



WANAKA SPORTS FACILITY

WHOLE OF LIFE REPORT

QLDC CONTRACT CT 13-015 | 1ST AUGUST 2014

01 EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

We have been asked to provide QLDC with a ‘whole of life’ cost assessment for the proposed Wanaka Sports Facility at Three Parks. The purpose of this assessment is to compare the cost of key building materials and components over the life-span of the building between three levels of quality; taking into account capital expenditure, life cycle replacement and running costs.

A. SPECIFICATION LEVELS

To inform the cost analysis Warren and Mahoney and Cosgroves provided three specification levels for the key building components and equipment:

1. **Basic Specification.**
 - Lower capital cost option, minimum code requirements for insulation, reduced longevity, minimum user comfort. Not all selections are considered fit for purpose.
2. **Recommended Specification.**
 - Recommended levels of materiality based on our detailed experience in this building type. This specification is considered good practice and fit for purpose taking in to account the climatic conditions and building orientation, longevity, user comfort, insulation levels, energy consumption, maintenance, replacement and repair, climatic influences and balancing quality within budget.
3. **Higher Performance Specification.**
 - High levels of specification for material quality and finish, low maintenance, best practice insulation levels, high user comfort, high acoustic attenuation, efficient plant and equipment.

The detailed specification and materials are included in the Warren and Mahoney design report.

B. WHOLE OF LIFE ANALYSIS

Rider Levett Bucknall have analysed the proposed design and levels of specification in relation to Capital Expenditure, Life Cycle Replacement and Running Costs on selected key building elements only.

The approach to analyse key building elements only has been adopted to mitigate significant time and expense to QLDC. Principle findings highlighted in this report whilst will vary slightly if all elements were analysed the fundamentally outcomes and are likely to remain.

To provide QLDC context with approach adopted, Rider Levett Bucknall have conducted a Whole of Life analysis on approximately 33% of the entire building CAPEX. Of the remaining 67%, approximately 47% of CAPEX is related to sub-structure, superstructure, sprinklers, fixed furniture and small power requirements all of which would be fundamentally the same across the three specification levels listed. As such, considered not necessary to analyse as outcomes all but identical.

The remaining 20% is made up of many building elements which to drill down to the level of detail required would incur significant time and cost. Balancing cost and time against the fact that this 20% is unlikely to affect key findings (of significant variance) in terms of percentages outlined later in this report has meant that this CAPEX has not been considered any further at this point in time.

Full detail is contained in their “Dry Facility – Whole of Life Report”, with their findings summarised as follows:

Life Cycle Replacement

Life Cycle Replacement is defined as costs which the owner of a facility incurs to replace or refurbish materials and equipment that have reached the end of their expected life. The analysis for the Wanaka Sports Facility has been projected over a fifty year lifespan.

Life Cycle Replacement is analysed in three categories as summarised in Table 1.

CATEGORY	SPECIFICATION LEVEL		
	Basic	Recommended	Higher
Life Cycle Replacement Cost (Years 1 to 50)	\$2,961,000	\$2,831,000	\$3,930,000
Initial Capital Expenditure	\$1,770,000	\$2,286,000	\$4,144,000
Forecast Spend (Years 1 – 25)	\$1,214,000	\$779,000	\$1,177,000

TABLE 1: LIFECYCLE REPLACEMENT

The main benefit of the recommended option is that it incurs a much lower spend in the earlier years of the building life compared to the basic and higher specifications. In addition the basic option will incur a greater number of replacement/refurbishment cycles to that of the recommended and higher options due to the lower quality of materials and equipment.

Running Costs

The annual running costs for each of the specification levels is summarised in Table 2. The largest running cost for the facility will be heating, with the basic specification facility having a lower operational cost than the recommended and higher facilities. This is due to the basic option not having any heating in the main sports hall, except over the spectator seating. All options include heating in the administration and changing areas.

Heating is recommended for the sports hall should the building be required to operate as a multipurpose venue, where occupants are less active than in sports mode, and require a higher level of thermal comfort.

The higher specification option has lower running costs than the basic and recommended options due to higher insulation levels and more efficient plant selections.

RUNNING COSTS	SPECIFICATION LEVEL		
	Basic	Recommended	Higher
Heating	\$17,000	\$80,700	\$70,500
Ventilation	\$100	\$1,100	\$6,400
Domestic Hot Water	\$9,500	\$9,500	\$9,300
Total cost [Per annum]	\$26,600	\$91,300	\$86,200

TABLE 2: RUNNING COSTS

C. SUMMARY

Table 3 summarises findings expressed as percentages highlighting differences between the three specification options proposed.

We note that these percentages are formed from key building elements only and not the entire building/facility as highlighted in Rider Levett Bucknall’s report.

SUMMARY COMPARISON	SPECIFICATION LEVEL		
	Basic	Recommended	Higher
Capital Cost (CAPEX)	Lowest CAPEX	+ 29% over Basic	+ 234% over Basic
Lifecycle Replacement (Over 50 years)	+ 5% over Recommended	Lowest OPEX	+ 139% over Recommended
Cashflow Spend (Years 1 to 25)	+ 51% over Recommended	Lowest Cashflow	+ 56% over Recommended

TABLE 3: COMPARISON OF KEY BUILDING ELEMENTS WHOLE OF LIFE COSTS

D. CONCLUSION

In terms of capital cost the basic option incurs the lowest initial outlay. Over time however the recommended option incurs a slightly lower OPEX and significantly lower cash flow than the basic option. The higher option offers no significant advantages given its higher capital cost. On this basis the recommended option, when assessed on a Whole of Life basis, has cash flow benefits to QLDC compared to the other options; and is our recommendation for the specification level to be adopted in the facility design.

Exclusions:

This report is based on the dry sports hall facility only and excludes the future pool and other site facilities.





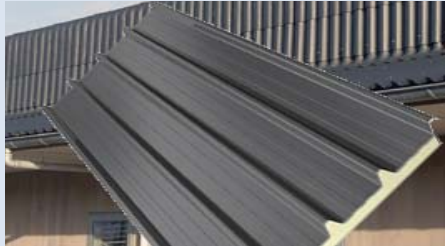




The cost analysis carried out excludes maintenance – however maintenance and longevity has been considered by Warren and Mahoney and Cosgroves when specifying products and systems.



Definitions:










CAPEX – Capital Expenditure


OPEX – Operational Expenditure

02 SPECIFICATION

REF	ITEM	BASIC SPECIFICATION	RECOMMENDED SPECIFICATION	HIGHER PERFORMANCE SPECIFICATION	CONSULTANT COMMENTS RE: WHOLE OF LIFE
ARCHITECTURAL SPORTS HALL MATERIALS					
EX-01	EXTERIOR Cladding to front of sports hall	0.4mm profiled metal cladding with insulation 	80mm Kingspan 'Evolution' flat 0.7mm gauge panels 	Rain screen cladding: western red cedar timber battens 50x50mm over 100mm Kingspan Micro-Rib panel 	Flat panel Kingspan in a rhythm of varying shades improves the visual appearance of the facility on approach from the car park, commercial hub and fields.
EX-02	EXTERIOR Cladding to rear and sides of Sports hall	0.4mm profiled metal cladding with insulation 	60mm Kingspan 'Trapezoidal' profile panels 	100mm Kingspan 'Evolution' Flat 0.7 mm gauge panels 	<p>More cost effective cladding solutions are proposed to the sides and rear of the facility.</p> <p>Kingspan panels are ideal for a sports hall, they are quick to install and provide both external and internal finishes. Thicker panels not only improve thermal performance but also span further, reducing support required.</p>
EX-03	EXTERIOR Roofing material to sports hall	0.55mm profiled metal cladding with insulation 	60mm Kingspan 'Trapezoidal' profile panels 	100mm low pitch Kingspan panels 	<p>Kingspan panels offer a durable finish to both sides and warm roof construction to minimise condensation risk.</p> <p>Kingspan can offer high insulation levels with minimised heat loss through thermal bridging.</p>

EX-05	EXTERIOR Skylights	None	<p>1.2m wide glazed skylights: polycarbonate aluminium frames fritted with opaque pattern to hide dirt and reduce glare</p> 	<p>1.5m wide glazed skylights: toughened laminate glass in thermally broken aluminium frames. Opaque frit pattern to glass to hide dirt and reduce glare</p> 	<p>The addition of skylights evenly spread across the ceiling will serve to reduce artificial lighting costs over the life of the building.</p> <p>The addition of natural light in the space can contribute to a more welcoming space, encouraging greater levels of participation in sport.</p>
P-01	INTERIOR Walls high level to sports hall	<p>9mm fibre cement cladding</p> 	<p>Internal face of Kingspan cladding panel</p> 	<p>Decortech timber panelling to high level of walls with slots and sound absorption to 20%</p> 	<p>The less dense fibre cement cladding is not as durable as the Kingspan panel and requires additional supports at close centres.</p> <p>Kingspan's pre-engineered, single component system comes with pre-finished interior lining.</p>
P-02	INTERIOR Walls low level to sports hall	<p>18mm plywood on timber frame</p> 	<p>18mm plywood on timber frame</p> 	<p>Thermomass precast sandwich panel</p> 	<p>Additional robustness can be achieved both internally and externally using the Thermomass product.</p>

F-01	INTERIOR Floor to sports hall	<p><i>Tiger Turf</i> polyurethane sports surface on concrete slab</p> 	<p><i>Rebound Ace</i> specialist sports flooring product on concrete slab</p> 	<p>Timber sprung floor, Beech</p> 	<p>Tiger Turf users are more prone to receive injuries than on other surfaces.</p> <p>Rebound Ace is a multi-purpose surface that is suitable for the likes of tennis and indoor soccer.</p> <p>The timber sprung floor is suitable for netball and basketball but can be too slippery for other sports. It is more expensive and would require temporary protection if the space were to be used for exhibitions, seated events etc.</p>
C-01	INTERIOR Ceiling to sports hall	<p>Thermacraft 'white knight' fire retardant light diffuser foil.</p> 	<p>60% 50mm Novahush panel absorber insulation (NRC 0.9) direct stick to underside of Kingspan panels.</p> 	<p>100% 50mm Novahush panel absorber insulation (NRC 0.9) on 12.5mm plasterboard (joints taped)</p> 	<p>The acoustic requirement for the sports hall is to provide for community sports, not for events. The acoustic engineer recommends a layer of mass in the ceiling (plasterboard) to prevent noise intrusion from rain.</p> <p>The incorporation of absorption material is beneficial for reducing the reverberation time of internally generated noise. It makes the audio comfort of the space more acceptable and easier to hear speech.</p>
ACCOMODATION BAR MATERIALS					
EX-04	EXTERIOR Cladding to accommodation bar	<p>Painted fibre cement cladding</p> 	<p>Timber cladding: western red cedar, vertical shiplap weatherboards over built up insulated wall system, natural weather finish</p> 	<p>Precast concrete cladding with iron oxide pigment</p> 	<p>Timber offers a natural variation in colour and texture which helps blend the building into the surrounding alpine landscape.</p> <p>Precast concrete is robust and will maintain an attractive appearance over a long period of time.</p> <p>Maintenance costs decrease with higher quality materials. The basic specification fibre cement cladding would require continual painting and lacks long term durability.</p>

F-02	INTERIOR Floor finish, general areas	Carpet tiles direct-fix on slab 	Carpet tiles direct-fix on slab 	Polished concrete finish, to all public areas, carpet tiles with underlay to admin and meeting room areas 	
F-03	INTERIOR Floor finish, wet areas	Standard non slip vinyl, coved to all walls 	Combination of carpet tiles and 'Tarkett Optima', or 'Eminent SafeT' (showers) vinyl, coved to all walls 	Non-slip ceramic tiles 	<p>The increase in specification of floor coverings gives greater durability and retains a better appearance over time.</p> <p>The addition of a durable carpet tile to the dry part of the changing rooms assists in absorbing noise and provides thermal comfort under foot.</p>

THERMAL PERFORMANCE <i>refer to Cosgroves document for further detail</i>					
REF		BASIC SPECIFICATION	RECOMMENDED SPECIFICATION	HIGHER PERFORMANCE SPECIFICATION	CONSULTANT COMMENTS RE: WHOLE OF LIFE
INS-01	Sports hall roof insulation levels	Minimum code requirements R-value: R1.9	R3.62 (60mm Kingspan) - on steel purlins - with additional R0.45 to area of roof - with 50mm Novahush panel absorber insulation.	R6.58 (100mm Kingspan) - on steel purlins - with 50mm Novahush panel absorber on 12.5mm plasterboard	The R-value determines the performance of the material to resist the transmission of heat; the higher the number the better it performs. Higher insulation values contribute to lower running costs and improved thermal comfort.
INS-02	Sports hall wall insulation levels - front	Minimum code requirements R-value: R1.2	R4.27 (80mm Kingspan 'Evolution') - with additional R0.32 for low level area - with plywood on timber frame	High level area: R5.54 (100mm Kingspan Micro-rib panel) - with Decortech lining on timber frame Low level area: R2.28 (Thermomass precast sandwich panel) - 100mm outer concrete/60mm XPS/200mm inner concrete	Kingspan products have the advantage of creating a warm roof; highly recommended for cold climates such as Wanaka. A warm roof minimises thermal bridging of the metal purlins, drastically reducing the risk of condensation.
INS-04	Sports hall wall insulation levels - sides and rear	Minimum code requirements R-value: R1.2	R3.48 (60mm Kingspan 'Trapezoidal') - with additional R0.32 for low level area with plywood on timber frame	High level area: R5.54 (100mm Kingspan 'Evolution') - on steel portal frame - with Decortech lining on timber frame at high level Low level area: R2.28 (Thermomass precast sandwich panel) - 100mm outer concrete/60mm XPS/200mm inner concrete	The significant increase in R-values from minimum code to the recommended values is due to the relatively low cost of the Kingspan product for the R-value that it achieves. Internationally R-values for these elements are substantially higher (i.e. UK current minimum code is R5.55). For clients wanting to minimise future running costs we would advise on increased insulation.
INS -03	Accommodation bar wall insulation	Minimum code requirements R-value: R1.2	R3.88 (western red cedar cladding) - on timber framed wall - with R4.0 insulation batts and GIB internal lining	R2.65 (200mm concrete) - with timber framed wall - with R2.6 insulation batts and GIB internal lining	It is noted that some of the higher speciation options have lower thermal performance than the recommended option. This is because the materials have been selected for improved durability, acoustic performance as well as above code thermal performance.
INS-04	Floor insulation	Minimum code requirements R-value: R1.3, un-insulated concrete slab	R1.85 (concrete on ground) - with 50mm XPS insulation	R4.08 (concrete on ground) - with 100mm XPS insulation	XPS insulation reduces heat loss under the slab and reduces water uptake from the ground. Under floor insulation is the most difficult insulation to retrofit in the future. If under floor heating is used this is important to improve efficiency.
INS-05	Glazing specification	No glazing to hall, minimum code double glazed unit to accommodation wing	R0.26 (double glazed argon filled, in aluminium frames)	R0.31 (double glazed with XL low-E coating in thermally broken aluminium frames)	High performance glazing significantly improves the thermal efficiency of the building envelope.

SERVICES <i>refer to Cosgroves document for further detail</i>	BASIC SPECIFICATION	RECOMMENDED SPECIFICATION	HIGHER PERFORMANCE SPECIFICATION	CONSULTANT COMMENTS RE: WHOLE OF LIFE
Sports hall heating system	Electric radiant heating to spectator area only	Electric radiant heating to hall & spectator area	Electric radiant heating to hall & spectator area	<p>The basic specification meets Building Code requirements but provides very little comfort to the building occupants.</p> <p>The recommended - high specification options allow for minimal comfort conditions to be achieved inside, providing a facility that will be more inviting with greater flexibility of use.</p>
Sports hall ventilation system	Natural ventilation - 173m ² minimum of fixed open weatherproof louvres.	Mechanical ventilation through three roof top exhaust fans. - 8.85m ² of filtered fixed open weatherproof louvers in exterior walls.	Mechanical heat recovery ventilation system	Reduced vent area and higher insulated wall types will result in reduced heat losses.
Accommodation bar heating system	Electric radiant heating to admin, first aid, meeting room, WCs and showers/change rooms areas only.	<p>2x Inverter Heat Pump air-conditioning systems to all spaces regularly occupied for extended periods such as admin and meeting room.</p> <p>Hydraulic under floor heating system including air-water heat pump, to the following occupied spaces: foyer/lobby, showers/change rooms</p> <p>Supplementary electric radiant heating to first aid area</p>	<p>3x Inverter heat pump air-conditioning systems to all spaces regularly occupied for extended periods such as admin, first aid and meeting room.</p> <p>Hydraulic under floor heating system to all non-air-conditioned occupied spaces including foyer/lobby/circulation, WC's, showers/change rooms.</p> <p>Optional supplementary electric radiant heating to foyer/lobby/circulation, WCs and showers/change rooms areas. System is all on or all off, used seasonally, provides instantaneous heating)</p>	<p>Energy efficient heat pump AC systems allow the indoor air temperature to be controlled to a constant internal temperature for a comfortable working environment.</p> <p>Heat pump systems are generally more energy efficient in delivering the required level of heating, as they draw heating energy from the air (rather than converting electricity to heat energy as electric radiant heating systems do).</p> <p>Heating to first aid area is recommended only during the times when the room is occupied during colder months for comfort.</p>

Accommodation bar ventilation system	<p>Mechanical exhaust supplied to all sanitary compartments</p> <p>Natural ventilation to all occupied spaces through min. 48m² of fixed open weatherproof louvers in exterior walls and draughty during cooler months of the year.</p>	<p>Mechanical supply and exhaust to occupied spaces through heat recovery ventilation systems</p> <p>Mechanical roof mounted exhaust fan to all WC's and cleaners store</p> <p>Additional natural ventilation to all central occupied spaces foyer/lobby/circulation through min.13.5m² of open able windows/doors in exterior walls.</p>	<p>Mechanical supply and exhaust to all occupied space through heat recovery ventilation systems</p> <p>Mechanical roof mounted exhaust fan to single WC and cleaners store</p> <p>Additional natural ventilation to all central occupied spaces foyer/lobby/circulation through min.13.5m² of open able windows/doors in exterior walls.</p>	<p>Heat recovery ventilation systems allow the heating inside the building to be retained as the exhaust air is used to pre-treat the incoming air.</p> <p>Mechanical exhaust is required to most sanitary compartments to comply with Building Code requirements.</p> <p>Reduced vent area and higher insulated wall types reduce heat losses.</p> <p>Provision of natural ventilation in Summer, where practical, will allow for some fan systems to be shut off, reducing the likelihood of internal temperature spikes due to solar gain.</p>
Accommodation bar domestic water heating	<p>Showers to be on continuous supply gas hot water system.</p> <p>Electric hot water supply to sinks and wash hand basins to be by standard electric hot water cylinder (min. 135L storage capacity) with recirculation system.</p>	<p>Showers to be on continuous supply gas hot water system.</p> <p>Electric hot water supply to sinks and wash hand basins to be by standard electric hot water cylinder (min. 135L storage capacity) with recirculation system.</p>	<p>Showers to be on continuous supply gas hot water system.</p> <p>Heat pump or solar hot water supply (with electric backup) to sinks and wash hand basins from hot water cylinder (min. 270-310L storage capacity) with recirculation system.</p>	<p>Instantaneous gas heating is considered the only suitable option for servicing the showers.</p> <p>Most heat pump/solar systems available would typically be oversized for the current demand of this facility. As such these systems are likely to provide little benefit to overall energy efficiency as they will need to run more often to maintain the temperature of a larger cylinder volume.</p>
LIGHTING <i>refer to Cosgroves document for further detail</i>	BASIC SPECIFICATION	RECOMMENDED SPECIFICATION	HIGHER PERFORMANCE SPECIFICATION	CONSULTANT COMMENTS RE: WHOLE OF LIFE
Sports Hall Lighting	High bay fluorescent	High bay fluorescent with dimming. Inclusion of skylights and clearstory glazing.	High bay LED with dimming.	The power consumption of the LED lighting system is considerably less and the lamp life is significantly longer. For the main sports hall the pay back would be approximately 3 years.
Accommodation Bar Lighting	Surface mounted, compact and linear fluorescent	Recessed, suspended, surface mounted and linear LED's. Domed skylights to circulation space.	Recessed LED extrusions, feature pendants, suspended up/down extrusion fittings, recessed LED extrusion fittings, and recessed LEDs.	The addition of clerestory glazing and skylights provides natural light, improving the quality of the space.