

# New Zealand's Health & Safety Environment and how it impacts Hydrosides

Slide Design

Slide Operations

Slide Maintenance  
Including alterations

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hydrosides and aquatics



## Why The Speech



- All of our clients striving to achieve best practice in health and safety
- With large fines and criminal liability for server health and safety breaches
  - When there are few documented guidelines for hydroslices
  - Wondering if
    - their open hydroslice with low sides constitute a breach of the working at heights rules?
    - How to you safely inspection open slides
    - Is a slide a confined space?
- We have observed or are aware of a number of practices that have the potential to be dangerous or have resulted in accidents:
  - Some due to an increase in obesity
  - Some due to changes that were made without proper knowledge of slide design
  - Some due to trains
  - Some due to a lack of the importance of water flow
  - Some due to poor slide design of the hydroslice



## Why The Speech



- The New Wave Team (including Cresta) has learned through a few early mistakes and through modern engineering how to design slides safely.
  - When skyline were occasionally sending riders flying in the air
  - Cresta was occasional sending them out of the slides
  - These practices are no longer acceptable and they are no longer necessary
  - 30+ years of designing and installing hydroslices
  - Some early lessons
  - A strong relationship with Australian Water Slides, until they split
  - Mean we know how to build slides to be safe and exciting
- The significant changes in the legislation are an important consideration for every employer and worker in New Zealand
- So I hope you will find what I have to say interesting

- As the NZRA Guidelines State:
  - Hydrolides are safe if they are operated properly
  - This is true as long as they are designed properly
- Hydrolides are a great opportunity to experience excitement and perceived danger
  - In complete safety
- But we all still have to be vigilant

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# Who We Are



## Who we are



- Cresta



- A respected NZ brand, best known in Aquatics and the Boat Industry
- Owned by Graeme McCaw for 30+ years
  - And he still works with us
- Cresta has manufactured and installed the majority of New Zealand's Hydroslices

- Merged with Reflex in 2014
  - General fibreglass manufacturer
  - Boat builder



- To Form The Composite Group





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The Composite  
Group



One of New Zealand's Leading  
Fibreglass Manufacturers

Tanks



Transport



Construction



Swimming Pools  
– Residential



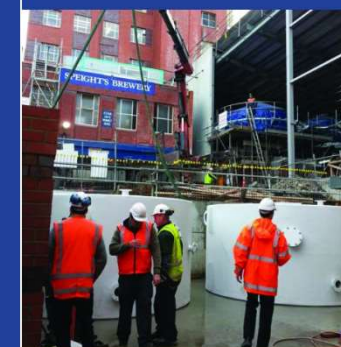
Architectural



Motor Homes



Industrial



Swimming Pools  
– Commercial





## New Wave



- New Wave was formed in 2017 to serve the Aquatics Sector
  - Hydroslide Design and Installation
  - General Aquatics
- Since this time we have
  - Won a key part of the new Metro Sports Facility in Christchurch
  - We have 6 active projects in New Zealand
  - We are actively bidding a number of others





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ProSlide



Saucers | Hybrids | Water Coasters | Funnels | Walls | Bowls | Custom Complexes

## Anchor Rides

Landmarks of your business.

- We have an agreement with ProSlide that includes New Zealand and Australia
- A world leader in hydroslide and theme park design



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ProSlide



- The latest feature rides
  - To
- Tiny domestic slides
- Supports by our factory in Christchurch





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## Our Special Effects Partners



# Together we're reinventing water play...

- With our partners
  - Click Suite and
  - Perceptual Engineering
- Two highly acclaimed specialists in their fields
  - Gaming
  - Av Special effects
  - Low cost alternative to replacing your slides

**CLICKSUITE**

**PERCEPTUAL ENGINEERING**

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# New Zealand's H&S Environment

and How It Has Changed



# The Big Influences



- Pike River
  - Has driven significant changes in the legislation
  - Has resulted in significant increases in fines
  - Has resulted in criminal liabilities
  - Has resulted in more balanced accountabilities
    - Employee and Employer fines, not just the later
  - Still being tested in the courts
  - Is driving major changes in health and safety cultures
    - **We all have to be more aware and more vigilant**



## The Big Influences



- Dream World Accident – Oct 16
  - Has resulted in significant amendments to AS3533
    - The Australian standards for Amusement Parks & Rides
    - Which covers hydroslices
  - It is setting a new benchmark for Amusement parks
    - Including in New Zealand as we do not have an equivalent
    - Is more focused on operations and maintenance
    - I have heard claims that it is over the top
  - The principles are not onerous to follow in New Zealand
  - And they will help operators demonstrate best practice

- The Four Key Areas That Need to Be Managed
  - Design,
    - Including installation & commissioning
  - Operations
  - Maintenance
    - Including alterations

# Slide Design

Including installation and commissioning

## Design Standards

- The New Zealand Building code does not require slide ride designs to be submitted or slide structural calculations
  - So consumers and councils are not protected by the building code against poor slide design
  - I have seen more than one slide that was clearly not professionally designed and potentially dangerous
  - It is my view that structures of this scale must include professionally prepared calculations for consent
  - We have seen slides designed to accommodate architects design constraints
    - That we refused to bid for
    - And resulted in problems



## Design Standards



- We adopt the European Standards for Slide Design
  - This is in my view the most comprehensive
  - AS3533 is very vague in respect to hydroslice design
    - It tends to be Amusement Park Oriented
  - The EN codes include maximum forces on the riders body
    - As well as many other relevant key design aspects and considerations
  - The EN codes also requires commissioning tests to prove the designer has achieved acceptable g force limits and that the slide is safe
  - Councils should be insisting on suppliers meeting this code,
    - Particularly the commissioning tests
  - The same standards should be applied to slide modifications as well
    - Relatively minor design changes can create a significant difference to the ride
  - Most of our older slides in NZ meet or exceed this standard
    - We are happy to audit older installations for compliance

# Design Standards

- Design is a combination of experience and mechanical engineering analysis
  - The standard leaves the ride design to the discretion and experience of the designer
    - This is to provide for freedom of design
    - But it can result in dangerous slides if the slide designer is not experienced
    - Or if the designer does not complete a proper ride analysis
  - The right combination and lengths of straights and turns is key
  - The forces can be significant so there is a risk of failure if the slides are not professionally designed
  - I have seen slides that were obviously not professionally designed
  - We draw on over 30 years of experience
  - We confer with ProSlide among others to help maintain best practice
  - We are right here in New Zealand so we are able to help our customers through these issues

## Design Standards

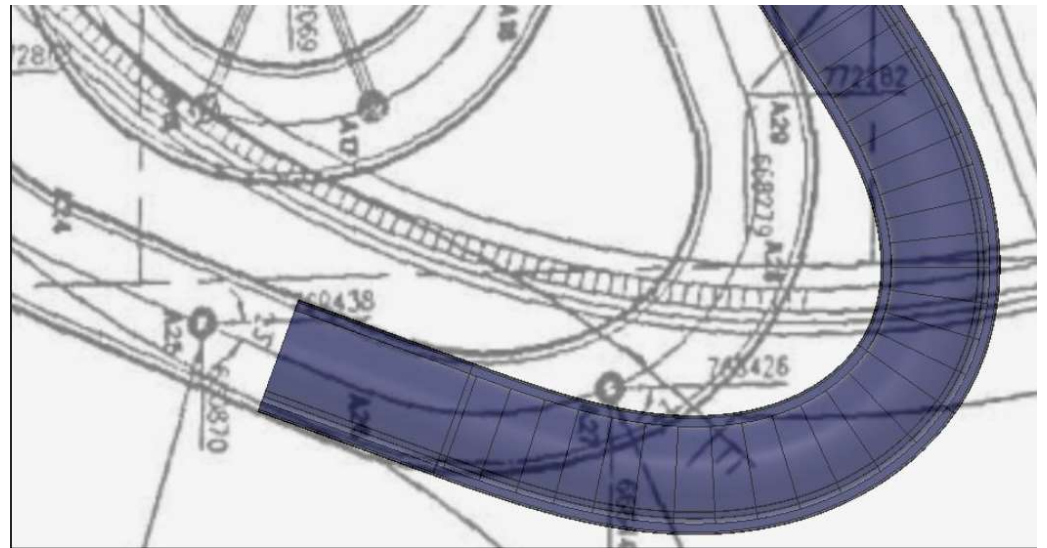
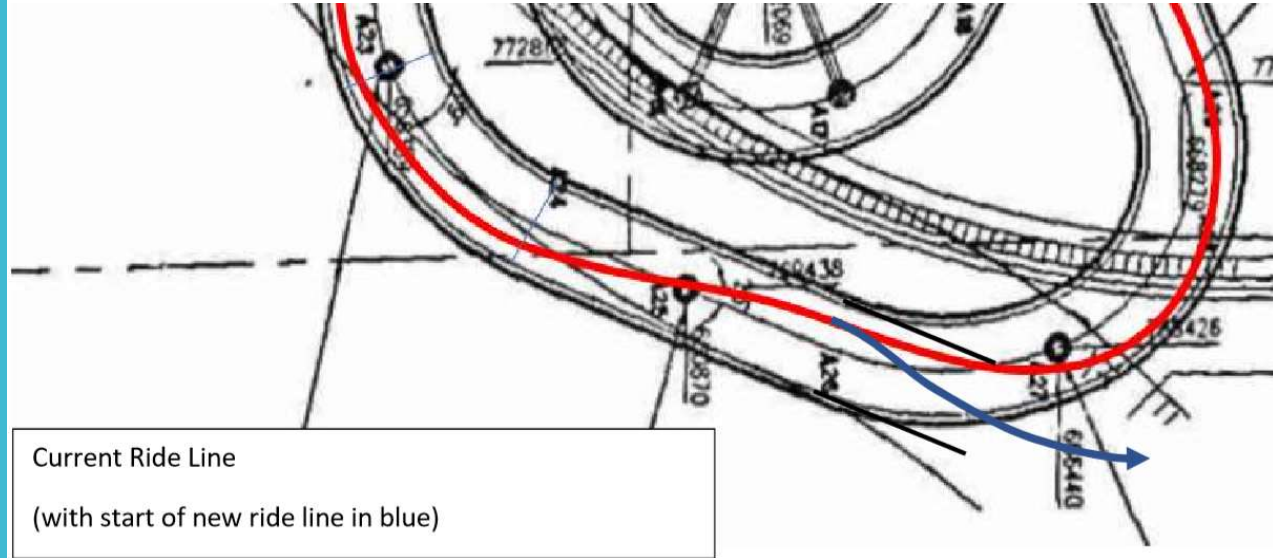


- Slide Installation is also important
  - We are aware of slide in New Zealand designed and supplied by experienced and credible slide designers but installed incorrectly
  - Slide are very flexible until anchored as designed
  - So they are tricky to install without experience
- Commissioning and Commissioning Tests are key
  - Testing has to be completed with the right gear
  - Commissioning has to be completed with the right riders
  - Commissioning has to be completed in a structured way and the results properly analysed
    - It's the final test that the designer and installer have got it right
  - Health and safety records are still important to ensure the ongoing design and operation are effective

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# Design Standards



## Design Risks



- For closed tube rides
  - Head knocks and shoulder injuries
  - Scrapes and bangs and collisions if the discharge is not properly designed
  - Skin burns if the water flow is not correct
- For open tube slides (raft or body slides)
  - All of the above plus
  - Lacerations
  - Leaving the slide
- Speed Slides
  - All of the above
  - Speed slides are particularly prone to riders leaving the slide if the runout design is incorrect
  - The skipping stone effect will occur at high speed with too much water and the wrong angle of entry
  - I am aware of a spinal injury in Australia on a slide made by one of the larger manufacturers
  - We experienced this many years ago and have learnt from our mistakes





## Where does the excitement come from



- Ride excitement can come from a range of factors:
  - Black holes – provide the unexpected and they are timeless
  - Progressively accelerating curves
    - Provide a safe, smooth and exciting ride
  - We are now offering special effects
    - Delivered by some of the best in the world
    - Providing a board range of appeal
    - Switch a switch to turn from a dragon to a butterfly
  - Gaming can offer another dimension
    - And it can be retrofitted
- With ProSlide's Support
  - We can even make you go uphill or loop the loop

## Design Conclusions

- Slides can be very safe if they are designed correctly
- The building code does not protect slide purchasers
- Some New Zealand slide owners have suffered from poor design

BUT

- There are relevant standards that can protect councils and other purchasers
- Its important that hydrosides are installed by experienced installers
- Its important that hydrosides are also tested during commissioning to the same standards
- This results in safe and exciting slides
  - And not a health and safety nightmare

# Slide Operation

and How It Has Changed



## Operations

- There is a need to document practices and procedures much more rigorously
- There is a need to ensure that you are following best practice
- There is a need to demonstrate continuous improvement
  - This is not hard to achieve for hydroslice operators
  - I believe this is a good thing
  - I don't believe it is anything to be afraid of

# Operations



- AS3533.2 Has a Comprehensive Section on Operations
  - Like the design part it is heavily focused on amusement rides
  - But it is comprehensive and has some key aspects that I feel are relevant to hydroslides
  - I believe it is establishing best practice
- Keeping a log book is a requirement of AS3533
  - Its simple to do
  - It's a standard practice in other industries
  - It an added safeguard when key staff leave
  - It provides a good history of changes, not dissimilar to pool water management records
- It reiterates many of the aspects that are required by our new OSH Act
  - Its quite specific in terms of accident and incident reporting
  - Aspects that most of us follow



# Operations



- Items Specific to Hydroslices
  - Items that should be covered in the designers manual
    - Rider orientation
    - Rider Spacing
    - Rider not to wear (glasses etc.)
    - Signage
    - And a range of other aspects and we recommend more
  - Items already covered in your other manuals and operating procedures
    - Water Management
    - Rescue Plans
    - First Aid
    - Operator Qualifications
    - Outdoor Inclement Weather
- It does require that hydroslices be registered
  - But this is not a requirement in New Zealand
  - I think this would be a step too far for New Zealand

## Issues we have observed



- We are aware of slides being ridden by trains of adults that are not designed for them
  - So make sure you understand the limitations on your slide designs
    - They should be in the manufacturers operating manual
  - We recommend that any limitations be clearly shown on signs
- We have seen slides that have become hazardous due to a general increase in rider weights
  - Your health and safety incident stats are likely to provide an indication of this
  - Make sure that your staff are aware of any weight limits on their slides
  - Many slides are designed for 100kg / px or 180kg / 2 px
  - Not a train of 4 or 5 px
- We have seen staff reduce water flows in the hope of reducing rider speeds
- Raft rides are more hazardous with large parents and small children in the one raft
  - Be aware of the manufacturers recommendations
  - Be careful when reordering tubes for raft slides

## Issues we have observed



- Waterflow is a key element of the slide design
  - The lower the flow the faster the riders
  - The higher the flow generally the more exciting the ride is
  - More water slows larger riders and speeds up smaller ones
  - The water flow should be checked and set on commissioning
  - We do not recommend that it be adjusted without the manufacturers input
  - We recommend water level markers or flow monitoring
    - Daily inspections of pump suctions and lint pots is important
- Rider spacing
  - If not sufficient then riders will clash either in the tube or in the runout
  - The spacing should be set by the designer during commissioning
  - Risks: burst ear drums / head knocks and other impact related injuries
  - The injuries are not normally serious but they are avoidable

## Issues we have observed



- Make sure that you incorporate the manufacturers manuals into your work procedures:
  - We recommend that key aspects be included on the signage
    - A requirement of AS3533
    - Something most NZ slide operators do well
    - But often one or two key items are missed
  - Prestart check lists are a key tool
    - Particularly for pump operations
    - Water flows
    - Runout chutes full
    - Slides inspected and safe to ride
- We recommend a comprehensive annual review

# Slide Maintenance

and How It Has Changed

# Maintenance

How it has changed



- Key Changes:
- If you take AS3533 as best practice
  - A key aspect is qualifications and training of maintenance staff
  - On a Hydroslice there is little to maintain so this is not a big cost
- The log book required in AS3533 covers maintenance
  - This approach is industry best practice in many industries
  - It's our view that it's simple to achieve and provides a good discipline
  - It means that mistakes in equipment changes can be traced
    - This provides a record of learnings
    - E.g. raft tube replacements

## Maintenance



- You should not have to do significant maintenance on your slides annually
  - We recommend an annual clean
    - Its important to use the right chemicals
  - Some of our owners clean 3 yearly with no degradation
  - Fibreglass will start to wear and fray over a very long time
    - This can result in minor cuts and abrasions
    - Slide inspections should pick this up
  - We recommend a through annual inspection
- We recommend that slide pumps be pulled once a year
  - To check for impellor or wear-ring damage or debris in the impellor
  - Most facilities have staff trained to do this
- The same goes for control gear and other piping systems
- Structural steel checks are important
  - But regular inspections by a suitably qualified professional is recommended
  - Most councils do this
- We recommend an annual review of safety stats, signage, and procedures
  - We are happy to support you with such audits



# Slide Alterations

and How It Has Changed

## Alterations



- Relatively minor changes in a slide's configuration can result in a significant change in the slide ride
  - So make sure that you use the original slide designer or a designer with sufficient experience to alter your slides
  - This is a requirement of AS3533
  - So in my view it constitutes best practice
  - And it can be dangerous if done incorrectly
- It is a requirement of AS3533 that any changes be documented
  - This is a standard approach in many other industries
  - Its also a good discipline that we recommend

# Conclusions

and How It Has Changed

# Conclusions



- Slides are exciting and safe
  - But there have been some unfortunate mistakes made in New Zealand
  - And the New Zealand Building Code does not protect owners or the public from shoddy design or shoddy testing and commissioning
- These can be avoided by:
  - Properly specifying slides during the procurement process
  - Having slides designed, Installed and tested by experienced and qualified professionals
  - The EU standards provide good protection for owners
  - But it still has to be implemented by the right professionals
- Slide development projects need to be designed
  - With architects suitably experienced in Hydroslice design
  - In conjunction with slide designers
- Slides Do Need to have
  - Properly documented operating procedures, signage and prestart checks
  - Theses need to reflect the owners / designers manuals and requirements
  - Annual reviews are a good safe guard

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- From the latest feature rides to
- Tiny domestic slides
- Supports by our factory in Christchurch

