

# ACO Urban Design Product Range

Pedestrian Safe Grates



## ACO Heelsafe® Anti-Slip grates

Standard '**Designer**' range

Custom '**Signature**' & '**Freestyle**' range

Linear **Permeable paver** solutions



## ACO Group

The ACO Group was established in Germany in 1946 and has been manufacturing products for the construction and building industry for over 60 years.

The group operates on a global basis through subsidiaries and manufacturing facilities in over 40 countries. ACO employs more than 4,400 people worldwide and has sales in excess of \$1 billion.

## ACO Australia

ACO was established in Australia in 1993 and offers an extensive portfolio of stormwater and building drainage products, cable pits, ducting enclosures, access covers and other products for niche applications, both external and internal.

ACO's manufacturing plant is located at Emu Plains, NSW and supports five offices and warehouses throughout Australia. ACO also supplies products to South East Asia and the Pacific Islands through its partners.

ACO provides technical advice to ensure the correct product is chosen for the application.

### Urban Infrastructure

Designing healthy urban spaces for people to socialise and enjoy is beneficial for business and the wider community.

ACO's urban drainage products offer excellent stormwater management solutions. They are designed to meet the needs of pedestrian areas and to harmonise with a project's architectural requirements.

### Typical applications:

- Streetscapes
- Public domains
- Recreational areas
- Car parks
- Schools
- Commuter facilities
- Private developments



ACO Pty Ltd, Head Office at Emu Plains NSW Australia

## ACO. The future of drainage.

### System Chain

ACO is a global leader in water management, with products that collect, clean, hold and release water; addressing all phases of the water cycle and supporting water sensitive urban design.



### Service Chain

To support ACO's extensive product range, ACO provides technical advice from concept design to final installation.

Customer service includes project specific design services, field support and installation advice. Product training and professional education seminars provide designers with the latest product information.





### ACO's philosophy on pedestrian safe surfaces

The importance of pedestrian and shared areas in our cities is being increasingly realised. These areas include public domains, community areas, streetscapes, schools, business parks, car parks and private developments. Urban designers have the responsibility to ensure that public spaces are functional, attractive and safe for pedestrians.

ACO believes that effective stormwater management is required for a durable and long-lasting pavement and foot friendly grates are necessary for pedestrian safety.

#### Principles that underpin ACO's Water Management philosophy

1. Pavements should be constructed as flat as possible for pedestrian safety with drainage systems that effectively capture and release stormwater
2. The slot size in surface drains should be kept to a minimum without compromising surface water drainage. There must be a balance between protecting heels, canes, bicycle tyres, wheelchairs and efficient surface water removal
3. All grates for surface drains must have a documented slip resistance rating. It is advisable that slip resistant grates are installed in pavements with a similar slip resistance rating
4. All grates for surface drains need to be durable, robust and load rated for service vehicles, cars and trolleys
5. All grates for surface drains must be secure and provide easy access for maintenance and cleaning to ensure continual optimum drainage performance



Download the published White Paper on pedestrian safe pavement design from [www.heelsafe.com.au](http://www.heelsafe.com.au)

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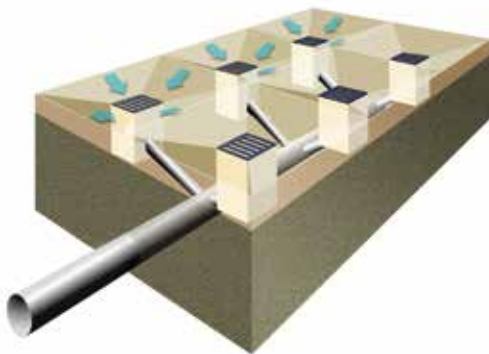
# Surface Water Management

## Pavement Design

Flat and level pavement design reduces risks to pedestrian safety and requires an efficient surface water management system to prevent hazards caused by ponding and standing water.

Effective surface water management also prevents damage to buildings and preserves the life of the pavement. There are two main approaches to surface water drainage; grated pit and pipe drainage and linear drainage.

### 1. Grated pit and pipe drainage



Grated pit and pipe

Precise and exact grading is required to intercept surface water with the grated pit and pipe option. The pits are located at strategic areas on the pavement to collect the water which is removed from the site via a network of underground pipes.

- ✗ Not aesthetically pleasing
- ✗ Undulating pavement involves complex construction and requires costly and extensive earthworks for pipe network
- ✗ May cause pedestrian safety hazards and property damage, for example runaway shopping trolleys
- ✗ The longevity of the pavement will be compromised if the pavement settles, creating areas for standing water
- ✗ Pipes may be easily blocked requiring frequent maintenance
- ✓ Initial product costs are low, but are generally offset by the issues raised above

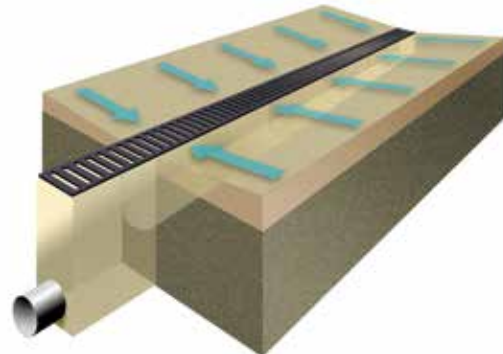


## Modular drain price comparison

A report prepared by independent quantity surveyor, Rider Levett Bucknall compared the installation costs of precast modular grated trench drains with cast-in-situ grated pit and pipe systems. The results showed precast modular solutions were the cost effective option, [www.heelsafe.com.au](http://www.heelsafe.com.au)



### 2. Linear drainage



Linear drainage

Simple one-way falls are required for linear drainage, enabling a continuous line of water capture which quickly and efficiently collects and transfers surface water off site.



- ✓ Aesthetically pleasing
- ✓ One way grading is simple and quick to construct, requiring minimal underground pipework
- ✓ Minimal standing water extends the life of the pavement
- ✓ Linear drainage can be useful to prevent water transgressing into environmentally sensitive areas and across thresholds
- ✓ Factory manufactured modular trench drains are produced with a consistent quality and comprise:
  - built-in slopes ensuring efficient drainage to outlets
  - advanced V-shape profiles minimising the build-up of silt
  - precast polymer which is more durable than concrete
- ✗ Cast-in-situ concrete trench drains require a complex construction process and may result in substandard quality. There is a limited range of grate options available
- ✗ Open swales cannot be walked on and may block with debris



Pedestrian Safe Grates

ACO Heelsafe® Anti-Slip grates provide the ideal surface water drainage solution for flat pavements where slip resistance, durability and heel safety are required. The grates provide a balance between pedestrian safety and surface water collection with maximum slot widths of 10mm.







ACO Heelsafe® Anti-Slip grates have been tested for slip resistance in accordance with AS 4586. Grates are available in a wide range of slip resistance ratings, ensuring there is an ACO grate suitable for any external application.

The grates are available in a variety of durable materials including cast iron, composites, stainless and galvanised steel. The grates are designed to withstand trucks, cars and trolleys.

Load Classification





ACO grates are load rated to AS 3996 to ensure they withstand the intended traffic for the application.

	<b>A</b> 10kN	<b>Extra light duty</b> <b>Wheel Load 330kg</b> Footpaths and areas accessible to pedestrians and cyclists only
	<b>B</b> 80kN	<b>Light duty</b> <b>Wheel Load 2,670kg</b> Footpaths that may encounter vehicles, light tractors and livestock
	<b>C</b> 150kN	<b>Medium duty</b> <b>Wheel Load 5,000kg</b> Malls and pedestrian areas that encounter commercial vehicles
	<b>D</b> 210kN	<b>Heavy duty</b> <b>Wheel Load 8,000kg</b> Carriageways and areas open to commercial vehicles

Heelsafe® Anti-Slip criteria

ACO believes that pedestrian friendly grates and slip resistance go hand in hand. The Heelsafe® Anti-Slip trademark identifies grates that meet the following criteria.



-  Designed to resist the penetration of a 10mm heel and comply with AS 3996 Clause 3.3.5: Surface Openings in Pedestrian Areas.
-  Comply with wheelchair and walking cane safety requirements of AS 1428.
-  Comply with bicycle tyre resistance criteria of AS 3996.
-  Slip resistance rated to AS 4586. ACO recommends grates have a similar slip resistance rating to the adjacent pavement, see page 18.



Special applications

For areas where surface water volumes are low and specific protection is required for stiletto heels, ACO can supply grates, with slot sizes no greater than 8mm that comply with ASME A112.6.3.

As small slots restrict surface water collection, ACO offers a free technical service where a grate's hydraulic intake capacity with blockage factors can be assessed against specific project requirements, see page 19.









## Product Range

### Standard 'Designer' range

A range of pedestrian friendly grates compatible with ACO's manufactured modular Polycrete® Channels and stainless steel channels.

- Grates are manufactured from a variety of materials suitable for most load applications
- Grates are available in standard widths and narrow slots
- Channels are available in a variety of depths and with a built-in fall to facilitate drainage



### Custom 'Signature' and 'Freestyle' range

Create a distinctive statement for your next project with unique custom designed grates.

ACO has the capability to manufacture custom designed pedestrian safe grates compatible with ACO's manufactured modular Polycrete® Channels or with other drainage substructures.

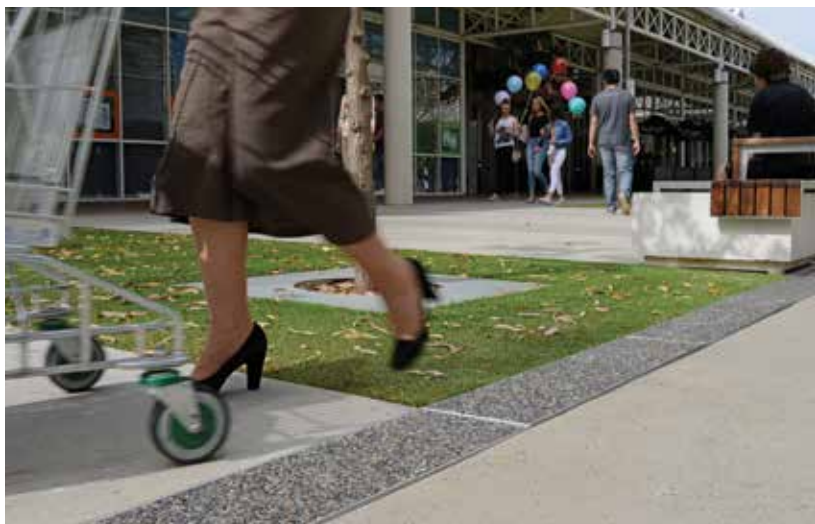
- ACO's 'Signature' grates comprise an extensive range of stainless steel longitudinal designs customised to any width, length and shape
- ACO 'Freestyle' enables designers to create a custom iron grate that is compatible with ACO's channels



### 'EcoPanel' linear permeable pavers

EcoPanel is a permeable paver system compatible with ACO's manufactured modular Polycrete® Channels. The panel surface is constructed from a durable, porous resin composite with a mix of fine and coarse aggregates. The finish is similar to smooth aggregate concrete.

- A choice of colours are available to coordinate with adjoining and/or surrounding pavement surfaces
- The permeable panel is designed to be installed adjacent to impermeable and permeable pavements



## Standard 'Designer' range

The 'Designer' range comprises a selection of pedestrian friendly grates and continuous slot inlets compatible with ACO's precast modular Polycrete® Channels and fabricated stainless steel trench drains.

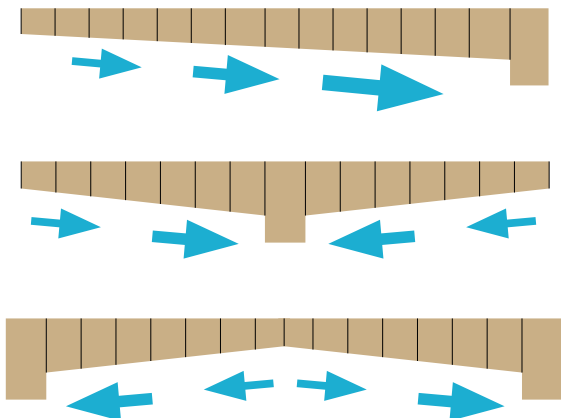
Systems are available in a variety of widths, depths, lengths and load ratings suitable for urban pavements and protecting buildings from stormwater.

### Versatility for pavement design

Draining flat pavements in the urban environment is challenging. The 0.5% internal slope in ACO's modular channels help to minimise undulations in the pavement for pedestrian safety.

ACO's Polycrete® Channels provide a continuous sloped run in flat pavements.

- 40 metres in one direction (end outlet)
- 80 metres in two directions (central or end outlets)



### Locking of grates

ACO offers a choice of locking mechanisms.

**DrainLok** is a patented, barless and boltless locking system that provides quick fitting and removal of grates that helps reduce installation time, maintenance time and cost. There are four locking points per metre.



## Grated trench drains

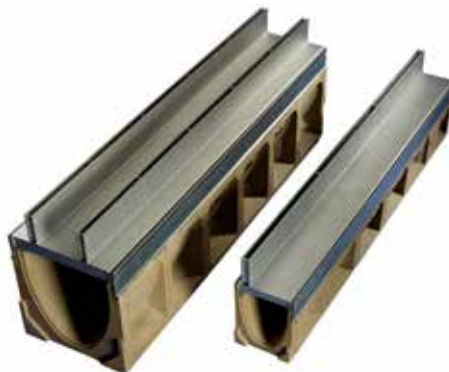
[www.acodrain.com.au](http://www.acodrain.com.au)



- Lockable grates for 50mm, 100mm, 200mm and 300mm modular channels with 0.5% built-in fall within the channel
- General purpose, heavy duty and shallow depth drain systems are available

## Continuous slot trench drains

[www.acodrain.com.au](http://www.acodrain.com.au)



- Continuous discreet slotted inlets for 100mm and 200mm modular channels with 0.5% built-in fall within the channel
- Single, double or twin slots are available with access units for easy maintenance

## Building drainage systems

[www.acobuildingdrainage.com.au](http://www.acobuildingdrainage.com.au)



- A range of drainage systems are available designed to protect the building from the ground level up to the roofline
- Shallow drainage systems suitable for restricted depth applications for balconies and thresholds
- Green roof drainage systems designed to manage both surface and subsurface stormwater

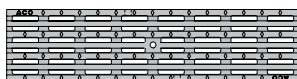


## Standard 'Designer' grates

'Designer' grates are available in 50mm, 100mm, 200mm and 300mm nominal widths compatible with ACO channels.



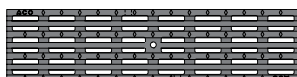
## Galvanised Intercept



Available in 100, 200, 300mm widths  
Slip rated to AS 4586: P3; R10



## Iron Intercept



Available in 50, 100, 200, 300mm widths  
Slip rated to AS 4586: P2; R9/R10<sup>1</sup>



## Iron Wave



Available in 100, 200, 300mm widths  
Slip rated to AS 4586: P4; R10



## Galvanised Longitudinal



Available in 100mm width only  
Slip rated to AS 4586



## Plastic Black Intercept



Available in 100mm width only  
Slip rated to AS 4586: P4; C/B<sup>1</sup>; R9/R10<sup>1</sup>



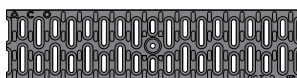
## Plastic Grey Intercept



Available in 100mm width only  
Slip rated to AS 4586: P4; C/B<sup>1</sup>; R9/R10<sup>1</sup>



## Plastic Slotted



Available in 100mm width only  
Slip rated to AS 4586: P5



## Stainless 5 Star



Available in 50, 100, 200, 300mm widths  
Slip rated to AS 4586: P4; C; R11  
Also available in R12  
(See Page 11 for more variations)



## Stainless Wedgewire



Available in 100, 200, 300mm widths  
Slip rated to AS 4586: P3; C/B<sup>1</sup>; R10  
(See Page 11 for more variations)



<sup>1</sup> Test direction (perpendicular/parallel) relative to the grate's length



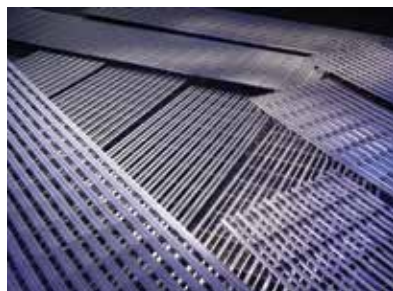
# ANZ

ANZ Tower 242 Pitt Street  
Through to Castlereagh Street





## Custom 'Signature' range



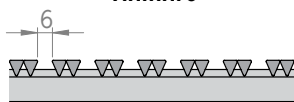
The 'Signature' range comprises a large selection of stainless steel longitudinal grates with 3mm and 5mm wire.

### ACO 'Signature' grates

'Signature' grates can be made to any width, length and shape. Possible applications include stormwater drains, building wastewater drains, floor matting, door thresholds, tree and HVAC grilles.

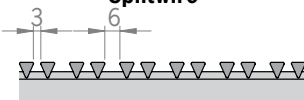


### Twinwire



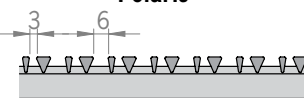
Available in custom and standard sizes  
Slip rated to AS 4586: P5; C/C<sup>1</sup>; R12/R12<sup>1</sup>  
Suitable for DrainLok, see page 8

### Splitwire



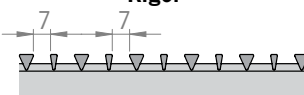
Available in custom and standard sizes  
Slip rated to AS 4586: P5; C/C<sup>1</sup>; R11/R11<sup>1</sup>  
Suitable for DrainLok, see page 8

### Polaris



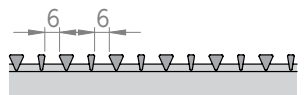
Available in custom sizes  
Slip rated to AS 4586: P4; C/C<sup>1</sup>; R10/R10<sup>1</sup>

### Rigel



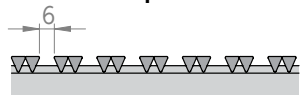
Available in custom sizes  
Slip rated to AS 4586: P3; C/C<sup>1</sup>; R11/R10<sup>1</sup>

### Atlair



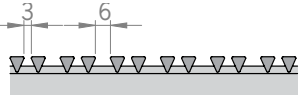
Available in custom sizes  
Slip rated to AS 4586: P4; C/C<sup>1</sup>; R11/R11<sup>1</sup>

### Alpha



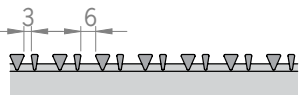
Available in custom sizes  
Slip rated to AS 4586: P1; C/B<sup>1</sup>; R10/NC<sup>1</sup>

### Delta



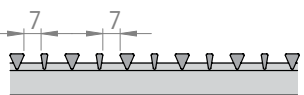
Available in custom sizes  
Slip rated to AS 4586: P1; C/B<sup>1</sup>; R10/NC<sup>1</sup>

### Luria



Available in custom sizes  
Slip rated to AS 4586: P1; C/A<sup>1</sup>; R10/NC<sup>1</sup>

### Orion



Available in custom sizes  
Slip rated to AS 4586: P1; C/A<sup>1</sup>; R10/NC<sup>1</sup>



<sup>1</sup> Test direction (perpendicular/parallel) relative to the grate's length







### Custom 'Freestyle' grates

It is desirable that urban spaces relate and coordinate with existing structures. Areas such as entrances, walkways, courtyards, streetscapes and shared access areas, whether public or private can all have their appearance significantly enhanced with the creative use of ACO 'Freestyle' grates.

ACO 'Freestyle' enables designers to incorporate contextual visual elements to their project by providing the tools to create unique custom designed iron grates that are compatible with ACO's Polycrete® Channels.

Flexible production tools at ACO's foundries make it possible for designers to create unique pedestrian safe grates with the DrainLok locking mechanism compatible with ACO's standard KlassikDrain channel.

ACO can assist to incorporate the desired level of slip resistance to the grate for the application.

#### Features

- Load Class D210kN AS 3996
- Manufactured from ductile iron
- ACO DrainLok locking system, see page 8
- ACO Freestyle grates are available for 100mm, 200mm and 300mm KlassikDrain systems  
<http://www.acodrain.com.au/klassikdrain/>







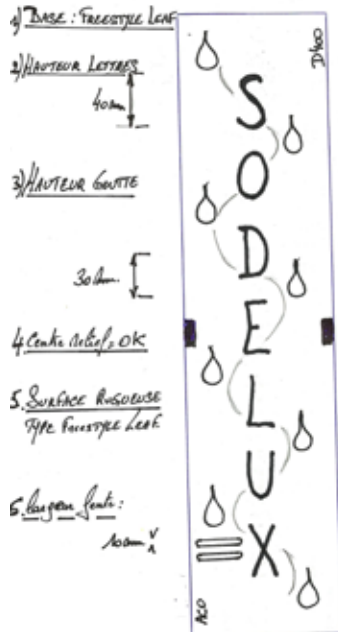


## 'Freestyle' Planning Kit

To create a custom designed grate, all you need to start is an idea and a sketch.

### 1. The idea

Speak to your ACO representative to discuss your design idea.



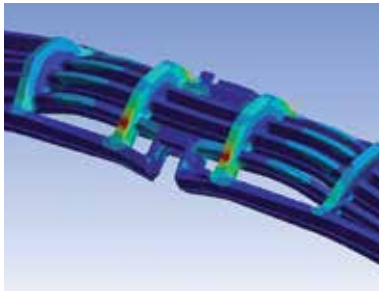
### 2. Three-dimensional model

Your design will be made into a three-dimensional model with a standard base. The standard base comprises the DrainLok device, see page 8.



### 3. Design approval

When the design has been approved, a computer simulator tests the strength of the grate and its suitability to be cast.



### 4. Tool ordering

The two part tool with the custom design is prepared.



### 5. Casting & surface protection

The parts are cast and the standard paint surface protection is applied.



## 'Freestyle' inspirations

ACO has produced and supplied 'Freestyle' grates worldwide. ACO has access to a selection of standard 'Freestyle' grate designs. Contact your local sales representative and download the **ACO Custom Freestyle Range Book** [www.heelsafe.com.au/signature-freestyle/](http://www.heelsafe.com.au/signature-freestyle/)









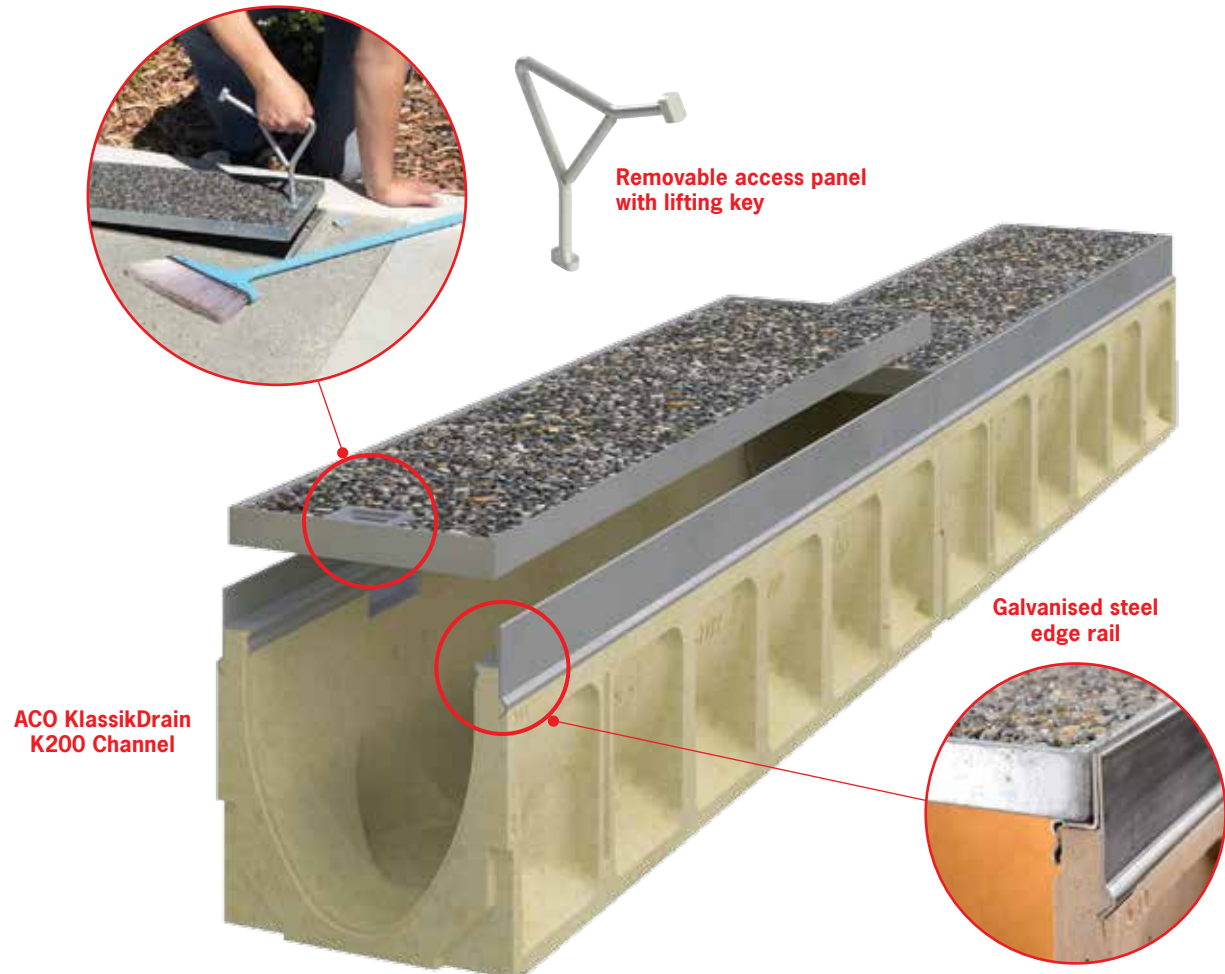
### 'EcoPanel' linear permeable paver

'EcoPanel' is a stormwater trench drain cover consisting of a galvanised steel frame that is filled with a permeable UV stable resin-bonded aggregate. This unique combination provides a durable load bearing surface enclosed in an engineered frame, allowing for water infiltration.

'EcoPanel' covers are installed into ACO Polycrete® Channels. A removable access unit is available for maintenance. Suitable applications include parks, playgrounds and landscaped areas.

#### Features

- Foot-friendly linear drainage system
- EcoPanel UV stable resin-bonded aggregate is available in eight colours
- The EcoPanel cover prevents litter and reduces sediment from entering and clogging the stormwater system
- Meets load class C150kN AS 3996
- Slip resistance rated to AS 4586: P5
- Hydraulically tested, see page 9



#### Colour options



Black Granite



Blue Marble



Silver Marble



Starlight Granite



Sand Marble



Grey Marble



EcoPanel drainage system

## Slip resistance of grates

With the increase in litigation for injuries caused by slips, trips and falls, designers need to specify grates and floor surfaces that comply with the standard for slip resistance.

### Testing for slip resistance of grates

Three tests are specified in AS 4586 to rate the slip resistance of a grate or floor surface:

- 1 Wet pendulum test** is applied to stormwater grates installed in urban pedestrian areas
- 2 Wet-barefoot inclining platform test** is applied to grates installed in wet areas where footwear is not worn, for example pools, waterparks and beaches
- 3 Oil-wet inclining platform test** is applied to grates installed in commercial and industrial areas that may be contaminated with oil or grease, for example commercial kitchens and food processing factories.

### A higher slip resistance rating does not necessarily provide a better solution

It is advisable that designers specify materials with a slip resistance rating suitable for the application. A trip hazard may occur when a grate has a higher slip resistance rating than the surrounding floor surface.

The Standards Australia Handbook SAHB 198: *Guide to the Specification and Testing of Slip Resistance of Pedestrian Surfaces*, provides the following information:

- Slip resistance classification of new pedestrian surface materials compliant to AS 4586
- Commentary on the National Construction Code (NCC) that references AS 4586 for particular applications
- General guidance for specifying pedestrian safe materials

### Minimum classifications recommended in SAHB 198:2014 for particular applications

Location	Wet pendulum test	Inclining platform test
<b>External Pavements and Ramps</b>		
External ramps including sloping driveways and footpaths steeper than 1 in 14	P5	R12
External ramps including sloping driveways and footpaths under 1 in 14, external stores, markets, external carparks, external colonnades, walkways, pedestrian crossings, balconies, verandas, carports, driveways, courtyards and roof decks	P4	R11
Undercover car parks	P3	R10
<b>Hotels, Offices, Public Buildings, Schools and Kindergartens</b>		
Wet areas	P3	R10
Transitional areas	P2	R9
Dry areas	P1	R9
Toilet facilities in offices, hotels and shopping centres	P3	R10
Hotel apartment bathrooms, en-suites and toilets	P2	A
Hotel apartment kitchens and laundries	P2	R9
<b>Supermarkets and Shopping Centres</b>		
Fast food outlets, buffet food areas, food courts and dining areas in shopping centres	P3	R10
Shops and supermarket fresh fruit and vegetable areas	P3	R10
Shop entry areas with external entrances	P3	R10
Supermarket aisles (except fresh food areas)	P1	R9
Other separate shops inside shopping centres – wet	P3	R10
Other separate shops inside shopping centres – dry	P1	R9
<b>Loading Docks, Commercial Kitchens, Cold Stores, Serving Areas</b>		
Loading docks under cover and commercial kitchens	P5	R12
Serving areas behind bars in public hotels and clubs, cold stores and freezers	P4	R11
<b>Swimming Pools and Sporting Facilities</b>		
Swimming pool ramps and stairs leading to water	P5	C
Swimming pool surrounds and communal shower rooms	P4	B
Communal changing rooms	P3	A
Undercover concourse areas of sports stadiums	P3	R10
<b>Hospital and Aged Care Facilities</b>		
Bathrooms and ensuite in hospitals and aged care facilities	P3	B
Wards and corridors in hospitals and aged care facilities	P2	R9

<sup>1</sup> Refer to the National Construction Code for specific classifications relating to stairs and ramps.



## ACO Technical Support

ACO has an established Technical Services Department with many years experience advising on surface drainage. The free service is offered without obligation and is supported with extensive information, brochures and technical documentation. Services include advice at the initial design stage through to on-site support when required.

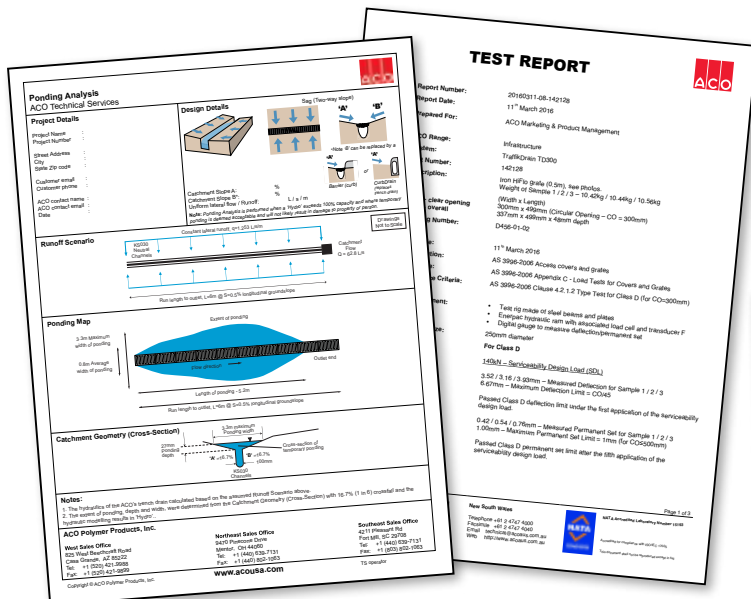
## Trench and grate hydraulics

- ACO provides information to help choose the correct size trench drain for the application
- ACO provides a service to check the hydraulic capacity of the grate to ensure no by-pass occurs and can be analysed with blockage factors applied



Grate intake testing based on experimental results and software developed by the UNSW Water Research Laboratory

## Technical documentation



## Certification

- NATA slip resistance certificates to AS 4586
- NATA load test reports to AS 3996 (ACO Laboratory NATA Accreditation No: 15193)
- Certificate of Compliance available

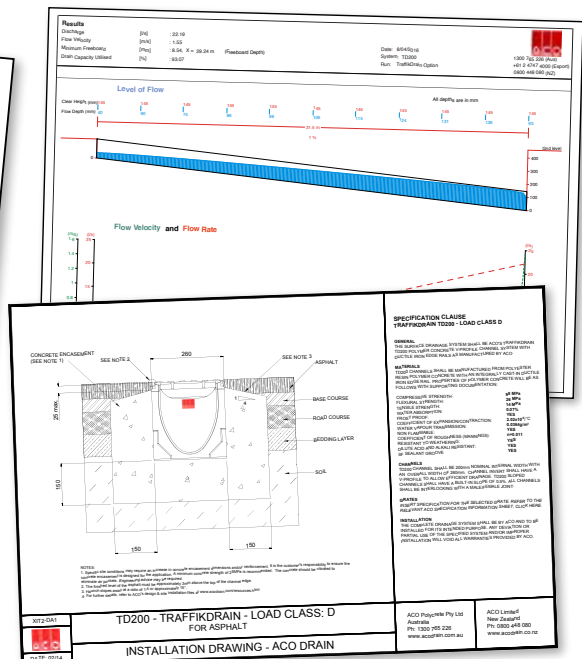


ACO's NATA Accredited Testing Machine

## Drainage layout advice

ACO understands that project costs can be best minimised early in the design phase. ACO has a Technical Services Department with qualified engineers able to recommend optimum drainage solutions where:

- earthwork and pipework need to be minimised
- existing drainage infrastructure and surface levels are to be utilised
- adherence to WSUD and specific client requirements are requested





## ACO Heelsafe® product lines

- **ACO Drain**  
Trench drains for urban environments
- **ACO Infrastructure**  
Trench drains suitable for transport infrastructure
- **ACO BuildLine**  
Trench drains for thresholds, balconies and green roofs

## ACO Pty Ltd

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