CLIENT COMMUNICATION

DUNEDIN MULTIPURPOSE STADIUM DEVELOPMENT - STADIUM PROJECT
for CARISBROOK STADIUM TRUST

Arrow International Ltd
150 Grantham Street
Hamilton

PO Box 1405
Hamilton
Tel: 07 838 0422 (Office)
Fax: 07 838 0230 (Office)

Date:	16 June 08	Page(s):	4
To:	Carisbrook Stadium Trust	Job No:	80106
Attn:	**Darren Burden**	CC No:	**146**
Email:	Darren.burden@Carisbrook.org.nz	File Ref:	
From:	Lale Ieremia		
Subject:	**RESPONSE TO WILL MCKENZIE SUBMISSION**		

	Name	Company	Transfer Method	Transfer Details
cc:	Peter Eggleton	Rawlinsons	email	p.eggleton@rawlinsons.co.nz

Darren,

Further to your email requesting clarification and responses to the specific detailed queries from the submission from Will Mckenzie issued directly to the Dunedin City Council (DCC). We have sourced direct responses from our Consultant team as well as specialist advisors including:

- HOK /Jasmax – Stadium Architects
- Connell Wagner – Building Services Engineers
- SSDM – Specialist Turf Consultants
- Rawlinsons – Project Quantity Surveyors
- Vector Foiltec – Specialist Roof Advisor

We have responded to each of the items raised in Will Mckenzie's submission, noting the various comments from the consultants and advisor in italics.

Initial Cost:

ETFE Roof Cost:
The report makes incorrect assumptions that the ETFE will only last 25-35 years. ETFE has been in existent for over 50 years and has been used on buildings for over 26 years. No signs of environmental UV or other degradation are evident, no replacement has occurred. Both field experience and artificial weathering tests indicate a design life well in excess of 75 years probably 100 years.

The oldest ETFE project in the world is at Arnhem Zoo in the Netherlands. Built in 1982 and still going strong. We put the lifespan of a well-maintained Texlon ETFE structure at 50 years + (warranty up to 25 years is available). ***Vector Foiltec.***

We have confirmation from the most experienced ETFE contractor in the world that we will be able to secure a warranty for up to 25 years.

From a cost perspective, Rawlinsons have provided detailed clarification that can be summarised as follows:

Without access to the detailed breakdown of the roof cost provided by Will Mckenzie of $52.5M, we have assumed that the scope provides for the ETFE roof over the pitch area, North stand and South stand. On a like for like basis, our comparative costs are some $32.5M – main roof costs. We have not been provided the detailed design information from Will Mckenzie.

The main roof cost includes for the primary truss and it's supports, but this is also the edge support for the southern stand roof which is covered in profiled metal roofing.

Note that the estimates include for a full proportion of fees, contingency, preliminary and general costs and are projected to include the inflation to a completion date of the end of year 2011. ***Rawlinsons***

From the project perspective, the assumptions of initial and life cycle costs are robust and have been substantiated sufficiently for this phase of the project.

Photo Synthetically Active Light (PAR) Transmission:
We do not think it is appropriate at this stage to get drawn into a detailed critique of the 2007 Hutchins report (as quoted in the SSDM report) and measurements made in the ETFE test rig, except to say that: There appears to be some confusion in the terminology used (angle of incidence vs. elevation of the sun) by 'Will McKenzie' when comparing results found in the ETFE test rig with those of Hutchins (2007).

This may explain why "light measurements taken at the Carisbrook test rig are markedly different to the Hutchins 2007 figures". Notwithstanding the above, it is SSDM's understanding that the Hutchins (2007) report is based on laboratory measurements of a single flat sheet of ETFE foil. On the other hand, the test rig is a two-sheet pillow system with each pillow representing a very complex curved surface In addition, there are both roof and side panels in the ETFE test rig, so structurally it is very different from a single sheet being tested in the laboratory.

We nevertheless acknowledge that predicted PAR light levels in winter could be an issue in terms of the health of the turf grass and its ability to be used over the winter period and the current winter trial extension in the test rig will provide a better assessment of the actual winter light level situation than predictions made from a laboratory report. ***SSDM***

The report makes incorrect statements about angular dependant light transmission.

Transmission does not drop off in linear fashion when incident radiation falls below 45deg see table below. The actual light falling on the turf will be a factor of incident and reradiated light for internal reflections etc

Tilting the roof will increase light transmission. It should be noted that as the cushions are formed from a curved surface due to their inflation incident light falling on them when the sun is not at its zenith will have an enhanced angle of incidence that if the roof were treated as flat (by as much as 20 deg)

Grass Growth Environment:
Whilst we clearly acknowledge that the ETFE roof will change the natural balance of light and temperature for turf grass growth, without being provided the detail of the 'alternative solution' proposed by 'Will McKenzie' it is impossible to assess whether the alternative will be better than, equal to, or worse than the existing HOK/Jasmax design. ***SSDM***

We actually have a lot of experience of growing plants under ETFE (Arnhem Zoo etc). Season confusion is not experienced.

Solar Heat Gain:
CFD Modelling undertaken to date has provided some guides to the dry bulb temperature expected in the stands during a variety of conditions including the worst-case scenario of "a hot still day". Revision 4 of the CFD report dated 11 Feb 08 stated: "The temperature of the occupied zone on a hot still day rises to 24˚C in the Northern and Western stand. The temperature in the Southern and Eastern stand rises to 26.5˚C. This is deemed acceptable for a naturally ventilated stadium". ***Connell Wagner.***

SSDM will be relying on the results of the computational fluid dynamics modeling being carried out by Connell Wagner in order to make a comment on the adequacy of the natural ventilation system. This modeling work is not yet complete. SSDM is not engaged to be able to predict the solar heat gain under ETFE. However, we do acknowledge that this expertise is being provided by Connell Wagner. We also acknowledge that adequate ventilation is of paramount concern to the health of the turf grass surface. ***SSDM***

The statement that the solar heat gain will be impossible to dissipate is clearly wrong there are numerous examples of buildings much smaller and lower to the ground than Carisbrook (and hence more difficult to ventilate) where this has been done successfully.

UV Effects on Patrons:
The aim of the design team has been to simulate the external environment as far as possible internally. Whilst air flow may, to a limited extent, be managed on an event day, it is correct that spectators and players will be exposed to sunlight as though they were outdoors. Spectators would be no more exposed than if they were sitting in a venue without a roof covering the entire volume. The south stand has a metal deck roof, providing shade for spectators in a traditional manner. ***HOK/Jasmax****.*

Glare:
One thing the team should consider is the use of a matt ETFE to some or all of the roof (which lets through the same amount of light as clear ETFE). Matt ETFE may enhance low level light penetration whilst reducing shadowing and glare. This should be looked at more in due course.

Shadowing:
Initial discussions with Sky Television indicate that they are comfortable with the level of shading on the pitch from the structure. We have responded to Sky's concerns over the impact of the low setting sun and modified the envelope to deal with this. The design team have in the past proposed ways of reducing shading through a more slender cable structure, however the roof design has been developed taking other factors such as cost into account. ***HOK/Jasmax***

As a team we will consider this issue through out the design. It is however symptomatic of all Stadia design and construction even without full roof structures. Mitigating strategies have also been considered including scheduling key fixtures likely to be effected, at night as well as the potential use of the stadium lighting during daytime events.

Light Transmission:
There is a difference of building type being noted here. The new stadium is not an indoor arena and therefore cannot be benchmarked against other such venues as listed. There is a definite broadening of opportunities that other traditional stadia could not accommodate given the nature of the DMS.

Traditional arenas require 100% blackout which would be expensive given the scale of the building and not applicable to the local market. If there was a business plan which called for a 30,000 capacity indoor arena then this should be considered.
HO/Jasmax

The report makes the argument that there is not enough light but too much UV. We are not sure that both elements can be considered simultaneously.

North and South Stands:
We believe the submission is referring to the east and west stands, not the north and south stands. The comments here relate to modes of operation, not the business plan nor the existing site constraints.

Expansion and the flexibility required for expansion has been considered and will be developed further with the Trust in the next phase of work.

The so called 'submission' does not provide information on what the alternative scheme is, therefore it is not possible to compare the two side by side. We are unable to provide any comment other than respond to the points raised against the existing design.

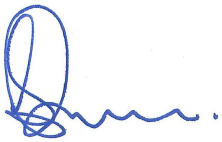
It is also disappointing to note that the 'submission' has taken a negative approach to what has been provided, and not a holistic one. The majority of the points raised in the 'submission' have been answered or ways of mitigating their affect have been identified. ***HOK/Jasmax***

Acoustic Issues:
We have been provided initial acoustic advice from our ETFE advisors who were the ETFE contractors on the Bejing swimming pool. The information provided notes that whether purpose made roofing iron or ETFE being used in a stadium type environment, there will be noise issues with heavy rain. However, there are options available such as rain suppressors that can be used in either a permanent or temporary way to assist in the minimization of noise.

Further tests specific to the stadium will be undertaken as part of the next design phase which will also include some specific tests to be undertake in the test rig.

In summary, we believe that all the issues raised by Will Mackenzie have both technical and practical reponses provided by our project team. Should any further clarification be required, please advise. If any alternative design information has actually been presented in detail, we will be happy to comment accordingly.

Regards



Lale Ieremia

cc: GM/MS