train

Introduction – Selecting the Right Product

When selecting trench drains, factors such as site and hydraulic requirements should be considered to ensure a long service life.

1 Introduction

2 Product Selection Guide

1 Introduction

Grated trench drains

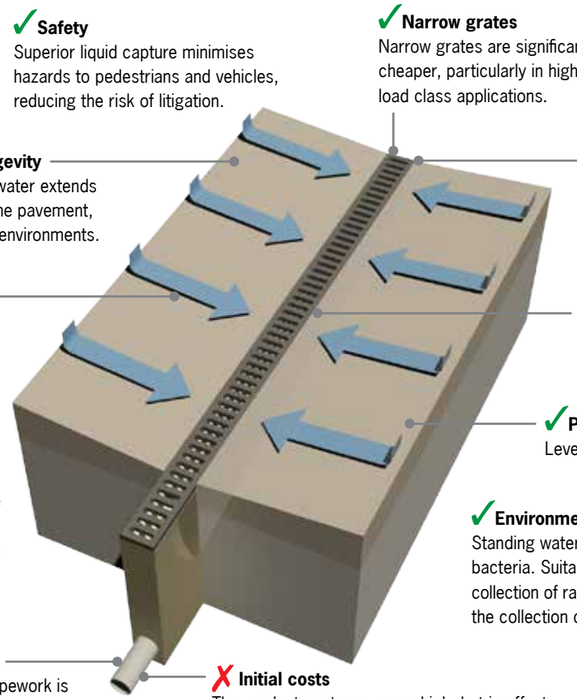
A trench drain is a continuous line of surface drainage that removes liquid from impermeable and semi-permeable surfaces.

Grated trench drains have continuous inlets along the entire length of the trench that enables maximum liquid capture and allows for simple one-way grading of the pavement.

Modular precast trench drains

Modular, factory produced trench drains offer consistent quality and can be created with advanced shape profiles with a built-in slope, providing additional benefits and cost savings.

Grated trench drains



✓ **Safety**
Superior liquid capture minimises hazards to pedestrians and vehicles, reducing the risk of litigation.

✓ **Narrow grates**
Narrow grates are significantly cheaper, particularly in high load class applications.

✓ **Pavement longevity**
Reduced standing water extends the service life of the pavement, especially in harsh environments.

✓ **Hydraulics**
Narrow systems with built-in slopes create increased velocity, resulting in drainage efficiency and lower materials costs.

✓ **Grading**
One-way slopes are simple, easy and quick to construct.

✓ **Improved aesthetics**
Grate used as a border or feature in the pavement.

✓ **Pedestrian safe**
Level pavements.

✓ **Maintenance**
Trench drains enable easy access for maintenance and the increased flow velocity reduces the amount of sediment build-up and maintenance time.

✓ **Environment and health**
Standing water attracts insects and bacteria. Suitable drainage enables the collection of rainwater for reuse and the collection of liquids for treatment.

✓ **Pipe cost savings**
Minimal underground pipework is required with reduced excavation and site costs.

✗ **Initial costs**
The product cost may seem high, but is offset by lower pipework and installation costs.

Cast-in-situ trench drains

A cast-in-situ drain is created on-site during a concrete pour. It has some similarities with modular trench drains except for the following disadvantages:

✗ **Deterioration** of concrete surfaces especially in harsh environments, which results in lower performing hydraulics and difficult to clean surfaces.

✗ **Wider grates** are more expensive, particularly in high load class applications.

✗ **Site work** involving excavation and the construction of formwork with a slope or 'V' profile can be costly. Tees and corners are difficult and time consuming to create.

✗ **Quality** can be inconsistent and vary greatly depending upon the contractor. It is difficult to achieve a level frame with adequate concrete support for the grate.

Alternatives to grated trench drains

Spoon drain

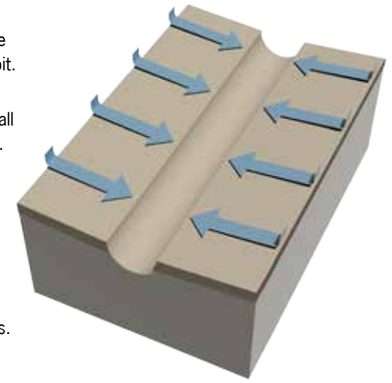
A spoon drain is a formed swale in the pavement, often leading to a grated pit.

✗ **Inconvenient ponding**
Cannot be walked on, even with a small amount of liquid. Potential trip hazard.

✗ **Inefficient drainage**
Shallow, inconsistent and irregular surface areas result in reduced hydraulic performance.

✗ **Maintenance**
Requires frequent cleaning as the spoon drain easily accumulates debris.

✓ **Low cost**
Quick to create with no product costs.



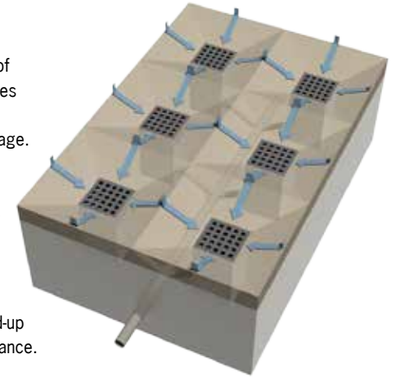
Spoon drain

Point drainage

Point drainage consists of a series of grated pits located at strategic places in the pavement. Precise and exact grading is needed for efficient drainage.

✗ **Pavement longevity**
The undulating pavement surface deteriorates prematurely, especially in harsh environments, reducing the service life of the drain.

✗ **Frequent maintenance**
Pipes are easily blocked by the build-up of debris requiring frequent maintenance.



✗ **Poor quality**
Inconsistent pavement finish results in settlement, which leads to ponding.

✗ **Undulating pavement**
Complex four-way slopes are difficult and time consuming to design and construct.

✗ **Costly pipework**
Extensive underground pipework, excavation and site work required.

✓ **Product costs**
Initial costs appear to be low, but is offset by higher pipework and installation costs.

Point drainage

Do nothing

Do nothing

✗ **Property damage**
Increased risk of property damage due to flooding and water ingress.

✗ **Legal ramification**
Risk of litigation from damage to property and/or injury to persons.

✗ **Environmental damage**
Risk of environmental issues and costly clean-up and remediation expenses.

✗ **Reduced life of pavement**

✓ **No money spent**

2 Product Selection Guide

A guide to grated trench drain selection

When selecting a grated trench drain, consider the following factors to ensure the drain has a long design life.

Application

The location considerations include loading, site and user requirements.

Hydraulics

The amount of liquid to be collected and drained.

Application

There are a number of critical issues to address regarding the correct installation of a trench drain. Incorrect product choice could lead to premature product failure, costly remediation, over-engineered solutions and possible litigation.

Load Class

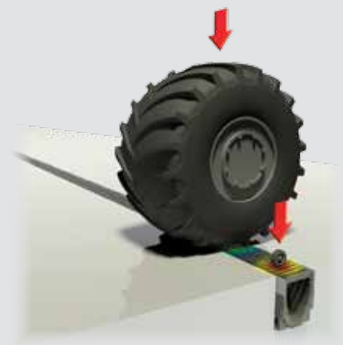
Loading refers to any kind of traffic or load being applied to the trench and grate and is categorised into several load classes from light (A) to heavy (G).

The EN 1433 Standard is specifically written for trench drains of different widths, and the AS 3996 Standard specifies the requirements for the grates and covers.

Consider the following criteria when selecting the correct drainage system:

- **Type of traffic** such as pedestrians, cars, trucks, forklifts and aircrafts.
- **Wheel load required** for the type of vehicle, weight of the load being carried, and the type of tyre on the vehicle such as solid or pneumatic.
- **Frequency of traffic** can vary from occasional use to high traffic areas.
- **Unusual traffic** may include construction and maintenance vehicles, temporary cranes and skip bins.

For more detailed information, see pages 104 to 109.



Site requirements

The specific requirements of the installation location will influence the choice of trench drain and grate.

- **Installation restrictions** such as limited down times may require trench drains that are quick to install.
- **Limited construction depth** will require a shallow trench drain system.
- **Corrosive liquids** will influence the choice of channel and grate material.
- **Non-metallic trench drains** may be required for factors other than chemical resistance, for example explosive environments and certain industrial applications where sparking may occur. Contact ACO for more information.
- **Environmental requirements** will be a determining factor in certain applications.
- **Sloped trench drains** may be required to eliminate standing water which provides a breeding ground for mosquitoes and potential illnesses such as Malaria, Zika and West Nile virus.

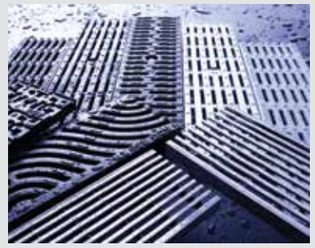
For more detailed information, see pages 110 to 113.

User requirements

User requirements determine the type of grate selected for the specific project. Considerations such as aesthetics, legal and safety concerns will affect the grate specification.

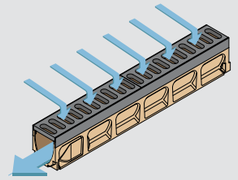
- **Aesthetic design decisions** influence the size and shape of the intake slots and the construction material selected such as iron, stainless steel or plastic.
- **Legal compliance** relates to slip resistance, bicycle and wheelchair safety.
- **Safety requirements** influence slot opening sizes, slip resistance and grate locks. ACO recommends locking grates in place, especially in high load class applications. Monolithic trench drains may be required for maximum grate security.

For more detailed information, see pages 114 to 115.

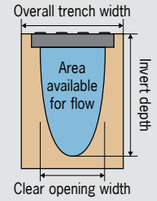


Hydraulics

Hydraulic performance refers to the amount of liquid a drain collects and discharges in a given time period. This determines the size of drain.



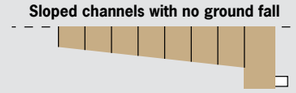
- Channel width and depth determines the area available for flow. The best combination either avoids flooding or unnecessary costs.



- Slope increases velocity providing a more efficient trench drain. Slope is added in 3 ways:

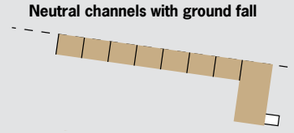
1. Sloping invert channels

Sloped channels with no ground fall



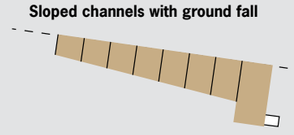
2. Constant depth channels with ground falls

Neutral channels with ground fall



3. A combination of both

Sloped channels with ground fall

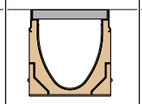
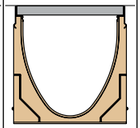
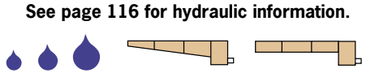
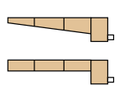
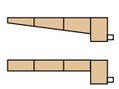
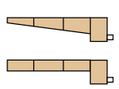


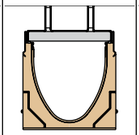
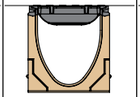
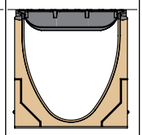
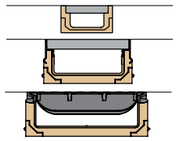
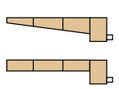
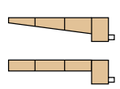
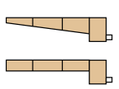
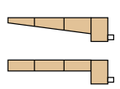
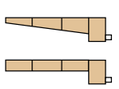
- Outlet size and position effects channel capacity.
- Grate slot opening size and design effects water intake.

For more information, see pages 116 to 121.

ACO DRAIN

Trench drain product table

SELECTION CRITERIA		KLASSIKDRAIN K100	KLASSIKDRAIN K200 & EcoPanel	KLASSIKDRAIN K300
				
		Page 22	Page 32, 58	Page 40
LOADING		Up to Load Class D	Up to Load Class D	Up to Load Class D
Loading refers to any traffic or load applied to trench drains. AS 3996 *Access Covers and Grates* classifies loads from A to G and is often applied to drains. The only internationally recognised standard specifically for trench drains is EN 1433. **See page 104 for load classifications.** 	A	✓	✓	✓
	B	✓	✓	✓
	C	✓	✓	✓
	D	✓	✓	✓
	E	✗	✗	✗
	F	✗	✗	✗
	G	✗	✗	✗
SITE REQUIREMENTS				
The project environment may influence the choice of trench drain and grate material to be used. For chemical applications requiring stainless steel channels, contact ACO for more information on stainless steel options. **See page 110 for site requirements.** 	Channel material	Polymer concrete	Polymer concrete	Polymer concrete
	Edge rail	Galvanised or stainless steel	Galvanised or stainless steel	Galvanised or stainless steel
	Grates *Ductile iron* *Galvanised steel* *Stainless steel* *Plastic*	 ✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✗	 ✓ ✓ ✓ ✗
USER REQUIREMENTS				
Specific project requirements will influence grate and channel selection. Government legislation, pedestrian safety, wheelchair and bicycle compliance are some of the issues to consider. **See page 114 for user requirements.** 	Lockings	DrainLok QuickLok	DrainLok QuickLok	DrainLok QuickLok
	Aesthetic options			
	Heel Safety			
HYDRAULICS				
The width, depth and slope of a trench drain will determine the amount of liquid a trench can collect and discharge in a given period of time. ACO's Technical Services Department has special computer software to ensure the correct drain size is specified for the project. **See page 116 for hydraulic information.** 	Channel width	100mm	200mm	300mm
	Slope			

KLASSIKDRAIN MiniKlassik	KLASSIKDRAIN Brickslot 100	KLASSIKDRAIN Brickslot 200	POWERDRAIN S100K	POWERDRAIN S200K	POWERDRAIN S300K	SLABDRAIN HK	SLABDRAIN HSK
							
Page 48	Page 52	Page 52	Page 66	Page 74	Page 82	Page 94	Page 94
Up to Load Class D	Up to 8 Tonne Wheel Load	Up to 8 Tonne Wheel Load	Up to Load Class G	Up to Load Class G	Up to Load Class G	Up to Load Class D	Up to Load Class G
✓	Not applicable	Not applicable	✓	✓	✓	✓	✓
✓	Not applicable	Not applicable	✓	✓	✓	✓	✓
✓	Not applicable	Not applicable	✓	✓	✓	✓	✓
✓	Not applicable	Not applicable	✓	✓	✓	✓	✓
✗	Not applicable	Not applicable	✓	✓	✓	✗	✓
✗	Not applicable	Not applicable	✓	✓	✓	✗	✓
✗	Not applicable	Not applicable	✓	✓	✓	✗	✓
Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete
Galvanised or stainless steel	Galvanised or stainless steel	Galvanised or stainless steel	Ductile iron	Ductile iron	Ductile iron	Galvanised or stainless steel	Ductile iron
✓ ✗ ✓ ✗	✗ ✓ ✓ ✗	✗ ✓ ✓ ✗	✓ ✗ ✗ ✗	✓ ✗ ✗ ✗	✓ ✗ ✗ ✗	✓ ✓ ✓ ✓	✓ ✗ ✗ ✗
DrainLok	Not applicable	Not applicable	PowerLok	PowerLok	PowerLok	DrainLok QuickLok	PowerLok
			✗	✗	✗		✗
50mm	100mm	200mm	100mm	200mm	300mm	100mm 200mm 300mm	100mm 200mm 300mm
							

www.acodrain.com.au

Choosing grates for trench drains

A grate's primary function is to ensure all the surface runoff on a pavement enters the drainage system efficiently. Grates also need to be strong enough to withstand traffic without breaking.

Design criteria for grates

- Liquid intake
- Material durability
- Loading
- Locking
- Slot style and aesthetics
- Legal and user requirements for:
  – Slip resistance
  – Wheelchairs and walking canes
  – Bicycle safety
  – Heel protection

In recent years, the visual design of grates and drainage systems has become more important.

ACO has an extensive range of grates with a variety of slot sizes, patterns and construction materials.

ACO's **Heelsafe®** *Anti-Slip* grates is a dedicated range specifically designed for pavements where a balance between pedestrian safety and surface liquid collection is required.

For more information visit:
www.heelsafe.com.au

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.
- 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.

Grates without inlets

EcoPanel linear permeable paver

EcoPanel is a stormwater trench drain cover consisting of a permeable UV stable resin-bonded aggregate infill available in a range of colours.

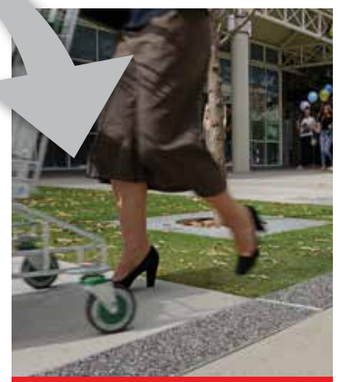
The unique construction material provides a durable load bearing surface. It is enclosed in an engineered frame, enabling water to infiltrate into the channel.

For more detailed information, see pages 58 to 61.

Visual considerations

Contextual – *grates that help to tell a story*

Contrast – *grates contrast with the surrounding surface*



Design – *grates are an integral part of the pavement design*

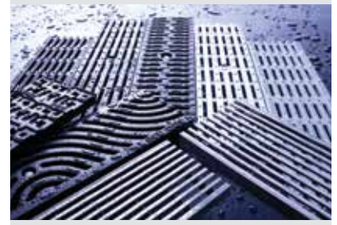
Aesthetics – *grates are used as a design element in the pavement*

Discreet – *drainage system has a minimal impact on the pavement*

ACO has an online tool, **'Visualizer'** that enables designers to visualise a selection of ACO grates in a variety of pavement finishes. See page 115 for more information.

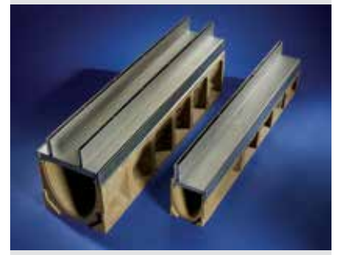
Grates with inlets

Standard grates



ACO Drain provides a wide selection of standard grates for all sizes and types of channels. These grates provide the most economic option and encompass popular designs and materials.

Slotted grates



When a discreet grate is required for a pavement design, a continuous slotted inlet is available in stainless steel or galvanised steel and in a single or twinslot option. For more information, see pages 52 to 57.

Freestyle custom grates

ACO offers a semi-custom design option that enables the designer to incorporate contextual visual elements in the top surface of an iron grate to complement the overall pavement design. See the following page for more information.

Freestyle grates

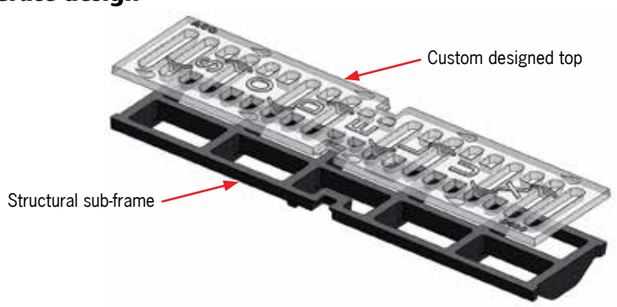
Architectural features such as entrances, promenades, courtyards and landscaped areas, whether public or private, can all have their appearance significantly enhanced through the creative use of ACO Freestyle grates.

Flexible production tools at ACO's foundries make it possible to create unique custom designed grates.

The two-part production tool consists of a standard lower part to provide the grate's structural support and a customised top part, where the unique design is created.

Contact ACO for more information.

Grate design



Features

- Load Class D – AS 3996.
- Manufactured from ductile iron.
- ACO DrainLok locking system.
- Available for 100mm, 200mm and 300mm wide KlassikDrain and SlabDrain system.

Example grate designs