

# StreamliNZ

the flume  
for sport science  
medicine and  
commercial applications

A Joint Venture Between  
The University of Otago  
and  
E Type Engineering Ltd

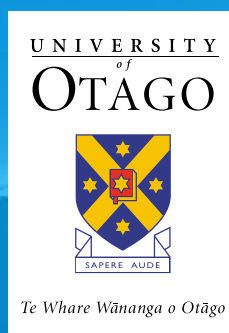
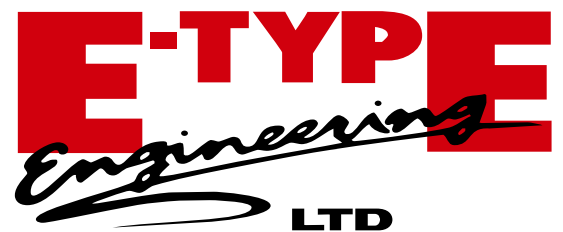




High-Tech

High-Performance

World Class



# Our Flume

The StreamlinZ flume is a world class, high-performance, high-tech flume.

As a joint venture between the University of Otago and E-Type Engineering Ltd, StreamlinZ has the distinct advantage of being able to offer both innovative, high-quality engineering and strong, reliable performance data, plus comprehensive pre-delivery training.

The partnership evolved following the successful development, design and construction of the flume at the university's Human Performance Centre.

## **Prior Market Research**

Before the flume was designed the University of Otago undertook surveys of potential user organisations; of activities considered likely to benefit; and, of likely usage patterns and user charges.

## **Evaluating Existing Flumes**

In the first instance, the university conducted a worldwide search for flume suppliers, which included visits to flume facilities in USA (2), Japan, Italy, and Germany. Existing designs did not meet its requirements for flow characteristics and control of the flow.

## **Creating Our Flume**

DesignPower (NZ) Ltd was contracted to design the flume to meet more exacting specifications and E-Type Engineering Ltd (NZ) was contracted to construct and install the flume.

StreamlinZ was subsequently formed for the marketing and future development of the flume.





The University of Otago is pre-eminent in the fields of human performance and health. The Human Performance Centre was established in 1986 and has worked with elite athletes in a wide range of sports, including New Zealand's All Blacks (rugby) and Silver Ferns (netball). The university is New Zealand's oldest and the only one with a presence in all four main cities.

E-Type Engineering Ltd specialises in 'design and build' projects particularly in the aluminium, hydro-energy, aquatic and tourism industries. The company was established in 1971 and is part of the Walker Engineering Group.

The project team for the development of the university's flume was led by Dr Alan Walmsley of the University of Otago Physical Education Department, and included biomechanist Dr Barry Wilson. The principal design consultant was Peter Reimann of DesignPower Ltd.

# Functions



The StreamliNZ flume uses the latest technology to create a unique aquatic environment. It resembles a treadmill, but with a channel of precisely-controlled flowing water instead of a walkway.

It is designed specifically to enable a wide range of functions including highly-accurate scientific research and testing in a controlled aquatic environment.

Potential usage includes:

- Sports performance
- Safety
- Rehabilitation
- Teaching
- Research
- Commercial Development

Water speed is controllable from 0 to 2.5 m/s or 3.2 m/s depending on flume choice/design. The flume has an optimal water flow quality operating speed of 1.8 m/s. Water flows in a channel 2.5m wide, 1.5m deep and a channel length depending on customer requirements from 6m to 10m. Effective channel width not influenced by the edge effects is 2.3m at 2 m/s

There are above-water viewing areas to the side and rear of the flume, a movable gantry/platform above and underwater viewing from the side.

Video cameras provide multiple views of swimmers and can be used for biomedical analysis and technique development.

Load cells can also be used to evaluate lift and drag on objects in the flume.



# Applications



The StreamliNZ flume may be used for a range of biomechanical, physiological and therapeutic applications including:

- Biomechanical analysis of swimming technique using video motion-analysis
- Physiological responses of swimmers from development to elite athletes
- Assessing propulsion and drag of swimmers' in order to coach the swimmers technique development
- Because of the unique environment, the flume is ideal for coach and athlete technical training

The flume, however, is used for more than analysing the performance of swimmers.

Other applications include:

- Water exercise therapy for special patient populations
- Research on human activity in conditions of neutral buoyancy
- Aquatic and thermoregulatory research on the effects of water temperatures, water conditions, clothing and buoyancy aids on performance.

- Study of kayak and canoeing strokes including both technique analysis and effects of equipment on performance.
- Testing of buoyancy aids and underwater structures against current flow.
- Design modifications on yacht hulls
- Aquatic product testing.

*An example of commercial development was the space-age swimsuit honed in New Zealand at the StreamLiNZ flume, and became the centre of a storm in the swimming world.*

*Speedo's LZR Racer suit enabled wearers to smash 12 world records and led to calls for a debate about their use.*

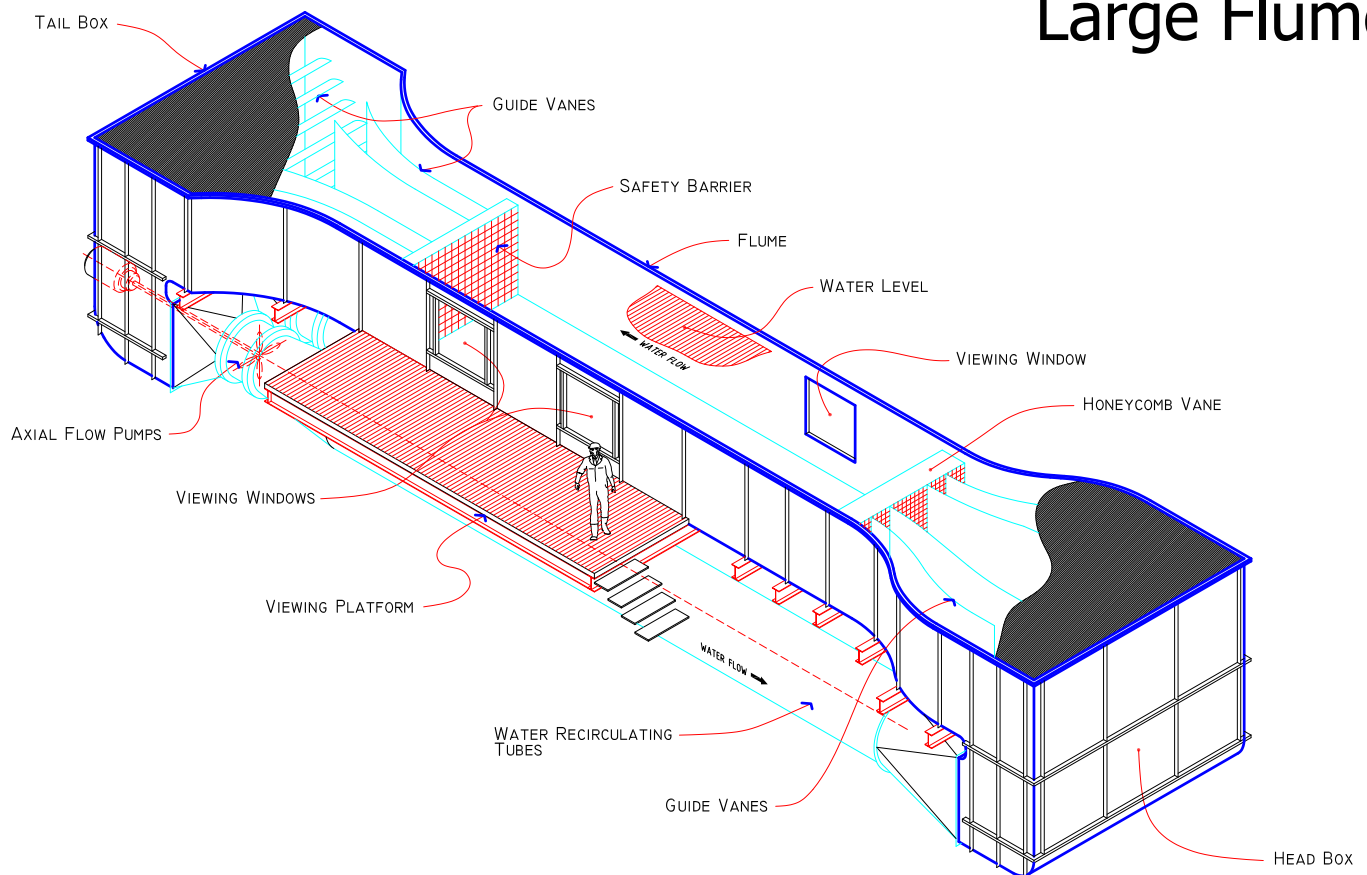
*The swimsuit was tested at Otago University, using the StreamliNZ flume; essentially providing a wind tunnel in water that facilitated the optimal design.*

*– Otago Daily Times, 2008*



# Construction

## Large Flume



	Length	Width	Height	Swim Area
Flume Dimensions (m)	23.5	4.7	4.0	10.0 X 2.5

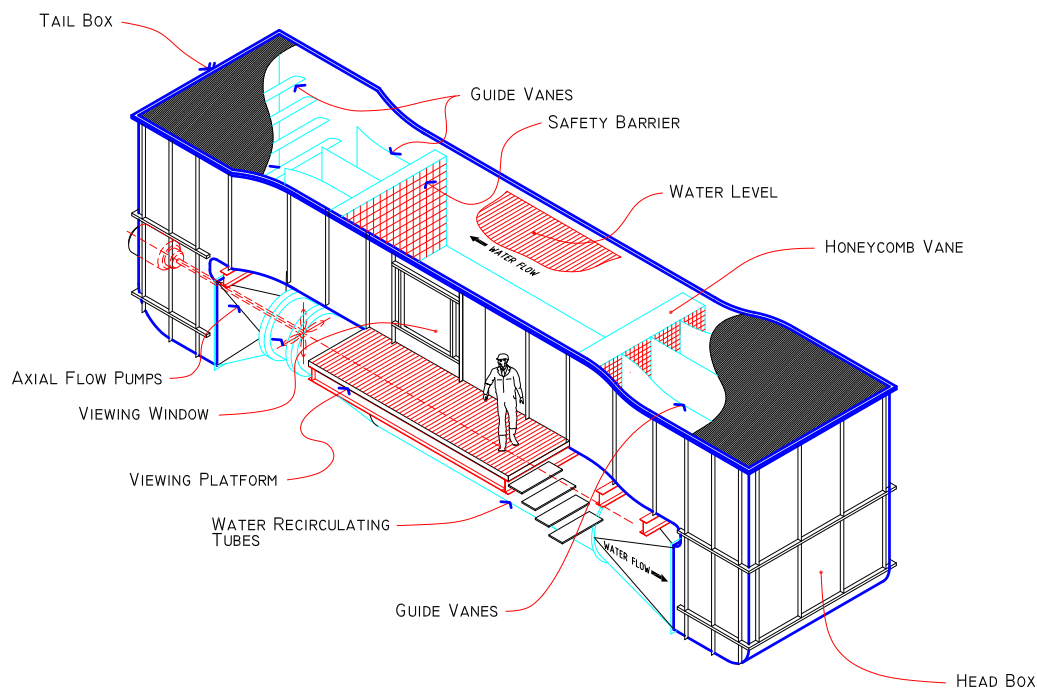
### Technical Specifications of StreamliNZ Flume

The StreamliNZ flume with a swim channel 10m long, 2.5m wide and 1.5m water depth fitted with 3 x 110 kW motors performs to the following specifications in the calibrated test section (the last 6 metres of the flow channel):

- Flume Speed  
Controlled from 0.3 to 3.2 m/s  
Optimal water flow quality operating speed 1.8m/s
- Flow uniformity  
Velocity accuracy <0.5% nominal velocity across the section  
<1% nominal velocity along the centre line  
Turbulence  $\simeq$  1%
- Wave height < 25mm at 2.00m/s
- Pitch of the water surface  
-20mm over 10m at 1.00m/s  
-15mm over 10m at 1.50m/s  
+10mm over 10m at 2.00m/s
- Effective channel width not influenced by the edge effects  
2.3m at 2.00m/s  
(Angle between axial flow and the vortex line estimated at <1 degree))
- Pump efficiency 70% at 3.0m/s



# Regular Flume



	Length	Width	Height	Swim Area
Flume Dimensions (m)	14.4	3.9	4.0	6.0 X 2.5

## Technical Specifications of StreamliNZ Flume

The StreamliNZ flume with a swim channel 6m long, 2.5m wide and 1.5m water depth fitted with 2 x 110 kW motors is expected to perform to the following proposed specifications in the the flow channel:

- Flume Speed  
Controlled from 0.3 to 2.5 m/s  
Optimal water flow quality operating speed 1.8m/s
- Flow uniformity  
Velocity accuracy <0.5% nominal velocity across the section  
<1% nominal velocity along the centre line  
Turbulence  $\approx 1\%$
- Wave height < 25mm at 2.00m/s
- Pitch of the water surface  
-20mm over 6m at 1.00m/s  
-15mm over 6m at 1.50m/s  
+10mm over 6m at 2.00m/s
- Effective channel width not influenced by the edge effects  
2.3m at 2.00m/s  
(Angle between axial flow and the vortex line estimated at <1 degree))
- Pump efficiency 70% at 2.0m/s

# Support and Service Warranty

Our agent will retain a suitably qualified engineer who would train your operational staff in all aspects of the flume's operation and servicing of water treatment and filtration units. We, are of course only a phone call or email away and give our assurance that we will attend in person if the situation requires it.

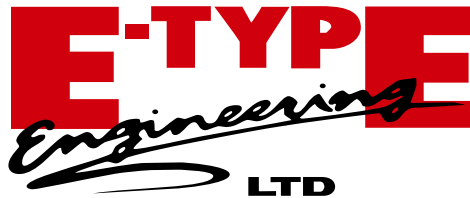
The University of Otago's School of Physical Education can offer a pre-delivery comprehensive training programme on flume operation and specific applications using the Otago StreamliNZ flume if this is required. StreamliNZ flume would be available for pre-purchase inspection should it be required.

The flume body and control system should require very little remedial or repair work once commissioning and testing is complete. Our warranty on the flume body and control system is 24 months from date of handover.

Our intention is to source the electrical, heating, conditioning and filtration equipment from local manufacturers. The manufacturers warranty applies for these locally supplied ancillary items.

For further information about the StreamliNZ Flume and E-Type Engineering's work profile, visit:

[www.e-type.co.nz](http://www.e-type.co.nz)



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