

# Bulkheads & SwimWalls 2019

## Anti Wave Moveable Bulkheads & SwimWall Systems

- Program Flexibility and Diversification
- Maximum Revenue Optimisation
- Durable Non Corrosive Materials
- Precise construction and tolerances



Anti Wave Bulkheads • World leading design and construction

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Bulkheads Since 1986

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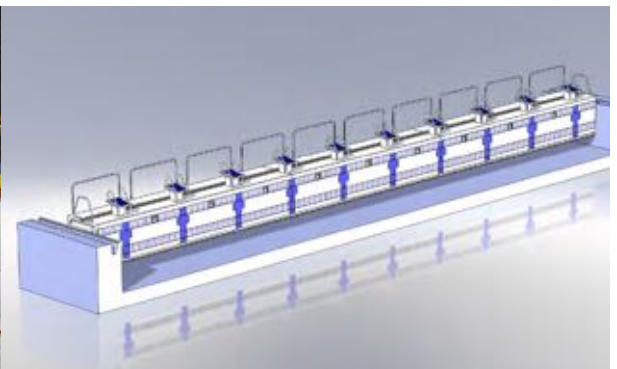


New Anti Wave Submersible SwimWall



Bulkhead Installation

Sydney 2000 Installation



Anti Wave Movable Bulkhead

**Section 1.0**

# Anti Wave Movable Bulkhead

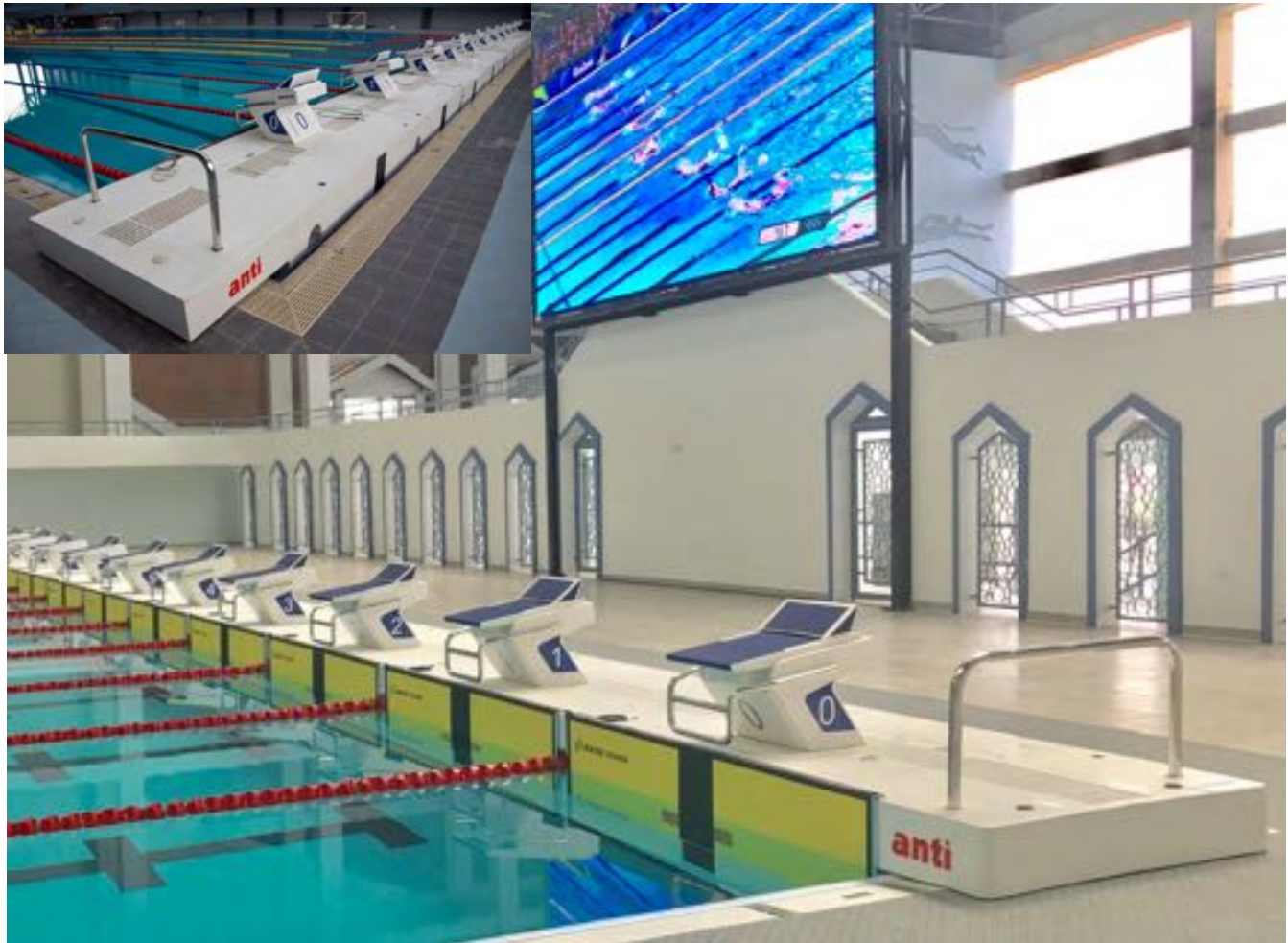
## Movable Bulkhead Overview

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 fibreglass infusion production ensuring the highest quality and design.

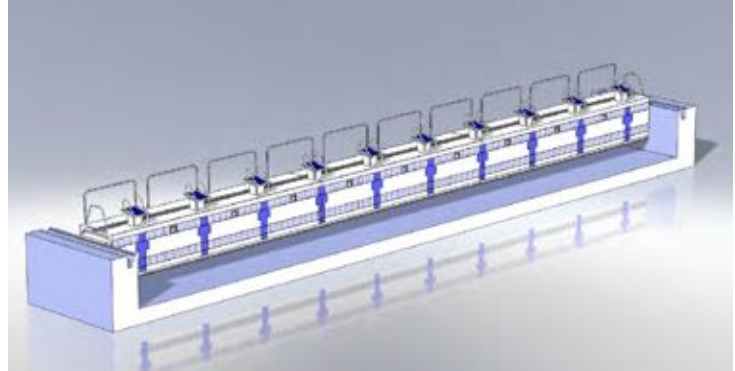
The bulkhead spans the full width of the pool and extends across the gutters to the full width of the raised platform at each end of the pool.



## Section 1.1 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 fibreglass modules which are joined to form a single unit.

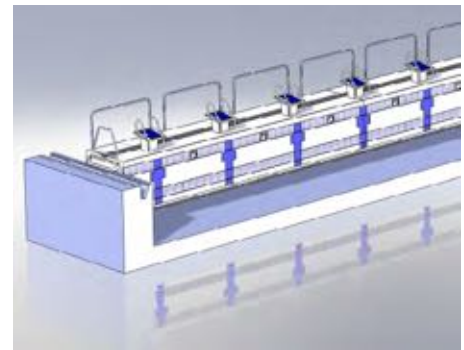
### 2 • The Transport Subsystem

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.

### 3 • The Anchoring Subsystem

The anchoring subsystem is comprised of three main elements:

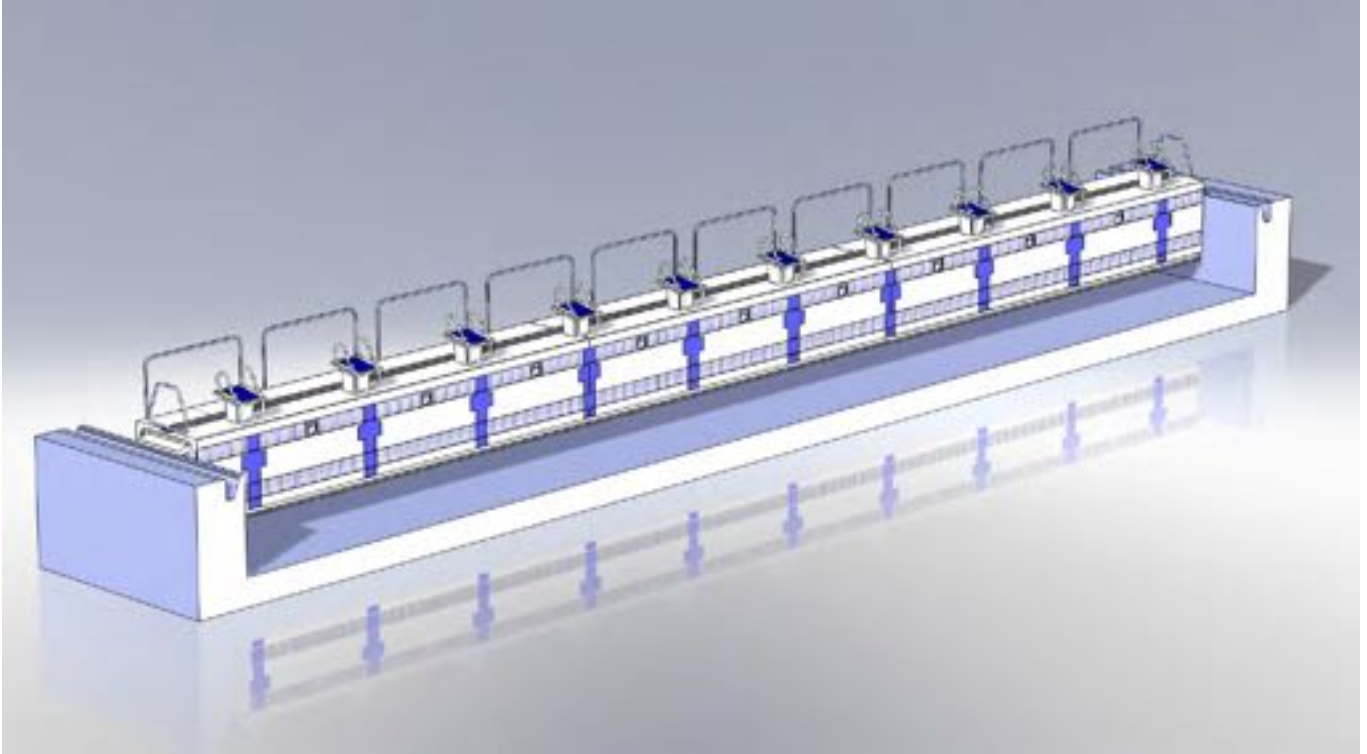
- Deck Hole fittings/sleeves
- Bulkhead anchoring pin
- Bulkhead Pin Locating Plate



### 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.

## Section 1.2 Bulkhead Features



### Anti Wave Bulkhead Features:

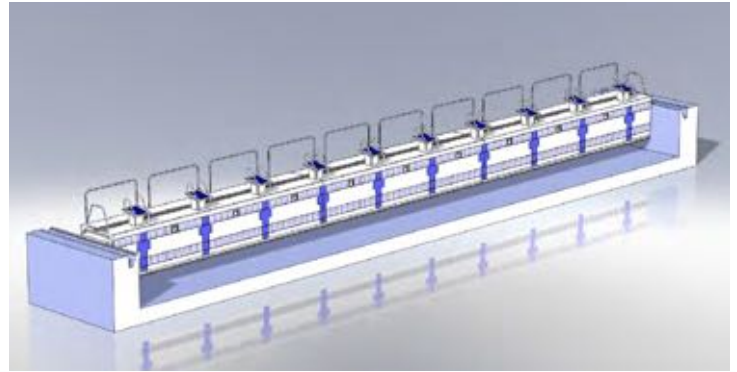
- Infusion production process ensures precision construction, strength and longevity.
- Mounting for Anti Wave Starting Blocks provided on both sides of Bulkhead (mountings suit other models).
- Removable access hatch at each end provides easy access to bouyancy system.
- Optional Rail and Chains can be mounted behind starting blocks.
- SS316 Push rails are mounted on each side of the bulkhead for easy transportation.
- Removable Deck Grating along top gutter for access to touch pad cables and internals.
- Mounting for Anti Wave Starting Blocks may be provided on both sides of bulkhead.
- Removable access hatch at each end for inspection and cleaning.
- 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.

## Section 1.3

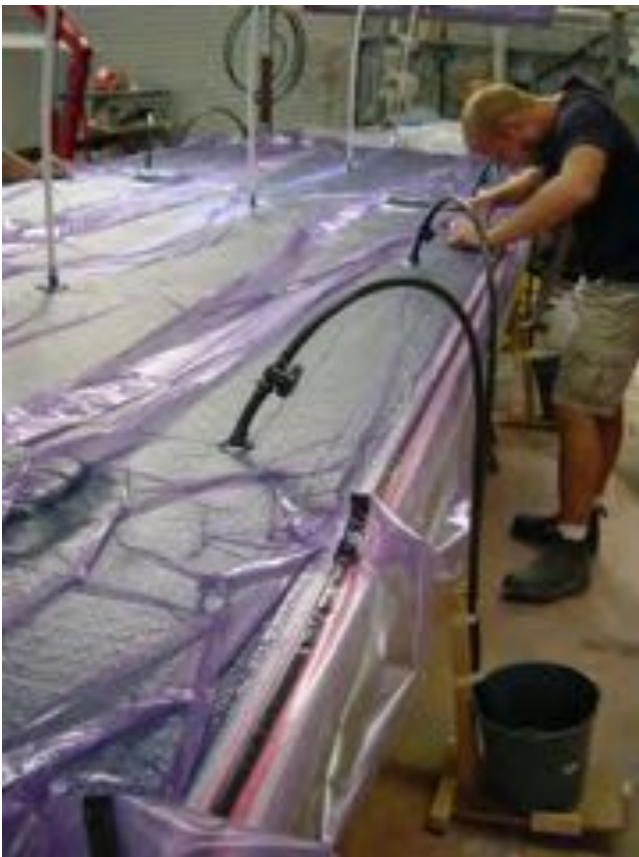
# Bulkhead Design and Production

Anti Wave Moveable Bulkheads are designed and produced to the highest FINA 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

## Section 1.4 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 fibre-glass 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.



## Section 1.4 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 move from pool end to 25m mark in 10 - 12 minutes.

### Load Limits and Tolerances

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

The Design of the verticle 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 withough 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 shard edges or corners, hazardous openings and non slip surfaces.

Edges and exposed surfaces are flowcoated with vinyl ester flowcoat.

### 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.



## Section 1.4 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 •SS316L Side Push Rails
- 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 at 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 flanged 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)

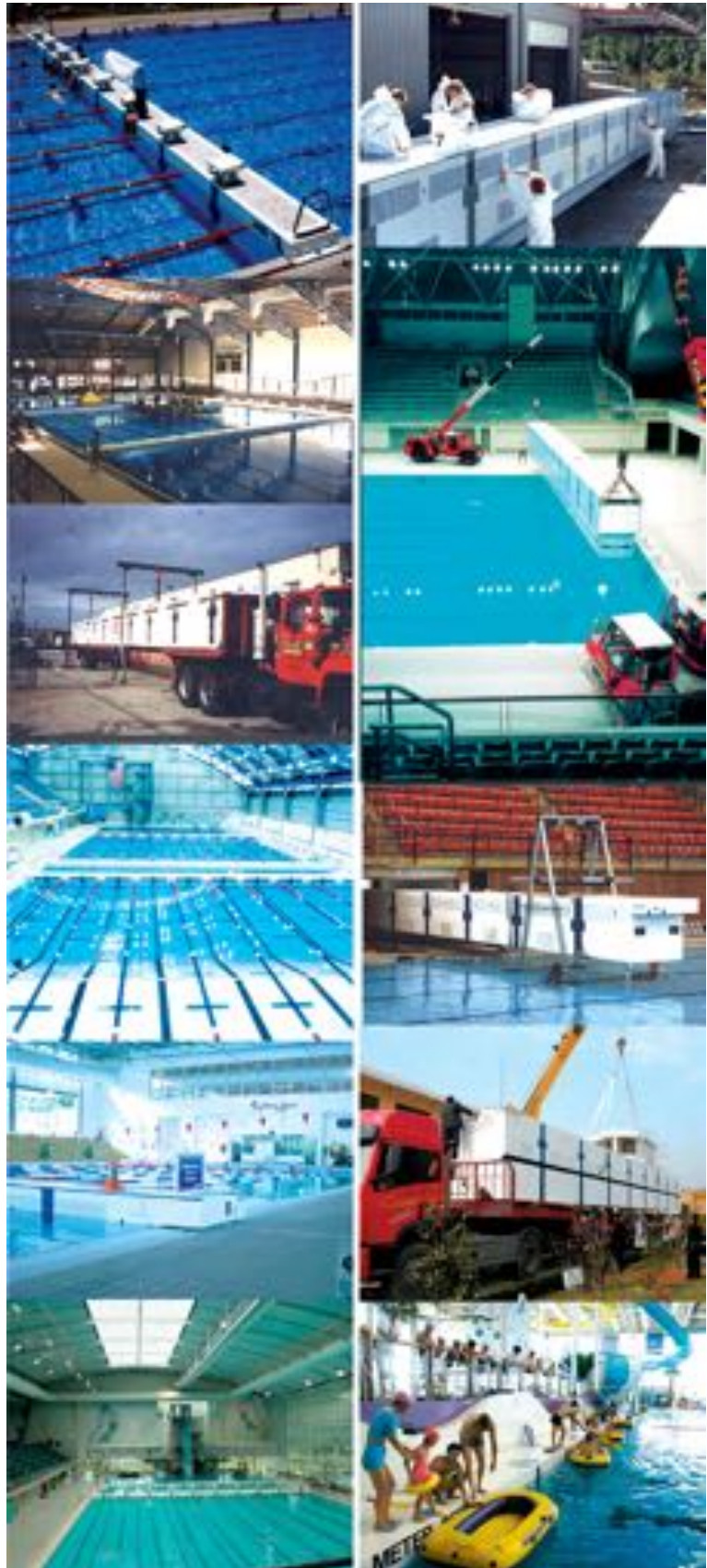
The bulkhead is installed with location pins which lock the bulkhead into position through sleeves installed in the pool tile surround. These sleeves and pins are manufactured from Type 316ss. These sleeves and pins are located after the bulkhead is in position and the location has been surveyed.

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

## Section 1.5 Bulkhead Installations:

### Installations Include

1986  
 Fortitude Valley Pool, Brisbane Australia  
 1987  
 City Bath Rotorua, New Zealand  
 Superdome, 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, Warringham 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  
 Cranbourne Aquatic Centre, Australia  
 2010  
 Asian Games, Guanzhong, China  
 Beijing Water Cube - 1st FINA World Cup  
 2010  
 Asian Games, Guangzhou, China  
 Singapore - First Youth Olympic Games  
 2011  
 South East Asian Games, Indonesia.  
 FINA World Cup Singapore  
 2012  
 FINA World Cup, Singapore  
 FINA World Cup Beijing Water Cube  
 2013  
 Myanmar, SE Asian Games, Myanmar  
 2018  
 Morodok Techno Aquatic Centre, Cambodia.  
 Venue for 2023 South East Asian Games.  
 2019  
 South East Asian Games, Clark City, Philippines



## Section 2.0

# 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 using supplied airlines 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 SwimWall - 'up' locked position

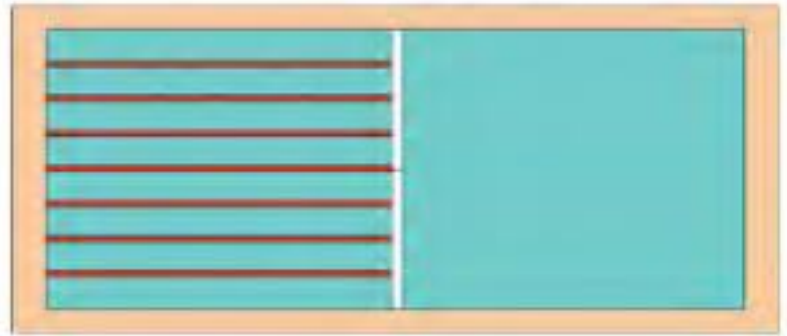
## Section 2.1 SwimWall Flexibility

With AntiWave SwimWall anything is possible...

Note: Below measurements are for demonstration only

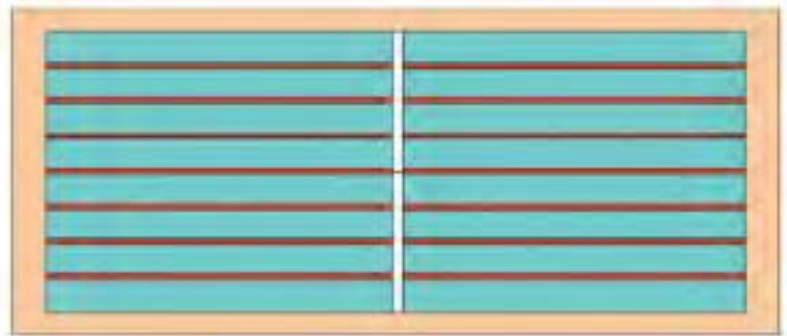
Program 1 (2 x 10m SwimWalls):

- 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



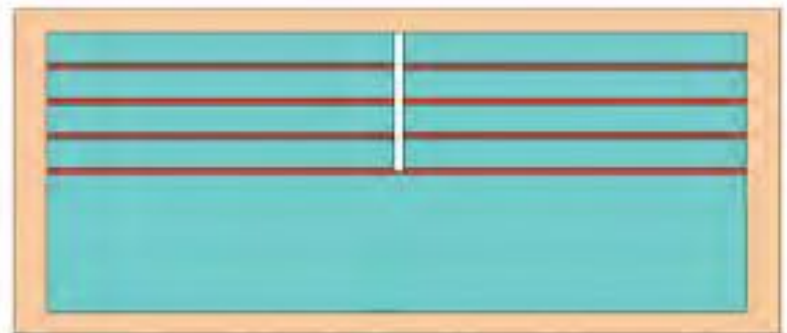
Program 2 (2 x 10m SwimWalls):

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



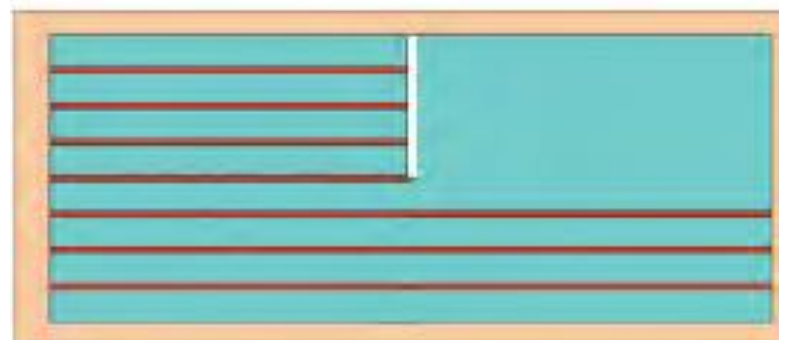
Program 3 (1 x 10m SwimWall):

- 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):

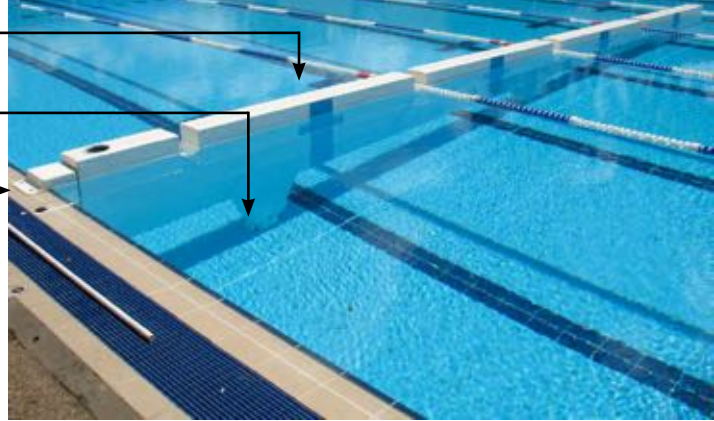
- One 4 Lane Pool 25m  
- Suitable for lap swimming
- One 4 Lane Pool 50m  
- Suitable for lap swimming
- One 25m Clear Pool  
- Suitable for Aquatic Sports



## Section 2.2 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.

### 3 • The SwimWall Locking Mechanism

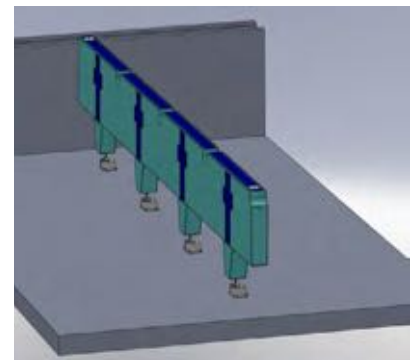
The Swimwall locking mechanism ensures secure fastening of the SwimWall in the 'up' position. A large diameter retractable pin secures the SwimWall to the SwimWall locking mechanism.

### 4 • Bouyancy Subsystem

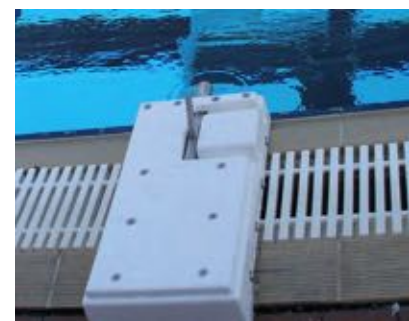
The Bouyancy subsystem is activated through the introduction of compressed air into the swimwall via the Air Input Pump.

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 Anchoring Subsystem



Swimwall Locking Mechanism

Swimwall Air Input Pump

## Section 2.3 SwimWall Operation



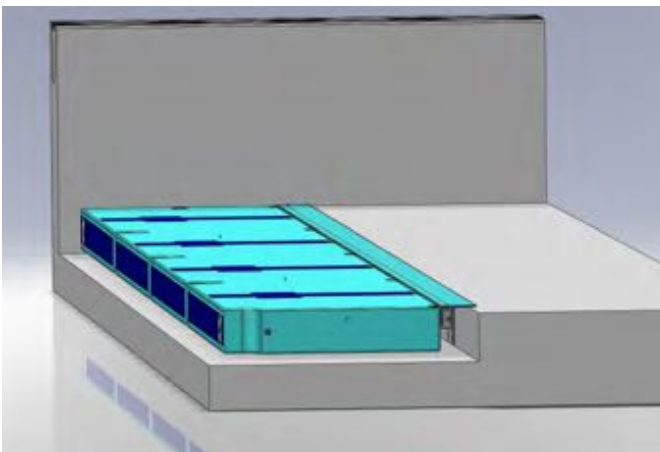
### Raising the SwimWall to the vertical position:

- 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.

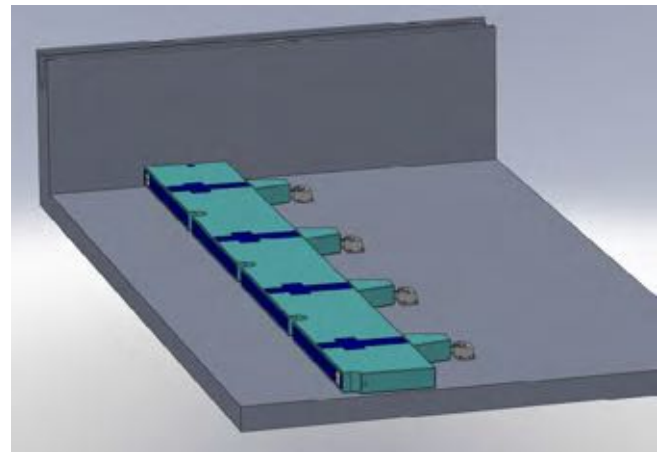
## Section 2.4 SwimWall Anchor Variations



### 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.

## Section 2.5 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

## Ordering Information

Since 1972 Anti Wave products and designs have been exported to over 150 Countries around the world.

Anti Wave has a widespread and growing global network of distributors and licensees, offering the most comprehensive and professional service and advice available.

Please contact our Global Headquarters to find your closest Reseller at [anti@anti.to](mailto:anti@anti.to)

Please contact our Global Headquarters for more information on our products.



FINA Singapore World Cup 2009 • Anti Wave Bulkheads • Anti Wave Maxi Lanes • Anti Wave Super Block

# Anti Wave International

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 Brisbane, Australia

With a global network of distributors and licensees around the world.

Contact us to find your closest reseller.

Anti Wave holds the following international Patents:  
 2001285610, 7100219, 4048677, 01818714 and 2003/2920

[www.anti.to](http://www.anti.to) [anton@anti.to](mailto:anton@anti.to)