Selection of Contractor

Approach to Selecting Contractors

Once a procurement route has been decided, the following outlines the approach to selecting a contractor:

- Contract structure
- Contract type
- Payment mechanism
- Typical selection criteria.

A critical part of this process is selecting a client project manager/quantity surveyor to manage works.

It is important when deciding on the contractor selection to consider the following points:

- Selection on preliminary and general costs, plus profit and margin and risks
- Evaluation panel with representatives from, facility operations, technical, property etc to reflect the owner's requirements
- Undertaking early contractor involvement (ECI) is essentially a form of collaborative contracting. As its name suggests ECI envisages early involvement of the contractor and the adoption of 'best for project' approaches by all parties.
- Within the ECI scope it is important to agree the deliverables, cost schedule, key risks and trade letting schedule at the outset
- Needs to include insurances for entire term of contract
- Single head contract
- Lump sum payments, payments by results for achieving outcomes and performance bonuses are options.

1 Australian Consulting Engineering Association (ACEA) Practice Note PN 4.05.
2 ACEA Practice Note PN 4.05.
3 ACEA Practice Note PN 4.05.

Practice notes and guidelines advise engineers and others on practice-related issues.

Contract Form and Payment Mechanism

Contract Structure

The following provides an overview of a contract structure that could be evaluated for the procurement. It is likely that almost all facilities will be delivered as a single contract.

Contract Structure

CONTRACT STRUCTURE	SUMMARY
Single contract	One major contract encompassing the entire project, tendered competitively on the basis of full working drawings and documents (or preliminary drawings if a design build approach)
Multiple contracts	Multiple contracts, each progressively tendered competitively on the basis of working drawings and documents, for separate sections or trades. Requires additional management time and cost control Timing of design/documentation and tenders normally follows a logical chronological sequence of construction activities
Management contract	This is a selected list of major contractors tendering competitively for overheads and profit (and perhaps also major construction equipment and services, scaffold, supervision etc) as a lump sum. Labour costs may also be quoted on a charge-out basis. The remainder of the work may then be carried out on a multiple sub-contracts basis or as cost reimbursement. Requires additional management time and cost control

Contract Type

A description of the different contract types is included below.

Contract Type

CONTRACT STRUCTURE	SUMMARY
NZS 3910 Conditions of Contract for Building and Civil Engineering Construction	A standard contract type for traditional delivery
NZMP 3914	A standard contract type for design and build (addendum to NZS 3910)
NEC3	A suite of contract forms for works, services or supply. Relatively new to the industry, but becoming more widely used, particularly by local government

Payment Mechanism

It is likely that almost all facilities will be delivered as lump sum payments, but there may be scope items that can be undertaken on a measure and value basis (eg, plant). A description of the payment mechanisms is included below.

Payment Mechanism

PAYMENT MECHANISM	SUMMARY
Lump sum	• Where the scope is clearly defined • Where risks are small and identifiable • Schedule of prices can be used, but is not necessary • Tenderer does own measure for pricing • Longer tender period • Variations likely to be minimal • Higher risk to contractor may be reflected in higher tender price • Where the client needs early knowledge of the final project cost
Measure and value	• Where the scope is defined • Where quantities may vary • Schedule of prices is necessary • Allows an early start to construction activities • Normally equitable to both client and contractor • May allow for variations in construction methods to suit variable conditions encountered during the work, especially for civil engineering work
Cost reimbursement	• Allows an early start to construction activities before design and documentation are complete • Requires selection/negotiation with one preferred contractor (usually on the basis of reputation or resource availability) • Allows great flexibility to vary the work or to speed up/slow down the project • Final costs are not fixed and it can be difficult to forecast out-turn costs for project unless suitable project controls in place • Commonly used for high-risk work so that the client carries the risks, paying the actual resultant costs rather than a premium for risk protection • Much higher level of client involvement in the day-to-day decisions • Short tender/negotiation period possible
Combination	• A cost reimbursement contract with a lump sum for overheads and profit. The lump sum may be extended to cover such identifiable items as; construction equipment; scaffold and supervision • A cost reimbursement contract with a lump sum for overheads and profit, plus a lump sum and/or measure and value items for appropriate sections of the work. For example, a project may have: lump sums for specified buildings; measure and value items for civil/structural work; and cost reimbursement for the mechanical/electrical and plant installation • A measure and value contract for civil and building trades, with a series of lump sums for specialist trades – electrical, heating and ventilation, floor coverings etc

Evaluation Criteria

Evaluation Criteria Framework

The framework is arranged in steps that are consistent with the selection approach for consultants, contractors and operators if required. The evaluation criteria and weightings should be agreed before the tender documentation is issued and clearly aligned with the objectives.

STEP 1 – determine your evaluation criteria. The example below breaks down the assessment of tenders into FOUR key attributes that the tenderer is expected to have demonstrated in their proposal. Does your working group agree with these four key attributes? Add and remove attributes as required. Once these have been determined, a weighting for each must be assigned. This allows you to recognise the importance of some criteria over others. For instance, 'price' typically has a high weighting as you will likely be working to a limited budget.

Step 1: Evaluation Criteria

NO.	ATTRIBUTE OVERVIEW	KEY QUESTIONS TO ASK YOURSELF WHEN EVALUATING THE TENDER
1	**Price**	Has the tenderer demonstrated good value for money?
2	**Knowledge and experience**	Has the tenderer demonstrated good knowledge of the sport and recreation sector? Have they demonstrated their skills through the completion of other/similar projects? What were the outcomes of those projects? Have references from those projects been provided?
3	**Methodology**	Has the tenderer demonstrated a good understanding of what you want to achieve? And does the process they have outlined make sense and work for you?
4	**Personnel**	Is the tenderer able to call upon people with different/necessary skill-sets to complete the project? And what is the risk to your investment should the lead consultant or nominated key personnel leave mid-project?

STEP 2 – determine your scoring methodology. The example below allocates scoring options that are appropriate to the level of compliance demonstrated. Each evaluator should stay within the agreed parameters, but their individual scores (within those parameters) may vary. Once the scoring system is agreed, the selection of 'weighted totals' is next.

Step 2: Scoring Methodology

COMPLIANCE	DEFINITION	KEY WORDS	SCORE OPTIONS %
Significantly exceeds	Significantly exceeds the requirement in a way that provides added value to the project	Significant added value	85, 90, 95, 100
Exceeds	Exceeds the requirement in some aspects and/or offers some added value to the project	Some added value	65, 70, 75, 80
Compliant	Has shown an understanding of the requirement to the specified level and can meet the requirement to the specified level	Specified level	50, 55, 60

COMPLIANCE	DEFINITION	KEY WORDS	SCORE OPTIONS %
Non-compliant	• Does not meet the requirement • Marginally deficient • Minimal cost or schedule impact to address • Minor negotiation required to meet requirement	Marginally deficient	40, 45
Non-compliant	• Does not meet the requirement • Requirement only partially met • Meeting of the requirement will impact on cost or schedule • Significant negotiation required to meet requirement	Partially met	5, 10, 15, 20, 25, 30, 35
Non-compliant	• Does not meet the requirement • Requirement not met to any degree by the solution offered • No information provided – critical deficiency	Not met	0

STEP 3 – take the score for each tenderer, the weighting factors for each of the non-price attributes and the price, and rank the tenders. Weightings can be found in the relative individual sections.

Typical Weightings for Contractors

Evaluation criteria will be based on the following:

- Operational/services
- Technical/design
- Price.

Typical Weighted Factors – Non-Price

ATTRIBUTES	SELECTION CRITERION	WEIGHTING
NON-PRICE	Operational/services	30%
	Technical/design	30%
PRICE	Total price	40%

Architectural

Site

The development of a facility design depends on a range of factors. It is critical therefore to employ an experienced and professional consultant design team to develop a concept and design for the specific site conditions and client brief.

The following reference facility design has been completed to inform a cost estimate and provide a tangible example of the guidelines in this document. The context for the reference facility design is described below.

Build – Reference Facility Brief

The reference facility brief is based on a non-specific site and has assumed the following conditions:

- Climate Zone 3 location
- Low water table so no tanking required
- Good ground structurally
- Level site.

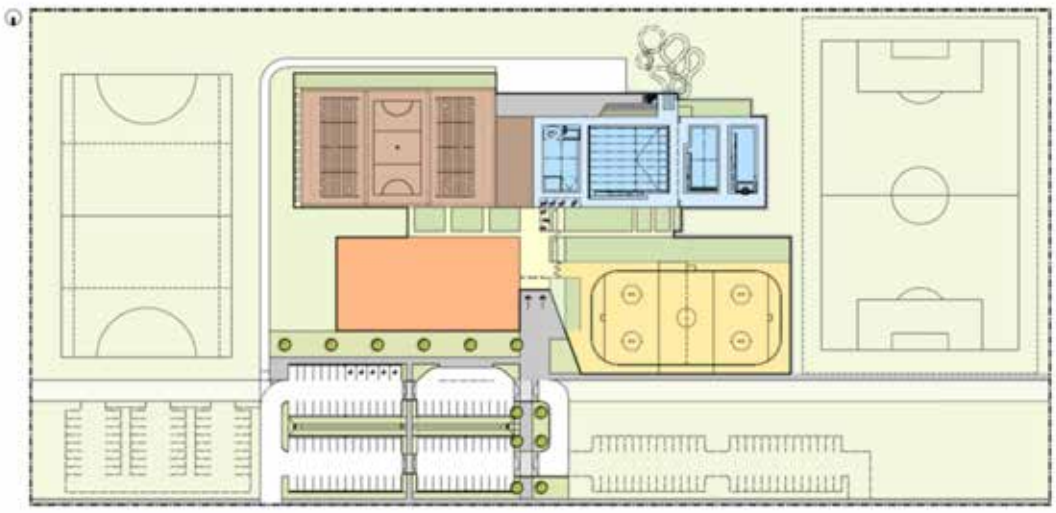
The reference facility has targeted a medium scale for a large community with a primary catchment of 50,000 population. The community has a vision to create a recreation precinct to provide a range of sporting opportunities, indoors and outdoors, which can expand as the community grows. A large, flat plot of land has been selected following a feasibility study that identified this central site as having the best catchment, adjacencies to local schools and good ground, therefore ensuring a cost-effective build and a good population catchment. A needs assessment has been undertaken and informed a design brief and area schedule for the mix of components. The facility's primary objective is to provide a range of community-level sports facilities. It is not intended for national or regional-level competitions, but may be used for local school competitions and training. A mixture of cycle and car parking is to be provided in addition to a dedicated school bus and coach drop-off area within the site.

Master Plan

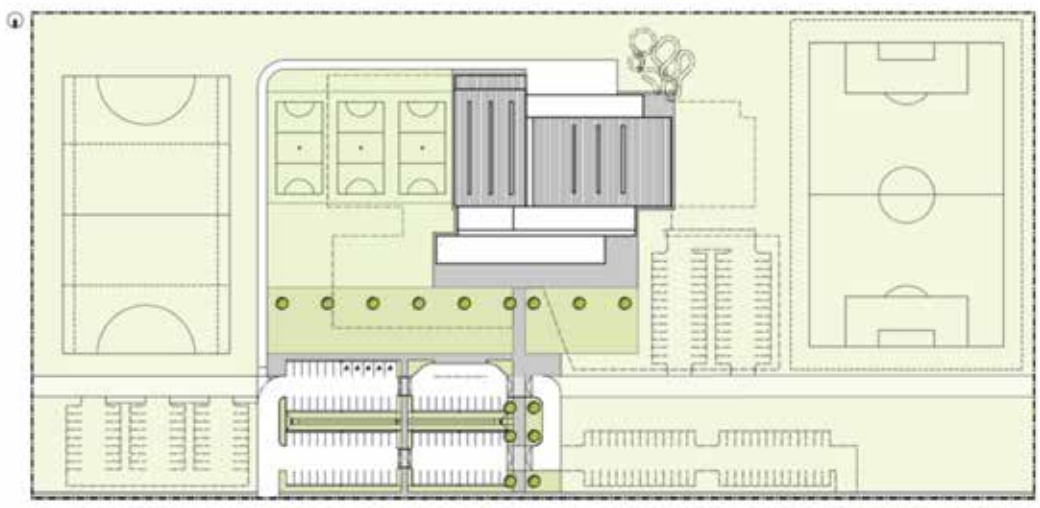
The long-term master plan vision includes an indoor ice rink and gymnastics hall as examples of expansion. The location and approximate scale of these have been considered and informed the location of the carparking, stormwater system and in-ground services' routes.

While the reference facility is based on a large greenfield site, the principle of a master plan informing the site and building location is equally important for a more constrained, inner-city site.

Site Master Plan (Linear Model)

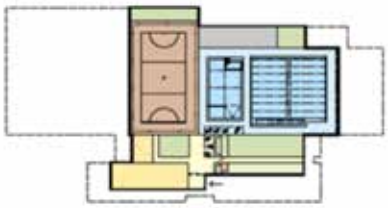
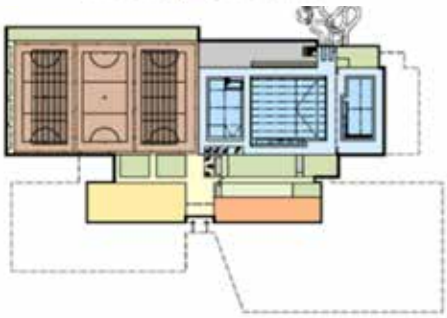
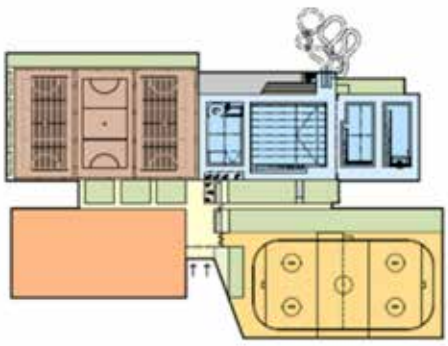


Site Plan (Linear Model)

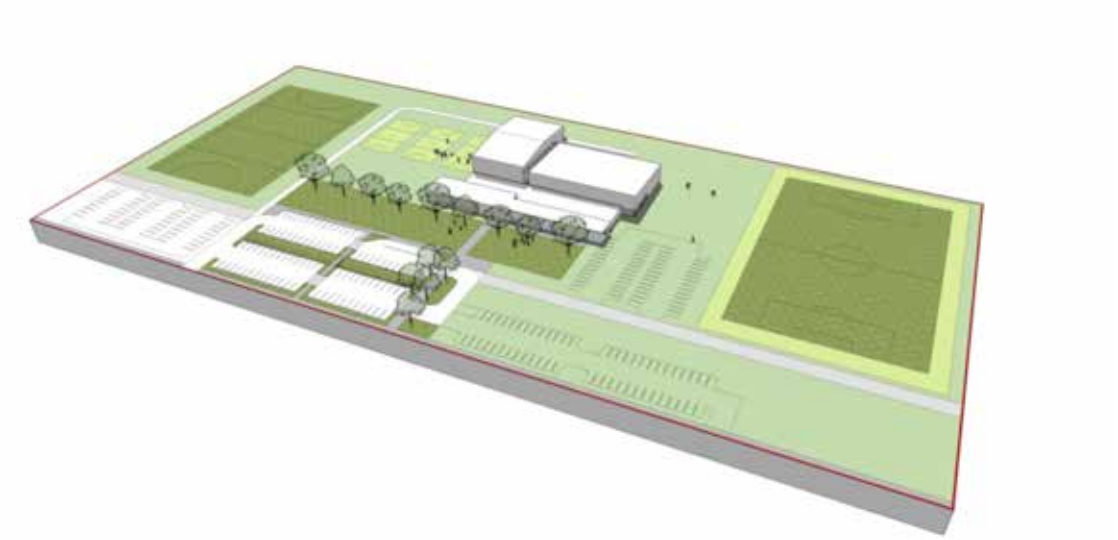


Sequential Expansion

The following diagrams illustrate a possible staged expansion of the facility over time.

NOTES	FACILITY EXPANSION	TIME
STAGE 1 • Initial facility includes a 25m lap pool, shared-use LTS and a single indoor court		
STAGE 2 • Two indoor courts are added and retractable seating included to allow hosting of events • A dedicated LTS pool is added • The fitness centre expands and a dedicated retail centre is added to the facility mix • Change rooms expand as demand increases		
STAGE 3 • An ice hockey and gymnasium facility are added along with support functions		

Master Plan – Site 3D View (Linear Model)



The linear model reference facility example allows for a sequential and staged expansion of the facility. It is typically suited to a large park or greenfield site where a recreation precinct or master plan is envisaged to integrate a variety of outdoor sports fields with an indoor community hub. The design allows clear separation of service access from the public frontage.

The example includes one indoor netball court and a basic aquatic centre. The sports and pool hall can expand as the facility grows. The flexibility of the planning diagram maximises the potential to 'hub' other large-scale facilities onto a central concourse. The planning is flexible and allows change rooms to grow as other sports codes and clubs relocate or new businesses and sports facilities demand.

Some examples of a linear model include:

- Wanaka Sports Facility (under construction)
- EA Networks Centre (Ashburton)
- Marlborough Lines Stadium 2000 (Blenhiem).

Reference Facility – Ground Floor Plan

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LEGEND:

0. WIND LOBBY
1. ENTRANCE FOYER
2. CORRIDORS
3. RECEPTION
4. ADMIN OFFICES
5. STAFF ROOM
6. DRY ADMIN STORAGE
7. STAFF CHANGE
8. MULTI-PURPOSE SPACE / MEETING RM
9. CAFE / FOOD & BEVERAGE AREA
10. KITCHEN & WASTE AREA
11. RETAIL
12. PUBLIC TOILETS
13. POOL HALL
14. MAIN POOL
15. LEARN TO SWIM AREA
16. LEISURE AREA
17. TODDLERS POOL
18. SPA POOL
19. POOL CHANGE - MALE
20. POOL CHANGE - FEMALE
21. POOL FAMILY CHANGE AREA
22. POOL ACCESSIBLE CHANGE
23. POOL STORAGE
24. CLEANERS STORE
25. INDOOR SPORTS COURT
26. DRY SPORTS STORAGE
27. DRY CHANGE 1
28. DRY CHANGE 2
29. DRY ACCESSIBLE CHANGE
30. LOCKERS
31. FITNESS STUDIO / PROGRAMME ROOM
32. FITNESS EQUIPMENT / CARDIO ROOM
33. INTERNAL PLANT
34. SPECTATOR SEATING

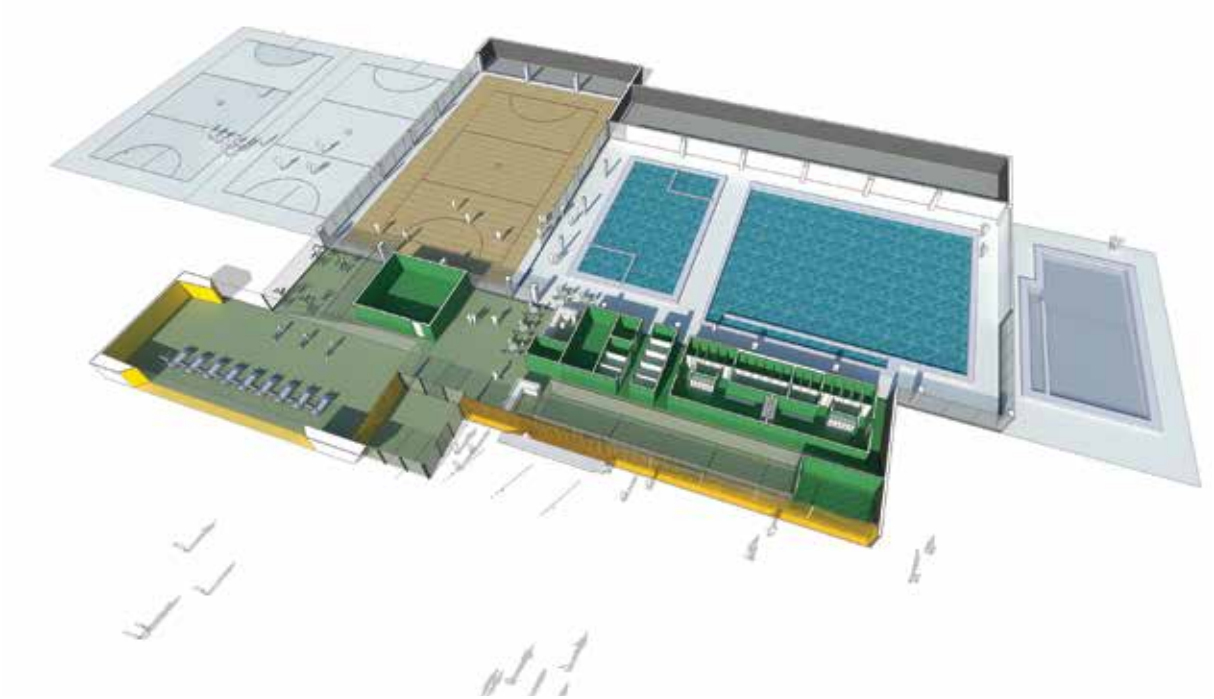
- 1a. CORE SPORTING AREA: INDOOR COURTS
- 1b. CORE SPORTING AREA: POOL HALL
- 1c. CORE SPORTING AREA: FITNESS CENTRE
- 2. ESSENTIAL SUPPORTING AREAS (STORAGE / CHANGING / SANITARY)
- 3. FOYER / CIRCULATION
- 4. INTERNAL PLANT
- 5. CORE MANAGEMENT AREAS (RECEPTION / STAFF AREAS)
- 6. OTHER AREAS (CAFE / SPECTATOR SEATING / INTERNAL WALLS)
- 7. RETAIL
- FUTURE EXPANSION ABILITY

SPACE COULD BE DESIGNED FOR A VARIETY OF OTHER FUNCTIONS SUCH AS ALLIED HEALTH OR MASSAGE ROOMS.

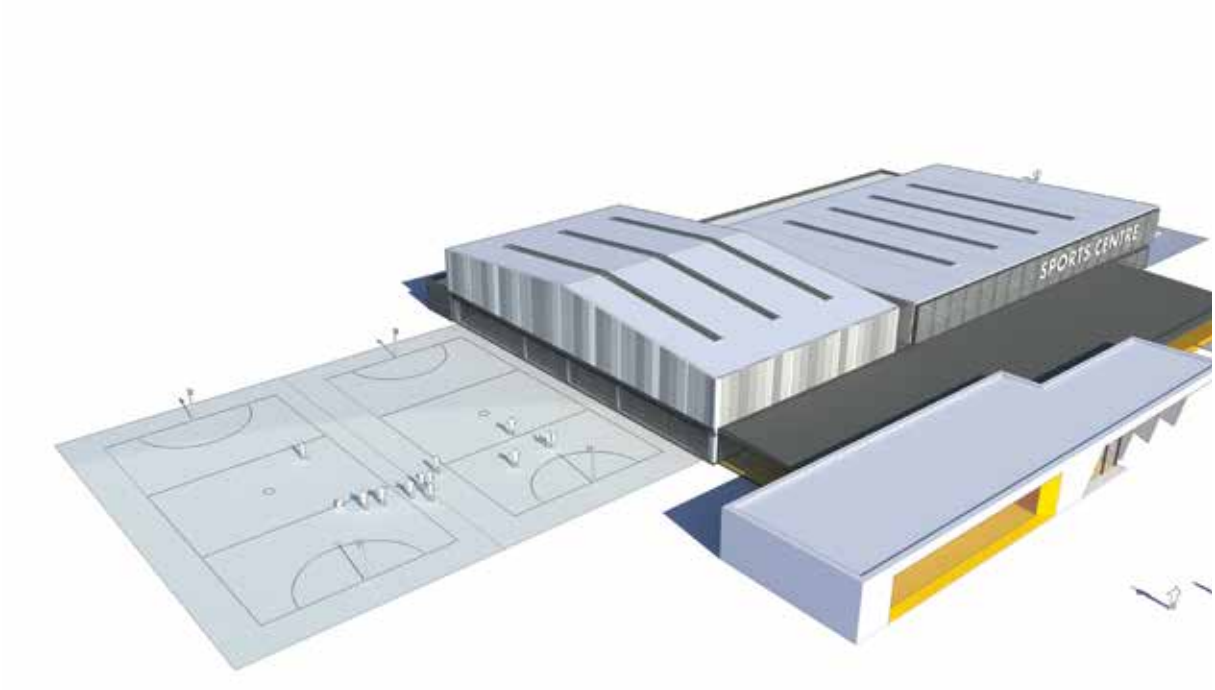
Elevations

Sections

3D Views



STAGE 4: BUILD



Design Commentary

The reference facility plan combines all sporting components into a simple single-level building. The core facilities that are included in the reference facility design are discussed below.

The internal layout of the building design has been arranged so that the main entrance elevation and foyer provide a 'shop window' to the key facilities within.

Entrance Canopy

An entrance canopy has been provided and sized to provide enough capacity for a school group to wait under cover. The entry and canopy face away from the prevailing wind direction and provide shade during the summer months and under-cover cycle parking.

Entrance, Foyer and Reception

The entrance and reception are designed to give users some viewing of, and direct access to, the internal sports and pool areas. The reception is also the central hub for the operation of the centre, with clear views of external and internal circulation routes. The reception point allows for the observation and management of the adjacent entry turnstile gates, dry change corridors and retail area.

Swimming Pool

The design includes an eight-lane, 25m main pool that is intended to accommodate the following activities:

- LTS – adults
- Teaching shallow dives/race starts
- Use by disabled people
- Leisure (mobile inflatable leisure equipment)
- Fitness swimming
- Aqua jog, aquafit, aquacise, exercise in water
- Water polo and mini water polo
- Underwater hockey
- Canoe/kayak practice
- Lifesaving training
- Sub-aqua training.

A secondary, multi-purpose area provides additional, shallower water to accommodate the following:

- LTS – children
- Leisure (water toys, rope swing, inflatables)
- Dedicated toddlers' paddling area
- Family spa.

The addition of a secondary pool improves the programme flexibility and income generation potential.

Future expansion has been identified and will include the construction of a dedicated LTS pool.

In-ground pipework and space within the plant room have therefore been provided to allow the additional dedicated LTS pool to be installed in future. The building plan allows for the logical staged expansion of the change rooms as the pool water area increases. Diving demands deep water and is therefore very rarely compatible with community facilities, so diving provision has not been included in the indicative reference facility design. A combination of open-sided and secure lockers is located along the edge of the pool concourse. Pool covers are integrated along the plant and storeroom walls. Limited bench seating is provided around two sides of the main pool and along one side of the leisure and LTS pool.

The pool hall has a height of 5-7m.

Wet Change Space

The wet change rooms have been designed with separate dry and wet entry processes to minimise the migration of dirt to the pool hall. The plan allows the wet change rooms to expand logically in line with pool expansion. Dedicated male, female and family change processes are provided and an oversized accessible change cubicle provided with direct pool access and space to store a wheelchair. Family change cubicles located adjacent to the shallow LTS and leisure beach entry. Five smaller family change cubicles provided, each with a bench and baby change table. A single pool-side toilet is provided in close proximity to the toddlers' area. Pool-side showers are located close or immediately adjacent to the change exit. Handrails to the main pool ramp separate the deep water from the male and female change rooms exit.

Sports Hall

A single indoor (netball court sized) sports hall (23.4x38.6m) is provided and is sized for one full netball court with the standard 3.05m run-off zones to all sides. A 1m wide circulation zone is provided in addition to the run-off zone to provide for bench seating and buffer space for the structural columns and space for lockers. Additional spectator seating beyond the basic perimeter bench is not considered necessary for this particular small, one-court, community facility.

The structural portal is designed to span the length of the court to allow the hall to expand east to accommodate one or two additional netball courts.

Three courts are considered a good configuration for an event court set-up due to the ability to configure the centre court as the main event court supported by retractable seating from the sides. For this reason, a gable end is proposed on the east façade and the main portal structure spans longitudinally, so that as courts two and three are added to the facility the structural portals can be extended eastwards.

A dry sports equipment store of 12.5 percent of the sports hall floor area is provided along the service side of the building. This provides direct access to the delivery area for flexibility of use when staging events or transporting equipment.

A clear height of 7.5m is provided as the facility is not intending to host international-competition-level netball or volleyball and premier or international-level badminton.

Fitness Centre

A 300m^2 health and fitness centre is proposed based on the local market conditions. The fitness area is highly visible from the foyer and glazed externally to activate the external landscape and carpark areas. The ground floor health and fitness area shares the use of the sports hall change rooms. A small, single, multi-purpose studio is located overlooking the indoor sports hall with dual access from the sports hall and from the open-plan fitness area space. Larger group sessions are proposed to be held in the large sports hall. A small instructor's space with desk and computer is provided inside the open-plan fitness/ cardio area. Secure lockers are integrated with the planning of the dry change corridors.

Subject to catchment and local competition factors, a larger health and fitness centre with more stations will attract more 'members' and casual users, and improve the financial performance of the centre.

Café

A 60m^2 café, sized to reflect the local market conditions, is provided with kitchen, dishwash area, servery and seating areas. The café is highly visible from the entry, sports courts, fitness centre and pool hall. It serves into two distinct seating areas: a dry lounge for non-sporting participants, and a pool-side wet lounge seating area that overlooks the toddlers' and leisure pool water areas.

Retail

A dedicated retail area is provided adjacent to the main reception. The retail space is highly visible from the foyer and access is from the main circulation spine. The reception staff will provide supervision and point of sale for this space.

Administration

The centre admin block backs onto the main reception space and provides staff support services including open-plan office, staff room, stationery storage, staff change facilities and a shared-use, multi-purpose meeting room. The intention is that the meeting room will be bookable by community groups and therefore act as another potential revenue stream.

Wellness

The admin block could be redesigned to provide wellness and treatment spaces. In this reference facility the multi-purpose meeting room is designed as soft expansion space and may be converted to wellness treatment rooms in future.

Area Schedule

An area schedule is designed to identify the key internal space requirements of the facility. Additional circulation and grossing factors will need to be applied to account for the realities of planning a facility. Typically, the greater the number of components the larger the internal circulation allowances required.

AREA SCHEDULE (FOR DETAILED FLOOR PLAN)

LEGEND	SPACE DESCRIPTION	AREA (m²)	
0	Wind lobby	28	
1	Entrance foyer	93	
2	Corridors	98	
3	Reception	9	
4	Admin offices	25	
5	Staff room	20	
6	Dry admin storage	4	This could be integrated with the admin area in small facilities
7	Staff change	4	Staff could share the general change areas in small facilities
8	Multi-purpose space/ meeting room	35	This space could also be used to provide a variety of other support functions or allied health or massage suites
9	Café servery	17	
9a	Wet lounge/seating area	28	
9b	Dry lounge/seating area	24	
10	Kitchen and waste area	18	
11	Retail	7	This is integrated with the reception area
12	Public toilets	24	
13	Pool hall	1,372	
14	Main pool	-	
15	LTS area	-	
16	Leisure area	-	
17	Toddlers' pool	-	
18	Spa pool	-	
19	Pool change area – male	63	
20	Pool change area – female	73	
21	Pool family change area	29	
22	Pool accessible change area	8	
23	Pool storage	70	
24	Cleaners' store	4	
25	Indoor sports hall	900	

AREA SCHEDULE (FOR DETAILED FLOOR PLAN)			
LEGEND	SPACE DESCRIPTION	AREA (m²)	
26	**Dry sports storage**	108	
27	**Dry change area 1**	17	
28	**Dry change area 2**	17	
29	**Dry accessible change area**	5	
30	**Lockers**	6	
31	**Fitness studio/ programme room**	65	
32	**Fitness equipment/ cardio room**	235	
33	**Internal plant**	215	
34	**Spectator seating**	0	Single benches included within pool hall and sports hall

The area above relates to the reference facility drawing on page 143.

Outline Specification

The outline specification for the reference facility has targeted a medium level of cost/maintenance/ quality. Each facility must consider the whole-of-life considerations particular to its specific development and make informed decisions on the trade-offs between cost, quality and whole-of-life.

The products and systems selected for a given facility will depend on a range of factors. It is therefore critical to employ an experienced and professional consultant design team to 'tailor' the available materials and systems to the specific site conditions and building use.

This outline specification covers only generic architectural and sanitary components and finishes and should be read in conjunction with the services' and structural outline specifications and design guidance notes.

The main building structure shall be specified to achieve a 50-year design life in accordance with the Building Code. The building envelope, key internal features, furniture and finishes should be formed with materials with a long life expectancy (minimum of 25 years). All elements of the building that require cyclical maintenance and/or replacement should be selected with whole-of-life costing in mind.

Internal Finishes, Materials and Systems

- Pool Environment

All areas such as toilets/change and circulation areas that are subject to the swimming pool environment are to be designed to the same standard as the pool hall in order to resist the associated high humidity and temperature. Special attention is to be given to the risk of interstitial condensation and corrosion. All exposed metal elements are to be treated with a corrosion-resistant paint finish.

ENTRANCE LOBBY AND FOYER, RECEPTION

ITEM	GENERIC DESCRIPTION
Floor	Polished concrete with non-slip coating Wind lobby and entry with recessed matt well
Skirting	Painted timber
Walls	Paint-finished GIB Superline on timber framing in dry areas – polyester insulation internally
Ceiling	Feature slotted acoustic timber-veneered panelling with sound-absorbent backing and firesafe MDF
Doors	Automatic entry sliding doors to main entrance Card-swipe access control entrance turnstiles to pool dry change corridor
FF&E	Reception joinery Furniture and seating Notice boards

SPECTATOR VIEWING

ITEM	GENERIC DESCRIPTION
Floor	Polished concrete with non-slip coating Wind lobby and entry with recessed matt well
Skirting	Painted timber
Walls	Paint-finished GIB Superline on timber framing in dry areas – polyester insulation internally Polyester insulation internally
Ceiling	Feature slotted acoustic timber-veneered panelling with sound-absorbent backing and firesafe MDF
Doors	Internal glazed aluminium partitions with toughened Grade A safety glass and manifestations
FF&E	Chairs and tables Vending machines

ADMIN OFFICES

ITEM	GENERIC DESCRIPTION
Floor	Heavy-duty commercial carpet tile
Skirting	Painted timber
Walls	Paint-finished GIB Superline on timber framing in dry areas – polyester insulation internally Polyester insulation internally
Ceiling	Acoustic mineral fibre tile, tegular edge, in proprietary suspended ceiling grid with seismic bracing
Internal glazing and doors	Internal glazed aluminium partitions with toughened Grade A safety glass and manifestations
FF&E	Workstations Storage shelving Storage credenzas

CORRIDORS

ITEM	GENERIC DESCRIPTION
Floor	Polished concrete with non-slip coating
Skirting	Painted timber
Walls	Ceramic tile on fair-faced blockwork walls
Ceiling	Acoustic mineral fibre tile, tegular edge, in proprietary suspended ceiling grid with seismic bracing
Internal glazing and doors	Internal glazed aluminium partitions with toughened Grade A safety glass and manifestations
FF&E	Lockers to dry change corridors (lockable)

STAFF ROOM

ITEM	GENERIC DESCRIPTION
Floor	Heavy-duty commercial carpet tile
Skirting	Painted timber
Walls	Paint-finished GIB Superline on timber framing in dry areas Polyester insulation internally Fabric-faced prefinished polyester acoustic panels on feature wall
Ceiling	Acoustic mineral fibre tile, tegular edge, in proprietary suspended ceiling grid with seismic bracing
Internal glazing and doors	Internal glazed aluminium partitions with toughened Grade A safety glass and manifestations
FF&E	Kitchenette joinery and glass splashback Kitchenette-associated sanitary (sink, taps) Fridge/freezer Microwave Chairs and table Storage lockers

STAFF CHANGE

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Vinyl with coved skirting Falls to floor waste
Walls	Tiled-over waterproofing system over fibre-cement board on timber framing Polyester insulation in stud cavity
Ceiling	Flush-stopped fibre-cement or GIB Aqualine Paint-finished
Internal glazing and doors	Internal glazed aluminium partitions with toughened Grade A safety glass and manifestations

FF&E	WC pan with cistern Wash-hand basin and taps Adjustable shower rose and lever Compact laminate shower screen Bench Hand dryer Mirror Sanitary bin

DRY ADMIN STORAGE

ITEM	GENERIC DESCRIPTION
Floor	Heavy-duty commercial carpet tile
Skirting	Painted timber
Walls	Paint-finished GIB Superline on timber framing to dry areas Polyester acoustic insulation internally
Ceiling	Mineral-fibre tile, tegular edge, in proprietary suspended ceiling grid with seismic bracing
Doors	Solid-core timber door and hardware, paint-finished
FF&E	Storage shelves to 2 sides Stationery cupboards to one side

MEETING ROOM

ITEM	GENERIC DESCRIPTION
Floor	Resilient rubber flooring
Skirting	Painted timber
Walls	Paint-finished GIB Superline on timber framing to dry areas Polyester insulation internally Fabric-faced prefinished polyester acoustic panels on feature wall
Ceiling	Acoustic mineral fibre tile, tegular edge, in proprietary suspended ceiling grid with seismic bracing
Doors	Internal glazed aluminium-framed doors
FF&E	Audio visual system Meeting table and chairs Whiteboard

CAFÉ, FOOD AND BEVERAGE AREA

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Vinyl with coved skirting Floor waste
Walls	Prefinished fibre-cement sheets, hygiene rated

Ceiling	Prefinished fibre-cement tile in proprietary suspended ceiling grid, seismic bracing in hygiene-critical areas Acoustic wall or ceiling panelling on seating areas
Doors	Solid-core timber door and hardware, paint-finished
FF&E	Kitchen and dishwash area fit-out Wash-hand stations Servery joinery Café tables and chairs Vending machines

RETAIL

ITEM	GENERIC DESCRIPTION
Floor	Polished concrete with non-slip coating Wind lobby and entry with recessed matt well
Skirting	Painted timber
Walls	Slat wall and internal glazed aluminium partitions with toughened Grade A safety glass
Ceiling	Feature slotted acoustic timber-veneered panelling with sound-absorbent backing and firesafe MDF
Doors	Internal glazed doors
FF&E	Glass display joinery built in to reception joinery unit Slat walls Signage Display stands

PUBLIC TOILETS

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Non-slip tiles Falls to floor drain
Walls	Ceramic tiles over fair-faced blockwork
Ceiling	Prefinished fibre-cement tiles in proprietary suspended ceiling grid system, seismic braced
Doors	Solid core with glazed sidelight Paint-finished
Cubicles	13mm compact laminate toilet partition system complete with door stops and coat hooks
Vanities	Compact laminate vanity No-mist Grade A safety mirror
Sanitary	Airblade-type hand dryers, wash-hand basins, WC pans with flush valves
FF&E	Fold-down baby change table in accessible public WCs Soap dispensers, sanitary bins, door stops

POOLS AND POOL HALL

ITEM	GENERIC DESCRIPTION
Pool tank	Reinforced, waterproof, in-situ concrete system with waterbars and backing strips Ceramic pool tiles to floor, walls and pool surround OR
	Stainless-steel pool walls on concrete base with PVC liner membrane to floor
	Main pool cross-section refer Option C – refer to pool design guidance stage 3, page 59
Pool drain	Graycol FRP (fibre-reinforced plastic) pool roll-out channels
Pool covers	Wall-mounted, insulated pool covers or insulation included in the movable floor
Balance tank	Waterproof concrete
Concourse floor	Designated wet floor Non-slip resin floor Laid to 1:40 fall to slotted floor drains
Skirting	Coved resin 150mm high
Walls internal below 2.55m	Ceramic wall tile on waterproof system to shower areas and sealed precast concrete to 2.7m high
Walls internal above 2.55m	Prefinished fabric-faced polyester wall panel infill to inside of Kingspan panels and wall girts above
Ceiling	Prefinished fabric-faced polyester insulation panels fixed to undersides of roof purlins
Doors	Solid GRP door sets, warranted for use in wet areas, with factory-fitted hardware Kick plates 920mm clear opening Glazed aluminium frame doors as part of curtain walling Solid-core composite aluminium doors to back-of-house areas
Sanitary	Pool-side timer sports showers
FF&E	Lane ropes Halfway, false start and backstroke markers Pool safety signage Drinking fountains Stainless-steel handrails, mirror polished, Grade 316 Accessible hoist, mobile unit Timing equipment Scoreboards Lockers (open-sided and lockable)

POOL CHANGE AREAS

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Non-slip resin floor Laid to 1:40 fall to slotted floor drains Underfloor hydronic heating to change rooms (this is a preferred solution in cold climates, ie, climate Zone 3)
Skirting	Coved resin 150mm high
Walls	Paint-finished fair-faced concrete blockwork, 140mm thick, core filled to change areas Ceramic wall tile on waterproof system to shower areas and behind vanities
Ceiling	Prefinished fibre-cement sheets on galvanised or timber ceiling framing with seismic bracing, flush-stopped with movement joints
Doors	Solid GRP door sets, warranted for use in wet areas, with factory-fitted hardware Kick plates 920mm clear opening preferred
Cubicles	13mm compact laminate toilet and shower partition system complete with door stops and coat hooks
Benches	100% recycled plastic slats Brushed finish three sides 140x35mm, three slats wide Pencil arise all exposed edges Powder-coated steel cantilevered bench brackets at 600 centres Coat hooks at 300 centres on compact laminate rail above benches
Vanities	Compact laminate vanity Grade A safety mirror
Sanitary	Airblade-type hand dryers, wash-hand basins, WC pans with flush valves, and timer sports showers
FF&E	Fold-down baby change table in family change rooms Soap dispensers Sanitary bins Lockers (lockable) Pace clocks Cleaning machines

ACCESSIBLE CHANGE ROOM, TOILETS AND SHOWER AREAS (UNISEX)
REFER TO SPORT NZ ACCESSIBILITY DESIGN GUIDE AND SELF-ASSESSMENT CHECKLIST

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Non-slip resin floor Laid to 1:40 fall to slotted floor drains
Skirting	Coved resin 150mm high
Walls	Wet room Ceramic wall tile on waterproof system
Ceiling	Prefinished fibre-cement sheets on galvanised or timber ceiling framing with seismic bracing, flush-stopped with movement joints
Doors	Solid GRP door sets, warranted for use in wet areas, with factory-fitted hardware Kick plates 920mm clear opening
Cubicles	13mm compact laminate toilet and shower partition system
Benches	Accessible fold-down shower bench
Sanitary	Accessible standard hand dryers, wash-hand basins, WC pans with cisterns, and adjustable shower rose, lever and grabrails
FF&E	Electric ceiling hoist fixed to structure Adjustable-height, stainless-steel wall-mounted bed Curtain track to change area for privacy Coat hooks 1,050-1,400mm above finished floor level

POOL STORAGE

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Non-slip resin floor Laid to falls to floor drain
Skirting	Coved resin 150mm high
Walls	Paint-finished fair-faced concrete blockwork, 140mm thick, core filled to change areas
Ceiling	No ceiling Concrete sealer or insulation may be required
Doors	Solid GRP door sets, warranted for use in wet areas, with factory-fitted hardware Kick plates
FF&E	Durable shelving

POOL CONTROL ROOM

ITEM	GENERIC DESCRIPTION
Floor	Vinyl coved skirting Falls to floor drain
Walls	Paint-finished fair-faced concrete block or precast Internal glazed aluminium partition system for viewing into pool hall
Ceiling	Prefinished fibre-cement ceiling tiles in proprietary suspended ceiling grid, seismic braced
Doors	Glazed aluminium doors
FF&E	Durable shelving Lockable wall cupboards Workstation and computer linked to the BMS and pool controls Note: VESDA fire-detection system should not terminate in the pool control room due to acoustic noise issues, so consider terminating in plant room instead

FIRST AID ROOM

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Vinyl coved skirting Falls to floor drain
Walls	Paint-finished fair-faced concrete block or precast
Ceiling	Prefinished fibre-cement ceiling tiles in proprietary suspended ceiling grid, seismic braced
Doors	Glazed aluminium doors Clear opening large enough to take mobile bed
FF&E	Wash-hand station Mirror Adjustable-height bed First aid cabinet Storage unit

CLEANERS' STORAGE

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Vinyl coved skirting Falls to floor drain
Walls	Paint-finished fibre-cement panels, waterproofed as required
Ceiling	Prefinished fibre-cement ceiling tiles in proprietary suspended ceiling grid, seismic braced
Doors	Solid-core timber door set Paint-finished
FF&E	Bucket sink and taps Storage shelves to 2 sides Full-height storage cupboards

INDOOR SPORTS COURT

ITEM	GENERIC DESCRIPTION
Floor	Polyurethane, cushioned, rubber sheet system, 9mm thick, on concrete floor slab Tolerance +-3mm over 3m
Skirting	Painted timber
Walls internal below 2.55m	18mm water- and boil-proof ply phenolic-coated or plastic laminate-faced rebound boards to provide rebound surface Stainless-steel countersunk screws Vertical board joints to be continuously supported by strips of 18mm ply to prevent edge depression
Walls internal above 2.55m	Prefinished fabric-faced polyester wall panel infill to insides of Kingspan panels and wall girts above
Ceiling	Prefinished fabric-faced polyester insulation panels fixed to undersides of roof purlins
Doors	Solid-core timber door sets, with glazed sidelight or vision panels Paint-finished
FF&E	Cast-in floor sockets for sports equipment posts Fold-down, ceiling-mounted, adjustable-height basketball hoops Drinking fountains Shot clocks Scoreboards

DRY SPORTS STORAGE

ITEM	GENERIC DESCRIPTION
Floor	Dust inhibitor on concrete floor slab Floor drain
Skirting	Painted timber
Walls	Paint-finished precast concrete or fair-faced blockwork
Ceiling	No ceiling Underside of roof sheet
Doors	Oversize up and over or roller shutter doors to external delivery area and sports courts
FF&E	Mesh storage netting to subdivide space

DRY CHANGE

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Vinyl coved skirting Falls to floor drains
Walls	Paint-finished fair-faced blockwork Ceramic tiles over waterproofing system over fibre-cement board to wet areas
Ceiling	Prefinished fibre-cement tile in proprietary suspended ceiling grid, seismic bracing in hygiene-critical areas Acoustic wall or ceiling panelling on seating areas
Doors	Oversize up and over or roller shutter doors to external delivery area and sports courts
Cubicles	13mm compact laminate toilet and shower partition system complete with door stops and coat hooks
Benches	100% recycled plastic slats Brushed finish three sides 140x35mm, three slats wide Pencil arise all exposed edges Powder-coated steel cantilevered bench brackets at 600 centres Coat hooks at 300 centres on compact laminate rail above benches
Vanities	Compact laminate vanity No-mist Grade A safety mirror
Sanitary	Airblade-type hand dryers, wash-hand basins, WC pans with flush valves, and timer sports showers
FF&E	Soap dispensers Sanitary bins

DRY ACCESSIBLE CHANGE
REFER TO SPORT NZ ACCESSIBILITY DESIGN GUIDE AND SELF-ASSESSMENT CHECKLIST

ITEM	GENERIC DESCRIPTION
Floor	Designated wet floor Non-slip resin floor Laid to 1:40 fall to slotted floor drains
Skirting	Coved resin 150mm high
Walls	Wet room Ceramic wall tile on waterproof system
Ceiling	Prefinished fibre-cement sheets on galvanised or timber ceiling framing with seismic bracing, flush-stopped with movement joints

Doors	Solid GRP door sets warranted for use in wet areas, with factory-fitted hardware Kick plates 920mm clear opening
Cubicles	13mm compact laminate toilet and shower partition system
Benches	Accessible fold-down shower bench
Sanitary	Accessible standard hand dryers, wash-hand basins, WC pans with cisterns, and adjustable shower rose, lever and grabrails
FF&E	Fold-down baby change table Electric ceiling hoist fixed to structure Adjustable-height, stainless-steel wall-mounted bed Curtain track to change area for privacy Coat hooks 1,050-1,400mm above finished floor level

HEALTH AND FITNESS CENTRE

ITEM	GENERIC DESCRIPTION
Floor	Heavy-duty commercial carpet tiles on cushion system Resilient rubber on cushion mat in weights areas
Skirting	Painted timber
Walls	Precast-concrete, clear-sealed pinboards Feature screens
Ceiling	Prefinished fabric-faced polyester acoustic panels fixed to underside of exposed trapezoidal metal roof tray
Doors	Access control to health and fitness centre main entry doors High-performance acoustic glazed aluminium partition and door system between programme rooms and fitness station areas
FF&E	Membership card software/interface system Drinking fountains Benches Fitness station equipment Weights area equipment Storage racks Other miscellaneous equipment (mats, balls etc) Mirror, full height to one wall Point of sale

INTERNAL PLANT ROOM

ITEM	GENERIC DESCRIPTION
Floor	Sealed concrete floor Falls to slot drain typical Main switchboard (MSB) room has removable grate floor for access to below-ground trench
Walls	Precast concrete clear sealed
Ceiling	No ceiling
Doors	Roller shutter doors to main pool plant Note: fire and/or smoke rating is typically required around the MSB room and sprinkler valve room
FF&E	Eyewash station Workbench and chair for water test station

SPECTATOR SEATING

ITEM	GENERIC DESCRIPTION
Pool hall	100% recycled plastic slats to form benches Brushed finish three sides 140x35mm, three slats wide Pencil arise all exposed edges
Indoor sports courts	Mobile timber bench units

Notes: the lower rebound wall construction has been taken to a height of 2.55m to accommodate a recommended clear door height of 2.5m to the sports hall and pool hall stores and change rooms.

External finishes, materials and systems

POOLS AND POOL HALL

ITEM	GENERIC DESCRIPTION
Pool tanks	Pools and balance tanks (base and sides) insulated with 100mm XPS (extruded polystyrene) (R value = 3.7m^2K/W)
Concourse floor	All slab edges insulated with 100mm XPS (R value = 3.7m^2K/W). Concourse floor uninsulated
Glazing	Curtain walling in European thermally broken aluminium frame, powder-coated finish. Double-glazed, low-E, argon-filled, warm edge spacers, double-glazing units (DGUs). (U value for system = 2.2W/m^2K) External powder-coated aluminium solar control louvres and electrically operated internal blinds to glazed areas
Walls	Precast concrete panels with external composite insulated panels (R value = 5.15m^2K/W) to plant room shared wall (full height) or glazing. Refer elevations Composite insulated panels (R value = 5.15m^2K/W) with poolsafe paint coating on LVL wall girts
Roof	Glulam portal structure with LVL purlins. Composite insulated panels (R value = 5.36m^2K/W)

Roof lights	Roof lights in European thermally broken aluminium system, powder-coated finish. Double-glazed, low-E, argon-filled, warm edge spacers, DGUs (U value for system = 2.2W/m^{2}K)
Gutters and rainwater system	External proprietary gutter with snowstraps
Roof access	Proprietary roof-access and fall-restraint system

SPORTS HALL

ITEM	GENERIC DESCRIPTION
Glazing	Double-glazed, low-E units in thermally broken aluminium curtain wall suite (U value for system = 3.0W/m^{2}K) to 2.7m high. Provision for external solar control blinds to control glare
Floor	Concrete floor slab on 2 layers of damp-proof membrane on sand blinding on compacted hardfill (refer structural report) All slab edges insulated with 100mm XPS (R value = 3.7m^{2}K/W) to min 500mm below ground level. Floor uninsulated
Walls	Composite insulated panels (R value = 5.15m^{2}K/W) with poolsafe paint coating to walls above on LVL wall girts
Roof	Glulam portal structure with LVL purlins. Composite insulated panels (R value = 5.36m^{2}K/W)
Roof lights	Multi-wall polycarbonate roof light with UV and glare control integrated into composite roof panel system
Gutters and rainwater system	External proprietary gutter with snowstraps
Roof access	Proprietary roof-access and fall-restraint system

FRONT-OF-HOUSE AREAS (FITNESS, ADMIN, OFFICES, CAFÉ, CHANGE ROOMS)

ITEM	GENERIC DESCRIPTION
Glazing	Double-glazed, low-E units in thermally broken aluminium curtain wall suite. (U value for system = 3.0W/m^{2}K.) Fixed external louvres and user-controlled internal blinds to control glare
Floor	Concrete floor slab on 2 layers of damp-proof membrane on 100mm XPS insulation on compacted hardfill; refer structural report (R value = 3.7m^{2}K/W). Underfloor hydronic heating to change room areas All slab edges insulated with 100mm XPS (R value = 3.7m^{2}K/W). Concourse floor uninsulated
Walls	Precast concrete sandwich panels with retarded exposed-aggregate pattern. 150mm structural skin/100mm XPS insulation in sandwich, 100m architectural wythe (R value = 3.7 m^{2}K/W)
Entrance canopy	Entrance canopy to signify point of entry for wayfinding and provide covered area for pick-up and drop-off
Roof	Warm roof system. Single-ply roofing membrane on USG Securock roof board on 100mm rigid PIR insulation board on vapour barrier on trapezoidal metal tray liner between steel rafters. (R value = 4m^{2}K/W)
Gutters and rainwater system	Internal membrane gutter with piped overflows
Roof access	Proprietary roof-access and fall-restraint system if required

BACK-OF-HOUSE AREAS (PLANT, MSB ROOM, STORAGE)	
ITEM	GENERIC DESCRIPTION
Floor	Sealed in-situ concrete floor with channel drain
Walls	Precast concrete panels with external composite insulated panels (R value = 5.15m^{2}K/W) to plant room shared wall (full height). Dust inhibitor to precast concrete walls
Roof	No ceiling Underside of roof sheet
Roof access	Proprietary roof-access and fall-restraint system and access stairs to upper plant deck. Roof walkways where maintenance access is required to prevent damage to roof
EXTERNAL WORKS	
Carparking and access road	Carparking and access roads to include all necessary drainage, kerbs, edgings and dropped kerbs for wheelchair access. To be to the specification of the civil engineer. To be constructed capable of taking vehicular loads from all vehicles likely to access the site, including emergency services, pool chemical deliveries and waste collection
External paving generally	Epoxy-bonded gravel including inset concrete sets and concrete slabs with drop kerbs and other features to Sport NZ accessible facilities standard
Soft landscaping generally	Native grasses and shrub planting and grassed areas
Hard landscaping generally	New external walls and retaining walls as required by proposed development and existing ground levels
Lighting generally	External illumination of vehicular and pedestrian-accessible areas utilising lighting columns of type and size to suit location. All lighting levels to be subject to the approval of the local authorities
Other requirements	Covered cycle parking with provision for securing cycles using stainless-steel D stands

Acoustic Design Criteria

Reverberation Time Design Criteria

The reverberation times of spaces within a community sports facility should be designed to achieve the criteria presented in the following table. These are largely based on the guidance provided in AS/NZS 2107:2000 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors.

Recommended Occupied Reverberation Times for Community Sports Facility Spaces

SPACE	OCCUPIED MID-FREQUENCY* REVERBERATION TIME(S)
Sports hall (<10,000m^3)	<1.5
Pool hall (<10,000m^3)	<2.0
Fitness room	<1.0
Foyer/entry area	0.6-0.8
Café	<1.0
General office areas	0.4-0.6
Private offices	0.6-0.8
Toilets and change rooms	N/A

* Mid-frequency refers to the average reverberation time in the 500Hz and 1,000Hz octave bands. The reverberation time at lower frequencies (125Hz and 250Hz octave bands) should be no more than 25 percent higher than the tabulated value.

Location of Sound-Absorbent Materials

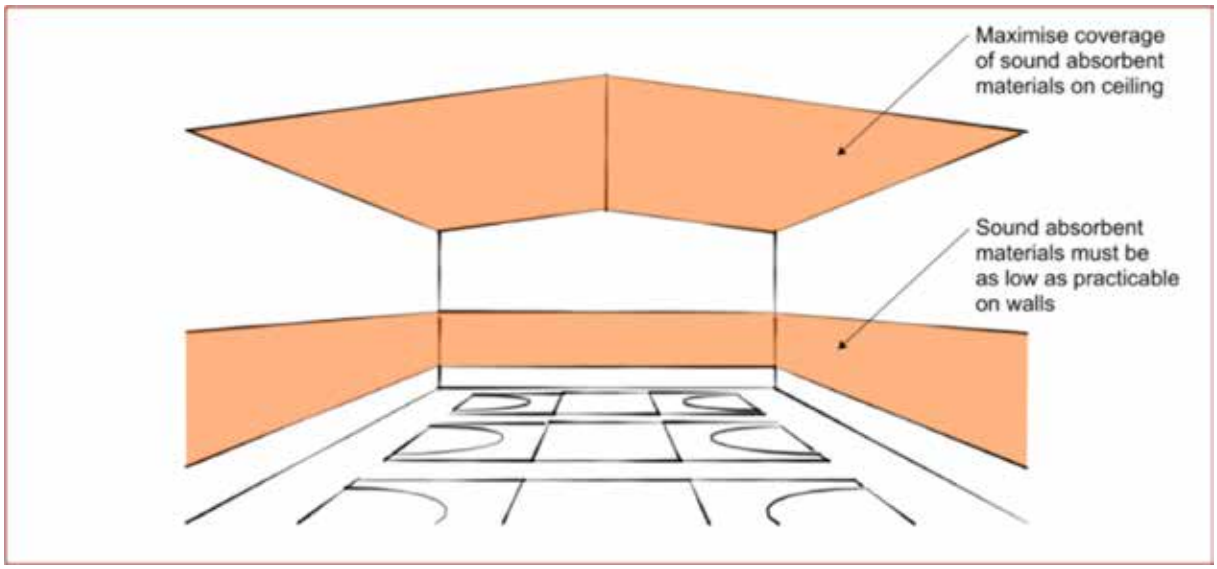
The location of sound-absorbent materials within a room is important. If there are large areas of acoustically hard parallel surfaces, flutter echoes can occur, significantly increasing the reverberation time and reducing speech intelligibility further. A strategic distribution of sound-absorbent materials will reduce this effect. Designing the space with non-parallel or diffusive walls in conjunction with sound-absorbent materials can also reduce this effect.

The ability of a material to absorb sound is commonly classified by a single number rating between 0 and 1 called the noise reduction coefficient (NRC). Sound-absorbent materials with an NRC rating of 0.7 or higher should generally be used where acoustic treatment is required.

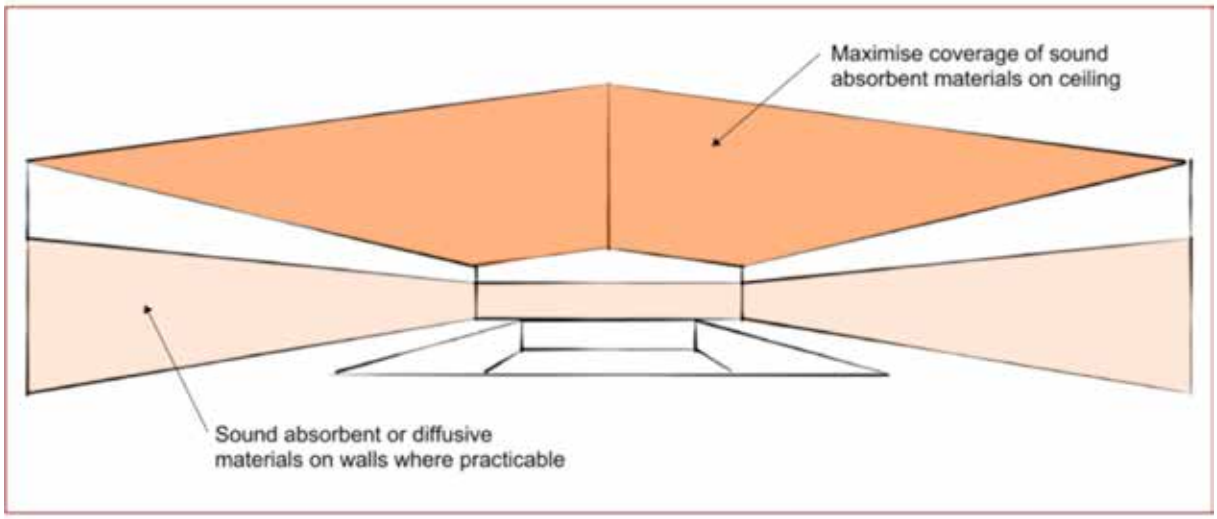
It is important for at least one out of each parallel pair of surfaces in a hall to include sound-absorbent materials (refer the figures below). To achieve the recommended reverberation time, the sound-absorbent materials should cover as much of the ceiling as possible (ie, >80 percent). In addition to the ceiling treatment, it is essential that sound-absorbent materials are located as low as practicable on the walls so that they are as close to the occupied zone as possible. Durable, impact-resistant, sound-absorbent materials should be used in these areas where practicable. Suitable products include perforated panels with a sound-absorbent backing, plush pile carpet and specialty impact-resistant acoustic panels. The wall coverage of sound-absorbent materials is dependent on the design of the space and would be determined by the project's acoustic engineer.

In pool halls where the placement of sound-absorbent materials on walls is often not practicable, the ceiling coverage and NRC rating of the absorbent materials should be as high as possible (eg, NRC ≥0.8 material with ≥90 percent coverage).

Recommended Locations of Acoustic Treatment Areas in a Sports Hall



Recommended Locations of Acoustic Treatment Areas in a Pool Hall



Internal Noise-Level Design Criteria

Elevated levels of noise within a community sports facility will cause greater masking of speech and therefore decrease intelligibility. It is possible to speak louder but this effect is limited and can also lead to voice strain. It is therefore important that internal noise levels from mechanical ventilation/building services' noise and external noise intrusion be designed to achieve the following criteria.

Recommended Internal Noise-Level Criteria

SPACE	INTERNAL NOISE LEVEL FOR MECHANICAL VENTILATION/ BUILDING SERVICES' NOISE AND EXTERNAL NOISE INTRUSION* (DB LA_{EQ})
Sports hall	45-50
Pool hall	45-50
Fitness room	45-50
Foyer/entry area	40-50
Café	45-50
General office areas	40-45
Private offices	35-40
Toilets and change rooms	50-55

* Applicable with windows closed. Rain noise levels within the room should be no greater than 5dB above these criteria, based on the average maximum rainfall rate during a five-minute period, per month.

In addition to achieving the above design criteria, it is important that the mechanical ventilation and building services systems are designed so that noise does not contain tonality, impulsiveness or significant low-frequency sound energy.

It is also important that noise levels in office areas and change rooms are not too quiet, ie, significantly below the lower range of the internal noise-level design criteria, as this has the potential to introduce speech privacy issues. If the mechanical ventilation and building services systems do not generate sufficient noise in these spaces, an electronic sound-masking system may be required to achieve adequate speech privacy.

Other Considerations

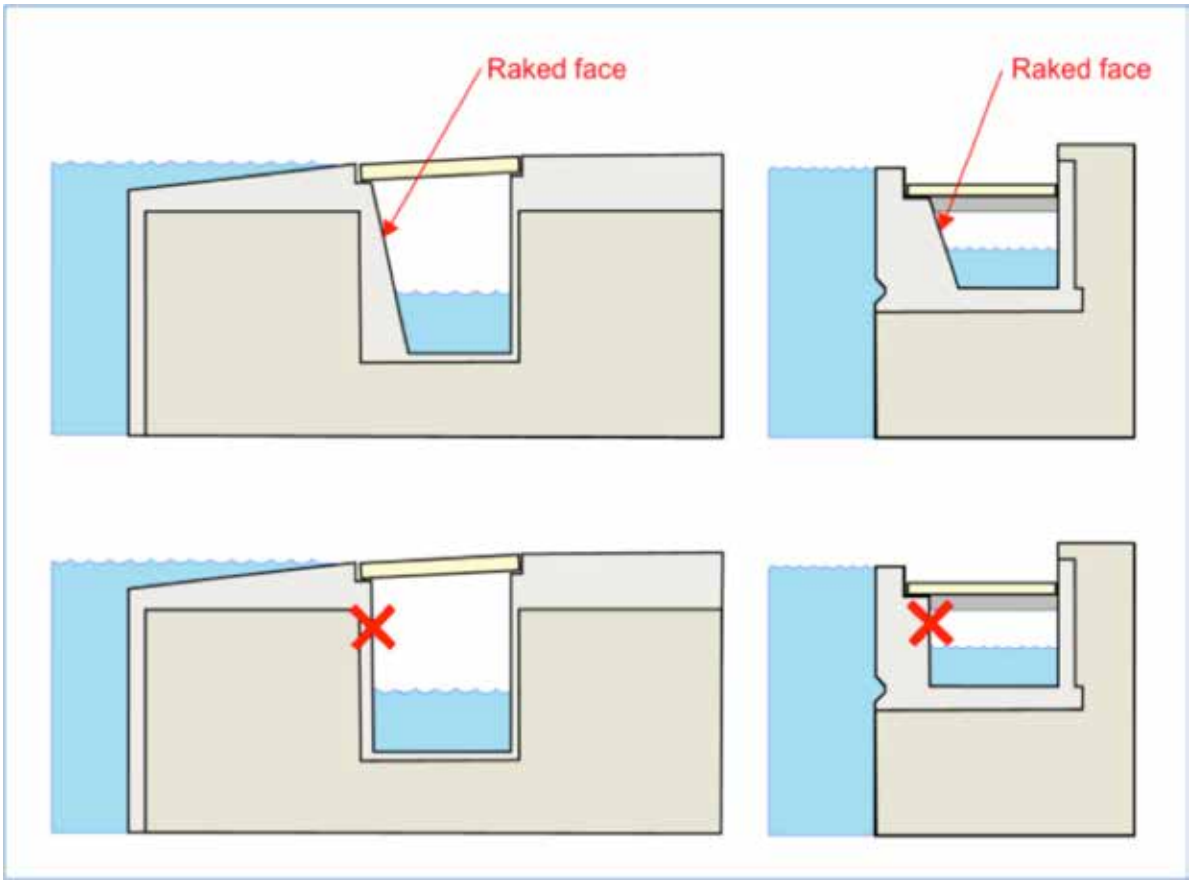
- Rain Noise

Noise generated from rainfall has the potential to create disturbance and significantly reduce speech intelligibility within a space if the roof-ceiling system is not designed appropriately. The average maximum rainfall rate during a five-minute period, per month, should be used to determine the performance required to achieve an internal noise level within 5dB of the criteria provided in the above table. This average maximum rainfall rate will vary depending on the location of the proposed community sports facility, and therefore roof-ceiling system requirements must be determined on a case-by-case basis. Additional roof sarking materials are generally used to reduce rainfall noise within a space. In the case of roof lights, secondary glazing with a large air cavity is often necessary.

- Pool-Edge Noise Generation

The sound generated by pool-edge drainage systems can generate significant unwanted noise, making for an uncomfortable environment and impeding speech intelligibility. In this situation, noise is generated where water from the pool edge free falls into the drain. A pool drainage system with a raked front face will allow the water to cascade from the edge of the pool into the drain as illustrated below:

Pool-Edge Noise Generation



- Sound Insulation Performance Design Criteria

To assist in the design process, an indicative partition sound insulation design matrix is provided in the table below. The recommended minimum sound insulation performance of partitions separating spaces is provided in terms of the weighted sound reduction index (Rw). Rw is measured in a laboratory and is commonly used by manufacturers to describe the sound insulation performance of building elements. The measured on-site sound insulation performance (apparent Rw) should be no more than 5dB lower than these values.

Airborne Sound Insulation Design Matrix (Rw)

PARTITION MINIMUM SOUND INSULATION PERFORMANCE (Rw)	SPORTS HALL/ POOL HALL	PLANT ROOM	DANCE/FITNESS ROOM	CHANGE ROOMS/ TOILETS	FOYER/ENTRY AREA/CAFé	OFFICES
Sports hall/pool hall	60	50	50	40	45	50
Plant room	50	N/A	45	40	45	60
Dance/fitness room	50	45	50	40	45	50
Change rooms/toilets	40	40	40	40	40	50
Foyer/entry area/café	45	45	45	40	40	45
Offices	50	60	50	50	45	45

In the case of a multi-storey sports facility, consideration must also be given to both horizontal and vertical impact sound transmission. This is especially where noise-sensitive spaces are adjacent to dance/fitness rooms or other rooms that include the use of treadmills, free weights or bouncing balls.

In general, offices, therapy rooms and other noise-sensitive spaces should not be located under gymnasiums or fitness or weightlifting rooms. Consultation with an acoustic expert is recommended to ensure building elements between spaces achieve a sufficient level of impact-isolation performance for the particular design and activities proposed.

Structural

Codes of Practice and References

The structural design shall be carried out in accordance with the Building Code and relevant design standards. The design standards include but are not limited to:

SUBJECT	CODE REFERENCE
General	• New Zealand Building Code
Loading	• AS/NZS 1170 Structural Design Actions • Part 0: General Principles • Part 1: Permanent, Imposed and Other Actions • Part 2: Wind Actions • Part 3: Snow and Ice Actions • Part 5: Earthquake Actions
Reinforced concrete	• NZS 3101 Concrete Structures Standard • NZS 4671 Steel Reinforcing Materials • NZS 3106 Design of Concrete Structures for the Storage of Liquids
Steelwork	• NZS 3404 Steel Structures Standard • Heavy Engineering Research Association (HERA) and Steel Construction New Zealand design guides (various)

SUBJECT	CODE REFERENCE
Timber	• NZS 3603 Timber Structures Standard • NZS 3604 Timber-Framed Buildings
Masonry	• NZS 4230 Design of Reinforced Concrete Masonry Structures
Corrosion protection	• AS/NZS 2312 Guide to the Protection of Structural Steel Against Atmospheric Corrosion by the Use of Protective Coatings • HERA Report R4-133 *New Zealand Steelwork Corrosion Coatings Guide*
Slabs-on-grade	• Concrete Ground Floors and Pavements for Commercial and Industrial Use, Parts 1 and 2, Cement and Concrete Association of New Zealand (CCANZ) and New Zealand Concrete Society

Structural Durability

Structural durability for new structures shall be in accordance with the relevant durability provisions of applicable material standards.

Corrosion Protection

Structural steelwork shall receive corrosion protection appropriate to performance requirements and exposure conditions and to suit the particular applications required. Particular attention is needed in relation to the structural steelwork in a pool hall. Performance requirements shall be based on a life to first major maintenance of 15+ years.

Importance Levels

Both the buildings shall be designed as importance level 3 buildings.*

Design Working Life

The design working life for all structures shall be 50 years.

Design Events – Probability of Exceedance

The sports hall, pool hall and pool tanks shall be designed for the following minimum design events, with the annual probability of exceedance determined in accordance with AS/NZS 1170.0.

IMPORTANCE LEVEL	LIMIT STATES	ANNUAL PROBABILITY OF EXCEEDANCE		
		WIND	EARTHQUAKE	SNOW
3	Ultimate	1/1,000	1/1,000	1/250
	Serviceability	1/25	1/25	1/25

The definitions and performance criteria to be considered at SLS and ULS are set out in AS/NZS 1170 for each design action as follows: Part 2 – Wind Actions, Part 3 – Snow and Ice, Part 5 – Earthquake Actions.

* The Building Code defines the significance of a building by its importance level (IL) which is related to the consequences of failure. There are five levels. Level 3 structures are those that may contain crowds, have contents of high value to the community or pose a risk to large numbers of people in close proximity.

Structural Robustness

Structures shall be tied together in both the horizontal and the vertical planes so that the structure can withstand an earthquake event without being disproportionally damaged. Section 6 of AS/NZS 1170.0 gives general guidance on provisions for structural robustness.

If poor or liquefaction-prone ground is encountered then it may be prudent to consider higher than Building Code minimum levels of design for serviceability, to limit the likelihood of time-consuming and costly repairs to the structure after a moderate earthquake event.

Low Damage Design

The adopted structural solutions shall take into consideration the principles of low damage design. In particular, for ULS events the design should limit structural member damage to localised, easily repairable elements, minimise non-structural damage, and also be durable and cost-effective.

Design Loadings

Permanent actions (dead load + superimposed dead load) and imposed actions including live load, wind, snow, earthquake, liquid pressure, ground water and earth pressure, shall all be determined in accordance with the relevant parts and sections of AS/NZS 1170.

Design loadings shall be determined for required serviceability and ULS return periods set out in Section 3 – Structural.

Seismic Actions

Seismic actions shall be determined in accordance with AS/NZS 1170.5 as noted above, with the following areas further highlighted.

General Seismic Requirements

The structures shall be configured with a clearly defined load path so that loads due to seismic actions together with gravity loads are capable of being transmitted into the ground in a predictable manner.

Where reference is made to USL earthquakes, these are defined as follows:

- Under the serviceability-level earthquake the building structure and non-structural components shall not require repair
- Under the ultimate-level earthquake the building shall be designed for life safety. The building may suffer significant damage, but the risk of collapse is appropriately low.

Site Hazard Spectra

The elastic site hazard spectra for horizontal loading, C(T), for a given return period are derived from the equation: $C(T) = C_h(T)\, Z\, R\, N\, (T,D)$

In the determination of C(T) using AS/NZS 1170.5 the following factors have been assumed:

- Site subsoil Class D
- Hazard factor Z = 0.3
- Return period R = 1.3 at ultimate level / = 0.25 at serviceability level
- Near fault $N(T,D)$ = 1.0
- Building period T = to be established by calculation

Structural Irregularity

The structural form should endeavour to avoid significant irregularities. Should a chosen structure be considered irregular in accordance with AS/NZS 1170.5, the appropriate design procedures shall be followed.

Serviceability Design Criteria

Under the SLS the building structure and non-structural components shall effectively be undamaged and not require repair. To meet these criteria, special attention shall be paid to design and detailing around all support structures.

The serviceability lateral and vertical displacement limits shall be based on Table C1 of NZS 1170.0. Specific attention should be paid to the detailing and interaction of non-structural and structural elements.

The serviceability requirements, including maximum crack widths for concrete pool tanks, shall be as per NZS 3106.

Alternative types of pre-engineered pool tanks shall be designed and detailed to avoid leaks at joints, damage to waterproof membranes and pool liners such as tiling, and permanent deformation of the tank shell.

Structural Systems

A brief description of the primary structural systems for each area of the reference facility is provided below. The structural system described is an example only for the reference facility, and other structural systems could be used, or may be considered more appropriate depending on site-specific conditions.

Sports Hall

- Superstructure
  - Structural steel portal frame spanning the length of the sports hall, allowing additional portal frames to be added should future expansion be considered
  - Steel cross-bracing provided at each end of the main portal frames between each of the portal columns
- Floor
  - Reinforced-concrete slabs-on-grade with chosen sports flooring applied on top
- Foundations
  - Shallow reinforced-concrete pad and strip footings under main structural elements

Pool Hall

- Superstructure
  - Timber glulam portal frames spanning full width of pool hall
  - Steel cross-bracing provided at each end of the main portal frames between each of the portal columns
- Floors
  - Concrete (together with pool tank) regular joints provided within the slab with waterproofing sealants and strips applied. Concrete includes additives to reduce shrinkage and improve watertightness
- Foundations
  - Shallow reinforced-concrete pad and strip footings under main structural elements

Pool Tank

- Structure
  - Reinforced-concrete, cast-in-place pool walls and slab, regular joints provided within the slab with waterproofing sealants and strips applied. Concrete includes additives to reduce shrinkage and improve watertightness

Ancillary Areas

- Superstructure
  - Structural steel roof rafters spanning each space from the portal frame columns
  - Steel cross-bracing or masonry block walls provided to give lateral resistance and to support roof rafters
- Floor
  - Reinforced-concrete slabs-on-grade with chosen sports flooring (or other typical flooring) applied on top
- Foundations
  - Shallow reinforced-concrete pad and strip footings under main structural elements

Mechanical HVAC Services

Indoor Design Conditions/Design Parameters

The indoor design temperatures proposed are listed below. The main plant will be selected to maintain these conditions at the designated external design conditions.

INTERNAL DESIGN CONDITIONS

	OCCUPANCY DENSITIES (M^2/PERSON)	WINTER TEMP MIN	SUMMER TEMP MAX	MIN FRESH AIR	PROPOSED SCHEME
Sports hall	(20 per court)	16	3-4°C above ambient	12L/s/person	Automated natural ventilation Electric radiant heating at high level
Dry storage	N/A	16	N/A	N/A	Mechanical extract
Fitness centre	4-5	18	24	20L/s/person	Split/VRF system Mechanical ventilation with heat recovery
Dry change	N/A	20	N/A	>6L/s/person (but no less than the extract air rate for wet change areas)	Heating via radiant panels Mechanical ventilation with heat recovery Extract via showers and WCs
Wet change	N/A	24-26	N/A	>6L/s/person (but no less than the extract air rate for wet change areas)	Mechanical ventilation with heat recovery Heating via warm air-ducted system
Admin/retail	10	22	24	10L/s/person	Split/VRF system Mechanical ventilation with heat recovery
Café	1-2	20	24	10L/s/person	Kitchen extract Split/VRF system Mechanical ventilation with heat recovery
Pool halls	N/A	28	28	Heating only	Heating only via roof-top packaged AHUs with air-to-air recovery

Utilities – Natural Gas (where available)

Where gas is available, a new connection to a local utility provider will be required, complete with new pipework and a new meter station/pressure regulator in a protective cage.

Within the building such gas will need to be reticulated to serve the café kitchen, gas-fired boiler and gas-fired radiant heaters etc.

Sports Hall

Natural ventilation will be provided through perimeter inlet louvres located on two sides of the building and roof-mounted ridge vents or high-level louvres in the façade.

Louvres and vents shall be provided with actuators and a ventilation control system, providing automatic operation to maintain temperature conditions and reduce overheating.

Heating will be provided through high-level electric radiant panel heaters.

Dry Stores

Mechanical extract ventilation via a roof-mounted fan will provide sufficient air change rates, with air being drawn in from the adjacent sports hall through internal wall or door louvres.

Fitness Centre

The fitness centre consists of the main gym room and a studio. A heat recovery AHU will provide a ducted outdoor supply along with an extract system. The AHU will be served via an LTHW heating coil from the central plant to provide final tempering of the air after the heat exchange process.

Local zone heating/cooling of each space will be provided via a VRF system or split DX systems. For this application, four-way ceiling cassettes are the most cost-effective.

Dry Change

This zone essentially forms part of the fitness centre and will be served by the plant described above.

Local heating will be via radiant ceiling panels. Although these are not an efficient source of heating, the capital cost is low and the annual heating demand is envisaged to be low for this space given it is an internal zone. Adjacent WCs will be provided with an extract system to draw air from the change rooms.

Admin Offices/Staff Room/Meeting Room

Local zone heating/cooling of each space will be provided via a VRF system or split DX systems. Smaller rooms will be served by one-way cassettes or hi-wall units, whereas larger spaces will be provided with four-way ceiling cassettes.

As this zone would operate typically during normal business hours, a separate heat recovery outdoor air system will provide outdoor air to these spaces.

Entrance Lobby/Foyer/Reception/Café Seating

Heating/cooling to the reception area will be provided via a VRF system or split DX systems. Owing to intermittent occupancy, a background level of outdoor air will be provided from the AHU serving the fitness centre and this will also provide make-up air for the WCs and kitchen extract. Localised zone heating/cooling of the reception space and café seating will be provided via a VRF system or split DX systems.

Café Kitchen

The café kitchen will be provided with mechanical extract ventilation and a stainless-steel kitchen hood. A roof-mounted fan with vertical discharge will be provided.

Plant Rooms

Fixed weatherproof louvres at high and low levels in the façade will provide air movement and reduce overheating.

Pool Hall HVAC Systems

Pool Hall Ventilation

The reference facility is based on a typical 100 percent outside air ventilation system, pre-heated, and a typical 100 percent outside air exhaust with heat recovery.

The total supply air quantity for the pool hall would be in the order of four to six ACH. Based on six ACH, the reference facility pool hall requires approximately 18m^3/s outside air.

The systems shall be designed so that the outside air intake quantity can be automatically varied, in response to pool hall relative humidity, from the minimum required to satisfy occupancy demands to 100 percent of the total air required for satisfactory ventilation of the respective pool hall.

The air-handling systems shall incorporate air-to-air heat recovery systems to transfer heat from the return air to the incoming outside air for energy use optimisation. The air-to-air heat recovery systems shall utilise plate-type heat exchangers.

Based on a location where natural gas is not available, a heat pump solution to heat the pool hall air is proposed.

An air distribution system comprising high-level ducted air supply and high-level return shall be utilised, with air throws and distribution designed to assist with the removal of DBPs from the pool hall and the minimisation of condensation on the façade, while keeping draughts to acceptable levels.

Particular care shall be taken in conjunction with the architect for the coverage of the roof structure to minimise condensation.

The preferred ductwork is lightweight textile ducts subject to the required throws being able to be achieved for effective air movement to minimise condensation and assist with the removal of DBPs.

The reference facility would require three roof-top packaged heat pump units complete with integral air-to-air heat recovery heat exchangers. The units will require specific anti-corrosion treatment to suit a pool environment. The units are required to be located outside, usually roof-mounted.

Change Room Ventilation

The change rooms require heated air for occupant comfort during changing and sufficient extract to remove odours and moisture from the change, shower and WC areas. The air would be heated from the common pool heating heat pump generating heating water.

A dedicated AHU, 1,200L/s capacity with heating only, will supply air to the change room. A dedicated exhaust fan will provide 1,200L/s exhaust air out of the room. Heat recovery could be incorporated into this system if a running cost analysis proves this worthwhile.

Pool Storage Ventilation

Ventilation to pool storage areas could be a mix of dedicated exhaust and some pool hall ventilation air from the main pool hall AHU.

Plant Room Ventilation

The pool water plant room should be ventilated via mechanical exhaust and outside air make-up. The electrical distribution board and control panels should be fitted with a proprietary pressurisation ventilation scrubber fan to protect electrical components from corrosion.

Hydraulic Services

Potable Cold Water Distribution for Domestic Purposes

The mains water should be supplied at a minimum of three to four bars at the point of supply. The water meters should be located in an underground chamber on hard surfaces at the site boundary. The incoming meter should be sized to supply potable water to the toilets and shower areas, and a separate dedicated meter and supply will be sized to serve the pool water treatment plant.

The cold water system would consist of:

- 100mm domestic cold water connections from the network utility supply system, each complete with a council water meter and RPZ (reduced pressure zone) -type backflow preventer
- 100mm fire cold water connections from the network utility supply system, each complete with a council water meter and RPZ-type backflow preventer

- Isolating valves, complete with appropriate backflow prevention for services' trades including mechanical, irrigation and fire hose reel system
- Pipework to supply the ablutions, header flush tanks, utility rooms, kitchen, café, plant rooms, building services, irrigation, hose taps, fire hose reel system and DHW plant
- Adequate provision around the complex of hose taps with vacuum breakers to serve grease trap areas, rubbish rooms, loading docks, plant rooms and roof wash-down
- Valved connections to each ablution (staff, public, teams, kitchens, laundry and first aid rooms).

The following water economy measures shall be incorporated into the design:

- Water-saving tapware, spring-loaded spray taps
- Reduced flow rate to the showers, push buttons with adjustable timers on all showers.

Domestic Hot Water Generation and Distribution

A DHW generation plant is to be provided to serve the shower areas and any retail or hospitality tenancies.

The hot water system would consist of:

- The DHW, pre-heated by the pool, heating the heat pump hot water to 40°C and then supplied to satellite hot water cylinders around the site. Suggest two 400L pre-heat cylinders
- An electric hot water cylinder and electric elements for the café tenancy. Suggest 180L with 6kW heating elements
- Electric hot water cylinders for local distribution to the showers, sinks, wash-hand basins and toilets in the facility.
- For the basis of this reference facility, a DHW storage volume of approximately 2,000-2,500L. Hot water would be pumped to all fixtures
- Branch pipes with flow meters, which will be provided to serve the individual tenant spaces to allow them to be metered and billed separately for DHW.

Consideration could be given to solar hot water boost heating, but this energy is weather/season dependent.

Stormwater Drainage

Surface-water drainage including rainwater outlets, hoppers, drains and gutters is to be provided to serve roof areas.

The stormwater system would consist of:

- Stormwater downpipes, outlets and overflows from main roof gutters and for canopies and decks
- Stormwater drains and heavy-duty rainwater outlets from walkway and concourse areas open to outside.

Sanitary Drainage

The internal sanitary drainage systems are to be designed to comply with local authority requirements and the local system network.

The sanitary systems are to operate by means of gravity serving all fittings from ground level. Soil/waste stacks with anti-siphon/relief vents are to collect discharges from all the fittings associated with the development. All vent pipes are to terminate through the roof and discharge to the atmosphere.

The sanitary drainage system would consist of:

- Drainage from ablutions, kitchens, tenancies, laundry, rubbish rooms, plant rooms and concessions
- Greasy waste systems to sanitary fixtures and appliances that discharge grease from areas within the complex from the kitchen (run to external below-ground grease trap located in an accessible location prior to entering the network utility system).

Pool Water Services

Materials and Protective Coatings

The materials and finishes shall be selected for satisfactory performance against the corrosive action of pool water and various pool chemicals, including due care for partially wet services.

Plant and Equipment

The plant and equipment shall be selected so that ongoing support for operation, maintenance and servicing can be assured and that the plant items have demonstrated performance in service in New Zealand.

Pool Water Recirculation Pumps

Recirculation pump sets shall be sized to deliver the required pool water circulation rate as well as the desired flow for effective backwash of the filtration system.

The minimum acceptable configuration for each pool shall be two identical end suction pumps complete with variable frequency drive control, with the capacity of each pump being 50 percent of the total design flow rate for the respective space, at the desired head.

Smaller water spaces such as spa and toddlers' pools may be provided with single pump systems.

Each pump shall be provided with a hair and lint strainer.

Pump sizes are:

- Main pool – two pumps (duty/standby), 60-70L/s each at approximately 300kPa
- LTS/leisure area pool – two pumps (duty/standby), 35-40L/s each at approximately 300kPa
- Spa pool – two pumps (duty/standby), 5-6L/s each at approximately 300kPa
- Toddlers' pool – two pumps (duty/standby), 5-6L/s each at approximately 300kPa
- Water features for LTS pool – 5L/s each at approximately 200kPa.

The water feature/play systems shall be generally water or air based or a combination and could include fountains, water spouts/jets, geysers (with air), air beds/bubblers, mini water slides etc.

These systems shall include the associated water and air reticulation, treatment, pumps, blowers, controls and feature/play equipment. These shall be flexible systems to allow adjustment for fine-tuning their performance.

Local and remote control facilities shall be incorporated to allow easy management by pool operators.

Pool Water Filtration Units

Units with benign filter media shall be chosen, utilising media with no known operator H&S risks. Where a regular addition of filter media is required, provisions shall be incorporated for the safe storage, handling, loading, introduction and disposal of the media, including necessary tank(s) with stirrer, material handling equipment, hood(s), ventilation etc.

Medium-rate, deep-bed pressure sand filters with air scour-assisted backwash are preferred for the particulate filtration of the pool water streams. The pressure sand filters shall have fibreglass shells with access manholes and inspection ports. The media bed depth shall be no less than 1,200mm with a free-board of no less than 600mm. The design and construction of the sand filters shall be so that they can be converted to multi-media types by a mere change of media. The filters shall be sized for a filtration rate of less than 25m/hr. Each filter unit shall be capable of being individually backwashed. Filters should be set up in a 'shunt backwash' configuration to allow the use of filtered water for backwash. Provision of equipment for automatic dosing of coagulant/flocculent shall be included, such as mixing tank(s) and dosing pumps.

Proposed filtration requirements for the facility are:

- Main pool – 6x1.4m diameter, vertical deep-bed sand filters
- LTS/leisure area pool – 4x1.4m diameter vertical, deep-bed sand filters
- Spa pool – 1x0.75m diameter, vertical, deep-bed sand filter
- Toddlers' pool – 1x0.9m diameter, vertical deep-bed sand filter.

Each filter shall be capable of being backwashed independently, with continued filtered and treated water supply to the respective water space, albeit at a reduced rate.

A common backwash retention system shall be provided with discharge at a controlled rate to trade waste to ensure compliance with the discharge rate limitations imposed by local authorities. The tanks shall be sized to permit backwash of at least two pool systems in a day. An alarm and pump interlock system shall be provided to prevent accidental overflow. The installation and tank discharge flow rate shall comply with the requirements of the local sewerage authority.

Disinfection and Water Chemistry Control

Fully automatic primary and supplementary water disinfection is to be provided to achieve compliant, satisfactory performance at all times. Chemical systems to enable proper chemical balance and pH will need to be selected to suit the disinfectant chosen.

Primary Disinfection

Primary disinfection shall be chlorine based.

Disinfection shall be based on the leased, on-site generation of 2.5 percent hypo complete with associated provisions for salt storage/handling, back-up hypo storage, 2.5 percent hypo storage tank, safety, ventilation etc.

Disinfectant dosing shall be controlled in response to continuous monitoring of the free available chlorine level in the water. The dosing pumps shall be of automatically adjustable capacity type and sized for peak requirement.

Necessary alarms for over-dosing or similar shall be incorporated.

Secondary Disinfection

Secondary disinfection is to be provided for the ability to reduce harmful DBPs and to kill parasites such as cryptosporidium.

A full-flow, medium-pressure, UV-based treatment for each water system is the preference. The UV units shall be modulating type with automatic control based on the combined chlorine level and shall be complete with automatic cleaning systems.

pH Control Including Water Balance

The facility for pH correction shall be designed to suit the chlorination method selected and be fully automatic in operation. For the proposed liquid-chlorine-based disinfection, the pH control is expected to be based on CO_2 gas.

To assist with ensuring a satisfactory water balance, a provision to allow controlled dosing of supplementary chemicals, including associated mixing tanks, dosing pumps etc, shall be incorporated.

The make-up water for normal operation shall be introduced to the balance tanks under an automatic level control with metering. Manual quick-fill control shall also be provided.

Provision for controlled water bleed for dilution shall be incorporated.

Pool Covers

Thermal pool covers shall be incorporated for the water spaces to assist with minimising evaporation and heat loss during non-use periods, such as nights. Pool covers shall be tough, tear resistant, non-permeable, non-toxic, UV stabilised and chemically resistant to pool water and chemicals, complete with reinforced edging. The covers shall be custom designed to suit the pool shape, orientation and storage arrangement. The design shall include suitable reels and a motorised winch(es) etc to enable easy handling for spreading over the pool before night and rolling back into storage in the morning by the pool operators. Dedicated permanent storage spaces shall be designed into the facility.

Pool Hydraulics and Pipework

The pool hydraulics system shall cover:

- Filtered-water return pipework from plant room to the pools/features with inlet nozzles/diffusers
- Soiled-water supply pipework from the wet decks to the balance tanks
- Extra low-level supply pipework from the pools to the balance tanks with pipework and control valves
- Pipework for water features, including associated pumps, air blowers etc
- Pipework interconnecting the various plant items, including respective balance tanks.

The function of the pool hydraulic system is to transport treated and filtered water from the treatment plant to the respective water space and back, and it should be arranged so that the water is continuously replaced in all parts of the pool. The system shall enable a thorough mixing of the treated and filtered disinfecting water with the water in the pool, discharging the pollutants by displacement.

Pipework and Valves

All pipework shall be suitable for handling chlorinated pool water, and therefore robust, non-metallic pipework is desired such as ABS PN12 with compatible fittings. Pipework for the transport of chemicals shall be selected to suit the material serviced, with any flexible tubing routed in conduit or similar for mechanical protection.

Valves shall be incorporated to facilitate isolation and balancing. Valves shall be located for accessibility complete with necessary safe access provisions.

Balance Tanks

The main pool and leisure/LTS pools will each require a balance tank – two in total. The balance tank would be located between the pool tank below the concourse.

Balance tanks shall be amply sized, taking into account bather displacement, wave action and backwash requirements. The sizing shall be based on recommendations of NZS 4441 and appropriate professional experience.

Each balance tank will require typically:

- Domestic cold water make-up water float valve
- Pump suction sump with pump anti-vortex suction plate
- Equilibrium float valve
- Trafficable sealed access hatch into balance tank from concourse complete with access ladder into tank
- Soiled-water return pipework from pool
- Vent pipes and remote level indicators.

It is imagined that the toddlers' and spa pools will be served by soiled-water return scuppers, negating the need for balance tanks.

Inlet Nozzles and Outlets

The nozzles and outlets shall be of non-metallic construction, typically plastics. The construction and installation shall ensure compliance with pool occupant safety requirements.

Location

Buried pipework (pipework not in accessible trenches or similar) shall be reinforced with the respective pool tank structure to minimise failure potential.

Ancillary Indications, Control and Monitoring

All necessary gauges, flow meters etc shall be incorporated to facilitate efficient and effective plant operation, including, but not limited to:

- Pressure gauges across all strainers, pumps and filter vessels
- Circulation flow measurement for each water space system
- Make-up water flow measurement of each water space
- Backwash discharge flow measurement for the facility.

Central control, monitoring and indication shall include touch-screen:

- Manual control of major equipment items, including water play equipment and hydroslides
- Changing of set points, start/stop programming etc
- Status indication of all major equipment, including faults, speed etc
- Flow rates for each of the circulation/make-up/discharge meters for each water space balance tank water level's and their water quality parameters such as levels of free available chlorine, combined chlorine and pH including Hi/Lo alarms
- Water space temperatures including Hi/Lo alarms
- Status and percentage operating capacity for the UV units
- Hi/Lo content for chemicals such as hypo and CO_2
- Backwash retention tank levels, including overflow alarm.

Pool Heating

A 500-600kW air-cooled heat pump will be used to generate heating water for the pool heating system. If gas is available at the site then a gas-fired boiler would also be a suitable heat generator. The heating capacity of the heat pump is dictated by the rate of returning the pool(s) back to operation from empty, ie, heating the filling pods.

LTHW heating water will be produced at 45-50°C and pumped throughout the building. The heat pump shall be selected so that it is able to produce condenser water at 50°C to allow for flexibility in the system in the future.

The heat pump would be located outside and heating water pumped throughout the building to:

- Four-plate heat exchangers for each of the four pools
- AHU serving the change room ventilation
- Pre-heat hot water storage for DHW
- Other ventilation heating AHUs.

The pipework should be welded schedule-40 steel pipework. The pumping regime could be primary-only duty/standby pumps in constant flow configuration with three-port control valves.

Each pool heating system shall also have the capacity and capability for quick pull-up of temperature after a full refill. The heat-up rate for larger pools is suggested to be in the 0.25°-0.5°C/hr range, while that for the smaller pools shall be such to allow heat-up in as little time as practical, to minimise operational down-time after refill subject to suitability from structural aspects.

Plate heat exchanger materials shall be selected to provide adequate protection against corrosion by pool water.

Electrical Services

Electrical Substations

Electrical substations will be provided to the facility and positioned as close as physically possible to the building or preferably integrated with the building. The substations will be designed to comply with the local lines company's design protocols. This is to ensure commonality of equipment types, rapid replacement should equipment failure occur, familiarity for local specialist high-voltage contractors, and flexibility for future change or expansion.

Each substation will consist of 11Kv ring main circuit breakers of a type commonly used by the local lines company's network. The ring main units will be configured so that spare switches could be integrated to enable aligned complexes to be constructed adjacent to the project.

The substation will be a minimum of one 500kVA; 11,000:400V oil-cooled transformers.

The substations will be two-hour fire separation from the main facility and will be located at ground level with 24-hour/seven-day access from the adjacent streets for the local lines company. For smaller facilities with a small electrical load, these could be external pad-mounted kiosks rather than a dedicated building.

400V Distribution Philosophy

Low-voltage distribution encompasses the distribution of electricity downstream of the substations outlined above. It includes the 400V main switchboards, diesel generation, the UPS, main and sub-main cabling, switchboards, and sub-circuit cabling as well as associated systems including earthing, metering, and power control and monitoring.

Major plant and equipment will be located above ground level within designated plant areas. This will ensure that plant and equipment can be accessed for service and maintenance while the facility is operational.

Primary horizontal cable access through the building will be provided through in-ground cable ducts, via ceiling voids, at high level above fitted-out areas and within service spaces. All routes will be designed to enable access for maintenance or future change with minimal disruption to the operation of the facility.

Vertical risers will generally be located adjacent to structural and other vertical building elements to minimise their impact on any future re-planning. Electrical equipment located at ground level will generally consist of:

- Main switchboards
- Central supply and distribution switchboards
- Distribution cabling
- A diesel generator(s), if deemed appropriate.

Space will be made available for future plant modifications and/or additions to support future facility upgrades or changes.

Distribution boards will be located within the areas that they serve and will be positioned to minimise the cost re-planning layouts. Note that planning constraints may require some distribution boards to be located outside the areas that they serve.

400V Main Switchboards

A 400V main switchboard will be provided adjacent to (preferably within 20m) of each substation to supply the facility/site. The main switchboards will be of fully Type Tested Form 4b construction configured in sections, with Castell keyed bus couplers linking the sections, where provided. Provision will be included for the synchronous connection (via the automatic transfer switch facility) of 400V diesel-powered generation up to 1,000kVA at the main switchboard.

Each main switchboard will have separate sections for:

- Safety systems – the safety systems bus shall be able to be supplied automatically from the diesel generation, whether temporarily or permanently installed
- General light and power
- Landlord services
- Tenancy services
- Specialist essential services.

Provision will be made within the main switchboards for future expansion of the facility, including spare capacity for possible 'moves and changes' within the facility. A minimum of 20 percent spatial capacity will be provided.

Power factor correction will primarily be provided at source (within the particular equipment) or within the major mechanical plant motor control centres. Additional power factor correction will be provided at each of the main switchboards for any remnant requirement. The power factor will be corrected to 0.95 as a minimum.

Transient/surge-protection devices will be provided at each main switchboard as part of an overall protection system for the facility as subsequently detailed.

Diesel-Engine-Driven Electrical Generation

From an operational perspective, there is no requirement for standby generation to provide emergency supplies to these types of facility in the event of normal mains power failure.

It is, however, a very common requirement for parts of these facilities to be able to be used as a post-disaster welfare centre (civil defence centre), in particular indoor courts. Should this be the case there will be a requirement for the provision of back-up generation to those key areas.

Furthermore, should any facility be proposed to have major events, eg, competitions in the pool hall or indoor courts, such generation would be required to be connected prior to a major event to ensure continuity of service for event-critical systems. Your professional consultant team should be asked if this is a requirement.

Portable standby generation connection points should therefore be considered at the main switchboard (the size to be determined by the proposed loads to be connected) and/or at locations to suit the supply primary event areas.

Temporary generator sets would be provided complete with integrated controls, daily service tanks and sound attenuation. The sets would be located adjacent to the main switchboards or the event area that they are supporting. Dedicated areas will need to be identified during the design to accommodate these.

The main switchboard shall be configured to enable the associated generator to provide supply to basic building systems such as selected lighting, critical ventilation, communication systems and security systems, and selected general-purpose power outlets.

To ensure that generators of the sizes required are available, strategic planning should be done to reserve them in advance and in accordance with the annual events calendar or major disaster. In some instances the operator may also choose to run generators during an event.

As an alternative to the temporary generator scenario outlined above, the option for permanently connected generator sets shall be investigated during the design stage where local lines networks operate demand-control periods. The investigation should consider the capital costs for the provision of such permanent generator sets against the electrical tariff benefits that would accrue.

This option would be based on generators permanently connected to the site main switchboard and configured to operate in both standby and synchronous modes. The option would include all aspects associated with a permanent generator installation, including the provision of sound attenuation, bulk diesel fuel storage, automatic transfer switchgear and exhaust, and resource consent considerations. In synchronous configuration the sets would start automatically in response to the line company's control period demand signal and operate to reduce site maximum demand.

Sub-main Cabling

Sub-main cabling will be installed from the main switchboards to the respective downstream switchboards.

Cabling will, wherever practical, be routed via in-ground cable ducts to vertical risers located at key positions throughout the building to ensure maximum flexibility to the main operational levels. Outside the in-ground cable ducts, cabling will be routed via ceiling spaces, service walkways and back-of-house service areas. Vertical access through the building will be provided adjacent to structural and other vertical building elements so as to minimise the impact on any future re-planning of layouts. Where a cable tray and ladder are used, consideration shall be given to its location and material used to prevent deterioration through corrosion.

Sub-main routes will be carefully designed to avoid proximity to areas susceptible to electromagnetic interference. Particularly sensitive areas will include: central communications equipment and primary distribution copper cabling, computer-intensive areas, audio visual and sound equipment and cabling, and outside broadcast cable pathways etc. The mitigation measures for any interference will consist of:

- Segregation – adequate distance between data and power systems
- Shielding – where segregation is not possible, cables will be shielded to minimise the effects of the electric and magnetic fields generated
- Cable installation configuration – single-core cables will be installed in trefoil to reduce the electromagnetic interference generated
- Equipment specification – equipment will be specified to have minimal harmonic content and influence on the power supply network
- Earthing – adequate earthing of all equipment and systems will help sink harmonics and other transients to earth.

Fire-resistant cabling will be installed in all safety services equipment as required by the fire engineering design. This is expected to apply primarily to supplies to lifts, smoke exhaust equipment and fire sprinkler pumps/protection equipment.

Cable types will be selected taking into account a number of factors, including the particular service or system being supplied, the proposed cable route, the sub-main length, load type etc.

Cables to emergency loads will generally be of the fire-resistant type while cables to general loads will be of the XLPE (cross-linked polyethylene) and PVC types. Where specifically required by the fire engineering solution, low-smoke and -fume cabling will be provided. Other cable types will be used as required to service any particular load requirements, ie, cabling to hazardous areas could be PVC/steel wire armoured/PVC.

Cable routes and support systems will take into account space and access for future cable installation. Routes will be coordinated with the other cabling contracts to ensure maximum compatibility of route types and methodologies.

Cable support systems will be colour coded to assist with future identification, maintenance and modification, ie, the support systems for the cable ladder and tray networks will be colour coded generally in consultation with the facility operator, usually as follows:

- High-voltage — Red
- 400/230V power and control — Orange
- Phones/data/security (access control) — Blue
- Fibre/co-axial — Brown
- Public address/emergency warning — Black

All cable support systems will be seismically braced to NZS 4191.

Distribution Boards

Distribution boards will be of the metal-clad cubicle pattern suited for both single- and triple-pole miniature circuit breakers. Separate lighting, power, controls and fuse distribution cabinets will be integrated as required with a typical distribution board.

Distribution boards will generally be located within the areas served and, specifically, in all tenancy areas. Locations will be chosen to provide flexibility for changes to area layouts and to allow ease of access for maintenance.

Fifty percent spare capacity (with reference to the number of miniature circuit breakers will be provided at distribution boards to allow for future expansion.

A series of dedicated and combined distribution boards will be provided for each operational, tenancy and plant area including:

- Leisure water area
- Multi-purpose pool area
- Fitness centre
- Support function area
- Reception
- Café
- Plant
- Storage
- Community courts
- Change facilities
- Health, fitness, and well-being areas (including studios)
- Function spaces
- Main facility street
- External areas (via external link/pillar boxes)
- Service tunnels (if provided).

Switchboards supplying the multi-purpose pool area and the indoor courts will be configured so that they can be supplied from either a temporary or a permanent diesel generation plant, to ensure that a robust back-up supply is available to these areas during important sporting and associated events.

A similar facility will be provided to the community court area so that it could be used as part of a post-disaster welfare/civil defence area if required.

Metering, Monitoring and Load Management

The metering to these types of facility is most likely to have a time-of-use and demand-based tariff structure for major consumers with local lines companies. Such tariffs are made up of various charges, a number of which are based on the kVA demand of the installation.

The incentive with such a charging system is to manage kVA demand in conjunction with the supply authority's demand profile. The ability to monitor and control demand should therefore form a fundamental part of the building/energy management system

It is envisaged that the features incorporated within the electrical systems to enable this monitoring and control will include:

- Energy retailer tariff metering
- Building area electrical metering
- Diesel generator control systems (if permanently installed)
- Lighting control and monitoring systems
- Automatic power factor correction.

The centralised monitoring, recording and control of the building load will be interfaced with the building management and control system.

It is envisaged that electricity retailer tariff metering will occur at 400V within the main switchboard (summation metering). The particular tariff structure will be negotiated for the facility by the operator, but is likely to include both time-of-use and demand components.

Check that metering will be provided to each electrical supply to monitor usage throughout the facility and for all key operational systems, ie, mechanical services plant rooms, all separate distribution boards, and lighting and power for all major areas.

Energy tariff meters will be provided to supplies that are intended for commercial use or lease arrangements.

Metering data will be automatically collected, collated and trended via specialist metering system software, with interface to the BMS for reporting and load management.

Uninterruptable Power Supplies

Uninterruptable power supply (UPS) units of nominally 30 minutes' duration at full rated load will be provided to support the following critical equipment:

- Central communications/data network equipment
- All communications/data network distribution frames equipment
- Security equipment, including closed-circuit monitoring and control equipment, and cameras
- Access-control-system monitoring equipment
- Cashier's equipment
- Critical front-of-house computers
- Building operational and maintenance system control equipment.

The access-control-system monitoring equipment will be provided with a UPS unit of eight hours' duration at full load.

The UPS shall consist of a combination of centralised units and distributed units, determined in consultation with the client by the professional consultant team and to suit the final locations of equipment.

General-Purpose Power Outlets

General-purpose switch socket outlets will be provided throughout the development. These will generally be of the flush-mounted pattern and located within office spaces, concessionaires, circulation routes and back-of-house areas for cleaning and servicing. Outlets will be supplied from the distribution boards serving the particular areas.

Outlet flush plates will generally be white, with red for UPS-supported outlets.

In the main, outlets will be provided with RCD (residual current device) protection. In particular, this will include outlets within public and wet areas.

Industrial three-phase, 32-amp, five-pin socket outlets of the PDL 56 series pattern will also be provided throughout all plant areas and as required for plant and building maintenance.

Cabling for electric vehicle charging points will be provided to locations within the carpark. This will be separately metered so that the costs associated with vehicle charging can be separately accounted for.

Outlets will also be located throughout the general carpark to enable connection to event and kiosk-style concessions.

Lighting

Lighting will be provided throughout the facility to meet the functional requirements of each area.

The lighting solutions will take into account the following philosophies:

- Interior illuminance levels will be in accordance with the recommended guidelines in AS/NZS 1680.0 and AS/NZS 1680.1, internationally recognised best-practice, and the requirements of applicable codes
- Lamp sources will be LED throughout – except where in specialist circumstances light fittings using LED technology are not available. Fittings installed within a common area will be provided with LEDs from the same manufacturing batch to ensure commonality of colour, temperature and performance
- Light fittings will be specially designed and constructed for LED lamp sources and will not have been adapted from fittings designed for other lamp types
- Light fitting types and installation locations will take into account maintenance requirements with respect to access (eg, no fittings would be located above pools), ongoing support, availability of spares etc
- Daylight harvesting shall be employed to maximise energy use, wherever possible
- Consistent with the architectural design concepts.

Exterior lighting performance will exceed the minimum performance requirements in AS/NZS 1158.3.1 Lighting for Roads and Public Spaces, AS/NZS 1680.2.1 and AS/NZS 1680.5 to ensure a safe, uniformly illuminated solution.

All exterior lighting that is not feature lighting (eg, carparks, walkways and security lighting) will be restricted to Type 6 luminaires in accordance with Table 2.10: Classification of Luminaires and Associated Criteria for Control and Glare and Upward Waste Light (AS/NZS 1158:3.1:2005). The lighting will be designed to comply with the requirements of the local authorities infrastructure design standards.

CPTED principles will be used during the design to ensure a safe external area is created.

The target illumination levels and uniformity throughout all external areas will be in accordance with lighting subcategory P6 of AS/NZS 1158.3.1, and spill light levels in compliance with the local authorities city plan 'glare' rules.

Event and Sports Lighting

Specialised sports floodlighting will be provided in accordance with the international recommendations as determined by CIBSE Lighting Guide 4 as required for international televised competition, competition, training and maintenance and as required following consultation with sporting bodies and organisations.

Sports covered in the design will include as a minimum swimming, netball, basketball, badminton, table tennis, health and fitness (ie, gymnasium and dance studios), movement and gymnastics.

A flexible and adaptable lighting system will be provided to the indoor court areas, particularly the event court and community court spaces, to meet the requirements of a variety of sporting and entertainment events.

A selection of pre-set lighting levels will be provided to ensure that the correct illumination is achieved for the selected event. The variety of pre-set lighting scenes will increase the flexibility of the spaces. Pre-set scenes will also include appropriate lighting for the set-up of events and post-event cleaning.

The sports lighting will be controlled by lighting control units located within the specific area and from the central control location. This system will allow the switching of various pre-sets with dimming facilities for events, and will be integrated with and control the lighting to associated areas. Emergency facilities will permit an operator to override the lighting system to provide full lighting in the event of an emergency.

Emergency and Exit Lighting

The emergency lighting and illuminated exit signage will be designed to comply with sections F6 and F8 respectively of the Building Code and the requirements of the fire safety design as outlined by the project fire engineer.

Particular emphasis will be placed on the fact that many of the spaces could have a large number of people present and that adequate lighting is a primary element in the management of panic in an emergency.

This system will be centrally computer monitored for ongoing reporting as part of building warrant of fitness requirements and to simplify maintenance.

The option for a system based on central batteries or single point units will be investigated during the design stage by the professional consultant team.
The investigation will review the pros and cons of each system, particularly with respect to availability for, and ease and cost of ongoing maintenance.

Where emergency lighting and illuminated exit signage are needed within tenanted areas, it will be a requirement that the fittings be part of the overall facility's centrally controlled and monitored system to simplify building warrant of fitness costs and processes.

Lighting Control

Lighting control will be integrated with the facility's operations using DALI (digital addressable lighting interface) technology in all light fittings.

Centralised control and programming will be possible for all light fittings.

Intelligent lighting control panels will be provided in strategic locations throughout the facility to enable local control of selected areas. These will be pre-programmed with scenes to suit the various operational modes of the areas.

Control philosophies will incorporate, where appropriate, a response to:

- The amount of available daylight – daylight harvesting
- Space occupancy – detection and control
- Facility operational status – open, closed, special event etc
- Facility emergency status
- Security level – minimal level for maintenance of building security
- Cleaning
- Special events
- Manual override.

Auto/off/manual override would be provided at local distribution boards to enable management staff to initiate lighting manually should communications with the central control system fail.

An interface will be provided to the building management control system to enable lighting control to be integrated with the overall facility status and control.

Lighting within tenant areas would be controlled as part of the tenants' own control systems.

Miscellaneous Electrical Systems

Earthing and Bonding

A main earth system will be provided for the electrical network. This would include the provision of earth mats, buried conductors, rods and connections to the main structural foundation reinforcing steelwork to provide for power system earthing in accordance with latest versions of the Electricity Regulations and AS/NZS 3000 Electrical Installations.

A supplementary and equipotential bonding system will be provided. All exposed and extraneous metalwork will be bonded to the earth system. Particular care will be required around the pool/wet areas.

A separate 'silent' earth system would be provided to all communications cabling hub panels, the main computer equipment room, specialist audio visual equipment locations, and other sensitive electronic services. This would typically consist of 25x3mm solid copper bars to provide the increased surface area required for the sinking of high-frequency transients. The power and silent earth systems would be connected by transient earth clamps at source.

All sub-mains and sub-circuits would be provided with earth continuity conductors.

Seismic Restraint

Seismic restraint of secondary systems and equipment will be particularly important throughout the facility, given its public nature and the potential number of occupants.

Electrical and ancillary systems will be seismically restrained in accordance with NZS 4219 Seismic Performance of Engineering Systems in Buildings.

Restraint systems will be coordinated between services within the building (electrical, mechanical, fire etc) to ensure commonality of support type and shared use, wherever practicable.

Particular attention will be paid to the provision of supplementary seismic support anchor points to allow for connections to specialist event equipment and systems.

Power Factor Correction

Power factor correction units will be provided at the main switchboard. The size of each unit would be determined following a power system survey upon the completion of the building. Particular features of the power factor correction equipment will include:

- Independently mounted units of robust, modular, metal-clad construction OR, if/where possible, incorporated into the main switchboard
- Provision by a specialist manufacturer
- Construction based on proven thermal performance
- Correction nominally to 0.95-0.96
- Harmonic blocking filters
- Intelligent monitoring and control utilising the communication network infrastructure
- Capacitor voltage rating suitable for modern harmonic-intensive environments
- Switching contactors designed for switching capacitor loads
- Prudent allowance for future expansion.

Lightning, Surge and Transient Protection

A lightning risk analysis, in accordance with AS/NZS 1768 Lightning Protection, will be undertaken once the final form and configuration of the facility are determined.

Irrespective of the outcome of the lightning protection risk analysis, surge protection will be provided to all main switchboards, sub-switchboards and local distribution boards based on a primary, secondary and tertiary protection strategy.

Specific sensitive or delicate electronic equipment will be provided with localised finer surge protection as part of the fit-out or FF&E.

General Noise Levels

The maximum design sound pressure levels from mechanical plant are detailed in the acoustic stage 4 (Build) page 170 of this document. Specific requirements will need to be confirmed with the various sporting bodies during the design stage.

Security

General

An integrated building security system is proposed. This system will incorporate security control and general surveillance of the building at strategic locations utilising a combination of access control, alarm monitoring, and closed-circuit television (CCTV) systems.

A central security room will be located in the building, preferably adjacent to the administration/back-of-house areas. The central security room will house the main security operations workstations and CCTV monitors, and will be combined with other monitoring facilities such as the fire control equipment and BMS.

A UPS unit will provide emergency power for no less than eight hours' duration at full load for all of the security systems.

Closed-Circuit Television

A CCTV system will be provided for general surveillance, through a combination of fixed and pan/tilt/zoom cameras, of the following areas:

- External site perimeter
- Carparking areas
- Building perimeter, including all entrances and exits
- Main lobby and internal street spaces
- Loading dock and service yard
- Reception/retail (cash sales) areas
- Entry/exit barrier systems
- Main public spaces.

All CCTV images will be archived onto a network video recording system. Storage capacity will be sized to enable the online retrieval of CCTV images for up to 31 days (based on recording all cameras at a minimum of 6fps). The system will be remotely accessible so that approved staff/personnel may access the network, eg, the Police to have access to external fixed cameras.

Image recording will be motion sensitive and incorporate vehicle- and face-recognition technology.

Access Control

An access control system will be provided to control movement into and within the facility. The control system will be configured to match the functional areas within the building and the various operational modes of the facility.

All perimeter entry and exit locations will be provided with access control in the form of proximity/pin-pad control. Cabling infrastructure will be provided to enable the retrofit of biometric control devices in the future.

Door contacts with alarms will be provided to monitor the status of all external doors, including emergency exits.

Motion detectors will be installed in places where it is necessary to monitor any movement after hours.

If vehicle barriers are provided to the carpark, these would be interfaced with the security control system.

Communications

Building Communications Cabling Network

The facility will be provided with a back-boned cabled communications infrastructure. A central communications network equipment room will be provided for the facility, which will function as the core for all communication systems. This will have the capability to be linked to other facilities operated by the same organisation via an external fibre network.

In addition to the main equipment room, the system will consist of communications frames located throughout the facility so that all areas of the building can be reached by a data cable no longer than 90m. In practice this will require a communications frame to serve zones of the facility no further than 60m away horizontally.

Each communications frame will be located within a room specifically designed for this purpose. All rooms shall provisionally be 5x4m, with the exception of the main communications network equipment room, which shall be 10x6m. The exact sizes of these rooms will be confirmed by the professional consultant team during the design stage.

In addition to the communications frames located within the building, external frames will be provided to ensure 'compliant' data is provided to services and equipment located within the carpark areas. The external frames shall be housed within weatherproof cabinets (nominally 1.2mWx0.8mDx1.2mH) located in the areas they serve.

A back-bone fibre-optic cable system will link the various distribution frames to the central communications equipment. The cabling will be configured so that there are a minimum of two physically diverse pathways to each distribution frame. A minimum of 12 core multi-mode fibres shall be provided to each frame.

Distribution cabling to outlets in the field will be configured using a home-run format and an unshielded twisted-pair (UTP) configuration of the latest approved category at the time of installation (presently Category 6A). Cable management within the distribution frames will be of VisiPatch configuration.

Consolidation points will be installed throughout the facility in access locations to provide flexibility for future change.

Wherever practicable, systems within the facility will use the communications cabling infrastructure to communicate and connect to end-of-line devices, rather than specialist, dedicated cabling.

Wireless provision shall also be provided, allowing for both public and private use.

Master Aerial Television

A master aerial television (MATV) system will be provided to enable TV signals to be received. The system will be provided with access to a minimum of two satellite providers (including SKY) as well as normal TV channels. The system will distribute multiple high-definition channels throughout the facility via the communications network fibre back-bone (dedicated fibre) to each of the communications frames. Distribution to final outlet locations will use UTP cabling. A facility for the future provision of fibre-optic cabling to outlet locations will also be made (conduit or blow-tube).

TV jack points will be provided in selected areas of the facility by the professional consultant team during the design stage.

Free-to-Air Channels

- The MATV system will allow for the distribution of all locally available free-to-air channels plus encrypted SKY analogue and digital signals.

In-house Channels

- In-house channels will be modulated and distributed to public areas through the MATV system to the following areas, allowing for sales and advertising broadcasts:
  - Reception/entrance lobby
  - Café area.

Public Address and Background Music System

General Operational Criteria

A public address and background music system will be provided for the facility to enable communication with users of the building and provide background music to selected locations. The system will incorporate a combination of central and distributed amplifiers with digital audio processing for all inputs and outputs.

The system will be zoned to suit the operational and functional spaces within the building, so that separate sound and voice announcements will be able to be distributed to each area. Specific zones will include:

- Leisure water pool
- Multi-purpose pool
- LTS pool
- Movement centre
- Central support area
- Reception
- Café (potentially integrated with a stand-alone system provided by the café)
- Indoor courts
- Health, fitness and wellness (one zone for each gym/studio
- Function spaces.

Subzones within each of the specific main zones outlined above will be provided with volume cutback facilities to enable the primary systems to be turned down, or off, to suit specific needs. For example, within the pool facilities, the following areas would be provided with volume cutback facilities:

- Spa, sauna and steam rooms
- First aid room
- Swim school pool office
- Change rooms.

Similar treatments would be provided within each of the main zones.

Audio and voice input points will be provided for each of the main zones outlined above to enable sound specific to the operational areas, eg, a gym instructor will be able to provide music specific to a given session from a portable audio device.

Generally, speakers will be at ceiling level, with specialist large area speakers for the major spaces, ie, sound spheres. Speakers will be located so that they are readily accessible for maintenance.

Hearing Augmentation

Hearing augmentation systems will be provided to all major public areas.

Emergency warning intercommunication system feeds will be broadcast to the hearing impaired.

Fire Services

Introduction

The protection from fire design for the proposed facilities shall be undertaken to meet the performance requirements of the Building Code. Compliance with the Building Code is expected to be achieved by applying the Acceptable Solutions C/AS4 and C/AS5.

These facilities will be designed to provide a multi-purpose community sport and recreation facility, which will be used by the general public and also be capable of hosting local and regional sporting events and competitions.

The overall fire design is to provide for the safety of occupants of these facilities using a combination of active and passive fire safety systems.

Design Standards, Guidelines, Codes of Practice

The design of the protection from fire for the facility will need to comply with the following Building Code clauses, standards and Code of Practice.

DOCUMENT	PURPOSE
C/AS 4, 5 and 7	Acceptable Solutions
NZS 4503	Hand Operated Fire-Fighting Equipment
NZS 4512	Fire Detection and Alarm Systems in Buildings
SNZ PAS 4509	New Zealand Fire Service Firefighting Water Supplies Code of Practice
NZ Building Code Clause F6	Visibility in Escape Routes
NZ Building Code Clause F7	Warning Systems
NZ Building Code Clause F8	Signs

The following fire safety systems are anticipated within the proposed facility.

Fire Detection and Alarm Systems

These facilities will require smoke-detection and associated warning systems throughout all covered areas. Thermal detection may be used in areas where smoke detection is susceptible to nuisance alarms. Fire-detection and alarm systems will comply with NZS 4512 and Clause F7 of the Building Code.

Exit Signage and Emergency Lighting System

These facilities will require emergency lighting to facilitate visibility in escape routes, and also escape route signage for wayfinding through all areas. Emergency lighting systems and exit signage will comply with Building Code Clauses F6 and F8, respectively.

Hand-Operated Firefighting Equipment

Hand-operated firefighting equipment in the form of portable extinguishers and fire blankets shall be provided in areas of specific risk, as appropriate, to comply with NZS 4503.

Water Supplies and Sprinkler Protection

The New Zealand Fire Service Firefighting Water Supplies Code of Practice (SNZ PAS 4509) shall be used to calculate the required firefighting water supply.

Sustainable Design

Introduction

The energy and sustainability strategy for the design, construction and operation of affordable sports facilities must be considered from the project outset.

It is important that the business case promotes sustainable design and includes both the tangible measurable benefits and the soft benefits to ensure that both capital costs and operating impacts are appropriately accounted for. All facilities have finite budgets and need to focus on dollar spend for best overall outcome. Pool facilities have significant energy use and operational costs, and environmental impacts – whole-of-life costing rather than capital costs should be the basis for deciding the most appropriate strategy, to focus on long-term overall value.

Sports centres with pools have a number of significant environmental impacts and are inherently high users of energy and water resources, with associated high operating costs. There is therefore scope to seek significant benefits from targeted energy-efficiency and sustainability measures.

Design Hierarchy

The design approach for swimming pools should be focused on achieving sustainable outcomes and energy savings in the most cost-effective and efficient manner. To achieve this, an integrated design approach using 'passive' measures to optimise the building and building envelope performance (such as optimising the building orientation and improvements to the form and fabric) should be applied before considering 'active' methods.

Fabric Performance

Thermal Transmittance

Part H1 of the Building Code provides the thermal transmittance (U value) criteria for building elements.

In the New Zealand climate, the indoor temperature of a sports centre is generally higher than the temperature outdoors. A large proportion of energy consumption in swimming pool buildings relates to heating the water in the pool tanks and the air in the pool hall. Therefore, to an even greater extent than in other building types, an optimised building fabric performance should be the first consideration with respect to reducing energy requirements and carbon emissions.

Design teams need to carry out their own calculations based on the specific form, fabric and systems used for each project. Computer simulations should be carried out to inform the comparison of options, and be the basis for decision-making.

Airtightness

Careful detailing to achieve a high level of airtightness is crucial, both for the external building envelope and between internal spaces with different design criteria.

In addition to this, and as part of the contractor's responsibilities, internal partitions between the pool hall and adjacent spaces should be specified under the same criteria, due to the energy consumption associated with air leakage. Also, the carry-over of air from the pool hall to adjacent spaces can cause issues with corrosion.

Condensation

The environment in a pool hall is hot and humid the year round, with humidity control most difficult in summer.

The design team needs to manage carefully the risk of condensation with attention to:

- Construction details, including removing cold bridges and sources of air leakage
- External glazing performance and air movement over glass
- Internal glazed partition performance, particularly between the pool hall and fitness suite
- Avoiding internal rainwater pipework
- Cavity wall design and vapour barriers to minimise the risk of interstitial condensation.

Design for Daylight

Natural light can make an important contribution to sustainability by reducing the electrical energy used for artificial lighting and also by providing passive solar heating. It can also contribute to the well-being of visitors and staff, as well as the feel of the spaces.

Location of Glazing and Glare

Location of Glazing and Glare

Glazing in the perimeter walls can provide users with pleasant views of outside areas and also help with wayfinding and promoting awareness of the facility from the outside. However, an appropriate orientation and placement of glazing is necessary to avoid the risk of glare to lifeguards. Building orientation and adjacencies can result in a compromise and elevations with north- and west-facing glazing may be unavoidable.

In this case, shading devices such as external louvres and overhangs, or internal light shelves or baffles, can be used to manage glare and diffuse direct sunlight. Solar-control glazing may also be required.

Windows that can be opened behind the pool-side seating can provide natural ventilation in summer, making the space more comfortable without requiring additional air-handling plant.

Roof lights generally provide a lower risk of glare from the pool-side areas due to the angles of reflection. They also provide the benefits of passive solar gain to the pool and a potential exhaust air path for natural ventilation in summer. A roof light area of approximately 15-20 percent of the pool hall should generally enable the above benefits to exceed the additional heat loss.

Translucent insulated panel systems can provide natural light with less heat loss than conventional glazing. However, the properties of these panels reduce the light transmission and solar gain, which can outweigh the benefits of the improved U value.

Ian Thorpe Aquatic and Fitness Centre

Minimising Energy Consumption

Larger Pools and Energy Consumption

A 50m pool will have a larger water volume, larger pool hall and therefore inherently higher energy consumption than smaller pools. Owing to the efficiency of support spaces and pool hall volumes, a 50m pool could achieve lower kWh/m^2 than two separate 25m facilities. However, energy consumption is strongly dictated by use and a 50m pool (equipped with booms and movable floors) will aim for intensive use and occupancy, with the following implications:

- The turnover rate, dilution water volume and associated energy consumption could be proportionally higher. Note: this would enhance viability for heat recovery
- The pool hall air change rate and associated energy consumption could be higher due to higher evaporation rates. Note: this would enhance the viability of incorporating options for natural ventilation in summer.

Essential Energy-saving Techniques

A range of essential energy-saving techniques for the indicative affordable pool designs have been allowed for within the cost plan. They are included for compliance with Part L of the Building Regulations and current construction and operating practice.

These measures include:

- AHUs with heat recovery
- Modulation of fresh air provided by the ventilation system
- Variable-speed drives on all pumps, for heating, domestic services and water treatment
- LED light fittings
- Sizing of ductwork for low specific fan power
- Daylight-linked dimming on lighting in well day-lit spaces.

Metering Strategy

By providing meters and sub-meters for energy-consuming plant and areas, the building operators are provided with information to enable them to manage the use of the spaces and minimise energy consumption.

Meters should be provided to align with NABERSNZ guidelines to measure:

- >95 percent of the annual energy consumption by use
- Output from any renewable energy generation
- Energy meters on the heating branch serving pool water heating.

The following sub-meters can also be considered for inclusion:

- Energy meter on the branch serving the coil(s) in the main AHU(s) serving the pool hall
- Electricity meter on the power supply to the water treatment plant
- Electricity meter on the power supply to the cooling plant
- Water meter on the power supply for the pool top-up.

Metering data should be logged automatically, incorporating a simple user interface to allow the building manager to view and export the data.

Water Conservation

The water consumption within aquatic facilities is significant and is required for showers, WCs, catering and the make-up of the swimming pool water.

The utility costs associated with the water supply are generally more modest than those for gas or electricity, leading to longer pay-back periods for water-saving technologies. However, many energy- and water-saving measures are interdependent and all benefits must be considered when looking at pay-backs.

Rainwater Recycling

Rainwater can be collected from rainwater pipes and directed into a storage tank. The following methods should be considered to improve the quality of the water:

- Leaf filtration
- Use of below-ground tank to allow sediment to collect (tank to be accessible for cleaning)
- Floating suction filter to collect water from the clean portion of the tank.

With the above filtration, rainwater may be suitable to backwash the pool filters and for irrigation of any pitches and soft landscaping.

If rainwater is to be used for WC flushing or pool top-up, further consideration is required of expectations about the visual appearance and risks to the public. UV filtration can be used to improve water quality, but the benefits should be weighed.

Greywater Recycling

For every bather 30L of water is recommended to be replaced from the pool, in order to control total dissolved solids. This water can be collected and recycled for WC flushing. The recycled pool water should not be stored for long periods of time (due to its elevated temperatures) and therefore break-tank sizes should be minimised.

Sustainability

Sustainability for the built environment is a wide-ranging subject and encompasses environmental sustainability and social/cultural and economic factors.

As a result the definition of a 'sustainable' facility is subject to some interpretation, but in each case the project needs to balance a number of key outcomes, including:

- Energy and environmental performance – is energy efficient and environmentally sensitive in construction and operation
- Safe and healthy – encourages active lifestyles and healthy environments and protects building users, staff and neighbours from potential hazards
- Functional – promotes functional and operational requirements
- Adaptable – has a design and philosophy to help accommodate alterations and changes in use and technology during the life of the facility
- Productive – achieves an attractive environment that encourages visitors and promotes user well-being
- User experience – provides an environment that attracts and sustains high levels of use and enhances marketing potential
- Aesthetics/appearance – provides an aesthetic and visual appeal that references local culture and that users can identify with
- Long-term value – is both affordable and offers tangible value during the life of the facility.

Sustainable Building Outcomes

Environmental Strategy

The overarching environmental strategy for the project should apply a reduce-reuse-recycle approach, which seeks to minimise resource inputs before overlaying and applying effective and efficient system selections. A typical strategy for a sports facility is outlined below:

Indoor Environment

- Promote a safe and healthy indoor and outdoor environment that attracts and sustains high levels of use

Energy

- Design to take optimum advantage of daylight, passive solar heating and passive ventilation while mitigating glare and unwanted solar gains in warm weather (heat pump performance will be enhanced with constant condensing temperature)
- Recover and reuse energy
- Optimise efficiency of heating energy sources and systems
- Plan for future renewables to be incorporated
- Metering strategy for monitoring and targeting

Lighting

- Natural light provides all necessary illumination to spaces during daylight hours
- Daylight control systems and low-energy lighting systems to optimise energy savings
- Long-life lamps and easy access for replacement
- External lighting is limited to that necessary for orientation, security and safety

Water

- Water consumption is minimised for pool and ancillary uses
- Design pool water treatment plant to allow for future installation of water recycling systems
- Monitor consumption and target improvements

Emissions

- Minimise water, waste, chemical odours, noise and light pollution from the site

Materials

- Select appropriate, environmentally preferable materials for long-term value

Transport

- Promote public transport and sustainable transport options.

EECA Assistance

EECA (the Energy Efficiency and Conservation Authority) provides financial assistance for energy efficiency in projects through its Crown energy efficiency loan scheme and also through its commercial building design advice programme. Project teams should review assistance available from EECA when carrying out an options appraisal.

Soft Landings

Soft Landings is a collaborative approach to delivering buildings that meet occupants' needs and allows the performance of the building to be optimised.

Commissioning bodies and design teams should collectively review the opportunities for a Soft Landings approach, in order to aim for a smooth handover and to get a building that operates as designed.

To aid the Soft Landings approach, in addition to the metering discussed above the BMS should enable the monitoring and logging of:

- Temperature and relative humidity in the pool hall at pool level and in spectator seating
- Visitor numbers.

For more information refer to *The Soft Landings Framework – Australia & New Zealand* document, which outlines how to implement Soft Landings in your scheme.

www.cibse.org/networks/regions/australia-new-zealand/the-soft-landings-framework-australia-new-zealand

STAGE 4: BUILD

Options Roadmap for Consideration and Inclusion

The following options are provided for consideration and potential inclusion. Many of these items are considered good or best-practice for energy-efficient and environmentally responsible design outcomes. Each project and each climate zone will have differing drivers and influences. The intention is that the options below are used as part of the project decision-making process to establish the most appropriate energy and environmental inclusions for each project.

Building Form and Planning

- Site and orientate the building for passive solar design and minimum energy use
- Provide effective wind lobbies or revolving doors to minimise heat gains and losses due to open doors
- Locate energy sources to reduce losses and plant rooms near loads
- Provide sufficient space for services to allow energy-efficient design and specification
- Size plant rooms for ease of maintenance and future replacement

Building Fabric

- Utilise 3D computer simulations to inform final specifications
- Consider minimum enhanced thermal insulation to external walls
- Consider minimum enhanced thermal insulation to external roof areas
- Consider minimum enhanced thermal insulation to exposed floor areas
- Consider thermal insulation to swimming pool walls and floor
- Specification to avoid thermal bridges and weak points
- Specification to minimise air leakage through the external envelope
- Finishes to roofs and façades to align with environmental strategy

Windows and Glazing

- Size and specify to provide economical balance of thermal, visual and view requirements – use computer simulations to inform final glazing specifications
- Consider roof lights for daylight
- Provide appropriate architectural solar shading to large glazed areas to limit glare and overheating
- Specify high-performance double glazing with thermally broken frames

Heating

- Consider geothermal heating
- Adjust seasonal set points to align with ambient conditions and use
- Provide heat recovery to pool hall exhaust and all large spaces
- Variable speed pumps match flow to suit the demand
- Insulate all pipework, valves and fittings to AS 4508 as a minimum
- Consider solar thermal contribution

Cooling

- Consider heat exchanger recovers energy (sensible + latent) from exhaust air, offering 'free' cooling to ventilation air or via heat pump to pool
- Insulate all pipework, valves and fittings to AS 4508 as a minimum
- Use 100 percent outside air whenever ambient conditions suit

Ventilation

- Control to minimum ventilation rates
- Provide increased ventilation rates to pool areas only
- Adjust ventilation rates based on indoor air quality
- Design fan/duct systems for low pressure loss
- Variable speed fans modulate airflow rate to suit demand

Lighting

- Select appropriate design levels for visual comfort and energy efficiency (AS 1680)
- Specify light-coloured interior finishes
- Provide roof lights and clerestory lights for day-lit interior spaces
- Maximise the use of low-energy LED technology
- Provide daylight compensation control
- Provide occupancy control
- Label switches clearly
- Select appropriate zone sizes to balance efficiency and flexibility
- Make it easy for users to understand the lighting design and operation

Domestic Hot Water Heating

- Consider heat pump water heating
- Insulate all hot water pipework to better minimum requirements

Pool Water Services

- Undertake backwashes based on pressure drop and programme them in a sequence
- Provide automated pool covers for use during after-hours periods
- Provide variable speed drives for pool water circulation pumps to ensure correct pump speed
- Provide appropriate pool water filtration
- Provide appropriate pool water disinfection
- Design for appropriate pool water flows and turnover rates, all in accordance with NZS 4441 as a minimum
- Select appropriate water temperatures for pool bodies
- Select appropriate air temperature and relative humidity targets for pool halls
- Provide automatic control for pool water heating, pool hall HVAC, pool water disinfection and pumping
- Include prompts for manual functions such as backwash and bleed

Water Efficiency

- Install low-flow adjustable taps in kitchens and bathrooms
- Install low-flow WCs with dual flush
- Install low-flow adjustable showerheads
- Install low-flow urinals
- Consider benefits of rainwater recycling and recovery
- Install water-efficient appliances as part of the building contract
- Install water meters to monitor water consumption for all major water uses in the project
- Provide water meters to monitor water consumption and any water leakage automatically
- Provide low-water-use irrigation systems and/or provide native planting
- Treat stormwater run-off to minimise watercourse pollution

Appliances

- Install energy-efficient sports/exercise equipment
- Install energy-efficient appliances as part of the fit-out

Controls

- Widen temperature control bands for savings
- Provide central BMS for control and monitoring
- Provide BMS time scheduling with user-friendly means of grouping and adjusting zones
- Provide economiser controls to use outside air for cooling when temperatures suit
- Provide zone air quality sensors to adjust ventilation rate to achieve air quality criteria
- Provide variable-speed pumps to match flow to suit the demand

STAGE 4: BUILD

Energy and Water Use Monitoring

- Provide metering to align with NABERSNZ recommendations
- Provide energy meter on pool water heating and coils serving pool hall ventilation
- Consider connecting sub-meters to electronic monitoring and reporting system
- Provide water metering and automatic leak detection
- Meter power supply to water treatment plant and cooling plant and include meter on pool water top-up
- Consider providing visual displays showing the energy/water use of the building

Energy Generation

- Future-proof electrical boards so that a photovoltaic (PV) cell installation for electricity generation may be integrated easily in the future
- Consider PVs

Waste

- Specify a comprehensive construction waste management plan and include a contract target for construction waste to be recycled
- Establish a comprehensive waste management plan for the operational phase of the facility
- Layouts to include recycling areas to align with best-practice guidelines

Transport

- Promote the use of public transport and more sustainable transport
- Provide priority parks for fuel-efficient vehicles
- Provide cycle storage and change facilities
- Consider charging points for electric cars
- Design cycleways and walkways as part of the site plan and landscaping
- Implement a green travel plan for the site
- Consider real-time displays in public areas to relay public transport information
- Provide sheltered, good-quality connections and waiting areas for public transport and sustainable transport connections

Materials

- Specify appropriate low-maintenance, durable materials for long-term operational value
- Specify environmentally preferable insulation, where possible
- Consider appropriate low-emission paint, where appropriate
- Consider appropriate low-emission carpets/flooring, where appropriate
- Consider appropriate emission materials, where appropriate
- Consider appropriate emission adhesives and sealants, where appropriate
- Consider appropriate formaldehyde composite wood products
- Consider appropriate zero ozone-depletion-potential (ODP) refrigerants
- Consider appropriate zero ODP thermal insulation materials
- Consider appropriate Environmental Choice certified products, where appropriate

Management and Operations

- Appoint an energy/sustainability champion to focus on improved energy efficiency and ESD outcomes
- Contractor to implement a comprehensive EMP (environmental management plan)
- Implement comprehensive IAQ (indoor air quality) plan during construction to reduce air quality problems
- Facility management team review of design proposals for ease of maintenance
- Agree list of equipment for ease of long-term management and maintenance
- Include in building services contract the requirement for full commissioning of building services to CIBSE/ASHRAE recommendations
- Include in building services contract the requirement for continual commissioning and tuning of building services for a minimum 12-month period
- Provide building users with guidance on how to operate the HVAC and lighting systems to align with the design intent
- Provide a guide outlining the design approach and technical features of the design

- Consider an independent commissioning agent to monitor and report on the commissioning of building services directly to the client
- Provide training for staff to understand the design intention and how best to operate the building and systems for the best outcome
- The BSRIA (Building Services Research and Information Association) Soft Landings Framework means designers and contractors stay involved with buildings beyond practical completion to assist building owners during the first months of operation (and beyond) to help fine-tune and de-bug systems, and ensure users understand the design philosophy and how to control and best use the building (preferred inclusion but depends on procurement option)
- Minimise building effluent and environmental, safety and health impacts on site and neighbours
- Reduce potential harm to the environment and people through improved management of chemicals

Benchmarking

- Benchmark the design inclusions using Green Star custom or agreed benchmarking option (note this is intended to benchmark the design only – not suggesting certification is pursued)

Capital Costs

The Rough Order of Costs included in this section are calculated using costing data derived from a number of projects completed within the last ten years. Escalation costs have been added to the analysed project costs so the listed rates are current as of the last quarter of 2017.

The rates provided are average rates for generic buildings within the city areas and should only be used for initial feasibility studies.

The costs given are based on the total floor area measured between the outer faces of external walls.

Whilst every effort has been made to ensure the accuracy of the information given herein, we do not, in any way, accept liability for loss of any kind resulting from the use by any person of such information.

Pricing Assumptions

The pricing included assumes the design and construction is at the affordable level of the design spectrum, allows for competitive market rates, good ground conditions and access.

As the figures given are for a typical building on a flat site, adjustment must be made for such factors as sloping sites, ground conditions, unusual shape and other design considerations. It should be stressed that attention must be given to particular circumstances and conditions of the project being reviewed, when using data contained herein.

No allowance has been included for locations remote from a city or town with the usual supply of materials, labour and construction skills required for the building of this type of facility. Additional allowances are needed to cover remote or rural locations.

Inclusions

The rates used include for the following:

- Construction Costs
- Fixtures, fittings and equipment
- Design fees
- Local Authority consent charges
- Siteworks, landscaping, carparking

Exclusions

The rates used exclude the following:

- GST
- Resource consent costs. These can vary tremendously depending on the location of the proposed site, regional and district plan zoning classifications and the effects the project will have on the greater environment. Costs could range from nothing, if the activity is permitted on that site, to $100,000 or more in difficult situations. Consultation with the responsible Regional and District Councils is necessary at the time site allocation is being made.
- Health and Fitness centre equipment. This is very often provided by the operator/leasee of the centre.
- Bad ground. Poor ground conditions can mean additional foundations, piling or other ground improvement methods. Other factors such as high water tables will also affect not only the design, but also the construction methods and subsequent cost of installation. The extra cost could vary from 4 to 10 per cent of the total construction budget.
- Increased costs beyond the final quarter of 2017.
- Substation/Transformer. Electricity providers in different localities have different policies in relation to charging for substation/transformer installation. Some build the cost into line charges and others require up front capital payment. Transformer costs can typically range from $50,000 to $150,000 depending on size.
- Land
- Legal fees
- Financing Costs

Indicative Cost Plan for the Building Options

Multi-Purpose Facility, Rough Order of Costs, Between Regions

Costs differ from region to region depending on market conditions, availability of resources and cartage, amongst other influences. The following regional indices make some adjustment for the market differences. These will change from time to time as the market varies.

MULTI-PURPOSE FACILITY* – ROUGH ORDER OF COSTS – BETWEEN REGIONS	M^2	$/M^2$	COST $	AUCK $	WGTN $	CHCH $	DUN $
REGIONAL INDICES	M^2	$/M^2$	COST	1	0.98	1.05	0.96
Small Facility	2,670	4,320	11,534,400	11,534,400	11,303,712	12,111,120	11,073,024
Medium Facility	3,710	4,420	16,398,200	16,398,200	16,070,236	17,218,110	15,742,272
Large Facility	7,065	4,350	30,732,750	30,732,750	30,118,095	32,269,388	29,503,440

* Based on GFA from "linear" facility

Included in the above figures are allowances for generic siteworks, including car parking, paving, landscaping and planting, that amount to 5 to 6 per cent of the total figures. Actual siteworks will vary from site to site.

The medium size facility is at a higher $/m^2 rate because of the ratio of the more expensive pool areas compared to the less expensive courts area. The proportion of the more expensive functional area is greater than the other two sized facilities.

FUNCTIONAL AREA ANALYSIS MULTIPURPOSE FACILITY (AQUATICS AND INDOOR COURTS)

SMALL SIZE FACILITY – AFFORDABLE/FUNCTIONAL SPECIFICATION	QTY	UNIT	$/M²	COST
Indoor Courts	900	m²	$2,800.00	$2,520,000.00
Pool Hall/Aquatic facility	870	m²	$5,500.00	$4,785,000.00
Fitness Centre	150	m²	$2,600.00	$390,000.00
Essential Sporting Area	340	m²	$3,000.00	$1,020,000.00
Foyer Circulation	152	m²	$3,000.00	$456,000.00
Internal Plant	132	m²	$2,600.00	$343,200.00
Core Management	77	m²	$3,000.00	$231,000.00
Other – Cafe, Retail	49	m²	$3,000.00	$147,000.00
Other – Retail, Wellness	n/a	m²		$0.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$459,020.00	$459,020.00
Landscaping & Car parking	1	item	$595,000.00	$595,000.00
	2670	**m²**	**$4,099.71**	**$10,946,220.00**

SMALL SIZE FACILITY – REFERENCE SPECIFICATION	QTY	UNIT	$/M²	COST
Indoor Courts	900	m²	$3,100.00	$2,790,000.00
Pool Hall/Aquatic facility	870	m²	$5,700.00	$4,959,000.00
Fitness Centre	150	m²	$2,700.00	$405,000.00
Essential Sporting Area	340	m²	$3,100.00	$1,054,000.00
Foyer Circulation	152	m²	$3,100.00	$471,200.00
Internal Plant	132	m²	$2,600.00	$343,200.00
Core Management	77	m²	$3,000.00	$231,000.00
Other – Cafe, Retail	49	m²	$3,000.00	$147,000.00
Other – Retail, Wellness	n/a	m²		$0.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$487,360.00	$487,360.00
Landscaping & Car parking	1	item	$646,000.00	$646,000.00
	2670	**m²**	**$4,319.76**	**$11,533,760.00**

FUNCTIONAL AREA ANALYSIS MULTIPURPOSE FACILITY (AQUATICS AND INDOOR COURTS)

SMALL SIZE FACILITY – ENHANCED SPECIFICATION	QTY	UNIT	$/M²	COST ($)
Indoor Courts	900	m²	$3,200.00	$2,880,000.00
Pool Hall/Aquatic facility	870	m²	$6,100.00	$5,307,000.00
Fitness Centre	150	m²	$2,900.00	$435,000.00
Essential Sporting Area	340	m²	$3,000.00	$1,020,000.00
Foyer Circulation	152	m²	$3,100.00	$471,200.00
Internal Plant	132	m²	$2,800.00	$369,600.00
Core Management	77	m²	$3,300.00	$254,100.00
Other – Cafe, Retail	49	m²	$3,300.00	$161,700.00
Other – Retail, Wellness	n/a	m²		$0.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$633,740.00	$633,740.00
Landscaping & Car parking	1	item	$750,000.00	$750,000.00
	2670	**m²**	**$4,600.13**	**$12,282,340.00**

FUNCTIONAL AREA ANALYSIS MULTIPURPOSE FACILITY (AQUATICS AND INDOOR COURTS)

MEDIUM SIZE FACILITY – FUNCTIONAL SPECIFICATION	QTY	UNIT	$/M²	$ COST
Indoor Courts	900	m²	$2,800.00	$2,520,000.00
Pool Hall/Aquatic facility	1,400	m²	$5,500.00	$7,700,000.00
Fitness Centre	300	m²	$2,600.00	$780,000.00
Essential Sporting Area	445	m²	$3,000.00	$1,335,000.00
Foyer Circulation	230	m²	$3,000.00	$690,000.00
Internal Plant	215	m²	$2,600.00	$559,000.00
Core Management	100	m²	$3,000.00	$300,000.00
Other – Cafe, Retail	60	m²	$3,000.00	$180,000.00
Other – Retail, Wellness	60	m²	$3,000.00	$180,000.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$723,880.00	$723,880.00
Landscaping & Car parking	1	item	$800,000.00	$800,000.00
	3710	**m²**	**$4,250.10**	**$15,767,880.00**

MEDIUM SIZE FACILITY – REFERENCE SPECIFICATION	QTY	UNIT	$/M²	$ COST
Indoor Courts	900	m²	$3,100.00	$2,790,000.00
Pool Hall/Aquatic facility	1,400	m²	$5,700.00	$7,980,000.00
Fitness Centre	300	m²	$2,700.00	$810,000.00
Essential Sporting Area	445	m²	$3,100.00	$1,379,500.00
Foyer Circulation	230	m²	$3,100.00	$713,000.00
Internal Plant	215	m²	$2,600.00	$559,000.00
Core Management	100	m²	$3,000.00	$300,000.00
Other – Cafe, Retail	60	m²	$3,000.00	$180,000.00
Other – Retail, Wellness	60	m²	$3,000.00	$180,000.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$742,750.00	$742,750.00
Landscaping & Car parking	1	item	$875,000.00	$875,000.00
	3710	**m²**	**$4,449.93**	**$16,509,250.00**

FUNCTIONAL AREA ANALYSIS MULTIPURPOSE FACILITY (AQUATICS AND INDOOR COURTS)

MEDIUM SIZE FACILITY – ENHANCED SPECIFICATION	QTY	UNIT	$/M²	$ COST
Indoor Courts	900	m²	$3,200.00	$2,880,000.00
Pool Hall/Aquatic facility	1,400	m²	$6,100.00	$8,540,000.00
Fitness Centre	300	m²	$2,700.00	$810,000.00
Essential Sporting Area	445	m²	$3,000.00	$1,335,000.00
Foyer Circulation	230	m²	$3,100.00	$713,000.00
Internal Plant	215	m²	$2,600.00	$559,000.00
Core Management	100	m²	$3,000.00	$300,000.00
Other – Cafe, Retail	60	m²	$3,000.00	$180,000.00
Other – Retail, Wellness	60	m²	$3,000.00	$180,000.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$827,910.00	$827,910.00
Landscaping & Car parking	1	item	$925,000.00	$925,000.00
	3710	**m²**	**$4,649.57**	**$17,249,910.00**

FUNCTIONAL AREA ANALYSIS MULTIPURPOSE FACILITY (AQUATICS AND INDOOR COURTS)

LARGE SIZE FACILITY – FUNCTIONAL SPECIFICATION	QTY	UNIT	$/M²	$ COST
Indoor Courts	2,425	m²	$2,800.00	$6,790,000.00
Pool Hall/Aquatic facility	1,905	m²	$5,900.00	$11,239,500.00
Hydroslide	1	no	$1,050,000.00	$1,050,000.00
Fitness Centre	500	m²	$2,600.00	$1,300,000.00
Essential Sporting Area	890	m²	$3,000.00	$2,670,000.00
Foyer Circulation	327	m²	$3,000.00	$981,000.00
Internal Plant	345	m²	$2,600.00	$897,000.00
Core Management	134	m²	$3,000.00	$402,000.00
Other – Cafe, Retail	89	m²	$3,000.00	$267,000.00
Other – Retail, Wellness	305	m²	$3,000.00	$915,000.00
Other – Specialist seating	145	m²	$2,600.00	$377,000.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$928,260.00	$928,260.00
Landscaping & Car parking	1	item	$1,500,000.00	$1,500,000.00
	7065	**m²**	**$4,149.58**	**$29,316,760.00**

LARGE SIZE FACILITY – REFERENCE SPECIFICATION	QTY	UNIT	$/M²	$ COST
Indoor Courts	2,425	m²	$3,100.00	$7,517,500.00
Pool Hall/Aquatic facility	1,905	m²	$6,100.00	$11,620,500.00
Hydroslide	1	no	$1,050,000.00	$1,050,000.00
Fitness Centre	500	m²	$2,700.00	$1,350,000.00
Essential Sporting Area	890	m²	$3,100.00	$2,759,000.00
Foyer Circulation	327	m²	$3,100.00	$1,013,700.00
Internal Plant	345	m²	$2,600.00	$897,000.00
Core Management	134	m²	$3,000.00	$402,000.00
Other – Cafe, Retail	89	m²	$3,000.00	$267,000.00
Other – Retail, Wellness	305	m²	$3,000.00	$915,000.00
Other – Specialist seating	145	m²	$2,600.00	$377,000.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$1,014,455.00	$1,014,455.00
Landscaping & Car parking	1	item	$1,550,000.00	$1,550,000.00
	7065	**m²**	**$4,350.06**	**$30,733,155.00**

FUNCTIONAL AREA ANALYSIS MULTIPURPOSE FACILITY (AQUATICS AND INDOOR COURTS)

LARGE SIZE FACILITY – ENHANCED SPECIFICATION	QTY	UNIT	$/M²	$ COST
Indoor Courts	2,425	m²	$3,200.00	$7,760,000.00
Pool Hall/Aquatic facility	1,905	m²	$6,350.00	$12,096,750.00
Hydroslide	1	no	$1,050,000.00	$1,050,000.00
Fitness Centre	500	m²	$2,700.00	$1,350,000.00
Essential Sporting Area	890	m²	$3,000.00	$2,670,000.00
Foyer Circulation	327	m²	$3,100.00	$1,013,700.00
Internal Plant	345	m²	$2,600.00	$897,000.00
Core Management	134	m²	$3,000.00	$402,000.00
Other – Cafe, Retail	89	m²	$3,000.00	$267,000.00
Other – Retail, Wellness	305	m²	$3,000.00	$915,000.00
Other – Specialist seating	145	m²	$2,600.00	$377,000.00
Fixtures, Fittings and Equipment [FF&E] Tier seating, scoreboards etc.	1	item	$1,414,780.00	$1,414,780.00
Landscaping & Car parking	1	item	$1,580,000.00	$1,580,000.00
	7065	**m²**	**$4,500.10**	**$31,793,230.00**

Additional Feature Costs

Additional cost of features from base line building costs can include:

Hydroslides – These can add between $650,000 to $1,100,000 depending on number of tubes, configuration, height and many other parameters. This allowance includes for foundations, building penetrations landing pool and the like.

Retractable seating – $600 to $700 per seat over and above building costs. This allows for automated retractable seating and varies depending on finishes and configuration. Be aware that additional seismic strengthening of the structure may be required to accommodate retractable seating.

Advice on Base Data

All costs included in this section are indicative high level figures for budgets to be determined. Should the project proceed beyond the initial "Concept" stage then a Professional Consultant team (PCT) will need to be engaged that will include a Quantity Surveyor to verify and review the project, based on region, timing and other external influences.

Rates have been generated and allow for generic costings last quarter 2017, increased costs will need to be added for projects started after this time.

The regional indices are based on the New Zealand market mid 2017 these will change over time as different areas come under the influence of increased or decreased construction and economic pressure.

Whole-of-Life Costs

What is Whole-of-Life Costing?

Whole-of-life costing is defined as an "economic assessment considering all agreed projected significant and relevant cost flows over a period for the facility expressed in monetary value. The projected costs are those needed to achieve defined levels of performance, including reliability, safety and availability".

Whole-of-life costs are substantially greater than capital or initial costs – it is estimated that the operational expenditure can be 5-10 times as much as the capital cost.

Whole-of-life costing is typically adopted by those developing sport and recreation facilities who have a long-term interest in the assets concerned. Often they come from the public sector and have a large portfolio of public property – it is a Treasury requirement that major capital projects be let taking account of whole-of-life costs.

Local authorities often adopt whole-of-life costing as part of their response to their duty to deliver best value for ratepayers and facility users.

Private companies that intend to own property for a long-term period also want to understand the full cost of that ownership.

Funders and insurers may be interested in whole-of-life costs as part of their due diligence enquiries into how robustly bids have been assessed and planned, and how successfully the risks of designing and constructing buildings have been tackled.

Demand for those developing community facilities and who want to consider whole-of-life costing is causing designers, contractors and manufacturers to develop their understanding of whole-of-life costs as applied to specific projects or their generic services.

What are the Benefits of Whole-of-Life Costing?

- Encourages analysis of business needs and communication of these to the project team
- Optimises the total cost of ownership/occupation by balancing initial capital and running costs
- Ensures risk and cost analysis of loss of functional performance due to failure or inadequate maintenance
- Promotes realistic budgeting for operation, maintenance and repairs
- Encourages discussion and recording of decisions about the durability of materials and components at the outset of the project
- Provides data on actual performance and operation compared with predicted performance for use in future planning and benchmarking.