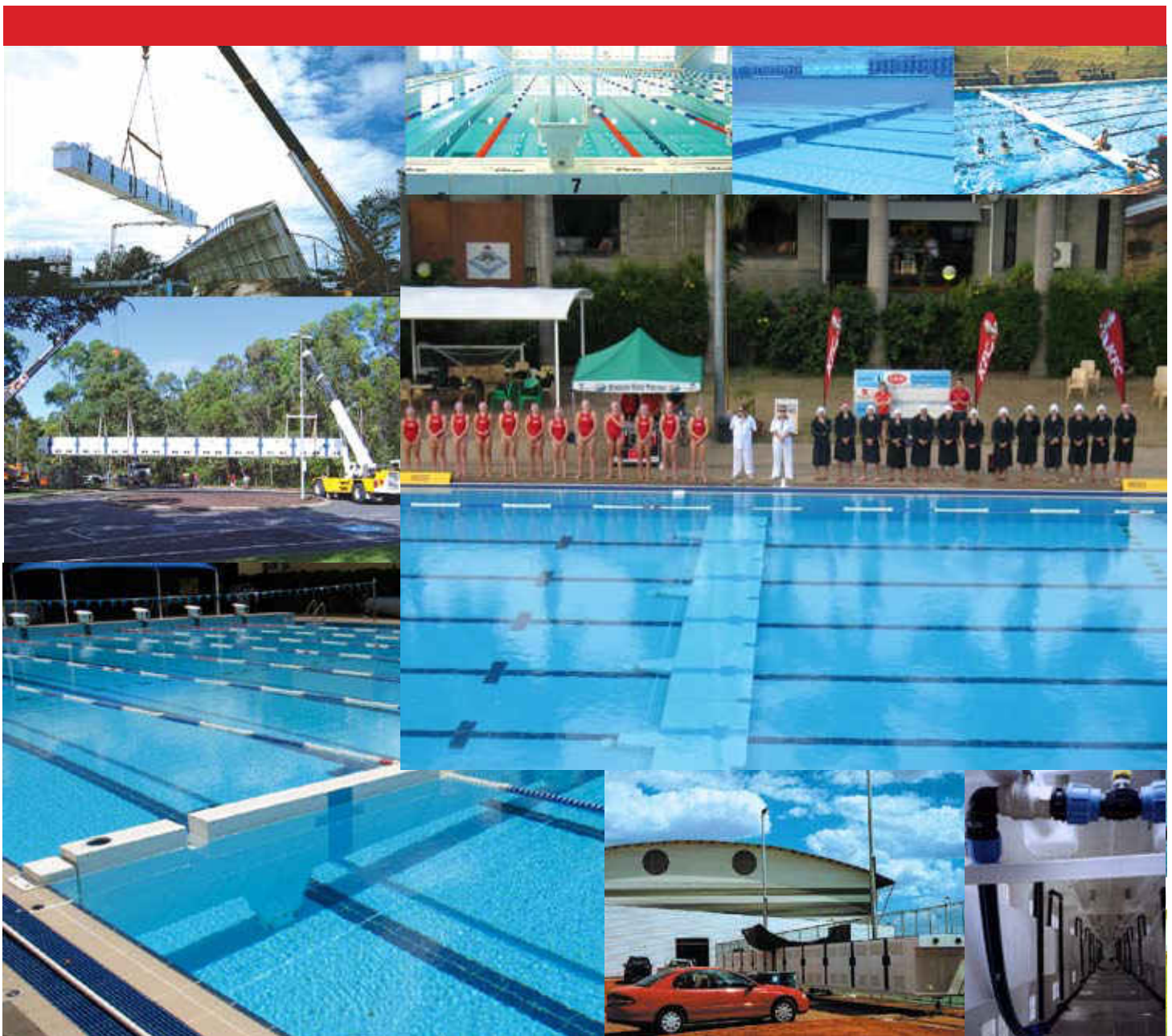


# AQUA ANTI WAVE BULKHEADS 2010

Multifunctionality for every pool:

- Program Flexibility and Diversification
- Maximum Revenue Optimisation
- Durable and Light-Weight Non Corrosive Materials
- Revolutionary Composite Resin Infusion Production



## Section 1 • Anti Wave Bulkheads

- 1.0 Movable Bulkhead Overview
  - 1.1 Bulkhead Components
  - 1.2 Bulkhead Features
  - 1.3 Design and Production
  - 1.4 Bulkhead Specifications
  - 1.5 Bulkhead Installations



Bulkheads Since 1986

## Section 2 • Anti Wave Submersible SwimWalls

- 2.0 Submersible SwimWall Overview
  - 2.1 SwimWall Flexibility
  - 2.2 SwimWall Components
  - 2.3 SwimWall Operation
  - 2.4 SwimWall Variations
  - 2.5 SwimWall Specifications



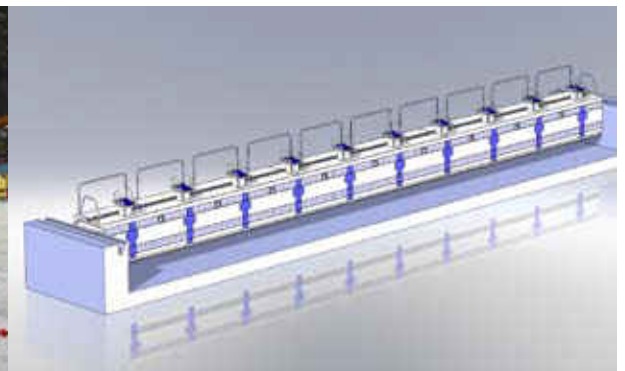
New Anti Wave Submersible SwimWall



Bulkhead Installation



Sydney 2000 Installation



Anti Wave Movable Bulkhead



# Anti Wave Movable Bulkhead

## Movable Bulkhead Overview

The Anti Wave Movable Bulkhead meets the highest international standards. Installed in the venues for the Sydney Olympics, New York Goodwill Games, Perth World Swimming Championships and the Beijing 2008 Olympics, the Anti Wave Bulkhead is the premier movable bulkhead around the world.

Anti Wave has developed a high-precision corrosion resistant bulkhead that successfully meets all international regulations and requirements that has positive appeal to the swimming community.

The Anti Wave Movable Bulkhead represents the highest level combination of certified engineering processes and fiberglass infusion production ensuring the highest quality and design.

The bulkhead spans the full width of the pool and extends across the gutters to the full width of the raised platform at each end of the pool.

Australia • Anti Wave Bulkhead



Australia • Bulkhead Motorisation



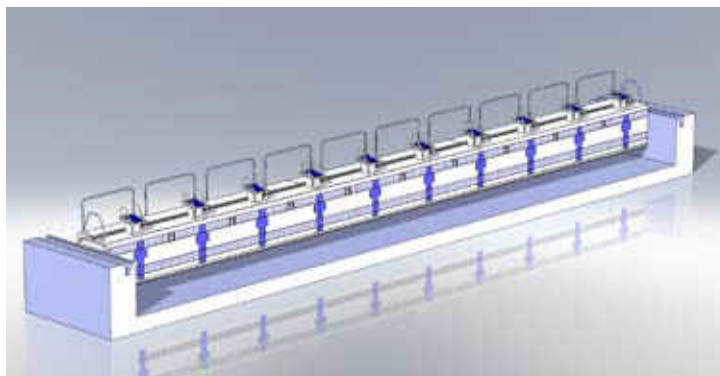
Anti Wave Movable Bulkhead Installed • Instalation



# Bulkhead Components

The Anti Wave Movable Bulkhead system comprises four key elements:

- 1 • Bulkhead
- 2 • Transport subsystem
- 3 • Anchoring subsystem
- 4 • Bouyancy subsystem



## 1 • The Bulkhead

The Bulkhead, or boom, comprises the primary element of the Bulkhead system. The boom is constructed as a series of fiberglass modules which are joined to form a single unit.

## 2 • The Transport Subsystem

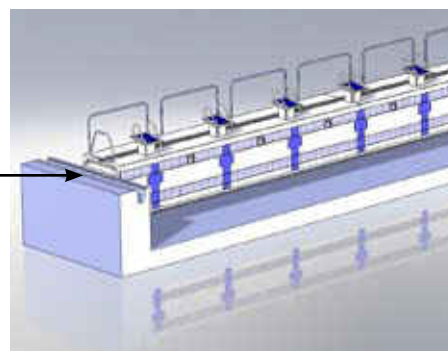
1/ Basic Model - Transport is provided by introducing air into the bouyancy system and moving the bulkhead along the length of the pool. Once the bulkhead is in position the air is released from the bouyancy system and the bulkhead is lowered onto the pool deck.

2/ Optional Model - Mechanised options are also available. Please enquire for further detail.

## 3 • The Anchoring Subsystem

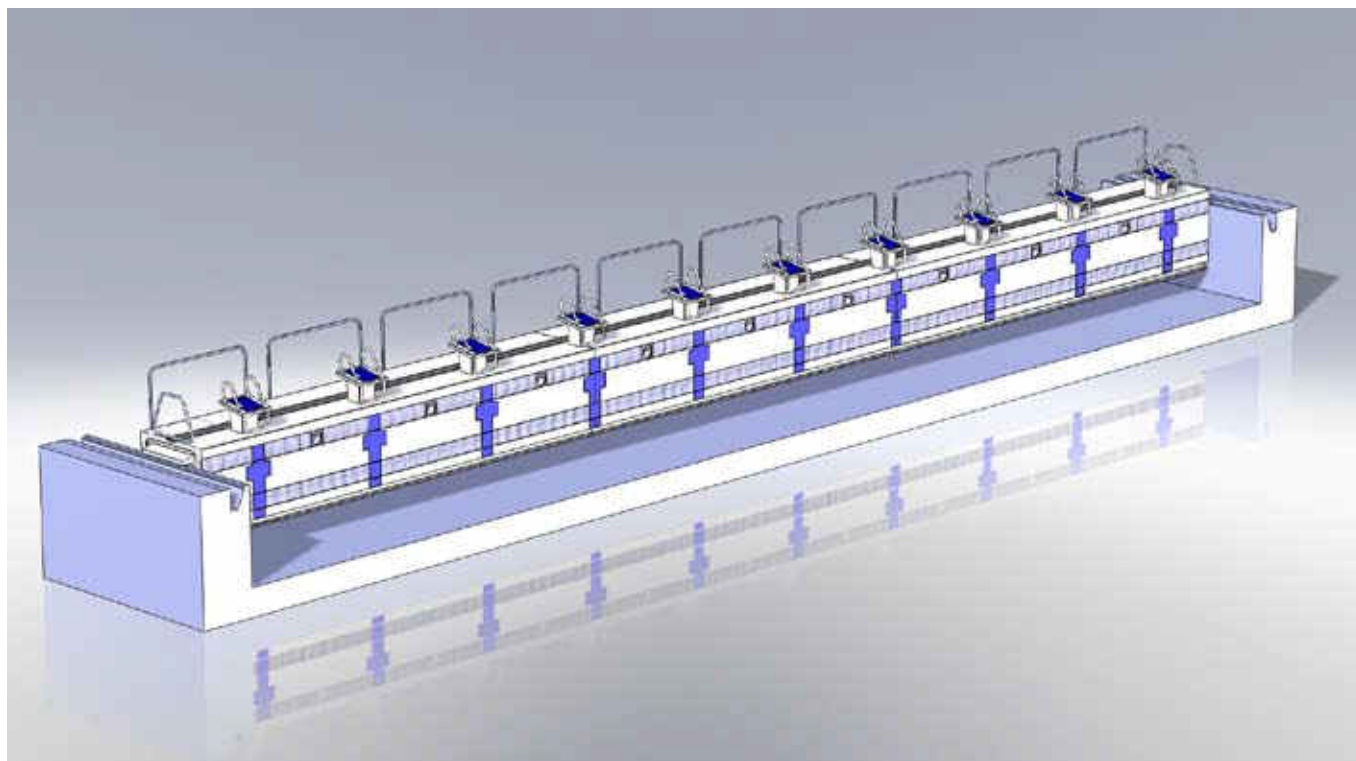
The anchoring subsystem is comprised of three main elements:

- Deck Hole fittings/sleeves
- Bulkhead anchoring pin
- Bulkhead Pin Locating Plate



## 4 • Bulkhead Bouyancy Subsystem

The backup bouyancy system is comprised of a series of Moulded Bouyancy Control tanks which is used to 'float' the Bulkhead up off its transport subsystem and thus move the bulkhead along the length of the pool.



## Bulkhead Features:

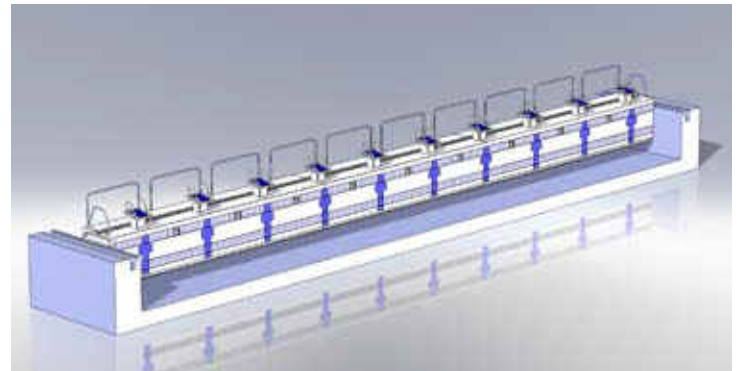
- Infusion production process ensures precision construction, strength and longevity. Non-corrosive fibreglass construction.
- Mounting for Anti Wave Starting Blocks provided on both sides of Bulkhead (mountings suit other models).
- Removable access hatch at each end provides easy access to bouyancy system.
- Optional Rail and Chains can be mounted behind starting blocks.
- Push rails are mounted on each side of the bulkhead for easy transportation.
- Gratings also included on upper and lower sections of bulkhead face.
- Mounting for Anti Wave Starting Blocks may be provided on both sides of bulkhead.
- Removable access hatch at each end for inspection and cleaning.
- Removable Deck Grating along top gutter for access to touch pad cables and internals.
- Flow through lane rope tubes with retractable lane rope anchors on each side provide for lane ropes to pass through bulkhead structure.
- All trafficable surfaces have specialised non-slip coatings.
- Lane Targets to FINA Specification.
- Removable Deck Grating along gutter for access to touch pad cables.



# Bulkhead Design and Production

Anti Wave Bulkheads are designed and produced to the highest international standards:

- SP High Modulus Structural laminate design and certification,
- Designed using Parametric Solid Modelling
- Constructed using Resin Infusion process
- Environmentally sound management systems
- Emphasis on waste and pollution reduction systems



Parametric Solid Modelling



Resin infusion process



Bulkhead Installation



# Bulkhead Specifications

## General Description

The bulkhead spans the full width of the pool and extends across the gutters to the full width of the raised platform each end of the pool.

The bulkhead is nominally 1.5m in width and 1.5m in depth and the top of the bulkhead at rest matches the raised section at each end of the pool. External boom dimensions are +0, -10 and subject to FINA regulations. 80mm clearance is provided to pool sides and the safety ledge.

The bulkhead is constructed as a series of fibreglass modules which are joined to form a single unit spanning the pool width with no visible joints. Buoyancy is built into the bulkhead to ensure that the bulkhead can be moved manually.

All dimensional data is confirmed prior to manufacture.

The core of the bulkhead is produced from closed cell foam PET, providing high impact and shear strength.

## Materials

The bulkhead is produced with Anti Corrosion 600 Chopped Stand Mat. A Powder bound chopped mat has been designed for use with orthophthalic and isophthalic unsaturated polyester, bisphenol and vinyl ester resin systems in contact molding and hand laminating.

The mat has been certified by Lloyds Register of Shipping, London.

Uniaxial Woven Rovings are used for tensile and impact strength.

Triaxial rovings are used for high strengths and stiffness. Unidirectional Rovings are used where shear strength is required.

The Core is produced Closed Cell PET foam.

Uniaxial Woven rovings are used for tensile and impact strength.

Triaxial rovings provide for high strengths and stiffness.

Unidirectional rovings are used where shear strength is required.

Vinyl ester resins provide for effective chemical barriers within the structure and Isophthalic resins in internal laminates for their greater structural strength. The vinyl ester resin as well as isophthalic resin 61-358.



Bulkhead Installation • Melbourne • Australia • 2009



# Bulkhead Specifications

## Bulkhead Movement

The bulkhead is moved either through positive buoyancy assisted hand movement, or through our optional mechanised movement.

The Bulkhead is capable of being moved from pool end to 25m mark in 10 - 12 minutes.

## Load Limits and Tolerances

The design live load of the bulkhead is 5.0kPa with the pool full and a vertical live load of 0.5kPa with a dry pool with maximum vertical deflection of 20mm.

The Design of the vertical face tolerance does not exceed +0, -5mm over the full height.

Design lateral deflection does not exceed +5, -5mm over the full length. The Horizontal deflection under this load including long term creep does not exceed 5mm irrespective of which side the lane ropes are fitted. The Bulkhead does not have a need to be anchored from the rear to meet the deflection requirements.

The bulkhead is designed to support a unified live load with 15mm maximum deflection and in addition to withstand all dead loads of 2000kg on the bulkhead walk area without the assistance of additional air to assist with the support of such a load.

The safety factor for all live and dead loads is at least ten (10).

## Surfacing

Non skid, UV resistant surfaces are provided which are moulded into the top surface.

Trafficable surfaces are produced to avoid sharp edges or corners, hazardous openings and non slip surfaces.

Edges and exposed surfaces are lowcoated with vinyl ester lowcoat.

## Gratings

Gratings are installed at the front and rear lower and upper faces of the bulkhead.

To ensure free water flow through the bulkhead during movement the front and rear faces are fitted with grills. All grates are made from durable thermoplastics.

The top surface of the bulkhead drains to each side from the centre at intervals of 2.5m.

The top surface of the bulkhead incorporates grates to drain the water from the surface.

The maximum top surface slope is 2mm across the top surface.





# Bulkhead Specifications

## Internal Reinforcement

All internal reinforcements, core material or 316ss and are totally encapsulated. Holes and cut-outs are sealed with a vinyl ester resin mix.

### Inclusions:

- Bulkhead design and construction
- Structure
- Gratings and surfaces
- Targets
- Rope anchors and flow through tubes
- Fixing Points for blocks
- Buoyancy system
- All work to be to FINA requirements
- Recessed continuous foot supports
- One set of locations for starting blocks

## Optional Extras

Optional extras are available on request.

## Fittings(if included)

Lane rope fittings on each side of the bulkhead are produced with 316ss and match the pool fixings as well as the enlarged ends of the tubes through the boom to allow the lane ropes to remain in place when the boom is moving.

The bulkhead may be fitted with a full set of Anti Wave Start Block fittings, compatible with Anti starting blocks or equal. These fittings comply with FINA requirements and are made from 316ss.

Lane anchors provided are designed to resist a pullout load of a least 4KN.

End Push Rails are provided at each end of the bulkhead to assist with movement. Rails are custom fabricated of one continuous length of tubing. The tubing is of Type 316 stainless steel.

Railings and chain may also be provided as an optional extra. Railings and chain are situated behind the starting blocks along the length of the bulkhead.

## Support Rollers

Support rollers for the fibreglass bulkhead are produced with resilient type PTFE bushed bearings or where appropriate, equivalent stainless steel wheels and tracks, depending on design and construction parameters.

## Provision for electronic Timing Systems (if included)

Bulkhead may include 100mm diameter PVC cable conduit angled timing equipment sockets complete with covers for the fitting of approved timing equipment sockets, located where suitable to requirements. These are fitted flush with the top surface of the boom with no sharp edges.

PVC conduit is used to enable the connection of the timing equipment to the starting blocks and timing pads. A fibreglass or 316ss cable tray may also be included.

## Location and Movement of Bulkhead and Mechanised Drive Options (if included)

The bulkhead is installed with location pins which lock the bulkhead into position through sleeves installed in the pool tile surround. These sleeves and pins are manufactured from Type 316ss. These sleeves and pins are located after the bulkhead is in position and the location has been surveyed.

In order to comply with FINA regulations the bulkhead has also a lateral adjustment system.



# Bulkhead Installations to date

## Installations Include

- 1986  
Fortitude Valley Pool, Brisbane Australia
- 1987  
City Bath Rotorua, New Zealand  
Superdrome, Perth Australia
- 1988  
International Aquatic Centre, Amers  
Netherlands &  
University Recreation Centre, Sydney Australia
- 1989  
Kilbernie Aquatic Centre, Wellington New Zealand
- 1994  
Olympic 2000 Venue, Sydney Australia  
Aquatic Centre, Warringah Australia
- 1996  
Albany Creek Aquatic Centre, Pine Rivers Australia  
Somerville House Sports Centre, Brisbane Australia
- 1997  
Aquatic Centre, Invercargill New Zealand
- 1998  
Goodwill Games Venue, New York USA
- 1999  
Southport Olympic Pool, Gold Coast Australia  
Aquatic Centre, Kalgoorlie - Boulder Australia  
Cook and Phillip Park, Sydney Australia
- 2000  
Aquatic Centre, Ryde Australia  
Regional Aquatic Centre, Caboolture Australia
- 2001  
QE11 Pool, Christchurch New Zealand
- 2002  
Aquatic Centre, Gorzow Wielkopolski Poland
- 2003  
Chandler Aquatic Centre, Brisbane Australia  
China National Training Centre, Beijing China
- 2004  
Logan Aquatic Centre, Logan City, Australia
- 2005  
Australian Institute of Sport, Canberra Australia
- 2006  
Wendu Water City, Beijing China  
Huangpu Swimming Pool, Shanghai China
- 2007  
FINA World Cup Venue, Singapore  
Asian Indoor Games Venue, Macau China
- 2008  
Macao Aquatic Centre
- 2009  
Launceston Regional Aquatic Centre, Australia
- 2009  
Cranbourne Aquatic Centre, Australia
- 2010  
Asian Games, Guanzhong, China



# AQUA Submersible SwimWall

## Submersible SwimWall Overview

The Anti Wave Submersible Bulkhead sits flat on the pool floor when not in use and can be raised in moments when required by introducing compressed air into the bulkhead. The bulkhead is then locked into the upright position against the pool side.

The ability to span either half or all of the pool means even greater flexibility for pool programming.

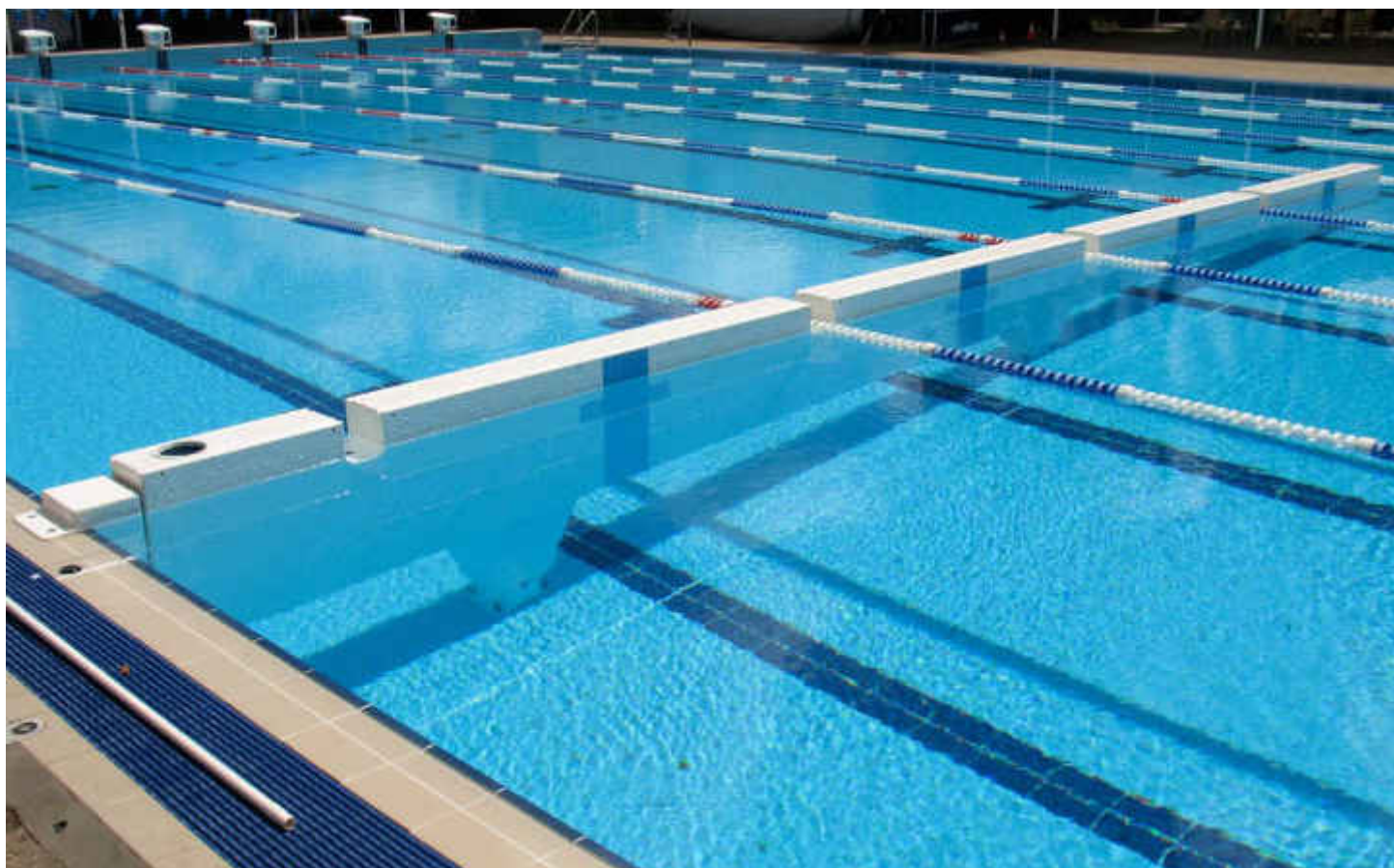
The Submersible Bulkhead is produced from FRP with internal buoyancy to permit manual operation using supplied air lines. Vertical walls of the bulkhead are supplied with target markings in accordance with Fina regulations.

Provision is made for lane ropes to pass through the bulkhead as required.

Bulkhead locked in 'up' position



Bulkhead flat against pool floor



Valley Pool • Brisbane • Australia • Anti Wave Submersible Swim Wall - 'up' locked position

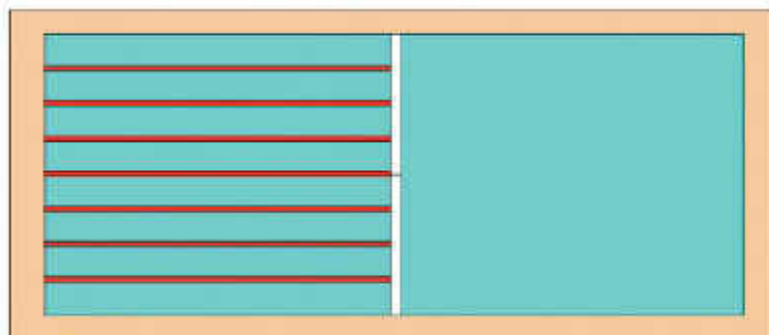
# AQUA SwimWall Flexibility

## With AntiWave SwimWall anything is possible...

Note: Below measurements are for demonstration only

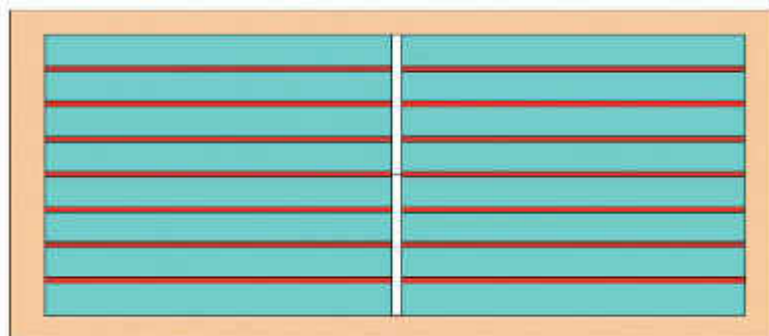
### Program 1 (2 x 10m SwimWalls):

- One 8 Lane Pool 25m x 20m  
- Suitable for lap swimming
- One 8 Lane Clear Pool 25m x 20m  
- Suitable for a range of Aquatic Sports



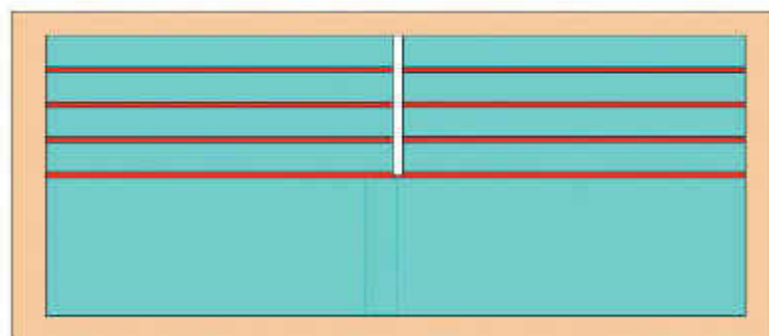
### Program 2 (2 x 10m SwimWalls):

- One 8 Lane Pool 25m x 20m  
- Suitable for lap swimming
- One 8 Lane Pool 25m x 20m  
- Suitable for lap swimming



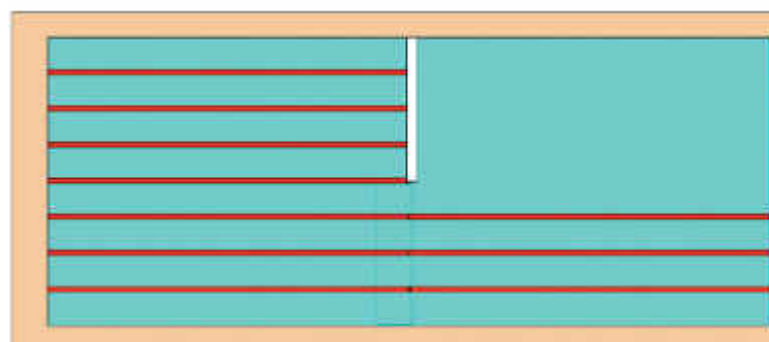
### Program 3 (1 x 10m SwimWall):

- Two 4 Lane Pools 25m x 10m  
- Suitable for lap swimming
- One Clear Pool 50m x 10m  
- Suitable for a range of Aquatic Sports



### Program 4 (1 x 10m SwimWall):

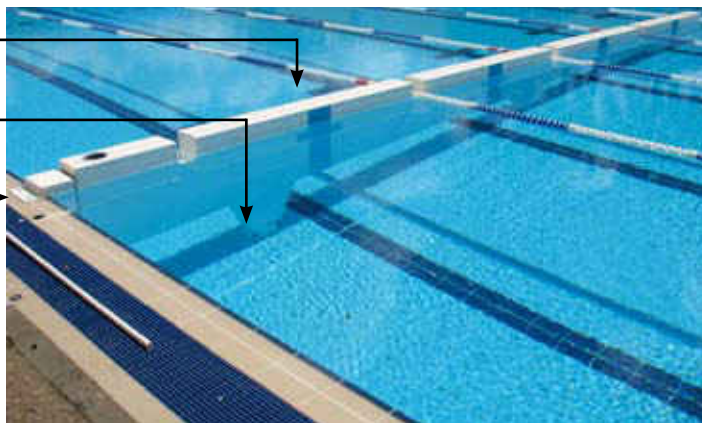
- One 4 Lane Pool 25m  
- Suitable for lap swimming
- One 4 Lane Pool 50m  
- Suitable for lap swimming
- One 25m Clear Pool  
- Suitable for Aquatic Sports



# AQUA SwimWall Components

The Anti Wave Submersible system comprises four key elements:

- 1 • Submersible Swimwall
- 2 • Pool Anchoring subsystem
- 3 • Locking mechanism
- 4 • Swimwall Bouyancy subsystem

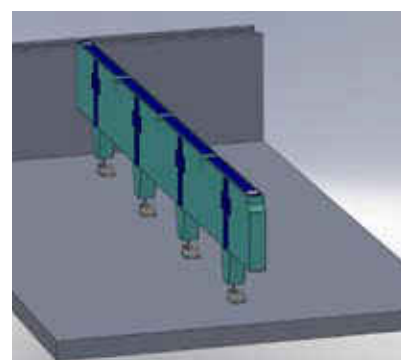


## 1 • The SwimWall

The Swimwall comprises the primary element of the Swimwall system. The Swimwall is able to move from a resting position on the pool floor to an upright position via the introduction of air by an operator.

## 2 • The Anchoring Subsystem

The Submersible Swimwall is anchored to the pool floor by the Anchoring subsystem. This system also allows for the Swimwall to move from the floor resting position to the upright position where it can be locked into place.



Swimwall Anchoring Subsystem

## 3 • The SwimWall Locking Mechanism

The Swimwall locking mechanism ensures secure fastening of the SwimWall in the 'up' position. A large diameter retractable pin secures the SwimWall to the SwimWall locking mechanism.



Swimwall Locking Mechanism

## 4 • Bouyancy Subsystem

The Bouyancy subsystem is activated through the introduction of compressed air into the swimwall via the Air Input Pump.

Air is entered into the Swimwall via an input valve near the Swimwall locking Pin. As the air enters, the Swimwall raises to its upright position.

A power outlet is required within 3 meters of the swimwall for operation of the Input Pump.



Swimwall Air Input Pump

# AQUA SwimWall Operation



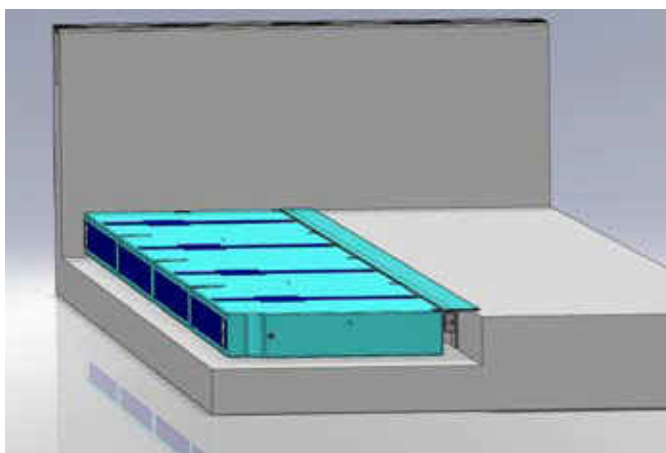
## Raising the SwimWall to the vertical position:

- Place Air Input Pump in Input Port and pump air into the SwimWall for 15-20 seconds then remove air line
- Lane ropes can remain in place while operating
- Operate the slide action locking pin into the SwimWall as the wall approaches the socket.

## Lowering the SwimWall to the Pool Floor

- Retract the slide action lockin pin
- Gently push the SwimWall to one side. This introduces water into the SwimWall.
- Flooding water displaces the remaining air inside the SwimWall and the SwimWall lays flat on the pool floor.

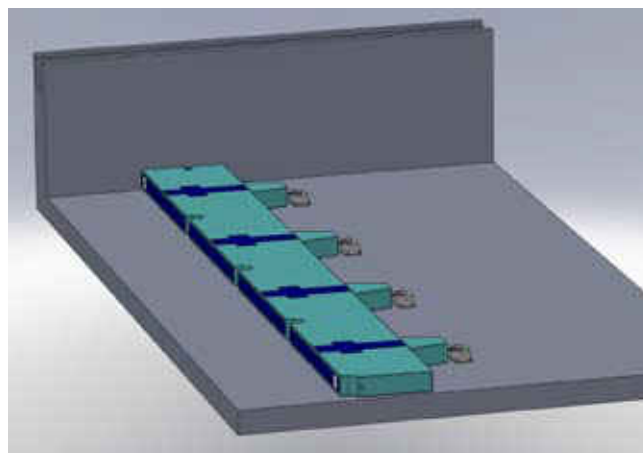
# AQUA SwimWall Anchor Variations



## Installation to Pools not yet finalised:

New Pools can be built to incorporate the SwimWall into their design. This simply requires the inclusion of a recessed pit in the pool floor.

This method allows the SwimWall to sit flush with the pool floor.



## Installation to existing Pools:

Installation of the SwimWall into existing pools is easy and requires no changes to the pool floor apart from the installation of the SwimWall anchoring system.

The SwimWall can be easily retrofitted to any Pool and can be produced to meet a wide range of needs.

# AQUA Swimwall Specifications

## General Specifications:

### General Description

The SwimWall is fabricated from FRP with internal buoyancy to enable the wall to be raised from the pool floor to the upright position.

Vertical walls of the SwimWall are supplied with target markings in accordance with Fina regulations.

Pins are located where lanes pass through to enable lanes to be secured directly to the SwimWall.

Provision is also made for the lanes to pass through the SwimWall.

### Materials

Anti Corrosion 600 Chopped Stran Mat. A powder bound chopped mat designed for use with orthophthalic and isophthalic unsaturated polyester is used.

The structural laminate design has been certified and approved by SP High Modulus.

Woven rovings are used for tensile and impact strength. Triaxial rovings provide for high strengths and stiffness. Unidirectional rovings are used where shear strength is required. Vinyl ester resins provide for effective chemical barriers within the structure.

Closed Cell Foam PET Core

### Stainless Steel

All stainless steel used in the SwimWall, anchoring and fittings are 316 marine grade for optimum corrosion resistance.

### Quality Control

Factory Procedures are compatible with ISO standards



Swimwall Down during Water Polo Competition



# Anti Wave International



Anti Kajlich  
Anti Wave International Pty Ltd

Anti's International experience in the design and manufacture of aquatic technologies extends back to 1972 when his company, Anti Wave, first supplied swimming equipment to the Munich Olympic Games swimming pool.

Anti Designs have been consistently used in Olympic and other major international swimming competitions ever since.

With licensing arrangements in eight countries and growing, these concepts and designs have been exported to over 150 countries under the widely recognised brand name Anti Wave.

Anti Wave aquatic equipment caters to both local and international pools. Anti has thirteen manufacturing and distribution locations around the world including Australia, China, Singapore, USA, UK, Sweden, Switzerland, Africa, India, Singapore, Malaysia, Taiwan, Japan and Korea.

[www.anti.to](http://www.anti.to)

Visit our website to see a video of the SwimWall in action.

Anti continues to participate directly with the utilization of various engineering designs in the development of cost effective aquatic facilities including competition pools and water parks.

Anti Moveable Floor, Bulkheads and swimming competition equipment have been more recently selected for both the Sydney 2000 and Beijing 2008 Olympics - securing the company as the premiere designers and producers of performance aquatic technologies.

## Contact Information

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