Toby Mason
Director

ETFE & Timber Roof - Coastlands Aquatic Centre

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Timber, Fabric & ETFE Experience…


Earth Centre Canopy - Fielden Clegg Bradley Architects


Woodlands - Fielden Clegg Bradley Architects


Alnwick Gardens - Hopkins /Buro Happold/VF


Cutty Sark Pavilion - YOUMEHESHE Architects


Magna Air Pavilion - Wilkinson Eyre Architects/VF



Resort Sentosa - Michael Graves Architects/VF

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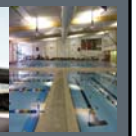
NZ - Sports & Aquatic Facilities Experience……



Alpine Aqualand, Queenstown - LHTDesign / ASC



Northern Arena Fitness & Aquatic Centre –Auckland – LHTDesign (CREATE Team)



New North Island Velodrome, Waikato – LHTDesign (CREATE Team), CBM Architects, Livingstone Construction

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Coastlands Aquatic Centre

LHTDesign (CREATE Team) – Lead Design Consultants,
Pool hall ETFE & Timber Roof, Aquatic Facilities,
Building Performance Modelling.

ASC Architects – Associated Architecture
LDP – Electrical & Lighting Design
Davis Langdon – Construction Stage PM and QS

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Traditional

ETFE & Timber

Challenge was to was create a scheme had all the benefits of natural daylight but could be delivered at close to Council's budget……

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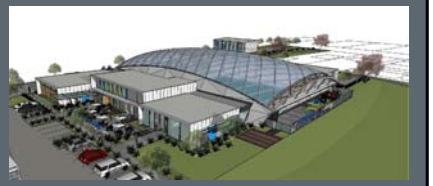
Comparative Study: Traditional verses ETFE – Capital Costs



The key benefits of the ETFE and Timber solution that lead to direct capital cost savings:

- Roof Build-up: Acoustic ceils required in traditional pool halls ETFE however is predominantly acoustic transparent.
- Lightweight Nature: ETFE is extremely light and flexible system.
- Geometric Stiffness: Flexibility of the ETFE cladding - doubly curved timber structure.
- Optimised Surface Area: Doubly curve the form - optimised roof and wall cladding areas.
- Erect ability: The ETFE and timber option - savings in the amount of scaffolding.

An independent QS Rawlinsons - estimated the relative difference of around $300-400K around 3% increase in overall budget estimate of $15M – Developed Design Stage.

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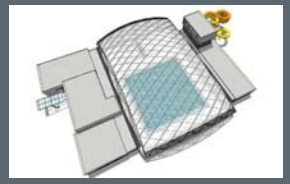
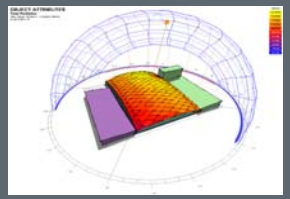
Comparative Study – Energy Use

- Traditional pool halls are high energy users - on average 5500MWh per annum equates to a cost of around $250K per annum.
- Initial Study - Free solar energy to heat the pools
- 3D Building performance modelling – Actual building fabric + NIWA weather data for Paraparaumu.
- Typical Annual Period - recover 25% free heating energy, equating to $30-40k per annum.
- Daylight modelling - potential to offer 30% saving in Artificial Light requirement $10k per annum.





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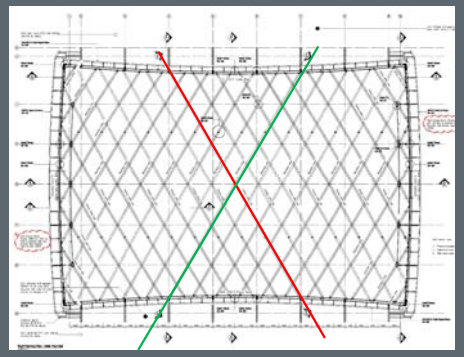
Design of ETFE and Timber Roof

Diagrid Geometry Definition

- Geometry needed to reflect constraints of materials.
- Curvatures defined to optimize ETFE and Limited Timber to planar arches.
- Simple biased arches - revolved to create double curved form



Plan

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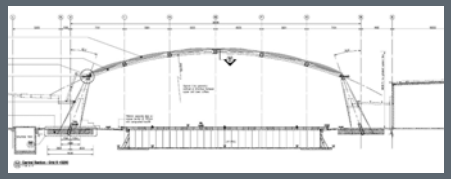
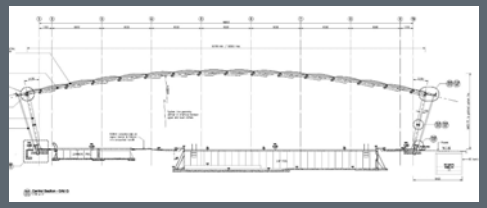
Design of ETFE and Timber Roof

Diagrid Rafter Geometry

- Lapped Nature of arches allows for simple details
- Revolved Geometry Only two Jig set ups – upper and lower rafter.
- Curvature suited standard 45mm Laminate Glulam GL10



Transverse



Longitudinal

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Design of ETFE and Timber Roof

Diagrid Rafters – Timber Lab (Formerly McIntosh Laminates)

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Design of ETFE and Timber Roof

ETFE Cushions

- 3 Layer Foil to give required R values 0.6
- Single Direction Cushions - most economic.
- Cushion Span and Radii - foil thickness and avoid patterning and rolling
- 3D Nonlinear Fabric Analysis - Optimise two-way spanning geometry

Cushions

Plan

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ETFE Façade Engineering

Evaluated Performance for User Comfort - Indoor/Outdoor Environment.
(*we commissioned peer review by Cundall, Melbourne, to verify our specification*)

- UV – Clear Foil transmits around 90% Visible Light & UV. UV Cut Foil reduces UV transmission to 30% - Total cushion 15% UV transmission.

  Solution meets WHO safe UV index requirements for internal spaces.
- Glare - Daylight modelling conducted to ascertained very limited given shading characteristics
- Solar Gains –Thermal modelling of specified foil characteristics – limited risk of over heating on very hot days but acceptable. Provided additional fresh air through louvers and ability to dump high level warm.
- Acoustics - ETFE is acoustically transparent to low and medium frequency noise. Added acoustic treatment on end walls for high frequency attenuation.
- Fire – ETFE melts at low temperature and self vents in the event of fire. Class 1. Used geometry to act as smoke reservoir and use alternate solution to ascertain safe travel distances.

Performance information imbedded within the Building Consent Package for Council.

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Tender Specialist nature of Timber & Foil - preferred 2 Stage Tender with nominated subcontractors:
Timber roof Package: Timber Lab – Roof Diagrid; Red Steel – Eaves CHS & Connections
ETFE Package: Vector Foiltec

Construction : Main Contract won by Mainzeal. Started on Site Jan 2012

Precast Cantilever Column with Curve CHS

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Construction

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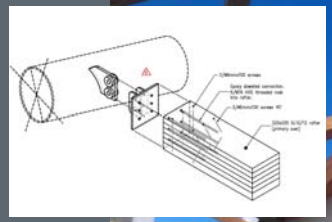
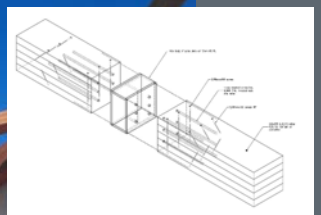
Design of ETFE and Timber Roof

Timber Details





Timber Rafter End and Splice Details

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Completion

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Thanks for Listening

CREATE

Project Team:

Client – Kapiti Coast District Council

LHTDesign (CREATE Team) – Lead Design Consultants, Pool hall ETFE & Timber Roof, Aquatic Facilities, Building Performance Modelling.

ASC Architects – Associated Architecture

LDP – Electrical & Lighting Design

Davis Langdon – Construction Stage PM & QS

Contractor – Mainzeal in Receivership